GROUNDWORK plus

White Rock Quarry

MINE OPERATIONS PLAN REVIEW

Prepared for:
Hanson Construction Materials Pty Ltd

Date:
31 March 2023

File Ref:
1901.600.001v1

Document Control

Project / Report Details

Document Title:	White Rock Quarry Mine Operations Plan Review
Principal Author:	Nicole Manning / Matthew Jones
Client:	Hanson Construction Materials Pty Ltd
Ref. No.	1901.600.001v1

Document Status

Issue	*Description*	*Date*	*Author*	*Reviewer*
V0	White Rock Quarry Mine Operations Plan Review	December 2020	Nicole Manning / Matthew Jones	James Rowe
V1	MOP Review amendments to address the Request for Alteration (RFA)	31 March 2023	Matthew Jones / Maxim Dupree	James Rowe

Distribution Record

Recipient	*Delivery Method*
Department for Energy and Mining	1 x Electronic
Hanson Construction Materials Pty Ltd	1 x Electronic

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Declaration of Accuracy

I, **Damon Case of Hanson Construction Materials Pty Ltd** (the applicant), have taken reasonable steps to review the information contained within this document to ensure its accuracy.

Name: Damon Case
Position: Development Manager
Dated: 31 March 2023

Acknowledgement of Country

We acknowledge Kaurna as the Traditional Owners of the land of which White Rock Quarry resides and we pay our respects to their Elders past, present and emerging. We respect their ongoing spiritual relationship with Country and acknowledge that their cultural and heritage beliefs are still as important to those living today.

We also acknowledge the support and information provided by the Traditional Owners through consultation and field work undertaken during the development of this document which has been incorporated into the planning, design and review of the future operations of the quarry. Hanson Construction Materials Pty Ltd (Hanson) are committed to ensuring that this commitment is further supported through the implementation of Hanson's Innovate Reconciliation Action Plan as part of Hanson's ongoing commitment to reconciliation.

Executive Summary

White Rock Quarry is a hard rock aggregate quarry owned and operated by Hanson Construction Materials Pty Ltd (Hanson), located on Hornsells Gully Road, Hornsell Gully, South Australia (the Site). The Site has operated since at least 1946 providing local employment and supplying essential construction materials into the Adelaide metropolitan and surrounding areas. These materials support all forms of development from small scale residential and community projects through to large scale commercial, residential, industrial, and major state significant infrastructure projects. White Rock Quarry is noted as a Strategic Resource Area (SRA) by the South Australian Government.

Hanson is undertaking a Mine Operations Plan (MOP) Review pursuant to Section 73G (13) of the *Mining Act 1971*. This document is an update to a submission made by Hanson to the Department for Energy and Mining (DEM) in December 2020. The updated MOP Review considers amendments requested by DEM in July 2021 and stakeholder feedback provided in both the lead up to the December submission and received through ongoing engagement up to the point of this submission.

In submitting this MOP Review document, Hanson acknowledge the communities' concerns regarding the original five (5) stage Development Plan presented during stakeholder consultation sessions held in October 2020, specifically the extent of Stages four (4) and five (5). Amendments were made prior to submission in December 2020 to reduce the proposed quarry footprint, however these were not presented clearly and gaps remained within the information presented. This MOP Review document includes significant amendments and additional detail to the original proposal as a direct response to the feedback Hanson have received.

Amendments made to the MOP Review include a four (4) Staged Development Plan comprising of Stage 1, Stage 2, Stage 3 & Stage 3A. Stages 1-3 remain in line with the Development Plans submitted in December 2020 with some amendments following the outcomes of consultation and further groundwater assessments. The footprint of Stage 3A has been reduced from what was proposed in December 2020 as a result of community views and those expressed by the Kaurna people to protect the geological feature along the northern boundary of Hanson's landholding and within Private Mine 188 known as the Bachelor Pad. While the Heritage Feature 'Pizey's Knob' has always remained undisturbed and outside the Development Plans, further geotechnical investigations and management controls relating to blasting have been included in the updated MOP Review to ensure protection of both Pizey's Knob and the Bachelor Pad. Updated visual modelling with an additional viewpoint has also been produced to accompany the amended Development Plans.

Total new disturbance on Site across all stages has been limited to 17.5 hectares (ha). This is in addition to the current 42.58 ha disturbance footprint within the 136.87 ha total landholding covered by Private Mine 188. A revegetation plan has been prepared with a high-level Post Mining Land Use Plan (PMLUP) for the quarry. Due to the long-term nature of the development and likely evolving view of the community, government, and Hanson over the life of the quarry, this PMLUP provides a baseline and will be further developed with future MOP Reviews undertaken for the Site.

For the Site to transition into the final Stage (Stage 3A), the 275 kilo Vault (kV) ElectraNet transmission line that intercepts the site will require relocation. A decision point has been nominated during Stage 2 to determine whether Stage 3A will proceed. The decision point is defined as 50% completion of Stage 2. Should it be determined that Stage 3A will not proceed a revised PMLUP and supporting rehabilitation strategy will be developed.

Environmental emission modelling (noise, dust, light spill etc.) has been completed on a worst-case scenario of 500 kilo tonne (kt) production per annum, however the site forecasts the yearly average to be in line with the historical production of approximately 300 kt per annum. The volume assessments for environmental modelling have been lowered from the worst case 1 million tonne (MT) used in the original submission, noting that the 1 MT worst case volume was not realistic given historical volumes and caused confusion for some in interpreting the MOP Review. The Site has recently transitioned away from the aged, fixed crushing and screening plant to conducting all crushing and screening activities within the pit. This has provided addition buffer distance and/or shielding for these activities from sensitive receptors to the Site. All environmental modelling and assessments completed confirm that Hanson can achieve compliance with the relevant regulatory requirements in implementing the MOP.

At current rate of extraction and market demand, the updated Development Plans within the MOP Review see an estimated further 70-year life for the quarry (a reduction from the original 120-year proposal). This will ensure that White Rock Quarry, will continue to support the building of communities and development within the Adelaide Metropolitan and surrounding areas both today and for future generations.

1. Introduction

1.1 White Rock Quarry

Hanson own and operate White Rock Quarry, located on Horsnells Gully Road, Horsnell Gully, South Australia (the Site). The Site entails the PM 188 which currently operates under the approved MOP dated August 2004.

Hanson is undertaking a MOP Review pursuant to Section 73G (13) of the Act in accordance with Regulation 82 of the *Mining Regulations 2011.* In December 2020 Hanson submitted a MOP Review to the DEM, who in July 2021 subsequently issued Hanson with a Request for Alterations seeking further work and amendments to be made to the MOP Review.

This document looks to address the amendments requested by DEM and has given consideration to stakeholder feedback received both prior to the December 2020 submission, and in the time since to the point of this resubmission. Stakeholder views considered include those of Government Agencies DEM, the Environment Protection Authority (EPA), the Department of Environment and Water (DEW), Traditional Owners the Kaurna People, the most proximate residents of White Rock Quarry and other interested parties.

Key amendments to the December 2020 submission include removal of reference to previously considered Stages four (4) and five (5) of the quarry development and updated visual, noise and air quality modelling to reflect this. Amendments to Stage 3A have also been incorporated to retain a geological feature known locally as the Bachelor Pad, undertaking geotechnical assessment of the Bachelor Pad and Heritage Place Pizey's Knob to inform management actions to ensure the quarry does not impact on these features and amendments to Stormwater Management Plan (SMP) including new and pending actions from Hanson's Environmental Improvement Plan (EIP). Further amendments made are discussed throughout the MOP Review document.

1.1.1 Background

White Rock Quarry has been in operation since at least 1946 and has supplied competent construction materials to the greater Adelaide area over the past 70 years. The Ferraro family operated the quarry in its early years and the landholding was proclaimed as a PM on 4 October 1973. The Pioneer Group of Companies procured the land and PM in approximately 1991. Hanson PLC acquired Pioneer, including White Rock Quarry in 2000, with Hanson and all its Australian operations including White Rock Quarry later being acquired by the Heidelberg Cement Group in 2007 – with Heidelberg Cement's Australian business continuing to trade as Hanson. Operations at the quarry pre date the introduction of the *Mining Act 1971* (the Act).

White Rock Quarry has been highlighted by the South Australian State Government as a SRA. An SRA is an area within the greater Adelaide region, or near a regional centre that is of key economic value to South Australia due to the quantity or quality of construction materials or mineral resources that are extracted or contained within that area.

White Rock Quarry supplies essential construction materials used for concrete aggregates, asphalt and road sealing applications, road base and other hard rock aggregate applications utilised in all forms of development across the Adelaide metropolitan and surrounding areas. These developments range from small residential projects in communities local to White Rock Quarry, to large Commercial and Industrial developments and State Significant Infrastructure projects.

Logistics is the key variable in the cost of bringing construction materials to market. The proximity of SRA's such as White Rock Quarry, Hanson's other hard rock quarry assets in Kanmantoo and Curramulka, and local competitors' operations to the end user are critical to ensuring an ongoing supply of affordable construction materials to support development at a community level and growth across of the State.

Drawing 1 – Site Location provides an understanding of the locality of the Site in relation to Adelaide. **Drawing 2 – Site Layout Plan** provides a more detailed image of the current disturbance area and locations of Site relevant items.

Within the drawings for the Site, elevation and survey data is provided in GDA94 under UTM Zone 54. The Reduced Level (RL) references throughout this document are to metres Australian Height Datum (mAHD), the vertical height or elevation above Mean Sea Level which forms the National Standard benchmark to which all height measurements are referred.

1.1.2 Mine Operations Plan Review

The MOP Review includes an assessment of compliance to objectives in the current MOP (2004) when measured against the criteria, to assess whether the objectives and criteria are supportive of the current legislative requirements. An assessment has been carried out to determine whether the current MOP objectives and criteria can be achieved with the development plan presented, refer **Attachment 1 – Objectives and Criteria GAP Analysis**.

The MOP Review is based on geological modelling using Petrographic Analysis and a targeted diamond drilling exploration program that provides a high level of confidence in a quality long term resource of circa 25 MT that can continue to supply the Adelaide Metropolitan and surrounding market for many years to come. Refer **Attachment 2 – Petrographic Analysis**. The Quarry Development and Rehabilitation Plan (QDRP) presents a Staged approach to developing and rehabilitatiing the Site.

As noted throughout this report, there is an undeveloped road reserve that traverses through the Site which was a continuation of Horsnells Gully Road. A formal road closure process is being undertaken with the Adelaide Hills Council. If as a result of such a closure process, Hanson acquire ownership of the road reserve separate tenure will be applied for under the requirements of the *Mining Act 1971*.

Hanson have engaged with stakeholders over the past 36 months including regulatory authorities, community interest groups, individual community members, Local Government bodies MPs and others. As part of the ongoing engagement process, Hanson are committed to making the MOP Review available to the public and will continue to engage with stakeholders throughout the future operations of the Site.

Environmental modelling aspects of this MOP Review consider the staged approach to quarry development and take a conservative approach based on a maximum throughput of 500 kt per annum to account for an absolute *worst-case* scenario. For reference, historical demand for products from the Site has averaged approximately 300 kt per annum over the past 10 years. The future demand for products from the Site is predicted to be in line with the 10 year average demand of 300 kt per annum. All modelling for this report has confirmed that with mitigation strategies adhered to, that the Site will be compliant with the *Mining Act 1971* and with relevant environmental criteria administered and regulated under the *Environment Protection Act 1993.*

The disturbance / operational area open at any one point in time will be managed by a progressive rehabilitation strategy outlined within the MOP Review. Currently there is 42.58 ha of disturbance / operational area established within the Site. The incorporation of progressive rehabilitation within the Site for future operations has been designed to manage the maximum unrehabilitated area of disturbance at the completion of a stage to be 48.90 ha which would occur at the completion of Stage 1.

1.2 Site Overview

An overview of the PM details are summarised in **Table 1 – PM Detail Summary**.

Table 1 – PM Detail Summary

PM Number	**PM 188**
PM Holder / Operator	Hanson Construction Materials Pty Ltd
Registration Grant Date	04/10/1973
Expiry Date	Nil
Commodities	Quartzite
Legal Area Hectares (ha)	136.87
Commodity Categories	Construction Materials

(Source: SARIG,2020)

1.3 Site Contact

Table 2 – Site Contact Details summarises the Site contact details.

Table 2 – Site Contact Details

Contact Name / Position	Simon Kitson, Quarry Manager
Phone Number	(08) 8431 4866
Postal Address	98 Horsnells Gully Road, Horsnell Gully, South Australia 5141

2. Description of the Environment

2.1 Regulatory Context

The White Rock Quarry Site consists of PM 188 covering a total area of 136.87 ha. The Site is located off Horsnells Gully Road in Horsnell Gully, approximately 10 kilometres (km) east of Adelaide.

In accordance with the provisions of the *Mining Act 1971* and the *Mining Regulations 2011*, once a MOP has been approved by the Director, the document carries forward being able to be amended, via a process of 'review' under sub-sections 73G (13) to (17).

As the Site has been operated continuously with an 'Environmental Authorisation' for the undertaking of an Extractive Industry, prior to the commencement of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), under Section 43A of the EPBC Act it is exempt the abovementioned legislation.

Under the provisions of the *Native Vegetation Regulations 2017*, pursuant to section 27(1)(b) of the *Native Vegetation Act 1991,* clearing of native vegetation is exempt on the PM as the activities were authorised under the Act and have not been discontinued for more than 12 months at any time after 21 November 1984.

2.2 Land Use

Mapped land uses are shown in **Drawing 3 – Land Use Map**.

The quarry was first established in 1946 with the PM proclaimed in 1973 and has been used for quarrying purposes since this time. In addition to construction materials, the Site produces concrete from the batching plant located onsite. The location of the existing operational areas and concrete plant is shown in **Drawing 2 – Site Layout Plan**.

The Site has been highlighted by the State Government as a SRA due to its location within the greater Adelaide region, providing resources of key economic value to South Australia due to the quantity or quality of construction materials that are extracted from the Site.

The Site lies within the Adelaide Hills Council and the City of Burnside local government areas. As shown in **Drawing 2 – Site Layout Plan** an undeveloped road reserve traverses the Site in a west to east direction. The reserve area is vested in Council and is gated at the Site entrance with only Quarry related traffic permitted beyond the Site entrance point. There is no formed road over the road reserve area and public access has not been available to this area since the quarry commenced in the 1940s.

Since this MOP Review document was first lodged with DEM in 2020, the *Development Act 1993* has been replaced by the *Planning, Development and Infrastructure Act 2016*. Both of Acts are expressed not to apply to the area of a PM (*Development Act 1993* section 76(2) and *Planning, Development and Infrastructure Act 2016* section 161(4)). Notwithstanding their inapplicability, the objectives relevant to the Hills Face Zone within which the quarry is located, have been considered in the preparation of the MOP Review.

Adjoining PM 188 to the south, the Minister for Environment and Conversation has leased an area (Section 1185) to Hanson for the purposes of including using the freshwater dam and for stock piling aggregates. Hanson have leased a portion of their landholding (outside of PM188 on comprised of Lot 100) situated between the Horsnell Gully Conservation Park and the Giles Conservation Park to the Minister for Environment and Conservation for the purposes of the Heysen and Yurrebilla trail.

2.3 Proximity to Infrastructure and Housing

Buildings and structures in proximity to the Site are identified in **Drawing 4 – Proximity to Infrastructure and Housing**. The main populated dwelling areas near the Site are within the areas of Horsnell Gully (west), Skye (West), Teringie (north) and Norton Summit (north east).

Residential dwellings are generally situated on large rural allotments to the north, east and west of the Site. In addition, denser rural areas exist in the suburb of Skye, to the west of the Site. No residential dwellings exist within close proximity to the Site in a southerly direction.

The Site is located in the Mount Lofty Ranges within a high bushfire risk area of which the Bushfire Danger Period for the Mount Lofty Ranges commences on 1 December until 30 April annually. The Country Fire Service (CFS) can declare a Total Fire Ban at any time requiring additional fire restrictions and measures to be applied within the operations of the Site. Hanson have prepared a Bushfire Management Plan for the Site in consultation with the CFS which includes management measures for activities that may impact on or influence the risk of bushfire occurrence and / or management within the Site as outlined within **Attachment 3 – Bushfire Management Plan**.

The Site contains a 11 (kV) SA Power Networks overhead transmission that runs to a transformer located adjacent to Sediment Basin 1 (SB1) which provides power to the concrete plant and pugmill. A 275 kV overhead transmission line traverses the western portion of the Site in a north to south direction with a second 275 kV transmission line also situated approximately 300 metres (m) east of the PM. Both transmission lines are owned by electrical transmission company ElectraNet. Separation distances of the 275 kV transmission line located within the Site up until the cessation of Stage 3 from the closest point of the ElectraNet infrastructure are outlined within **Diagram 1 – Separation Distances to Power Infrastructure**. Hanson are in discussion with ElectraNet regarding feasibility investigations into potential future relocation of the transmission line. The scope of the MOP review considers the establishment of the full quarry development up to and including Stage 3A as there is a reasonable prospect that the transmission lines could be relocated, however, the relocation of the transmission lines will be subject to a separate approvals process outside of the *Mining Act 1971*.

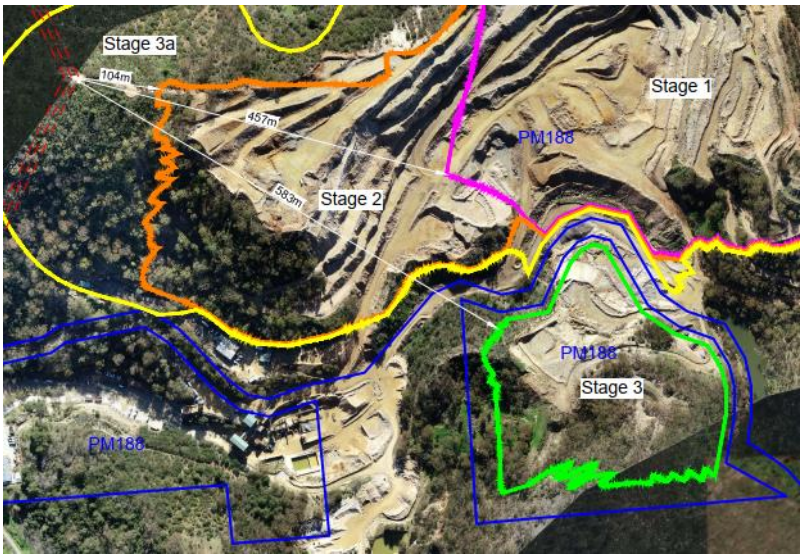

Diagram 1 – Separation Distances to Power Infrastructure

2.4 Amenity

2.4.1 Visual Modelling

The Site and surrounding land is characterised by vegetated, steep slopes that are dissected by watercourses. The vegetated and steeply sloping Horsnell Gully and Giles Conservation Parks are situated to the south of the Site. In addition, Hanson own a large land parcel comprised of lot 100 between the two (2) Conservation Parks which is outside of the PM area. Currently Hanson leases a portion of this land to the Minister for Environment and Conservation.

To assess the potential for visual impacts that may result from the future quarry development, a detailed visual assessment was undertaken on 17 August 2020 with an additional photo point established on Coach Road on 6 September 2022. Five (5) representative viewpoint locations were selected for visual modelling, as shown on **Drawing 5 – Visual Assessment**. The proposed QDRP (Stages 1 through to Stage 3A) were overlaid on the current views of the Site. **Attachment 4 – Visual Assessment Photomontage** shows the extent of the quarry development that is expected to be visible during each Stage of quarry development, and the current view as assessed on 21 December 2022.

2.4.1.1 Photo Location 1 (Reserve on Corner of Edward Street and St Bernard Road, Magill)

Photo Location 1 is situated approximately 2.4 km to the north west of the PM, in the suburb of Magill. This location was selected after a visual inspection of the wider area to locate a worst-case and representative photo location of the metropolitan suburbs located north west of the Site.

Currently, the local topography and vegetative buffers on the north west side of the Site shield views of the operational areas within the Site from this location and surrounds. Some areas of cleared land can be seen on the hills from this location however, it is noted that the cleared areas observed are located outside of the land owned by Hanson and do not fall within the PM.

The extent of the view from Photo Location 1 from Stage 1 through to Stage 3A is presented in **Attachment 4 – Visual Assessment Photomontage**. The photomontages indicate that there are no present or future views of the quarry from this location. Due to the shielding of the Site from natural topography and vegetated land between this location and the PM, there are not likely to be any significant views to receptors within this area throughout the future quarry development.

2.4.1.2 Photo Location 2 (Roadside adjacent 64 Woodland Way, Teringie)

Photo Location 2 is situated approximately 700 m from the northern boundary of the PM, on Woodland Way. The location sits at approximately 350 mAHD and was selected as it has a clear line of sight, free from roadside vegetation, towards the PM while representing the sensitive receptors in the area. The local topography and vegetative buffers on the north and north west side of the existing pit shield views of the operational areas from this location and surrounds.

The quarry development has been designed to utilise the topographic contours within the PM to mitigate potential views of operational areas within the Site from this location. The extent of the view from Photo Location 2 from Stage 1 to Stage 3A is presented in **Attachment 4 – Visual Assessment Photomontage**. From this viewpoint the area to the south east of the PM is noticeable, for this reason, this area of the PM (albeit hosting valuable resources), has been removed from disturbance within the QDRP.

In Stage3A, the visual modelling shows that the ElectraNet transmission line that can be observed on the PM is removed to allow for the progression of the pit in a westerly direction.

2.4.1.3 Photo Location 3 (Roadside Adjacent 631 Old Norton Summit Road, Norton Summit)

Photo Location 3 is situated approximately 450 m to the north east from the PM boundary however closer to 900 m from the current disturbance area. As can be seen in **Attachment 4 – Visual Assessment Photomontage**, current views from this location consist of steeply sloping agricultural land in the foreground and views of the vegetated north east portion of the PM. Currently, the upper benches of the western extraction area can be observed from this location.

Importantly, the current views within the foreground will be retained as this section of the PM hosts the heritage item Pizey's Knob and has significance to the residence of the Peregrine Falcon.

Views from this location during Stage 1 of the quarry development remain largely unchanged from the existing view described above as the Stage 1 extraction areas are shielded by local topography.

During Stage 2 and Stage 3 of the quarry development, progressive rehabilitation of the south eastern faces of the pit is undertaken. Views from Photo Location 3 are visually softened as vegetative cover is progressively established on these pit faces and as the landform on the north west of the pit is lowered. Minor portions of the unrehabilitated extraction areas remain visible at this location during these Stages.

In Stage 3A, the extraction area extends in a westerly direction with the pit extent reaching the topographic point of approximately 390 mAHD on the hillside. As presented in **Attachment 4 – Visual Assessment Photomontage**, a portion of the upper extraction area comprised of the upper western benches of the Site can be seen in the distance. The degree and extent of the view may vary from this aspect with visual relief provided from established vegetation within private property and along the road side.

2.4.1.4 Photo Location 4 (Roadside Adjacent 120 Coach Road, Skye)

Photo Location 4 is located on Coach Road, to the south west of the PM. Following inspection of local topography and views from along Coach Road and within the Skye area, this view was selected as the most representative view location of the eastern end of Coach Road due to its direct line of sight to the PM and western portion of the Site based on current and future operational areas.

As seen in **Attachment 4 – Visual Assessment Photomontage**, current views from this location are largely comprised of land within PM 188 and the adjacent conservation parks, to the south of the Site. Views of the existing pit are largely comprised of the north east pit face whilst the natural topography provides shielding to views of the remainder of the extraction area, to the west. As previously mentioned, the location has a clear line of sight into the PM which is due to its elevated topography and the presence of very minimal roadside vegetation.

Stage 1 of quarry development entails the progression of the existing pit in an eastern direction and the commencement of progressive rehabilitation of the lower portions of the pit. Views of the north east pit face are expected to increase during this Stage. Decommissioning and removal of the existing fixed crushing and screening plant has commenced and been replaced with mobile crushing undertaken on the pit floor, adjacent to the Stage 1 extraction area. The location at which the plant will be situated is expected to be shielded by natural topography from Photo Location 4 during Stage 1. A temporary overburden stockpile area will be established within the southern portion of the Site within the Stage 3 footprint and may be viewed from this location. The overburden stockpile will be constructed from the bottom up and stabilised with hydroseeded grasses during construction which will also provide a vegetated cover crop and blend in with the surrounding environment.

Views during Stage 2 and Stage 3 of quarry development are similar from this location. Views of the pit faces along the northern portion of the pit are opened as the pit progresses to the west of the PM and the topography between the pit and Photo Location 4 is lowered. A temporary overburden stockpile area will be established within the southern portion of the Site within the Stage 3 footprint and may be viewed from this location. The overburden stockpile will be constructed from the bottom up and stabilised with hydroseeded grasses during construction which will also provide a vegetated cover crop and blend in with the surrounding environment and use for future rehabilitation activities. Progressive rehabilitation of the upper benches on the eastern faces of the pit also become apparent during Stage 2 and 3.

During Stage 3A, views of the western portion of the pit are further developed. The progressive rehabilitation of the north eastern portion of the pit progresses on all benches up to the middle of the extraction area where the remaining faces will remain as rock benches to support future potential recreational land uses of the Site post quarry closure identified within the PMLUP. The extent of the views of the rock benches will be restricted to only a small portion of the northern faces of the quarry as the western benches will remain shieled from view behind the existing topography.

2.4.1.5 Photo Point 5 (Private Property at 84 Coach Road, Skye)

Photo Location 5 is located on Coach Road, to the south west of the PM. Following inspection of local topography and views from along Coach Road and within the Skye area, this view was selected as a representative view of Coach Road where the views transition from those that are experienced from Photo Location 4 due to shielding of the Site from the natural topography within the Site.

As seen in **Attachment 4 – Visual Assessment Photomontage**, current views from this location are largely comprised of undeveloped land within PM 188 and some aspects of the conservation parks, to the south of the Site. The existing pit is shielded from view from this location due to the natural topography within the western portion of the Site.

Stage 1 of quarry development entails the progression of the existing pit in an eastern direction and the establishment of a temporary overburden mound within the southern portion of the Site within the Stage 3 footprint. The extent of view of the overburden stockpile is restricted to the western batter of the overburden stockpile which faces towards the view point. The height of the overburden mound will be 400 mAHD and does not exceed the height of the surrounding topography. The overburden stockpile will be constructed from the bottom up and stabilised with hydroseeded grasses during construction which will also provide a vegetated cover crop and blend in with the surrounding environment.

Views during Stage 2 and Stage 3 of quarry development are similar from this location. Views of the pit faces along the eastern and southern portion of the pit are opened as the pit progresses. A temporary overburden stockpile on the pit floor is to be established for the use of overburden in future rehabilitation activities. Progressive rehabilitation of the upper benches on the eastern faces of the pit also become apparent during Stage 2.

During Stage 3A the progressive rehabilitation of the north eastern portion of the pit progresses on all benches up to the middle of the extraction area where the remaining faces will remain as rock benches to support future recreational land uses of the Site post quarry closure as identified within the PMLUP. Views of the rehabilitation and rock benches within the final landform are restricted to a small portion of the eastern rehabilitation areas and the western and northern rock benches are shielded by the natural topography within the western portion of the Site.

2.4.2 Light Spill Assessment

A light spill assessment for the Site was undertaken in December 2020, refer **Attachment 5 – Light Spill Assessment**. Measurements were undertaken on 4 December 2020 between 3.00 am and 5.00 am with all regularly lit luminaries active and functioning during the measurements. Luminaires at the Site are comprised of LED floodlights and internally lit buildings.

Light spill measurements were compared to the *Australian/New Zealand Standard AS/NZS 4282:2019 Control of the Obtrusive Effects of Outdoor Lighting* (AS/NZS 4282) criterion 'Curfewed hours, A2 – Low district brightness' of one (1) Lux. The criterion is normally applied at the boundary of properties containing sensitive receptors. For the purpose of the assessment, measurements were taken at distances much less than the closest separation distance between the luminaries and the Site boundary of which the results are considered to be a conservative measure.

The majority of sensitive receptors do not have direct line of sight to the luminaires. Some of the sensitive receptor locations on the eastern side of Coach Road, Skye, overlook the operations and illuminated areas of the Site were visible from these locations. Measurement locations that are representative of these receptors were selected for the purpose of the assessment.

Findings from the assessment indicate that light spill levels from the onsite lighting are unlikely to exceed the criterion of one (1) Lux, with compliance of this criterion having been achieved at set back distances of much less than the distances between the luminaries and sensitive receptor locations.

2.5 Noise, Dust and Air Quality

2.5.1 Noise

The noise environment varies across the Site and the surrounding land. Currently, the Site operates with several noise mitigation measures in place.

A noise investigation was undertaken on 7 April 2020 including noise measurements at various sensitive receptor locations and updated and remodelled on 7 September 2022. The assessment findings indicate that ambient noise consists of natural sources such as fauna and foliage movement as a result of the wind at majority of the surrounding sensitive receptor locations. Closer to the road network, particularly Old Norton Summit Road which runs parallel to the northern boundary, the noise environment is controlled by traffic. During the inspections, quarry noise was audible at two (2) locations to the south west of the Site. The noise investigation results (including detailed modelling) are presented in Section 2.3 of **Attachment 6 – White Rock Quarry Operational Noise Assessment**.

The purpose of the noise investigations was to obtain actual Site based data for the subsequential use in modelling to assess the predicted noise levels at sensitive receptor locations (residential dwellings) against the relevant noise criteria as detailed in the South Australian EPA *Environment Protection (Noise) Policy (2007)* (Noise EPP) for each Stage of development. The relevant noise criteria are derived in accordance with Part 1, Clause 5 of the Noise EPP and are presented in **Table 3 – Noise Criteria**.

Table 3 – Noise Criteria

Zone in which the source and receptors fall within	Noise Criteria ($L_{EQ, 15min}$, dB(A))	
	Day time hours (7.00 am to 10.00 pm)	Night time hours (10.00 pm to 7.00 am)
Hills Face Zone – Rural Industry, Rural Living	52	45
Conservation Zone – Rural Living	50	43

Each of the sensitive receptor locations for which noise levels were modelled, are discussed, and presented in Section 2.2 of **Attachment 6 – White Rock Quarry Operational Noise Assessment**. As discussed in **Section 2.3 Proximity to Infrastructure and Housing**, sensitive receptors are situated to the north, east and west of the Site. Where sensitive receptors fall within dense suburban areas, locations that represent a group of close sensitive receivers with similar noise exposure are used for the modelling purposes.

The model considers the quarry development and operational conditions during each Stage of development. Stage 2 and Stage 3 of the quarry development are operationally similar, and a single model was used to assess these two (2) Stages.

The noise model is considered to be conservative, representing a worst-case configuration for noise emissions during each Stage of development. Specific source locations and travel paths are selected based upon proximity to residential receptors and where there would be minimal noise shielding effects from the future pit geometry. Vehicle movements are based upon noise emissions that are expected to occur using current technologies, which may improve into the future with the Site achieving a conservative throughput value of 500 kt per annum noting that future throughputs for the Site are predicted to be in line with the 10 year average demand of 300 kt per annum.

The initial modelling results without noise mitigation in place predict compliance at the majority of receptors. Noise levels at receptors situated in Norton Summit and Teringie are compliant with the noise criteria throughout all Stages of quarry development. During Stage 2 and Stage 3 of the quarry development, minor night time exceedances of the noise criteria are predicted at receptors located in the suburb of Skye (one (1) decibel (dB) (A) above the criteria of 45 dB(A)). During Stage 3A of the quarry development, minor night time exceedances of the noise criteria are predicted at receptors located in the suburb of Skye (three (3) dB(A) above the criteria of 45 dB(A)) while minor exceedances are also predicted during day time limits for residents located in the suburb of Skye (Three (3) dB(A) above the criteria of 52 dB(A)) and a residence located in Horsnell Gully (five (5) dB(A) above the criteria of 50 dB(AT).

Mitigation measures were identified and integrated into the model to inform the identification and implementation of appropriate mitigation strategies that are required to achieve compliance. Key mitigation measures include acoustic shielding of the mobile plant during night time operation for Stage 2, Stage 3 and Stage 3A and acoustic treatment and or shielding of the rock drill during daytime operations for Stage 3A. The noise modelling results indicate that compliance with the noise criteria will be achieved both day time and night time periods at the locations described above when mitigation measures are put in place.

2.5.2 Air Quality

To assess the potential for air quality impacts on the nearest sensitive receptors as a result of the ongoing operations, computational air dispersion modelling was undertaken using the CALPUFF modelling system. The model considered the whole of the development within the Site in order to assess the cumulative impacts of the operation for each Stage of the MOP Review, refer **Attachment 7 – Air Quality Assessment**. The modelling is based on a conservative throughput value of 500 kt per annum noting that future throughputs for the Site are predicted to be in line with the 10 year average demand of 300 kt per annum.

The modelling was undertaken to predict deposited dust concentrations, particulate dust concentrations (Total Suspended Particles (TSP), particulate matter with a diameter of 10 micrometres or less (PM_{10}) and particulate matter with a diameter of 2.5 micrometres or less ($PM_{2.5}$)). Emission rates were derived for an average throughput operating day and an assumed worst-case operating day. Results for the worst-case operating day were compared to criteria associated with a 24-hour averaging period only as the worst-case throughput scenario was considered as a peak scenario rather than sustained annually.

The modelling has also undertaken a review of Respirable Crystalline Silica (RCS) predictions by assessing cumulative impacts associated with the proposed quarrying activities by considering background RCS concentrations in addition to a predicted contribution from the Site operations. The background concentrations have been derived from an air quality monitoring program undertaken at the Site during July, August and September 2022. Results of the background concentrations are considered conservative as the Site was in operation during the monitoring program and it was likely that the Site operations provided some contribution to the measured RCS concentrations. Based upon the results of the background RCS monitoring, a background concentration of 0.044 µg/m3 has been adopted as an annual average for inclusion in the air quality modelling. To estimate RCS concentrations attributed from the Site operations, a factoring approach was applied where a conservative 70 percent proportion of the predicted PM_{10} concentrations was assumed to be comprised of RCS. Subsequent to the Air Quality modelling being undertaken, additional RCS monitoring has been undertaken weekly. As of 14 March 2023, the average RCS concentration has been calculated as 0.049 µg/m3 which is aligned with the background concentration adopted within the modelling demonstrating compliance with the RCS criteria. Notwithstanding this, Hanson will continue undertake RCS monitoring to complete a period of 12 months.

Modelling results were assessed against the air quality criteria defined in the EPA *Environment Protection (Air Quality) Policy 2016* (Air Quality EPP) and National Environment Protection (Ambient Air Quality) Measure 2016 (Air NEPM). The air quality goals for $PM_{2.5}$ and PM_{10} are based on 24-hour annual average concentrations and are related to the protection of human health. The EPA has also identified a suggested TSP target limit of 120 µg/m^3 as a 24 hour average to prevent nuisance impacts and an annual average TSP of 90 µg/m^3 was adopted for the assessment (based upon criteria adopted in other Australian States). Reference has also been made to a commonly adopted dust deposition limit of 4 g/m^2/month (e.g. NSW EPA). A summary of the criteria used in the assessment is displayed in **Table 4 – Air Quality Criteria**. Additionally, an RCS air quality goal of three (3) µg/m3 (annual average) for the PM_{10} size fraction of dust in ambient air was assessed in line with the interim RCS criterion currently adopted by the SA EPA.

Table 4 – Air Quality Criteria

Compound	Criteria (µg/m³)	Averaging Period	Source of Criteria	Criteria in relation to
TSP	120	24 hour	SA EPA	Nuisance
	90	Annual	Other Australian states	Nuisance
PM_{10}	50	24 hour	SA Air Quality EPP	Health
	25	Annual	NEPM	Health
$PM_{2.5}$	25	24 hour	SA Air Quality EPP and NEPM	Health
	8	Annual	SA Air Quality EPP and NEPM	Health
Deposited Dust	4 g/m³/month	Monthly	Other Australian states	Nuisance

The assessment considered each of the quarry development Stages to assess potential impacts of operations on nearby sensitive receptors. Sensitive receptors are defined as a fixed location such as a house, building, other premises or open area where health, property or amenity is affected by emissions that increase the concentration of the emitted parameter above background levels in the EPA Ambient Air Quality Assessment (August 2016) guideline.

Operations at the Site are currently approved to occur 24 hours per day, seven (7) days a week however activities specific to crushing and screening are proposed to occur between the hours of 06:00 am and 18:00 pm for the future quarry development Stages. The model has taken the proposed crushing and screening hours of operation into consideration. The model is also noted to take into account a standard watering rate (Level 1, < 2 L/m²) for haul routes and a mobile processing plant with water sprays while also noting that it is essential sealed access roads (Horsnells Gully Road) are cleaned regularly and maintained at all times to ensure silt loading is minimised.

Modelling predictions indicate that the main emission sources for the Site include extraction activity, wind erosion over exposed surfaces / stockpiles, haul routes, a concrete batching plant and processing plant.

The results of the modelling demonstrate compliance with the air quality criteria for all the Stages of the proposed development for the average and worst-case scenarios including the air quality goal of three (3) µg/m³ (annual average) ambient air quality for crystalline silica as a conservative 70 percent composition of PM_{10}. The highest predicted concentrations are associated with Stages 1 and Stage 3A, but in general the concentrations are similar across all Stages. Concentrations differ due to extraction footprints, which also affect haul road locations and worst-case extraction face locations.

Detailed modelling results can be viewed in **Attachment 7 – Air Quality Assessment** Appendix B.

In 2021, Hanson installed a real time PM_{10} dust monitor with a co-located meteorological monitor and HiVol sampler in 2022 in consultation with the EPA and DEM at a location along Coach Road Skye, west of the quarry Site. To inform the operations within the Site, Hanson have developed an EPA approved dust management plan, refer **Attachment 8 – White Rock Quarry Dust Management Plan** inclusive of an Air Quality Trigger and Response Plan (TARP) to assist in the management of dust onsite. The TARP actions are linked to outputs from the real time air quality monitor, refer Section 6.8 TARP of **Attachment 8 – White Rock Quarry Dust Management Plan**. Air quality monitoring for PM_{10} will continue to be undertaken for the Site as part of the Dust Management Plan (DMP) and reviewed on an annual basis.

In addition to the dust management strategies implemented onsite, Hanson have also committed to the construction of a truck wheel wash to assist with minimising drag out from the Site within three (3) years of the MOP Review approval. Details of the proposed truck wheel wash are provided within **Attachment 9 – Conceptual Truck Wheel Wash Details** of which the proposed location is provided within **Drawing 2 – Site Layout Plan**.

2.6 Topography and Landscape

Site topography as assessed by Unmanned Aerial Vehicle (UAV) 17 July 2020 is presented in **Drawing 6 – Topographic Plan**.

The Site is located on the western side of the Adelaide Hills within the Mount Lofty Ranges. A search of Government of South Australia Enviro Data application '*NatureMaps*' (2022) confirms that the Site lies within the Stonyfell Land System characterised by steep very rocky hillslopes scattered between Anstey Hill and Crafers. The system stands above much of the surrounding landscape. The land directly adjacent to and surrounding the Site lies within the Brownhill Land System.

The Mount Lofty Ranges are composed primarily of the Kanmantoo group metasediments and are associated with frequent rock outcrops and deeply incised valleys, locally steepening into gorges. This system is characterised by steep slopes that are strongly dissected by watercourses. More than 85 percent of the surrounding land system is steeper than 30 percent (DEW, 2020) of which the topography within the Site ranges between 215 mAHD and 460 mAHD.

Along the northern aspect of the Site there are two (2) quartzite and meta-sandstone / argillite geological features known locally as Pizey's Knob and the Bachelor Pad located within **Drawing 2 – Site Layout Plan**. The features are located within a Neoproterozoic to Middle Cambrian basin complex (Drexel and Preiss 1995) and is part of the Adelaide Geosyncline (Adelaide Rift Complex). Within the geological features, the Stonyfell Quartzite unconformably overlies the Woolshed Flat Shale of which weathering has resulted in the development of a rock overhang being formed within each of the locations. The Pizey's Knob feature is slightly more cavernous approximately 11 m wide and approximately 17 m in depth, while the Bachelor Pad is slightly more elongated extending approximately 20 m wide and approximately eight (8) m in depth. Both of these geological features remain undisturbed by the QDRP's.

2.7 Climate

Climate data has been sourced from the Mount Lofty Bureau of Meteorology (BoM) (Station No. 023842), located approximately 5.9 km to the south of the Site. Climate throughout the Mount Lofty Ranges consists of a Mediterranean pattern with hot, dry summers and moderately wet winters. The Mount Lofty Ranges are subject to orographic rain, correlating to the topography of the ranges, resulting in higher rainfall averages when compared with the Adelaide Plains. Most rain falls between May and September and the driest month is January. The annual mean rainfall is approximately 989.3 millimetres (mm) (BoM, 2020).

As shown in **Table 5 – Climatic Statistics – Mount Lofty**, mean monthly maximum temperatures are highest in January and February, and are lowest in July.

Table 5 – Climatic Statistics – Mount Lofty

Jan	Feb	March	April	May	June	July	August	Sept	Oct	Nov	Dec	Annual
Mean maximum temperature (Degrees C) for years 1991 to 2023												
22.8	22.5	19.8	16.4	12.3	9.5	8.9	10	12.5	15.3	18	20.4	15.7
Mean minimum temperature (Degrees C) for years 1991 to 2023												
12.5	12.8	11.2	9.9	7.7	5.6	5	5.2	6.1	7.5	9.2	10.8	8.6
Mean rainfall (mm) for years 2004 to 2023												
38.5	36.5	38.2	58	109.6	143.5	147.9	139	114.1	65.6	43	44.8	986.4
Highest rainfall (mm) for years 2004 to 2023												
80	107.4	142.4	128.6	201.8	239.4	233.6	232.4	312.2	174.2	82.8	133.6	1570.4
Lowest rainfall (mm) for years 2004 to 2023												
0	1.6	0.6	8.6	0	22.4	42.8	36	31.4	12	1	0.8	789.4

(Source: BoM Mount Lofty (station No. 023842)

As demonstrated within **Attachment 10 – Long Term Wind Rose Data** from the Mount Lofty BoM (Station No. 023842)**,** the area is dominated by westerly and easterly winds.

2.8 Geohazards

A search of the South Australia Resources Information Gateway (SARIG) database for seismic events returned two (2) results within three (3) km of the Site, the most recent event occurring during the year 1978. The location and details of the events are summarised in **Table 6 – Seismic Event Details**.

Table 6 – Seismic Event Details

Magnitude	Date	Time	Seconds	Longitude	Latitude	Depth (km)	Distance from Site (km)	Direction
1.3	28/03/1978	2326	27	138.736	-34.936	3.6	2.4	south east
3.9	28/05/1914	1321	Data not available	138.7	-34.9	Data not available	2.5	north

(Source: SARIG. 2020)

A search of the SARIG database indicates that Neoproterozoic Ordovician faults exist approximately one (1) km to the west and two (2) km to the east of the Site. No known natural geohazards associated with faults or karst features have been identified at the Site.

The main geology of the Site includes Quartzite. Quartzite is a source of RCS when crushed into finer particles. In November 2020 the Site had an audit conducted from the Regulator (Safework SA) who were satisfied with Hanson's management of RCS exposure within its workforce. Hanson does and will continue to measure workers against the relevant legislative requirements. The current South Australian legislation has a Workplace Exposure Limit (WEL) for RCS for an eight (8) hour time weighted average of 0.05 mg/m3 of which the Site achieves compliance.

RCS has also been considered as part of the environmental air quality modelling undertaken for the Site refer to **Section 2.5.2 Air Quality**. The SA EPA is currently adopting an interim air quality goal of three (3) µg/m^3 ambient air quality for crystalline silica (as PM_{10}) the results of the air quality modelling demonstrate compliance with this air quality goal.

2.9 Hydrology

The Site is located in the centre of the Torrens River Catchment receiving surface waters from the Horsnell Gully and Giles Conservation Parks forming part of the Third Creek Sub-Catchment. There are two (2) water bodies (Giles Dam and Horsnell Gully Dam (SD2)) and a stream order class four (4) watercourse that intercepts the quarry area from east to west. The watercourse (part of the Third Creek Sub-Catchment) is located through the centre of the Site with inflows originating from the Giles Conservation Park and the Horsnell Gully Conservation Park.

Third Creek has three (3) main tributaries in the hills near Norton Summit. It travels toward Magill and Tranmere through sections of concrete channel before entering the suburb of Firle through underground infrastructure into a narrow drainage reserve or concrete channel until it joins the Torrens River in Felixstow. A portion of the Third Creek catchment is directed into a wetland system established by the City of Burnside Council to harvest stormwater as part of a Managed Aquifer Recharge (MAR) scheme to provide irrigation water for local parks and reserves.

The Site consists of 14 distinct surface water catchment areas, three (3) associated with a clean water diversion system and 13 associated with the existing and future quarry development area. Given the level of complexity on the Site with regard to stormwater hydrology, a runoff-routing hydrological model was developed to enable a hydrological assessment of the existing catchments and discharge points or associated silt management at the Site. Details of the defined catchment areas are summarised within Table 4 – Existing Catchment Details of the SMP developed for the Site, refer **Attachment 11 – Stormwater Management Plan**.

The key hydrological movements at the Site are described as follows; clean surface water from the east of the Site flows along a series of natural and modified drainage lines and an underground pipe referred to as the clean water diversion system in a westerly direction through the Site before entering the stream order class four (4) watercourse at the entrance to the Site on Horsnells Gully Road. Overland flow from the quarry area is separated from the clean water flows within the Site and is directed toward a series of sediment basins and low lying depressions outlined within **Drawing 7 – Stormwater Management Plan - 2022**. Surface water flows from the lower portions of the Site located within catchments C4 and C5 flow in a westerly direction via two (2) sediment basins (SB1 and SB2) before converging with the clean water diversion water course via a V-notch weir approximately 215 m west of the Site adjacent to SB2. A portion of the catchment C5 is occupied by the Hanson Magill Concrete Plant of which the surface water catchment of this area is managed by a series of gutters, diversion humps, spoon drains and graded areas creating elevations for drainage systems into different flow paths segregating contaminated surface flows (pH affected) from dirty areas (sediment laden) outlined within **Drawing 8 – Hanson Magill Concrete Water Management Plan**.

Based upon the results of the hydrological assessment of the Site outlined within **Attachment 11 – Stormwater Management Plan**, the existing hydrological conditions of the Site are intended to be retained and built upon with; the proposed upgrade to SB2, refer **Attachment 12 – Sediment Basin 2 - Options Review** and **Attachment 13 – Sediment basin 2 - Use of Flocculants** and the implementation of quarry sumps designed as sediment basins located within new disturbance areas in accordance with the staged development of the Site, outlined within the following drawings:

- **Drawing 9 – Stormwater Management Plan - Stage 1**
- **Drawing 10 – Stormwater Management Plan - Stage 2**
- **Drawing 11 – Stormwater Management Plan - Stage 3**
- **Drawing 12 – Stormwater Management Plan - Stage 3A**

The clean water diversion will continue to be retained enabling surface water from the Horsnell Gully and Giles Conservation Parks to remain separated from the quarry development areas. A single point of offsite discharge will continue to be retained adjacent to SB2. Further details of surface water management are discussed in **Section 3.9 Silt Control and Drainage**.

Turbidity and surface water flow is continuously measured at the V-notch weir as part of the water quality monitoring programme for the Site, refer **Attachment 14** – **Hanson White Rock Quarry Water Quality Monitoring Plan**.

2.10 Groundwater

The Site falls within the Central Adelaide Prescribed Wells Area (CAPWA) in which groundwater extraction requires a licence. Hanson hold a groundwater licence for 12,280 kilo litre (kl) (Licence No. 137780) associated with Well No 6628-06231 for the supply of groundwater to the Site, refer **Drawing 2 – Site Layout Plan**. The Site does not fall within a Prescribed Water Resource Area (PWRA).

In October 2020, a groundwater assessment was undertaken to determine the groundwater elevations at the Site and inform the pit design, refer **Attachment 15 – Groundwater Assessment**. The assessment used data from publicly available data sources and the August 2019 groundwater monitoring and hydraulic test investigation that was conducted at the Site.

In March 2022, a further groundwater assessment was undertaken to provide additional groundwater information to support the MOP Review pit designs, refer **Attachment 16 – Request for Alteration - Groundwater Related Tasks**. The assessment combined previous information collected during groundwater studies in 2020 refer **Attachment 15 – Groundwater Assessment** with additional monitoring data available from fieldwork conducted in September and November 2021 which included the drilling of observation wells, groundwater monitoring and sampling. The assessment findings indicate that the groundwater elevation at the Site ranges between 237 and 323 mAHD based upon the available drillhole data. It is highest at topographic highpoints in the central and eastern portions of the Site while elevations are lower beneath drainage lines to the north and south of the existing pit. To enable the development of a groundwater contour map while noting the terrain difficulties in establishing monitoring bores in some areas of the Site, the assessment incorporated additional data sets into the measured water level data to develop a Site

groundwater contour map. Based on any uncertainties in developing the groundwater contour map, the assessment provided recommended quarry development planning buffer distances to the groundwater contour map to ensure groundwater will not be intersected. The pit floors have been designed in accordance with the recommendations of a buffer distance of at least four (4) m above the groundwater contour map and up to five (5) m in areas of increased uncertainty.

The groundwater assessment conducted in March 2022 recommends ongoing data validation to reduce uncertainties that informed the conservatism presented in the recommended buffer distances while Section 4 detailed a proposed groundwater monitoring program incorporating the additional wells installed during September and November 2021, refer **Attachment 16 – Request for Alteration - Groundwater Related Tasks**. The depth to water table results for October 2022 are shown in **Table 7 – Depth to Water Table Monitoring** and are consistent with those measured during installation of the wells.

Table 7 – Depth to Water Table Monitoring

Drillhole	Unit No	Surface Elevation (mAHD)	Casting stick up (m)	DTW (m bTOC)	
				Installation 2021	October 2022
GW-3	6628-31591	306.31	0.86	16.93	16.27
GW-4	6628-31589	258.92	0	21.19	21.09
GW-6	6628-31590	320.61	0.7	20.85	20.33
Old Bore	Not known	296.93	0	7.00	7.10

As noted in Section 4.6 of **Attachment 15 – Groundwater Assessment**, a search of the BoM Atlas for Groundwater Dependent Ecosystems (GDE) returned no results for aquatic GDE with a high potential for groundwater interaction. The search returned results for potential terrestrial GDE at the Site and immediate surrounds, identified as being eucalyptus woodland with low to moderate potential for groundwater interaction. This vegetation is likely to be dependent upon rainfall and / or surface water as opposed to groundwater. It is noted that onsite observations and data obtained at the onsite observation well indicate that standing water levels are at least six (6) m below creek lines within the quarry.

In September 2022, a groundwater assessment was conducted to investigate the source of water intersected during the construction phase of SB2 and to assess the potential impacts for continued construction, refer to **Attachment 17 – White Rock Quarry – Water Interception During Construction of On-Site Sediment Basin**. The assessment detailed that the sediment basin is located within a buffer zone of a groundwater dependent stream (fractured rock aquifer) as indicated by the Adelaide Plains Prescribed Wells Area Water Allocation Plan (DEW, 2022) released subsequent to the design concept of SB2. The buffer zone suggests the stream that joins the stream order class four (4) watercourse that intercepts the quarry from east to west just upstream of the sediment basin and from the south may have groundwater dependence. The groundwater assessment identified and assessed the key risk events to groundwater and GDE's as a result of the sediment basin construction for both the construction and operational phases of the basin is low to negligible.

2.11 Vegetation, Weeds and Plant Pathogens

2.11.1 Native Vegetation

While the EPBC Act is not applicable, an *Environment Protection Biodiversity Conservation Act 1999* (EPBC) Protected Matters search of the Site and surrounds summarises the Matters of National Environmental Significance (MNES) (flora) that may occur within three (3) km of the Site, refer **Attachment 18 – EPBC Protected Matters Report**.

The EPBC Protected Matters Report identified 10 endangered or vulnerable species and one (1) critically endangered species of native flora which may occur in the area.

A search of the Government of South Australia Enviro Data application '*NatureMaps*' (2022), did not identify any MNES flora within one (1) km of the Site boundary, however there are six (6) species listed as Rare under the *National Parks and Wildlife Act 1972* that have been sighted within proximity to the Site within the last 20 years, refer to **Table 8 – State Rated Flora**.

Table 8 – State Rated Flora

Species	Common Name	State Rating	Date of Last Record
Poa umbricola	Shade Tussock-grass	R	22-Nov-2008
Eucalyptus dalrympleana ssp. dalrympleana	Candlebark Gum	R	08-Feb-2019
Eucalyptus fasciculosa	Pink Gum	R	08-Feb-2019
Eucalyptus viminalis ssp. viminalis	Manna Gum	R	08-Feb-2019
Spyridium spathulatum	Spoon-leaf Spyridium	R	09-Oct-2012
Leionema hillebrandii	Mount Lofty Phebalium	R	09-Sep-2010

A desktop assessment of relevant data and aerial imagery was undertaken for the Site and immediate surrounds indicating that the Site is dominated by one (1) main vegetation community comprised of Eucalyptus forest and (mid) woodland (described as SA Vegetation code SM1001) represented with *Eucalyptus leucoxylon ssp* mid woodland over *Acacia pycnantha*, *Olearia ramulosa* mid shrubs with *Briza maxima*, *Arthropdium strictum +/- Hibertia exutiacies*, *Scenecio pterophorus* mid tussock grasses.

Through historical observations and flora sightings recorded in the Government of South Australia Enviro Data application '*NatureMaps*' (2022), *Eucalyptus oblique / Eucalyptus. baxteri* (Stringybark), *Eucalyptus viminalis / Eucalyptus baxteri* (Manna gum) and *Eucalyptus camaldulensis* (River red gum) have also been observed within the Site and adjacent areas.

A vegetation survey undertaken by Groundwork Plus (SA) Pty Ltd (Groundwork Plus) Native Vegetation Accredited Consultants in October 2022 confirmed the presence of native vegetation within the Site. The condition of the vegetation within the Site is quite variable and evident of historical vegetation clearing and revegetation activities that have been undertaken as part of the historical quarry operations over the past 80 years. A Bushland Native Vegetation Assessment of the native vegetation within Site and specifically the future extraction areas was undertaken to help inform the condition class rating of native vegetation within the Site, refer **Attachment 19 − Native Vegetation Assessment**. Based upon the outcomes of the assessment, the condition of native vegetation within the Site varies from poor within the previously disturbed areas to moderate to good within undisturbed areas of the Site with better quality vegetation recorded in areas adjacent to the conservation parks outlined within **Drawing 13 − Bushland Vegetation Assessment Map**.

A total of five (5) Vegetation Associations were identified across the Site within the future extraction areas:

- **Vegetation Association 1** - *Eucalyptus leucoxylon ssp.* mid woodland over *Acacia pycnantha* and *Olearia ramulosa* mid shrubs over *Hibbertia exutiacies*, *Lomandra sp., +/- Senecio pterophorus* and mid tussock grasses in good condition;
- **Vegetation Association 2** – Previous rehabilitation areas comprised of planted Eucalyptus woodland over *Acacia pycnantha, Dodonaea viscosa* over *Genista monspessulana, Briza maxima,* and *Ornithogalum sp.* in moderately poor condition;
- **Vegetation Association 3** – Previous rehabilitation areas comprised of scattered *Eucalyptus leucoxylon* over introduced herbaceous species in poor condition;
- **Vegetation Association 4** - *Eucalyptus leucoxylon ssp.* open forest over *Acacia pycnantha,* and *Acacia paradoxa* mid shrubs over *Hibbertia exutiacies*, *Briza maxima, Arthropodium strictum, +/- Senecio pterophorus* and mid tussock grasses in good condition; and
- **Vegetation Association 5** - *Eucalyptus leucoxylon +/- Eucalyptus sp. (fasciculosa* or *cosmophylla*) *+/- Allocasuarina verticillata* open woodland over dense *Dodonaea viscosa, Acacia pycnantha* shrubs over *Astroloma humifusum, Pultenaea largiflorens,* and introduced herbaceous species in moderate condition.

Regionally, the vegetation associations are moderately represented, with high levels of fragmentation from horticultural and agricultural activities to the north and north east of the Site and urban development to the west.

The remainder of the vegetation across the Site, mainly falling outside the future extraction area, (refer to **Drawing 13 − Bushland Vegetation Assessment Map**) was classified by Site observations and desktop mapping and comprises of the following:

- *Eucalyptus leucoxylon* woodland – north-facing slope

The vegetation appears to be similar in composition to either Vegetation Association 1 or 4, with *Eucalyptus leucoxylon* being the dominant overstory species. Vegetation appears to be more intact with no evidence of historical disturbance. Being north-facing steep slopes, vegetation appears to be sparser than other aspects, which may mean species diversity and density is naturally lower but weed invasion may also be lower.

- Gully Vegetation

This vegetation is restricted to a narrow gully near a water catchment dam. Vegetation appears to be thick and weed species are in high abundance. Dominant overstory species is likely to be scattered *Eucalyptus camaldulensis* with dense olive infestation in parts.

- *Eucalyptus spp*. woodland – south-facing slope

Vegetation on the south east edge of the PM is likely to be dominated by *Eucalyptus leucoxylon* and, given the aspect is southerly, may be similar to Vegetation Association 1. Weed invasion, particularly woody weeds, is likely to be higher on the lower portions of the slope. The vegetation is connected to the Conservation Park and appears to be more intact and does not contain evidence of historical disturbance.

- Degraded *Eucalyptus spp.* woodland

Vegetation occurring on the northern portion of the property. High weed invasion is likely, particularly woody weeds such as Aleppo Pines, Olives and Ash Trees. Aspect is northerly and is likely to grade from *Eucalyptus leucoxylon +/- Allocasuarina verticillata* over dense mid-shrubs similar to Vegetation Association 5 to higher cover of *Eucalyptus leucoxylon* with sparser mid shrubs similar to Vegetation Association 1 and 4.

There were no Nationally listed flora species observed during the survey or known to occur within the Site.

2.11.2 Weeds and Pathogens

The EPBC Protected Matters search identified 19 species of Weeds of National Significance (WoNS) that may be present within three (3) km of the Site, refer **Attachment 18 – EPBC Protected Matters Report**.

Table 9 – Recorded Declared and Environmental Weeds provides a summary of the declared and environmental weeds that have previously been recorded within the Site and incorporated into the weed control programme for the Site. Annual weed control is undertaken within the Site as outlined within **Attachment 20 − Weed Control Report**.

Table 9 – Recorded Declared and Environmental Weeds

Scientific Name	Common Name
Aira sp.	Hair-grass
Allium triquetrum	Three-cornered Garlic
Arctotheca calendula	Cape Weed
Avena barbata	Wild Oats
Briza maxima	Large Quaking-lily
Bromus sp.	Brome
Cirsium vulgare	Spear Thistle
Cortedaria	Pampas grass
Crataegus monogyna	Hawthorn Tree
Crataegus sinaica	Hawthorn
Cytisus scoparius	Scotch Broom
Dittrichia graveolens	Stinkwort
Echium plantagineum	Salvation Jane
Ehrharta longiflora	Annual Veldt Grass
Galium aparine	Cleavers
Genista monspessulana	Cape Broom
Gomphocarpus cancellatus	Cottonbush
Hypericum perforatum	St John's Wort
Hypochaeris radicata	Rough Cat's Ear
Ixia sp.	Ixia
Lathyrus tingitanus	Tangier Pea
Linum trigynum	French Flax
Medicago sp.	Medic
Oxalis pes-caprae	Soursob
Piptatherum milliaceum	Rice Millet
Pittosporum undulatum	Sweet Pittosporum
Plantago lanceolata var.	Plantain
Prunus sp.	Prunus
Rosa canina	Dog Rose
Rosa rubiginosa	Sweet Briar
Rubus fruticosus	European Blackberry
Rubus ulmifolius	Blackberry
Rumex sp.	Dock
Sonchus oleraceus	Common Sow-thistle
South African orchid	Salvation Jane
Spergula arvensis	Stinkwort
Tropaeolum majus	Nasturtium
Verbascum Thapsus	Blanket Weed
Verbascum virgatum	Twiggy Mullein
Vicia sp.	Vetch
Asparagus asparagoides	Bridal Creeper
Carduus tenuiflorus	Slender Thistle
Centranthus ruber	Red Velarium
Chrysanthemoides monilifera	Boneseed
Cynara cardunculus	Wild Artichoke
Disa bracteata	South African orchid

Foeniculum vulgare	Fennel
Fraxinus angustifolia subsp. Angustifolia	Ash Tree
Lycium ferocissimum	African boxthorn
Olea europaea	Olive
Ornithogalum thyrsoides	Chincherinchee
Pinus halepensis	Aleppo Pine
Rhamnus alaternus	Mediterranean Buckthorn
Scabiosa atropurpurea	Pincushion plant
Senecio pterophorus	South African Daisy
Silybum marianum	Variegated Thistle
Zantedeschia aethiopica	Arum lily

The Site is located within the Mount Lofty Ranges within a high risk phytophthora threat location based upon the high rainfall and presence of native vegetation within the Region. A search of the Government of South Australia Enviro Data application '*NatureMaps*' (2022) confirmed one (1) recorded instance of phytophthora within one (1) km of the Site, situated approximately 700 m to the south east. The record is dated 2007 and falls within the Giles Conservation Park. A number of phytophthora symptoms and one (1) confirmed occurrence area also recorded within the Horsnell Gully Conservation Park to the south, however, there are no known occurrences of phytophthora within the Site. Phytophthora hygiene requirements for the Site are undertaken in accordance with **Attachment 21 − Phytophthora C./Dieback Management Plan**.

2.12 Fauna

2.12.1 Native Fauna

A number of fauna species have historically been recorded within the Site, including *Macropus fuliginosus* (Western Grey Kangaroo), *Phascolarctos cinereus* (Koala), *Pseudocheirus peregrinus* (Ringtail Possum), *Trichosurus vulpecula* (Brushtail Possum), *Antechinus flavipes* (Yellow Footed Marsupial Mouse), *Rattus fuscipes* (Bush Mouse), *peregrinus macropus* (Peregrine Falcon) and unspecified varieties of bat.

Further discussed in **Section 2.14 Heritage (Aboriginal, European, Geological)** is the State listed heritage place, Pizey's Knob, which falls within the northern portion of the PM. This contains cliffs in which a pair of *peregrinus macropus* (Peregrine Falcon) is known to nest and have done so for many years without disturbance from the quarry operations. The earliest record of the species nesting found at the time of the MOP review is provided as **Attachment 22 – Heritage Register Assessment Report Pizey's Knob**, dated 1989. The species are listed as Rare under the South Australian *National Parks and Wildlife Act 1972*. The quarry development does not disturb Pizey's Knob and the cliff face the habitat associated with the Peregrine Falcon. There have not been any disturbances to the Peregrine Falcon habitat based upon the historical quarry operations undertaken to date.

An EPBC Protected Matters Search of the Site and immediate surrounds summarises the MNES (fauna) and other matters protected by the EPBC Act that may occur within three (3) km of the Site. It also identifies identified invasive species that may occur in this area, refer **Attachment 18 – EPBC Protected Matters Report**.

The EPBC Protected Matters Search Report identified the following:

- 14 Listed Threatened Species – 12 Bird Species and two (2) Mammal Species.
- 14 Listed Migratory Species – one (1) Migratory Marine Bird Species, five (5) Migratory Terrestrial Species and eight (8) Migratory Wetlands Species.

A search of Government of South Australia Enviro Data application '*NatureMaps*' (2022) for records of State and Federal listed species at the PM returned results for instances of *Pteropus poliocephalus* (Grey-headed Flying Fox) occurring at the PM, within the last 20 years. The species is classed as Vulnerable under the EPBC Act and typically roosts in large groups, with the only known camp in which the species roosts continuously in Adelaide located in the Adelaide CBD parkland near the Torrens River. The species may occur at the Site as transient visitors only, likely whilst foraging, and are unlikely to be impacted by the ongoing quarry operations.

The search also returned instances of endangered species *Hylacola pyrrhopygia parkeri* (Chestnut-rumped Heathwren) within the Horsnell Gully Conservation Park south of the Site. *Hylacola pyrrhopygia parkeri* (Chestnut-rumped Heathwren) is listed as Endangered under the *National Parks and Wildlife Act 1972 and the* EPBC Act, with the closest known record of this species is approximately 600 m south of the existing extraction area along the eastern perimeter of the Horsnell Gully Conservation Park. Within the Mount Lofty Ranges distribution and population size vary widely of which there are only six (6) to seven (7) fragmented populations recorded (Department of Environment and Heritage (DEH)). The next closest population of this species is recorded approximately 1.5 km north of the Site; however it is isolated from the Site and the Horsnell Gully Conservation Park population due to historical vegetation clearing resulting in fragmented patches of native vegetation occurring within the area. Whilst native vegetation patches have been fragmented from historical vegetation clearing activities, alternative habitat may still occur between the native vegetation patches that could support the species.

Environment and Biodiversity Services Pty Ltd (EBS Ecology) have undertaken a review of the threatened species that are likely to occur within the Site and undertaken a fauna risk assessment to help inform the potential impacts to threatened fauna species, refer **Attachment 23 − Fauna Assessment**.

The fauna risk assessment was undertaken to identify the risk level for each nationally and State listed threatened fauna species, where the risk is considered to be modification of species habitat range and/or potential impacts to future populations. In consideration of the characteristics of the Site and the preferred habitat for the rare and endangered species, the risk assessment identified:

- Three (3) species (Chestnut-rumped Heathwren (Mt Lofty Ranges), Scarlet Robin and Painted Buttonquail) are of medium risk to future potential impacts and the remaining 11 species are of low risk based on species preferred habitat, occurrence records, range and population densities where known.
- Areas of high biodiversity value include patches of Eucalypt woodland across the Project Area. One (1) area in particular, Vegetation Association 5, northwest of the Project Area, consisted of E. leucoxylon, E. fasciculosa and Dodonaea viscosa. Whilst fragmented by adjacent cleared areas for the quarry operations and not directly connected to the Conservation Parks, this vegetation area had low weed presence and was in good health with a dense shrub layer which is favourable to species such as the Chestnut-rumped Heathwren (Mt Lofty Ranges); and
- Areas that have lower habitat value include patches of vegetation that were on the edge of already cleared areas which consisted of more weeds and pockets of Eucalypt Forest that had less shrub density (Vegetation Associations 2 and 3).

The Chestnut-rumped Heathwren (Mt Lofty Ranges), Scarlet Robin and Painted Buttonquail have been identified as a medium risk from future potential impacts based upon the potential preferred habitat availability within the Site. However, historical vegetation fragmentation by adjacent cleared areas for quarry extraction and operational areas within the Site has reduced the connectivity of the preferred habitat located within the north west portion of the Site to the known populations within the Horsnell Gully CP. Additionally, existing quarry operations without vegetation and degraded native vegetation exist between the potential preferred habitat and the nearest known populations. On this basis It is unlikely that future vegetation clearance will lead to the long-term decrease in the size of the current populations, however vegetation clearance may reduce the area of lower quality habitat for the species within the Site. Progressive rehabilitation of the quarry batters is also intended to be undertaken within the Site incorporating local native plant species that are sympathetic to the surrounding environments.

2.12.2 Introduced Fauna

Pest fauna species that are known to occur within the area and may occur within the Site include *Felis catus* (Domestic Cat), *Oryctolagus cuniculus* (European Rabbit), *Rattus rattus* (Black Rat), *Vulpes vulpes* (Red Fox), and *Capra hircus* (Goat).

The EPBC Protected Matters Search Report identified 22 Invasive Fauna Species – 11 Invasive Bird Species and 11 Invasive Mammal Species, as being likely to occur within three (3) km of the PM.

2.13 Topsoil and Subsoil

The Stonyfell Land System report obtained from the Government of South Australia Enviro Data application '*NatureMaps*' (2022) indicates that the main soil features at the Site are shallow profiles over bedrock and grey, sandy surfaces which are gritty and stony, often without the presence of subsoils (DEW, 2020).

Onsite observations confirm that topsoil and subsoil is minimal. Depths vary from five (5) centimetres (cm) on areas of higher topography to 20 cm in valley areas.

In July 2020, ProAg Soil Management (ProAg), undertook an assessment of overburden and other materials at the Site, to inform rehabilitation strategies, refer to **Attachment 24 – Soil Assessment and Analysis**. The assessment was undertaken given the limited volume of topsoil and subsoil that is available for use in rehabilitation onsite, and the abundance of overburden, sand and product material potentially available. The soil assessment was undertaken in two (2) parts, being the assessment of the suitability of overburden, sand and product material for use as media to support revegetation and the assessment of slope stability and suitable stabilisation techniques.

A number of representative samples of material that could potentially be used as planting media in future rehabilitation activities were taken from the Site, representing four (4) categories. A detailed description of findings is provided in **Attachment 24 – Soil Assessment and Analysis**, and a summary of these findings is provided below.

Overburden east
The overburden to the east of the pit has been in place for several years (refer **Drawing 2 – Site Layout Plan** for the location). This material supports vegetation (including trees and shrubs) that has established via natural seeding from surrounding vegetation. This material is deemed to be the most suitable material for use in rehabilitation, to support vegetation, as it is stable, has good cation exchange capacity, it contains some organic matter, and it has a proven ability to support vegetation growth. A profile of 25 cm of material such as the overburden east material is suitable for use in the revegetation of rehabilitated batters.

Overburden west
This material has been removed from the western extent of the pit and stockpiled for later use in rehabilitation. The soil assessment indicates that the material is suitable for use as a base material when constructing batters. It is recommended that the material be improved via the incorporation of gypsum if required for use as an upper soil layer for vegetation growth.

Quarry sand
The quarry sand material is categorised as a loamy sand. It is produced as a by-product of onsite processing. The soil assessment indicates that this material is not suitable for use in the upper profile of revegetation areas, though, it may be blended with the overburden west material. It is recommended that if the material is to be used in a blend of sand and overburden that analysis be undertaken to confirm its suitability for the intended use, prior to its application.

Product material
The product is produced via onsite crushing and screening. The soil assessment indicates that the material is largely comprised of gravel and a fine sand and is not suitable for use in the upper profile of areas to be revegetated unless blended with the overburden west material. It is recommended that if the material is required to be used in the upper soil layer for vegetation growth in a blend of product and overburden that analysis be undertaken to confirm its suitability for the intended use, prior to its application.

Findings from the assessment of slope stability and suitable stabilisation techniques are presented in **Attachment 24 – Soil Assessment and Analysis** and have been used to inform the rehabilitation planning and design for the Site.

In order to support the desired rehabilitation for the Site, the rehabilitation batter profiles of the QDRP's for the Site support a 1V:2H profile as can be noted within **Diagram 2 – Rehabilitated Batter Profile**.

Diagram 2 – Rehabilitated Batter Profile

2.14 Heritage (Aboriginal, European, Geological)

2.14.1 Aboriginal Heritage

Hanson has extensive landholdings across Australia, and many have cultural significance which must be preserved. In 2021 Hanson released its Reconciliation Action Plan (innovate) with commitment to improving Hanson's connection to the land, it's people and their culture.

In March 2018, the Kaurna People were recognised as the Native Title Holders for lands around Adelaide including the Mt Lofty Ranges and Adelaide Plains. The judgement determines Kaurna as primary Traditional Owners of the Adelaide Region, which was explicitly reiterated during the consultation for the MOP review. Native Title rights have been determined for 17 parcels of land within the Native Title Claim area from Lower Light to Myponga, however, Native Title within the Site has been extinguished as the land was held in fee simple prior to 1994.

At the request of the Kaurna People and in accordance with the provisions of the *Aboriginal Heritage Act 1988*, the following attachments referenced within this section are required to be treated as confidential and the requests of the Kaurna People have been acknowledged within the development of the revised QDRP's.

A search of the Central Archive of the Department of Premier and Cabinet Aboriginal Affairs and Reconciliation (DPC-AAR) which includes the Register of Aboriginal Heritage Sites and Objects in October 2020, returned no entries for Aboriginal Sites in relation to the Site, refer **Attachment 25 – Confidential - DPC AAR Search Results**.

To further inform the Aboriginal Heritage Values of the Site, an Aboriginal Cultural Heritage Survey (ACHS) was undertaken by Integrated Heritage Services (IHS) with Kaurna Aboriginal Traditional Owners to provide cultural expertise and services to identify any potential issues, concerns and / or Aboriginal Heritage sites within the future quarry development areas. The survey was designed to achieve detailed recording standards to identify all visible archaeological features and anthropological values within the future quarry development area to inform a risk profile and assist with future management of Aboriginal Cultural heritage sites and values. The survey did not identify any

Aboriginal Cultural Heritage sites or objects within the future quarry development area of which it was noted that there was a high degree of historical disturbance from historical uses of the land such as quarrying and rock climbing. Based upon the landform and the historical disturbance of the Site, the ACHS informed that the future extraction areas contained low risk of discovering Aboriginal Cultural Heritage sites or objects, refer **Attachment 26 – Confidential - Aboriginal Heritage Report PM 188**.

Whilst no Aboriginal Cultural Heritage sites or objects were identified, the survey noted two (2) geological features comprised as rock shelters within the northern portions of the PM that contain Kaurna cultural values as evidenced by the proximity to other similar landforms within the region which contain archaeological deposits. Further detailed investigations including a series of archaeological test pits were undertaken to inspect the soil deposits. Rock art enhancement photographs known as 'decorrelation stretch' were also taken of the rock shelters to inspect for any signs of Aboriginal Cultural Heritage art work that may have been obscured from the historical rock climbing disturbance. No Aboriginal archaeological materials were discovered during the excavations and the archaeological analysis of the rock shelter walls and ceilings did not identify any evidence of Aboriginal rock art, refer **Attachment 27 – Confidential - Archaeological Test Pits Excavations Report**. Notwithstanding the outcomes of the detailed archaeological investigations, the rock shelters and surrounding environment continue to hold intrinsic cultural value to the Kaurna Traditional Owners of which they have specifically requested best efforts to be made for the preservation of the rock shelters. Refer to **Section 4 Results of Consultation** regarding details of the consultation undertaken with Kaurna.

2.14.2 European and Geological Heritage

A search of the Government of South Australia Enviro Data application '*NatureMaps'* (2022) identified 29 State Heritage Items and 15 Local Contributory Heritage Places within three (3) km of the Site, listed in **Attachment 28 – State and Local Heritage Items** and outlined within **Drawing 14 – Heritage and Conservation Areas Map**. Apart from the Heritage Place referred to below, none of these items or places are located within the Site.

"Pizey's Knob" (Heritage Place No. 14120), is located within the northern portion of the Site adjacent the Norton Summit Road boundary. The place is registered as "Natural feature – Wellington Rock or Pizey's Knob". A copy of the SA Heritage Places data base search, the map linked to the data base, and a copy of the map identifying the place on the South Australian Government Location SA map server is provided within **Attachment 47 – SA Heritage Places Database Search and Maps**.

As part of a process undertaken in 1989, the place was recommended for inclusion in the Register as "Pizey's Knob (Wellington Rock) and abutting escarpment" as outlined within **Attachment 22 – Heritage Register Assessment Report Pizey's Knob**. However, the ultimate listing of the place does not include reference to the "escarpment" which includes the Norton Summit Road ridgeline and other land not owned by Hanson. This is reflected in the search and the map outlined within **Attachment 47 – SA Heritage Places Database Search and Maps**. In any event, the MOP Review designs do not encroach on the registered place, or the larger area shown in **Drawing 14 – Heritage and Conservation Areas Map**. Planning and design of the MOP review has ensured that the whole of this area is located outside of the quarry development area ensuring that the Pizey's Knob natural rock feature is retained.

2.15 Proximity to Conservation Areas

A search of the Government of South Australia Enviro Data application '*NatureMaps*' (2022) identified conservation areas located within three (3) km of the Site. A list of these conservation areas and their proximity to the Site is provided in **Table 10 – Surrounding Vegetation Conservation Areas** and outlined within **Drawing 14 – Heritage and Conservation Areas Map**.

Table 10 – Surrounding Vegetation Conservation Areas

Conservation Area Location	Direction from Site	Distance from Site Boundary (km)
Horsnell Gully Conservation Park	South	0
Giles Conservation Park	South	0
Morialta Conservation Park	South	1
Ferguson Conservation Park	West	2.1
Greenhill Recreation Park	South west	2.7
Cleland Conservation Park	South	2.7
Heritage Agreement (80)	South east	1.9
Heritage Agreement (1306)	South east	2
Heritage Agreement (1529)	North east	2.6
Heritage Agreement (62)	North east	2.3
Heritage Agreement (29)	North east	2.9

Note: Heritage Agreements as defined by the Native Vegetation Act 1991 (Source: DEW, 2020)

The Nature Maps search did not return any results for geological monuments within three (3) km of the Site.

2.16 Pre-existing Site Contamination and Previous Disturbance

A search of the EPA Contaminated Site Register on 20 October 2020 confirmed there are no records of contamination within the Site.

The White Rock Quarry has a long history of quarrying activity, with the Ferraro family commencing operations from approximately 1946. To date, approximately 42.58 ha of land is operated on and has an active disturbance area. Future disturbance areas are outlined within **Section 3.9 Silt Control and Drainage** and **Table 14 – Staged Rehabilitation**.

3. Description of the Operation

3.1 Introduction

This section is provided to give a general description of the planned extraction and rehabilitation activities to be undertaken onsite. The rock source will be extracted in a generic open cut quarrying method supported by a Site-specific geotechnical assessment.

Visual modelling and staged rehabilitation have been key inputs into the design of the plans to reduce the potential impacts on the surrounding receptors and hence priority has been given to establishing a terminal boundary as soon as practicable to enable the progressive rehabilitation of the Site.

Due to the limited availability of topsoil and subsoil at the Site for use within rehabilitation activities, ProAg were engaged to undertake an assessment of overburden and other materials at the Site to inform rehabilitation strategies, refer to **Attachment 24 – Soil Assessment and Analysis**. The assessment identified that revegetation and successful rehabilitation will be achieved on batters comprised of quarry overburden.

Staged Extraction Plans and associated QDRP are provided and described throughout **Section 3.4 Mining Operations**. The plans demonstrate how the Site is to be extracted in a staged manner, how overburden volumes will be managed for rehabilitation and how the Site will be progressively rehabilitated to achieve the batters specified within the base case final landform.

Once the rehabilitation batters have been established and stabilised with a cover crop, revegetation planting will occur progressively including a mixture of local provenance understorey and tree species from locally sourced seed. The species mix and composition of the planting is intended to be sympathetic with the surrounding environment which will vary across the landform depending upon the aspect of the revegetation works as outlined within **Attachment 29 − Revegetation Plan** and **Drawing 15 − Conceptual Revegetation Plan**.

The QDRP include a reference table in the bottom left-hand corner of the drawing set providing an estimate of the timeframe to complete the relevant stage. The estimation is based on the anticipated production profile for the Site in addition to the predicted overburden material movements required to achieve the base case final landform.

Technical assessments were completed to inform the development of the Extraction Plans and ensure that the QDRP do not impact upon Pizey's Knob and the Bachelor Pad.

3.2 General Description and Summary

Drawing 1 – Site Location

- Highlighting Site location in relation to the township of Adelaide
- An outline of the main roads within proximity to the Site
- Site Location

Drawing 2 – Site Layout Plan

- Cadastral boundaries
- PM boundaries
- Overview of quarry infrastructure and features including:
    - Site Entrance
    - Horsnells Gully Road
    - Septic
    - Weighbridge
    - Transport Office
    - Concrete Plant
    - Decommissioned Fixed Crushing Plant
    - Maintenance Shed

- Top Offices and Lunchroom
- Above ground fuel tank
- Proposed Truck Wheel Wash
- Concrete Returns & Washout Controlled Area
- Historic Overburden Storage
- Product Stockpiles
- Raw Feed Stockpile
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- SB1
- SB2A
- SB2B
- SD1
- Giles Dam

Drawing 3 – Land Use Map

- Cadastral boundaries
- PM boundaries
- Land uses

Drawing 4 – Proximity to Infrastructure and Housing

- Cadastral boundaries
- PM boundaries
- One (1) km and two (2) km proximity to Site boundary
- Sensitive receptors highlighted
- Infrastructure highlighted (power and water)
- Areas containing sensitive receptors
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)

Drawing 5 – Visual Assessment

- PM boundary
- Cadastral boundaries
- Photo locations
- Direction of viewpoint
- Major roads

Drawing 6 – Topographic Plan

- Cadastral boundaries
- PM boundaries
- Topographic contours (Minor and Major Contours)
- Road Names

Drawing 7 – Stormwater Management Plan - 2022

- Surface water flow direction
- Diversion Bunds
- Underground piped network
- Catchments and Catchment Areas (ha)
- Sediment Basin Locations

Drawing 8 – Hanson Magill Concrete Water Management Plan

- PM boundary
- Cadastral boundary

Drawing 9 – Stormwater Management Plan - Stage 1

- PM boundary
- Cadastral boundary
- Topographical contours
- Surface water flow direction
- Diversion Bunds
- Underground piped network
- Catchments and Catchment Areas (ha)
- Sediment Basin Locations
- Progressive rehabilitation

Drawing 10 – Stormwater Management Plan - Stage 2

- PM boundary
- Cadastral boundary
- Topographical contours
- Surface water flow direction
- Diversion Bunds
- Underground piped network
- Catchments and Catchment Areas (ha)
- Sediment Basin Locations
- Progressive rehabilitation

Drawing 11 – Stormwater Management Plan - Stage 3

- PM boundary
- Cadastral boundary
- Topographical contours
- Surface water flow direction
- Diversion Bunds
- Underground piped network
- Catchments and Catchment Areas (ha)
- Sediment Basin Locations
- Progressive rehabilitation

Drawing 12 – Stormwater Management Plan - Stage 3A

- PM boundary
- Cadastral boundary
- Topographical contours
- Surface water flow direction
- Diversion Bunds
- Underground piped network
- Catchments and Catchment Areas (ha)
- Sediment Basin Locations
- Progressive rehabilitation

Drawing 13 – Bushland Vegetation Assessment Map

- Quarry Development Stage Outlines
- Vegetation survey Photo Points
- Mapped Vegetation Association Zones

Drawing 14 – Heritage and Conservation Areas Map

- PM boundary
- Location of Heritage Places (State and Local)

- Cadastral Boundary
- Conservation Areas
- Native Vegetation Heritage Agreements
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)

Drawing 15 – Conceptual Revegetation Plan

- Cadastral
- Private Mine Boundary
- Conceptual Revegetation Planting Zone

Drawing 16 – Regional Geology

- Private Mine Boundary
- Cadastral Boundary
- Road
- Regional Geology

Drawing 17 – Typical Quarry Rehabilitation Detail

- Existing Ground Surface
- Pit Design Surface
- Rehabilitation Surface
- Rehabilitation Surface Batter
- Rehabilitation Benching
- Rehabilitation Drainage
- Conceptual Final Landform Surface
- Fill Placement Criteria

Drawing 18 – Interim South Wall Stockpile Design

- Existing Ground Surface
- Pit Design Surface
- Overburden Surface
- Overburden Surface Batter
- Overburden Benching
- Overburden Drainage
- Conceptual Final Landform Surface
- Fill Placement Criteria

Drawing 19 – Extraction Plan - Stage 1

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class

Drawing 20 – Extraction Plan Cross Section - Stage 1

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement

- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class
- Existing Ground
- Design Surface
- Groundwater Contour Map

Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Existing Site Disturbance (ha)
- Extraction Area
- Overburden Stockpiles (seeded)
- Topsoil Stockpiles
- Topographical contours
- Concrete Returns & Washout Controlled Area
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone

Drawing 22 – Extraction Plan - Stage 2

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class

Drawing 23 – Extraction Plan Cross Section - Stage 2

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class
- Existing Ground
- Design Surface
- Groundwater Contour Map

Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Existing Site Disturbance (ha)
- Extraction Area
- Progressive Rehabilitation Earthworks and Seeding
- Overburden Stockpiles (seeded)
- Overburden Stockpile Rehabilitation Area
- Topsoil Stockpiles
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone

Drawing 25 – Extraction Plan - Stage 3

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class

Drawing 26 – Extraction Plan Cross Section - Stage 3

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class
- Existing Ground
- Design Surface
- Groundwater Contour Map

Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3

- PM boundary
- Cadastral boundary
- HV Transmission Cables and Easement
- Existing Site Disturbance (ha)
- Extraction Area
- Progressive Rehabilitation Earthworks and Seeding
- Overburden Stockpiles (seeded)
- Overburden Stockpile Rehabilitation Area

- Topsoil Stockpiles
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone

Drawing 28 – Extraction Plan - Stage 3A

- PM boundary
- Cadastral boundary
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class

Drawing 29 – Extraction Plan Cross Section - Stage 3A

- PM boundary
- Cadastral boundary
- Extraction Area
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone
- Vegetation Condition Class
- Existing Ground
- Design Surface
- Groundwater Contour Map

Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)

- PM boundary
- Cadastral boundary
- Existing Site Disturbance (ha)
- Extraction Area
- Progressive Rehabilitation Earthworks and Seeding
- Overburden Stockpiles (seeded)
- Overburden Stockpile Rehabilitation Area
- Topsoil Stockpiles
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone

Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A

- PM boundary
- Cadastral boundary
- Existing Site Disturbance (ha)
- Extraction Area

- Progressive Rehabilitation Earthworks and Seeding
- Overburden Stockpiles (seeded)
- Overburden Stockpile Rehabilitation Area
- Topsoil Stockpiles
- Topographical contours
- Quarry pit design details
- Geological Feature (Bachelor Pad)
- Geological Feature (Pizey's Knob)
- Blast Monitoring Trigger Distances and Exclusion Zone

Drawing 32 – Conceptual Final Landform Plan

- PM boundary
- Cadastral boundary
- Rehabilitated Area
- Grassed Area
- Remaining Faces
- Abandonment Bund

Drawing 33 – Conceptual Final Landform Cross Sections A-A to E-E

- Conceptual Final Landform Surface
- Groundwater Contour Map

3.3 Reserves and Products

3.3.1 Geological Environment

The operations target rocks of the Adelaide Geosyncline and prominent outcropping at the Site includes that of the Saddleworth Formation, Woolshed Flat Shale and Stonyfell quartzite (*SARIG, 2020*), refer **Drawing 16 – Regional Geology**.

Multiple drilling campaigns have taken place at the Site since 1972. This Site is defined by a series of faults crossing the Site and bounding the local geology. A dominant feature of the Site is an anticline fold, striking north east. To the west of the Site, bedding is observed to the overturned and steeply dipping (60 – 80 degrees), with the youngest rock layers in the north east. The most recent resource investigation was undertaken in 2019. Consistent with previous drilling, the 2019 diamond drillhole cores reported siltstone overlying interbedded sandstone and siltstone. This in turn overlay silica rich quartzite before returning to siltstone at depth.

A largely gradational weathering profile was observed, with the greatest extent of weathering observed toward the surface. The upper siltstones were highly to moderately weathered with the meters of interbedded siltstone and sandstone showing slight to moderate weathering throughout the core. These layers were also noted to have medium to hard strength.

The quartzite, whenever observed was fresh and hard. Below the quartzite the siltstone and sandstone units varied in weathering from moderately weathered to fresh. This is a reflection of the faulting and jointing throughout the deposit creating weathering channels causing the rock to be weathered at depth.

3.3.2 Material to be Recovered

Main materials extracted from the Site is quartzite, sandstone and siltstones. All material will be processed via a crushing and screening plant to the desired Particle Size Distribution (PSD) prior to being dispatched to the infrastructure project, general public via the onsite concrete plant or freight distribution truck.

3.3.3 Estimate of Reserves

The total resource within the Extraction Plans has been estimated as outlined within **Table 11 – Onsite Resource (t)**. The basis of this estimate was informed though geological modelling undertaken by Hanson's Geological Department upon the completion of the resource investigation drilling and logging campaign completed in 2019. The extent of this estimated resource has been defined to not intersect groundwater in line with the proposed operations for the Site.

The logging completed during the resource investigation enabled the further breakdown of resource definition into three (3) categories identified as Roadbase (RB), Concrete Aggregate (CA), or Overburden (OB) where:

- RB was defined as resource predicted to satisfy the specification requirements of medium to high specification roadbase products
- CA was defined as resource predicted to satisfy the specification requirements of aggregates for use in the manufacturing of concrete, and
- OB was defined as resource comprised of topsoil, subsoil and low-grade resource predicted not to satisfy the requirements of either RB or CA

Table 11 – Onsite Resources provides the breakdown of resource outlined above for each proposed Stage of the extraction.

Table 11 – Onsite Resource (t)

Product	Stage 1	Stage 2	Stage 3	Stage 3A
OB	1,108,328	952,259	2,100,147	1,130,352
RB	1,078,029	2,824,070	25,890	4,554,396
CA	6,393,308	1,166,713	35,837	4,662,956
TOTAL	**8,579,665**	**4,943,042**	**2,161,874**	**10,347,704**

The total resource defined as RB and CA is estimated at 20.7 MT while the total resource defined as OB is estimated at 5.3 MT.

3.3.4 Production

While annual production rates are dependent on the market demand for construction materials of which the historical demand for products from the Site has averaged approximately 300 kt per annum over the past 10 years. The future demand of products may fluctuate year on year based upon market demand, however the Site is predicted to remain in line with the 10 year average demand of 300 kt per annum.

The resource breakdowns per extraction stage are contained in **Table 11 – Onsite Resources**.

At a predicted product demand of approximately 300 kt per annum and estimated timeframes for overburden movements, the Site is estimated to have an operating life of approximately 74 years.

3.4 Mining Operations

3.4.1 Type of Mining Operation to be Carried Out

The current and future quarrying method to be undertaken onsite will be the use of traditional Open Cut Quarrying methodology. The process will include the following activities:

- Clearing of vegetation (likely with a Bulldozer and or Excavator)
- Drilling and Blasting
- Rock face excavation (likely with Front End Loader (FEL) and / or Excavator
- Crushing and Screening
- Stockpiling
- Overburden Storage

- Sales and Distribution (Quarry and Concrete Products)
- Concrete Manufacturing through the concrete plant
- Rehabilitation activities

A geotechnical assessment was conducted to inform the Extraction Plans and QDRP's to ensure that the plans can be effectively executed, refer **Attachment 30 – Geotechnical Assessment**.

The geotechnical assessment including Limit Equilibrium / Finite Element and Kinematic assessments and provided recommended slope design guideline for the final benches, summarised in **Table 12 – Recommended Slope Design Guidelines Final Benches**.

Table 12 – Recommended Slope Design Guidelines Final Benches

Residual soils, extremely to highly weathered rock clays, and overburden dumps.	Maximum batter angle	26°
	Maximum bench height	11m
	Minimum bench width	10m
Distinctly to Slightly weathered rock upper bench areas.	Maximum batter angle	60°
	Maximum bench height	11 m
	Minimum bench width	10 & preferably 25 metres
Slightly weathered to fresh rock (Generally most areas of the quarry)	Maximum batter angle	70 to 85°
	Maximum bench height	11 m
	Minimum bench width	10 m

Typical details for the establishment of base case rehabilitation batters and temporary overburden stockpiles were developed as part of the geotechnical assessment to ensure short-term and long-term stability of the batters. The typical details are provided within **Drawing 17 – Typical Quarry Rehabilitation Detail** and **Drawing 18 – Interim South Wall Stockpile Design**. An abandonment bund will be established for the western benched as part of the base case final landform, refer **Drawing 32 – Conceptual Final Landform Plan**.

3.4.2 Type of Equipment

The Site has recently commenced decommissioned the fixed crushing and screening plant. The decision to discontinue use of the fixed plant, which had been in operation for many decades, was made due to the age of the plant and significant short-term repair and maintenance requirements, but more importantly with consideration given to the flexibility and additional benefits moving to mobile crushing provide.

Mobile Crushing has allowed the Site to transition into undertaking these activities within the pit which has moved operations further away from the sensitive receptors to the west. Mobile crushing also provides the flexibility to match crushing and screening equipment utilised with market / product demand at a particular point in time.

Hanson manage a State based fleet of Heavy Mobile Equipment (HME) with National support provided as required. At the time of writing this MOP Review report, the items noted below are the main quarry related items of plant used onsite, refer **Table 13 – Heavy Mobile Equipment Listing**. This listing does not include concrete agitators and / or freight distribution trucks that can access the Site at any time.

Table 13 – Heavy Mobile Equipment Listing

Machine	Make / Model	Noise Source	Exhaust Source
Blast Hole Rig (Percussion)	Atlas Copco SmartRoc T40	x	x
Excavator	Komatsu PC450LC	x	x
FEL	Komatsu WA 480 - 6	x	x
	Komatsu WA 600 - 3	x	x
	Volvo L180H	x	x
Haul Truck(s)	CAT 771D	x	x
	Komatsu HD325-7	x	x
	Volvo A25D	x	x
Water Cart	CAT 725	x	x

(Source: Hanson. 2020)

3.4.3 Sequence of Operation

Historically, the quarry has been working to the extraction area approved within the current MOP document (2004). This extraction area has been physically pegged to guide operators on the extent of the approved area.

The MOP Review is comprised of a staged approach to extraction and rehabilitation activities developed to enable the achievement of the base case rehabilitated landform. In July 2020, ProAg were engaged to undertake an assessment of overburden and other materials at the Site to inform rehabilitation strategies, refer to **Attachment 24 – Soil Assessment and Analysis**. The assessment was undertaken given the limited volume of topsoil and subsoil available for use in rehabilitation onsite. The assessment identified that revegetation and successful rehabilitation will be achieved on batters comprised of quarry overburden and detailed a program for revegetation. The program recommended:

- the use of material defined as ‘overburden east’ for the building of the surface profile (250 mm) of all batters to be revegetated, and
- the use of material defined as ‘overburden west’ as a base layer when constructing batters.

The recommended use of ‘overburden east’ and ‘overburden west’ materials have been considered to inform the MOP Review Sequence of Operations proposed. The properties of overburden have been inferred based on geographic location within the Site. Periodic laboratory testing throughout stripping activities is recommended to confirm the final rehabilitation use of material and support strategic stockpiling of overburden materials.

The MOP Review includes two (2) drawing sets developed to detail the proposed Staging. The drawing set titled Extraction Plan contain the Staged extraction areas only while the drawing set titled QDRP include the staged extraction, overburden management and progressive rehabilitation for the Site.

The QDRP and sequence of operations have been developed based upon a guiding principle of minimising land disturbance to the extent necessary by ensuring a terminal boundary is established for the Site within Stage 1 enabling progressive rehabilitation. **Table 14 – Staged Rehabilitation** details the committed progressive rehabilitation by stage and associated unrehabilitated area of disturbance.

Table 14 – Staged Rehabilitation

Stage of MOP Review	Additional Disturbed Area (ha)	Total Cumulative Disturbed Area (ha)	Progressive Rehabilitation (ha)	Total Cumulative Progressive Rehabilitation (ha)	Unrehabilitated Area of Disturbance (ha)
Current	-	42.58	-	-	42.58
Stage 1	6.32	48.90	0.00	0.00	48.90
Stage 2	3.70	52.60	11.10	11.10	41.50
Stage 3	0.00	52.60	0.00	11.10	41.50
Stage 3A (progressive)	7.90	60.50	3.00	14.10	46.40
Stage 3A	0.00	60.50	10.50	24.60	35.90
Final Landform	0.00	60.50	29.10	53.70	6.80
Total =	**17.92**	**60.50**	**53.70**	**53.70**	**6.80***

*Note: The balance of unrehabilitated area within the Site is associated with the retention of quarry benches as identified within the PMLUP for potential future use to support recreational rock climbing activities.

Stage 1:

Drawing 19 – Extraction Plan - Stage 1 and **Drawing 20 – Extraction Plan Cross Section - Stage 1** demonstrates the progression of the existing pit in an easterly direction to develop a terminal boundary for the Site. Developing a terminal boundary for the Site early in the future development is considered a priority to enable the direct placement of overburden rehabilitation as it becomes available throughout the subsequential stages and hence reducing the likelihood of double handling material. Stage 1 pit floor is graded with a defined high and low point of RL315 m and RL295 m respectively in accordance with the quarry development planning recommendations of a four (4) m or five (5) m buffer distance to the groundwater contour map described within **Attachment 16 – Request for Alteration - Groundwater Related Tasks**.

Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1. Some clearing of vegetation will occur within Stage 1, however most of the disturbance area has been assessed as disturbed from historical quarrying activities within the area. Any topsoil made available during stripping is proposed to be temporarily stockpiled along the eastern terminal boundary for use within the rehabilitation surface profile of Stage 1.

During Stage 1 the existing designated controlled area for the receival of concrete returns and concrete washout from Hanson concrete plants located within the 'old quarry', refer **Attachment 31 – Concrete Returns and Washout Resource Management Plan** will be depleted and relocated within the pit floor, as shown in **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**. A drive over bund will be established around the new designated controlled area for the receival of concrete returns and concrete washout as detailed within **Attachment 11 – Stormwater Management Plan**.

The 'old quarry' will be used as an overburden stockpile area. Topsoil available within the overburden stockpile area will be temporarily stockpiled along the southern and western extents of the overburden stockpile for use in the proposed overburden stockpile rehabilitation area identified in Stage 2. Placement of overburden material will occur via the use of haul trucks (rigid and / or articulated), the material will be spread using various HME tools including bulldozer, FEL and potentially grader in a bottom-up layered approach as detailed within **Drawing 18 – Interim South Wall Stockpile Design**. A bottom-up layered approach enables the establishment of a bund on the western extent of the stockpile prior to constructing each layer. The western face of each bund will be stabilised with seeding grasses in a Hydromulch mix providing the additional benefit of softening the temporary visual impacts of the overburden stockpile. Stage 1 overburden material will be used within the surface profile of rehabilitation batters.

The establishment of a terminal boundary within Stage 1 will enable significant progressive rehabilitation to be completed in subsequent Stages, however Hanson will investigate short-term pit planning opportunities to enable minor rehabilitation works to be completed during Stage 1 where practicable.

Stage 1 is estimated to take up to 25 years to achieve based on the current extraction profile and predicted overburden movements.

Stage 2:
Drawing 22 – Extraction Plan - Stage 2 and **Drawing 23 – Extraction Plan Cross Section - Stage 2** demonstrates the progression of the pit in a westerly direction, toward Horsnell Gully. Stage 2 pit floor is graded with a defined high and low point of RL307 m and RL295 m respectively in accordance with the quarry development planning recommendations of a four (4) m or five (5) m buffer distance to the groundwater contour map described within **Attachment 16 – Request for Alteration - Groundwater Related Tasks**.

Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2. Some clearing of vegetation will occur within Stage 2 however most of the disturbance area has been assessed as disturbed from historical quarrying activities within the area. Any topsoil made available during stripping is proposed to be temporarily stockpiled along the western extent of Stage 2 for future use within the surface profile rehabilitation.

Overburden extracted during Stage 2 will be placed directly into the bottom layers of the 'Rehabilitation Area'. The overburden stockpile formed during Stage 1 will be used within the surface profile of the rehabilitation batters of Stage 2 to support revegetation. The topsoil temporarily stockpiled along the western and southern extents of the Stage 1 overburden stockpile will be used to support revegetation within the area identified as 'Overburden Stockpile Rehabilitation Area'.

The 'Rehabilitation Area' for Stage 2 will be battered at a base case rehabilitation slope of 1:2 and detailed within **Drawing 17 – Typical Quarry Rehabilitation Detail**. As described within **Attachment 24 – Soil Assessment and Analysis,** batter surface stabilization for a 1V:2H batter will be implemented through the application of a Hydromulching Bonded Fibre Matrix (BFM) to provide erosion control until the seeding roots have established. Hydromulching will include sterile Ryecorn and native grass seed (where available) for the establishment of a grassed cover crop prior to revegetation planting occurring. Once the rehabilitation batters have been stabilised with a cover crop, revegetation planting will occur progressively over the landform including a mixture of local provenance understorey and tree species from locally sourced seed. The species mix, composition of the planting is intended to be sympathetic with the surrounding environment which will vary across the landform depending upon the aspect of the revegetation works as outlined within **Attachment 29 − Revegetation Plan** and **Drawing 15 − Conceptual Revegetation Plan**. The rate and extent of revegetation works undertaken each year will vary depending upon the establishment and stabilisation of the progressive rehabilitation landform.

Stage 2 is estimated to take up to 14 years to achieve based on the current extraction profile and predicted overburden movements.

For the Site to transition into Stage 3A, the existing transmission line will be required to be removed. A decision point has been nominated during Stage 2 to determine whether Stage 3A will proceed. The decision point is defined as the 50 percent depletion of the Stage 2 estimated resource, as detailed in **Table 11 – Onsite Resource (t)**. Should it be determined that Stage 3A will not proceed at the defined nominated decision point, a revised Conceptual Final Landform Plan and supporting rehabilitation plans will be developed for approval.

Stage 3:
Drawing 25 – Extraction Plan - Stage 3 and **Drawing 26 – Extraction Plan Cross Section - Stage 3** demonstrates the further extraction of the 'old quarry'. Stage 3 pit floor is graded with a defined high and low point of RL321 m and RL296 m respectively in accordance with the quarry development planning recommendations of a four (4) m or five (5) m buffer distance to the groundwater contour map described within **Attachment 16 – Request for Alteration - Groundwater Related Tasks**.

Overburden extracted during Stage 3 will be shifted to a new overburden stockpile located at the western end of the pit floor for use within the surface profiles of future rehabilitation batters as shown in **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**. It is anticipated that the overburden from Stage 3 will be similar in quality to the material defined as 'overburden east' and hence is proposed to be used within the surface profile of future rehabilitation batters.

No significant rehabilitation will be completed within Stage 3 as the operation will be focusing on establishing a southern terminal boundary for the Site and the remaining quarry faces will be required for future extraction activities during stage 3A. There may be opportunities for minor rehabilitation works to be completed during Stage 3 depending on the short-term pit planning implemented throughout Stage 3. The rehabilitation and revegetation areas established within Stage 2 will continue to be maintained and monitored. Where required, infill planting may be undertaken to further enhance the revegetation structure and composition where plant survival rates are less than 75 percent.

Stage 3 is estimated to take up to four (4) years to achieve based on the current extraction profile and predicted overburden movements.

Stage 3A:
For the Site to transition into Stage 3A, the existing transmission line will be required to be removed. The decision point is defined as the 50 percent resource depletion of the Stage 2 estimated resource, as detailed in **Table 11 – Onsite Resource (t)** and described within Stage 2.

Drawing 28 – Extraction Plan - Stage 3A and **Drawing 29 – Extraction Plan Cross Section - Stage 3A** represents the maximum extraction area within this MOP Review document. Throughout this Stage of development, the northern crest will advance slightly to the northern aspect and to the terminal face. The western aspect of the pit shell will advance to the crest of the western hill, this will be the terminal extraction limit within this MOP Review document. Stage 3A pit floor is graded with a defined high and low point of RL328 m and RL308 m respectively in accordance with the quarry development planning recommendations of a four (4) m or five (5) m buffer distance to the groundwater contour map described within **Attachment 16 – Request for Alteration - Groundwater Related Tasks**.

The QDRP for Stage 3A has been detailed within two (2) drawings to demonstrate the sequencing of activities.

Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive) presents the initial overburden and rehabilitation activities within Stage 3A. Overburden extracted from the northern extent of Stage 3A will be placed directly into the bottom layers of the 'Rehabilitation Area' to the Stage 3 extraction area or 'old quarry'.

The 'Rehabilitation Area' for Stage 2 will be battered at a base case rehabilitation slope of 1V:2H and detailed within **Drawing 17 – Typical Quarry Rehabilitation Detail**. As described within **Attachment 24 – Soil Assessment and Analysis,** batter surface stabilization for a 1V:2H batter will be implemented through the application of a Hydromulching BFM to provide erosion control until the seeding roots have established. Hydromulching will include sterile Ryecorn and native grass seed (where available) for the establishment of a grassed cover crop prior to revegetation planting occurring. Once the rehabilitation batters have been stabilised with a cover crop, revegetation planting will occur progressively over the landform including a mixture of local provenance understorey and tree species from locally sourced seed. The species mix, composition of the planting is intended to be sympathetic with the surrounding environment which will vary across the landform depending upon the aspect of the revegetation works as outlined within **Attachment 29 – Revegetation Plan** and **Drawing 15 – Conceptual Revegetation Plan**. The rate and extent of revegetation works undertaken each year will vary depending upon the establishment and stabilisation of the progressive rehabilitation landform.

Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A presents the final overburden and rehabilitation activities within Stage 3A. The overburden extracted from the western extent of Stage 3A is to be placed directly into the bottom layers of the 'Rehabilitation Area' to the northern extent of Stage 3A. The overburden stockpile located within the pit floor will be depleted for use within the remaining areas of 'Rehabilitation Area' and across the pit floor. The 'Rehabilitation Area' for Stage 3A will be battered at a base case rehabilitation slope of 1V:2H and detailed within **Drawing 17 – Typical Quarry Rehabilitation Detail**. As described within **Attachment 24 – Soil Assessment**

and Analysis, batter surface stabilisation for a 1V:2H batter will be implemented through the application of a Hydromulching BFM to provide erosion control until the seeding roots have established.

Hydromulching will include sterile Ryecorn and native grass seed (where available) for the establishment of a grassed cover crop prior to revegetation planting occurring. Once the rehabilitation batters have been stabilised with a cover crop, revegetation planting of the rehabilitation batters will occur progressively over the landform including a mixture of local provenance understorey and tree species from locally sourced seed. The species mix and composition of the planting is intended to be sympathetic with the surrounding environment which will vary across the landform depending upon the aspect of the revegetation works as outlined within **Attachment 29 – Revegetation Plan** and **Drawing 15 – Conceptual Revegetation Plan**. Hydroseeding and or direct seeding of the quarry floor with sterile Ryecorn and native grass seed (where available) will be undertaken progressively as areas of the quarry floor are no longer required for operational activities. The rate and extent of revegetation works undertaken each year will vary depending upon the establishment and stabilisation of the progressive rehabilitation landform.

Stage 3A is estimated to take up to 31 years to achieve based on the current extraction profile and predicted overburden movements.

3.4.4 Modes and Hours of Operation

The Site is currently approved for 24 Hours operations, seven (7) days per week.

Technical assessments were completed for the Site to refine the operations and inform the MOP Review modes and hours of operation. Refer **Attachment 6 – White Rock Quarry Operational Noise Assessment** and **Attachment 7 – Air Quality Assessment**.

Quarry operations will be on a regular and ongoing basis:

- Drilling and blasting: Monday – Saturday (between 6 am – 6 pm)
- Crushing and screening: Monday – Saturday (between 6 am – 6 pm)
- Load and haul: Monday – Saturday (between 6 am – 6 pm)
- Maintenance activities: Monday – Sunday (24 hour as required)
- Quarry sales (transport): Monday – Sunday (24 hour as required)
- Concrete plant: Monday – Sunday (24 hour as required)
- Concrete sales (transport): Monday – Sunday (24 hour as required)

3.4.5 Use of Explosives

Blasting is required at White Rock Quarry to assist with the dislodgement of insitu rock and to enable a usable particle size for the loading tool (Excavator and / or FEL) to manage and handle and transport to the crushing and screening plant in a safe manner.

Frequency of blasting depends on the market demand for construction materials. The historical demand for products from the Site has averaged to approximately 300 kt per annum over the past 10 years. The future demand of products from the Site is predicted to remain in line with the 10 year average demand of 300 kt per annum. To meet this demand, the Site will typically blast once per month, however this could change depending upon market demand.

The Site is attended by a third-party explosive provider on the day of blasting under a nationally negotiated contract. The holes are loaded and initiated on the same day where possible and no explosives will be stored on the Site. All blasts will be undertaken in accordance with the requirements of Australian Standard (*AS) 2187.2 – Explosives – Storage and Use, Part 2 – Use of Explosives.*

A blasting assessment has been completed for the extraction plans for the Site. The assessment confirms that quarrying practices do not significantly impact on the surrounding neighbours and infrastructure ensuring that the quarry will comply with relevant Australian Standards, refer to **Attachment 32 – Blast Parameters Evaluation**. The assessment evaluated the potential blast vibration, airblast overpressure and flyrock impacts for the sensitive receptors and infrastructure located closest to the staged extraction plans and concluded that blasting across the Staged

extraction plans will meet the required limits by adopting the recommended blast parameters and design techniques within closer proximity to receptors within future Stages. The recommended blast parameters and design techniques have been incorporated into the Site's blast management procedures, refer to **Attachment 33 – Blast Management Standard** and **Attachment 34 – Blast Management Plan**.

A blast impact assessment has been undertaken specifically for the geological features identified on the Site, known locally as the Bachelor Pad and Pizey's Knob, refer to **Attachment 35 – Geological Features - Blasting Assessment Study**. The assessment proposed drill and blast activities with associated parameters to control potential blast vibration, airblast overpressure and fly rock impacts to ensure a significantly low probability of structural damage within the geological features. The recommendations of the assessment have been incorporated into the Site's blast management procedures, refer to **Attachment 33 – Blast Management Standard** and **Attachment 34 – Blast Management Plan**.

The Site will monitor each blast with the required locations of monitoring determined by the location of blasting within the Site and the proximity to sensitive receptors, infrastructure and or the geological features. The blast monitoring trigger distances are described within **Attachment 34 – Blast Management Plan** while the blast monitoring trigger distances for the geological features and infrastructure are also outlined within the Extraction Plans and the QDRP's. **Table 15 – Locations of Sensitive Receptors, Infrastructure and Geological Features** provides a summary of the locations that will be monitored during blasting depending on the specific location of blasting within the Site.

Table 15 – Locations of Sensitive Receptors, Infrastructure and Geological Features

Description	Address / GPS Location
Sensitive Receptor	197 Old Norton Summit Road
Sensitive Receptor	225 Old Norton Summit Road
Sensitive Receptor	257 Old Norton Summit Road
Sensitive Receptor	313 Old Norton Summit Road
Infrastructure	Latitude = -34.9244605 Longitude = 138.7025642
Geological feature (Bachelor Pad)	Latitude = -34.9238799 Longitude = 138.7052679
Geological Feature (Pizey's Knob)	Latitude = -34.9224285 Longitude = 138.7127781

3.4.6 Overburden Storage

As identified within **Attachment 24 – Soil Assessment and Analysis**, revegetation and successful rehabilitation will be achieved on batters comprised of quarry overburden from the Site at the batters specified. The base case rehabilitation detailed for each stage of the MOP Review has been designed to utilise the overburden available onsite while **Section 3.4.3 Sequence of Operation** details the overburden management strategies taking into consideration the recommended use of 'overburden east' and 'overburden west' materials detailed within **Attachment 24 – Soil Assessment and Analysis**.

The minimum volumes of rehabilitation material required to achieve the base case rehabilitation batters specified for each stage of the MOP Review are provided in **Table 16 – Base Case Rehabilitation & Overburden Materials Balance**.

Table 16 – Base Case Rehabilitation & Overburden Materials Balance

Stage of MOP Review	Total material extracted volume (t)	Estimated Product volume (t)	Estimated overburden volume (t)	Volume required for proposed stage base case rehabilitation (t)
Stage 1	8,579,665	7,471,337	1,108,328	-
Stage 2	4,943,042	3,990,783	952,259	2,043,750
Stage 3	2,161,874	61,727	2,100,147	-
Stage 3A	10,347,704	9,217,352	1,130,352	201,563 (progressive)
				1,735,313
Total	**26,032,284**	**20,741,199**	**5,291,085**	**3,980,625**

The material balance outlined within **Table 16 – Base Case Rehabilitation & Overburden Materials Balance** demonstrates that there is sufficient overburden available on the Site to meet the base case rehabilitation requirements.

Two (2) key overburden stockpiles are required during the quarry development to ensure sufficient overburden material will be retained onsite for future Site rehabilitation. The establishment of the stockpiles will facilitate the establishment of terminal boundaries to the eastern and southern boundaries during Stage 1 and Stage 3 respectively as detailed within the QDRP. **Section 3.4.3 Sequence of Operation** details the overburden material movements developed to minimise the potential for overburden material with dispersive characteristics defined as 'overburden west' to be stockpiled for extended periods of time. Overburden with the potential for dispersive characteristics has been identified for direct placement within the lower layers of the proposed rehabilitation areas.

Placement of overburden material within the identified stockpiles will occur via the use of haul trucks (rigid and / or articulated), the material will be spread using various HME tools including bulldozer, FEL and potentially grader in a bottom-up layered approach to improve the stability of the stockpile faces as detailed within **Drawing 18 – Interim South Wall Stockpile Design**.

The geotechnical assessment included the assessment of the overburden stockpile to be established during Stage 1 to ensure the stockpile can be feasibly established. The geotechnical assessment is provided as **Attachment 30 – Geotechnical Assessment** and provided a typical detail for the establishment of the temporary overburden stockpile, refer **Drawing 18 – Interim South Wall Stockpile Design**. The specified layered-up detail enables the establishment of a bund on the western extent of the stockpile prior to constructing each layer. The western face of each bund will be stabilised with seeding grasses with a Hydromulch mix also providing the additional benefit of softening the temporary visual impacts of the overburden stockpile.

3.5 Exploration Activities

Several Exploration programs have been undertaken over the life of the current quarry, the most in-depth account of drilling occurred in 2019. **Attachment 36 – 2019 Exploration Summary** is provided to understand the works undertaken in the Diamond Drilling program of 2019. Subsequent development of this MOP Review report is an outcome of this work being undertaken.

3.6 Stockpiles

Overburden stockpile locations have been identified on the QDRP and further information detailing the overburden stockpiling activities has been provided within **Section 3.4.6 Overburden Storage**.

As detailed within **Section 2.13 Topsoil and Subsoil**, there is minimal topsoil and subsoil available at the Site. Where small volumes of topsoil and subsoil do become available during stripping activities, they will be temporarily stockpiled at the locations identified on the QDRP for future use within the surface profile of the proposed rehabilitation areas. Where practicable, the topsoil and subsoil locations have been nominated at locations coinciding with the surface water catchment boundaries identified within the SMP to reduce the likelihood of erosion due to surface water. The topsoil stockpiles will not exceed two (2) metres.

A raw feed pad is located within the pit adjacent to the mobile crushing and screening plant. Finished products from the in pit mobile crushing and screening plant will be temporarily stored within the pit before being loaded and hauled to the stockpiling areas adjacent to SB1.

The Site includes an existing concrete plant and pugmill, both of which have nearby stockpiles of material that are used to manufacture concrete and pugged products respectively. The materials utilised within these processes are predominately from the Site but may also include some materials supplied from alternative sites depending on the end application of the concrete or pugged materials.

3.7 Crushing and Processing

3.7.1 Crushing and Processing Plant

Recognising the age of the existing fixed plant, the Site transitioned from fixed plant crushing and screening to mobile plant crushing and screening deployed into the pit in 2021. The mobile crushing and screening plant currently in use at the Site is comprised of the following types of plant items:

- Jaw Crusher
- Reclaimer Screen
- Cone Crusher
- Screen Deck, and
- Return Stacker

Mobile crushing and screening equipment deployed at the Site by either the operator or contractors will be consistent with the above plant items guided by the source rock characteristics. Mobile crushing and screening equipment to be used at the Site will include water sprays at transfer points.

Decommissioning and removal of the existing fixed crushing and screening plant has commenced with the removal of a cone crusher and some conveyors for use at an alternative Hanson operation. The remaining fixed crushing and screening plant will be progressively removed throughout the life of the Site.

The Site includes an existing concrete plant and pugmill with associated cement silos as identified on **Drawing 2 – Site Layout Plan**.

No wet washing of materials occurs within the Site.

3.7.2 Plant and Transport Hours of Operation

Transport, either concrete or quarry enter the Site 24 Hours seven (7) days per week, this is for the loading and delivery of concrete in agitator bowls and loading of quarry materials for distribution.

As detailed **Section 3.4.4 Modes and Hours of Operation**, technical assessments were completed for the Site to refine the operations and inform the MOP Review modes and hours of operation.

Quarry operations will be on a regular and ongoing basis:

- Drilling and blasting: Monday – Saturday (between 6 am – 6 pm)
- Crushing and screening: Monday – Saturday (between 6 am – 6 pm)
- Load and haul: Monday – Saturday (between 6 am – 6 pm)
- Maintenance activities: Monday – Sunday (24 hour as required)
- Quarry sales (transport): Monday – Sunday (24 hour as required)
- Concrete plant: Monday – Sunday (24 hour as required)
- Concrete sales (transport): Monday – Sunday (24 hour as required)

3.7.3 Crushing and Processing Wastes

Processing wastes are not anticipated to be generated from the quarrying activities.

Overburden is proposed to be used within rehabilitation activities at the Site and as detailed within **Section 3.4.6 Overburden Storage**.

3.8 Industrial and Domestic Wastes

Domestic wastes generated by the Site are reused, recycled, or removed to a facility that can lawfully accept the waste by a third-party waste disposal contractor under a nationally negotiated contract. Oils and other industrial wastes are to be disposed of by an appropriately licenced third-party and relevant EPA waste tracking certificates are retained onsite.

As per EPA Licence No. 12714 (expiry 30 November 2023) the Site maintains an approval to receive concrete returns and concrete washout classified as Construction and Demolition Waste (inert) from concrete plants that are operated by Hanson. The purpose for the Construction and Demolition Waste (inert) authorised activity is to facilitate the receival of concrete returns and or concrete washout from Hanson operated operations for recycling and reuse as saleable construction materials with the key benefits of preventing the material from being disposed of in landfills and secondarily reducing the demand on virgin materials and provide alternative recycled products. Hanson has a management plan outlining processes specific to this activity, refer **Attachment 31 – Concrete Returns and Washout Resource Management Plan**.

A SMP has been developed for the Site, refer to **Attachment 11 – Stormwater Management Plan**. Section 5 Magill Concrete Batching Plant of the SMP provides a description of the water management for the concrete batching plant located on the Site including a description of the first flush containment system. All pits, storage tanks, pumps and float switches are inspected monthly and routinely maintained. The ability of the first flush system to maintain capacity requires routine maintenance of water storage tanks. A monthly maintenance schedule is in place to inspect and where required remove cementitious silt via an industrial vacuum truck. Alkaline solutions (slurry) are removed by a third-party contractor and disposed at an appropriated licenced facility. Waste tracking forms are completed and retained onsite in accordance with EPA guidelines (EPA 416/07 Waste tracking form).

3.9 Silt Control and Drainage

The Site is required to operate in accordance with EPA Licence No 12714. As part of the EPA Licence conditions for the Site, an EIP – Stormwater Management has been approved by the EPA on 29 September 2017 of which the sediment control and management strategies outlined within the EIP have been carried over into the MOP to inform the ongoing management of surface water within the Site. To help inform the level of water quality discharging from the Site continuous real time monitoring of turbidity (NTU), water level (m), flow rate (m^3/s) and flow volume (ML) occurs onsite in accordance with an approved water quality monitoring programme, refer **Attachment 14 – Hanson White Rock Quarry Water Quality Monitoring Plan**. Monitoring is undertaken in line with the water quality monitoring plan at the V-notch weir located in stream (creek) approximately 215 m west of the Site.

Operations at the Site will produce sediment. The key sources of sediment for the Site include:

- Exposed and disturbed soil areas within the Site and extraction operations
- Material Stockpiles which contain material sourced from the Site or external sources, and
- Vegetation clearing and topsoil stripping

The management of these sediments is outlined below.

The QDRP and sequence of operations detailed within **Section 3.4.3 Sequence of Operation** have been developed to a guiding principle of minimising land disturbance to the extent necessary by ensuring a terminal boundary is established for the Site within Stage 1 enabling progressive rehabilitation. **Table 14 – Staged Rehabilitation** details the committed progressive rehabilitation by Stage and associated unrehabilitated area of disturbance.

As identified within **Attachment 24 – Soil Assessment and Analysis**, revegetation and successful rehabilitation will be achieved on batters comprised of quarry overburden from the Site at the batters specified. The base case rehabilitation detailed for each Stage of the MOP Review has been designed to utilise the overburden available onsite while **Section 3.4.3 Sequence of Operation** details the overburden management strategies taking into consideration the recommended use of 'overburden east' and 'overburden west' materials based on dispersion testing results detailed within **Attachment 24 – Soil Assessment and Analysis**. Batter surface stabilisation for erosion protection until seeding roots have been established are also detailed in **Section 3.4.3 Sequence of Operation**. **Table 17 – Surface Stabilisation Technique** provides a summary of the surface stabilisation technique by batter.

Table 17 – Surface Stabilisation Technique

Rehabilitation Batter	Surface Stabilisation Technique
1:2	Hydromulching BFM

The Site is comprised of a complex stormwater management network consisting of both disturbed and undisturbed catchment areas and a drainage system including water dams, stormwater pits, open channels, piped networks, sediment basins and drains to manage surface water. Current catchment details for the Site including associated hydrology features are shown in **Drawing 7 – Stormwater Management Plan - 2022**.

A SMP has been developed for the Site, refer to **Attachment 11 – Stormwater Management Plan**. The SMP was developed with the intent to inform the long-term surface water management framework for the Site and will be subject to review throughout the life of Site. The SMP includes the following specific to the Site:

- Proposed stormwater operational procedures, water quality monitoring plan, Surface Water TARP and responsibilities
- Hydrological assessment of the current catchment details shown in **Drawing 7 – Stormwater Management Plan - 2022**
- Design of stormwater quality management control measures for the disturbed areas of the current and future catchment areas of the Site
- Description of the water management for the concrete batching plant located on the Site including a description of the first flush containment system
- A water balance assessment for the current and future catchment areas of the Site including the concrete batching plant.

The International Erosion Control Association (IECA) Best Practice Erosion and Sediment Control (BPESC) guidelines have been applied in selecting appropriate stormwater quality management control measures for the disturbed areas of the current and future catchment areas of the Site. A PSD analysis undertaken on the sediment at SB2 indicated that the sediment produced by the Site was comprised of wide range of particle sizes, refer to **Attachment 37 – Sediment Basin 2 - Particle Size Distribution**. Sediment basins were therefore selected as the key sediment control measures due to the area of disturbance and due to their ability to retain a wide range of sediment particle sizes when compared to other types of sediment traps. Type D basins were selected for all sediment basins (excluding SB2) and the quarry sumps due to their required locations resulting in multiple inflows. Type D basins are designed to retain water for long periods (up to five (5) days) allowing extended time for the settlement of finer particles benefiting turbidity control.

A detailed options analysis undertaken for the design of SB2 has been previously assessed and approved for the construction of a Type A sediment basin presenting the optimal sediment basin solution for the SB2 catchment, refer to **Attachment 12 – Sediment Basin 2 - Options Review**. The development of a Type A basin is to provide a High Efficiency Sediment (HES) Basin which incorporates a process to actively treat the water and provide increased settling rates and higher water quality performance. The active treatment of the Type A basin for White Rock Quarry is designed to incorporate the use of flocculation to increase the settling rates of the sediment within SB2 of which the risks and operational requirements associated with the use of flocculants has been assessed within **Attachment 13 – Sediment Basin 2 - Use of Flocculants**. To support the construction of SB2, a groundwater assessment was conducted to investigate the source of water intersected during the construction phase and to assess the potential impacts for

continued construction. The key risk events to groundwater and groundwater dependent ecosystems as a result of the sediment basin construction for both the construction and operational phases of the basin were assessed as low to negligible, refer to **Attachment 17 – White Rock Quarry – Water Interception During Construction of On-Site Sediment Basin**.

The location and size of the sediment basins and associated infrastructure are outlined within a series of drawings listed below corresponding with the staged development of the Site:

- **Drawing 7 – Stormwater Management Plan - 2022**
- **Drawing 9 – Stormwater Management Plan - Stage 1**
- **Drawing 10 – Stormwater Management Plan - Stage 2**
- **Drawing 11 – Stormwater Management Plan - Stage 3**
- **Drawing 12 – Stormwater Management Plan - Stage 3A**

The water balance assessment was completed with the design assumption that controlled releases of captured water for Type D basins was achievable where the Site received no rain for four (4) consecutive days, i.e. assuming natural settlement of sediments only. A control jar settlement test was completed on sediments sampled from the Site to establish a base case understanding of the time taken for sediments to settle naturally at the Site. The control had a starting turbidity of 779 NTU and was tested periodically until a result of less than 50 NTU was achieved. The result was achieved within 14 hours and 21 minutes or 0.6 days, refer **Attachment 38 – Control Jar Settlement Testing**. The results of the water balance assessment for the Site stormwater network are summarised within **Table 18 – Stormwater Network - Water Balance Assessment Results**.

Table 18 – Stormwater Network - Water Balance Assessment Results

Parameters	Concrete Batch Plant	SB1	SB2	SB3	SB4	Storage Dams SD1 / SD2
Total inflow (ML/yr)	0.98	17.93	45.07	14.4	2.92	34.40
Total evaporation (ML/yr)	Nil	0.78	1.57	0.80	0.26	1.58
Usage demand operations (ML/yr)	17.10	40.36	Nil	Nil	Nil	Nil
Recycled for operations (ML/yr)	Nil	14.88	N/A	Nil	Nil	25.6
Treated / controlled release volume (ML/yr)	0.01	Nil	37.90	5.10	1.70	N/A
Overall release volume (ML/yr)	0	3.03	5.77	4.58	1.10	9.74
Overflow releases (count/yr)	***0***	***2***	***4***	***5***	***4***	***2***

The above overflow releases are provided for each individual basin simulated in isolation. Taking into consideration the timing of the simulated overflow releases and the network configuration, specifically where SB2 is the last basin in sequence before the designated Site offsite discharge point, the predicted total overflow release count from the Site is five (5).

Quarry sumps were modelled separately to the stormwater network above as excess water will be contained through flooding of the quarry pit floor until a controlled release can be achieved rather than resulting in a release to alternative stormwater infrastructure on the Site. The results of the water balance assessment for the quarry sumps are summarised within **Table 19 – Quarry Sump - Water Balance Assessment Results**.

Table 19 – Quarry Sump - Water Balance Assessment Results

Parameter	Stage 1	Stage 2 and 3	Stage 3A
Total inflow (ML)	30.71	36.58	47.60
Total evaporation (ML)	2.65	4.59	5.90
Usage demand operations (ML)	Nil	Nil	Nil
Recycled for operations (ML)	Nil	Nil	Nil
Treated / controlled release volume (ML)	18.20	21.05	27.42
Overall release volume (ML)	N/A	N/A	N/A
Overflow releases (count)	***N/A***	***N/A***	***N/A***

The water balance assessment demonstrates:

- There is adequate capacity to treat contaminated water in the concrete batching plant through harvesting and reuse back into the concrete batching operation
- There is sufficient water available within the sediment basin and the storage dam network to meet the operations demand usage whilst demonstrating that the storage dams are expected to hold water all year round for bush fire management, and
- The sizing of sediment basins for the disturbed catchment areas under the IECA BPESC guidelines will ensure that stormwater that has been contaminated by extracted material on the premises has had as much extracted material removed from it as is reasonably practicable taking into consideration the restrictive footprint of the Site and modelled natural settlement of sediments only.

3.9.1 Magill Concrete Plant

The Magill Concrete Plant is located near the Site entrance, refer **Drawing 2 – Site Layout Plan**.

As discussed in **Section 3.9 Silt Control and Drainage** and detailed further in **Attachment 11 – Stormwater Management Plan**, the surface waters derived from the concrete plant footprint are harvested, treated and recycled, also refer drawing number **Drawing 8 – Hanson Magill Concrete Water Management Plan**. Additional water required for the concrete plant operations will be sourced from SB1 and the storage dams (SD1 / SD2) as required.

3.10 Supporting Infrastructure

3.10.1 Accommodation and Offices

There are multiple different office locations onsite, shown on **Drawing 2 – Site Layout Plan**, including:

- Main office (bottom office)
- Weighbridge office
- Transport office
- Site office and Crib Room (Top offices)
- Concrete Plant Office

There are two (2) dwellings located within the PM boundary, owned by Hanson. Neither are tenanted and it is unlikely they will be tenanted for residential purposes.

3.10.2 Access, Public Roads, Services and Utilities Used by the Operation

Access to the Site is via Horsnells Gully Road which connects to Old Norton Summit Road. The Site entrance point is delineated on **Drawing 2 – Site Layout Plan**.

Power and telecommunication services are utilised by the Site. An 11 kV SAPN overhead powerline enters the Site via the western boundary and runs along the Site access road, supplying power as far as the pugmill. The underground telecommunications line also enters the Site via the western boundary along the Site access Road to the Site entrance.

A historical mains water connection to the Site exists via an offsite connection situated on Old Norton Summit Road however, the infrastructure is dilapidated and currently not available for use.

3.10.3 Visual Screening and Site Security

Visual screening of operations is described in **Section 2.4 Amenity** of this report.

The Site entrance is currently secured by fencing and a gate locked daily at close of business. Warning signage is present at the Site access point to ensure that members of the public, contractors and staff are aware that the land is private property and that there are conditions of entry. Similarly, signage is installed to the north of the pit area, so that any members of the public attempting to reach the heritage listed rock faces within the PM are aware of the presence of the quarry. There are four (4) tracks that enter the Site via the adjacent conservation parks. Each of these tracks are secured with a locked gate and signage, an example of which is shown in **Photo 1 – No Access Signage**. In addition, security patrols are undertaken to ensure that trespassers are not present within the Site.

Photo 1 – No Access Signage

4. Results of Consultation

As part of the MOP Review, in 2020 Hanson commenced formal stakeholder engagement. A series of strategies to engage with stakeholders were implemented concurrent with the MOP Review process. Consultation was undertaken with a wide variety of stakeholder groups. A summary of the engagement process that was undertaken and the outcomes of the consultation are provided as **Attachment 39 – Community Consultation Summary Report**. Following the initial submission of the MOP review, Hanson have continued to engaged with a variety of stakeholders including but not limited to, local residents, Kaurna People, Local Government, Regulators, Rock Climbers and Members of Parliament.

The outcomes of the consultation have been incorporated in amendments to the overall QDRP as well as the overall control and management strategies for the Site. A summary of the matters raised and how they have been considered within the MOP review is provided within **Attachment 40 – Community Consultation Summary 2021 - 2023**.

5. Environmental Management

5.1 Introduction

To facilitate the management of potential environmental impacts at the Site in an efficient and effective manner, **Section 6 Potential Impact Risk Assessment** has been developed in accordance with *Minerals Regulatory Guideline MG12: Guidelines for Miners: preparation of a mine operations plan (MOP)* and Section 80 of the *Mining Regulations 2011* and Section 73G(1) of the *Mining Act 1971*.

In order to satisfy the requirements of a MOP review, in accordance with the associated regulation 82 (r. 82 (a – d)) of the Mining Regulations, **Attachment 1 – Objectives and Criteria GAP Analysis** has been developed to:

a) Assess the achievement of existing approved MOP objectives when measured against the criteria.
b) Indicate the extent to which the objectives have not been met (where applicable). If an objective has not been met, further analysis is to be undertaken.
c) Analyse whether the existing approved objectives are still appropriate and will continue to be appropriate.
d) Provide details of proposed alterations to the objectives and criteria (if any).

Section 6 Potential Impact Risk Assessment provides an analysis of risk associated with potential impacts that may occur as a result of the operations and informs the proposed objectives and measurement criteria for both the operational phases of quarry life and mine closure.

The risk assessment is undertaken with consideration for the following environmental components:

- Surface water (erosion, silt and stormwater management)
- Noise
- Dust
- Visual amenity
- Native Vegetation
- Weeds, pests, and plant pathogens
- Habitat (native fauna)
- Topsoil management
- Waste management
- Public safety
- Traffic
- Heritage
- Protection of third-party property
- Blasting
- Groundwater

A risk assessment matrix has been prepared in accordance with *AS/NZS 4360:2004 Risk Management*, **Attachment 41 – Risk Assessment Matrix**. The risk assessment matrix has been used to determine the risk of the identified impacts presented in the following sections.

The risk assessment has been undertaken to establish inherent and residual risk rankings of the identified environmental impacts.

The assessment of inherent and residual risk that has been adopted is a qualitative risk-based approach, designed to assess risk, based on:

- The likelihood of the impact or event occurring
- The consequences of the occurrence

Objective and measurement criteria have been developed to monitor the effectiveness of the controls and management strategies for inherent risks ranked higher than ‘low’.

Applicable Legislation and Standards for each environmental aspect is provided in **Attachment 42 – Legislation and Standards**.

A summary of objectives and measurement criteria is presented in **Attachment 43 – Summary of Objectives and Measurement Criteria**.

Operational management plans attached may be subject to review and amendment based upon changes in future circumstances.

6. Potential Impact Risk Assessment

An assessment of potential impact is outlined below taking into consideration the views and interests of third parties and other stakeholders as summarised in **Section 4 Results of Consultation**.

6.1 Surface Water (Erosion, Silt and Stormwater Management)

6.1.1 Context

As outlined within **Section 2.9 Hydrology**, the Site is located in the centre of the Torrens River Catchment receiving surface waters from the Horsnell Gully and Giles Conservation Park forming part of the Third Creek Sub-Catchment.

Surface water discharge from the Site converges with surface water within the Third Creek sub catchment flowing toward Magill and Tranmere through sections of modified watercourses and concrete channels / culverts before entering the suburb of Firle through underground infrastructure into a narrow drainage reserve or concrete channel, until it joins the Torrens River in Felixstow. A portion of the Third Creek catchment is directed into a wetland system established by the City of Burnside to harvest stormwater as part of a MAR scheme to provide irrigation water for local parks and reserves.

The Site is comprised of a complex stormwater management network consisting of both disturbed and undisturbed catchment areas and a drainage system including water dams, stormwater pits, open channels, piped networks, sediment basins and drains to manage surface water. Current catchment details for the Site including associated hydrology features are shown in **Drawing 7 – Stormwater Management Plan - 2022**.

Site operations that have the potential to cause erosion and sedimentation or risk to receiving surface waters include:

- Exposed and disturbed soil areas within the Site and extraction operations
- Material stockpiles which contain material sourced from the Site or external sources.
- Vegetation clearing and topsoil stripping.
- Uncontrolled Sediment Basin releases.
- Construction and maintenance of carpark, roads and hardstands.
- Spillage during handling of materials.
- Use and storage of oils, greases, fuels and other chemicals.
- Waste water discharge from the concrete batching plant

The Site is required to operate in accordance with EPA Licence No 12714. As part of the EPA Licence conditions for the Site, an EIP – Stormwater Management has been approved by the EPA on 29 September 2017 of which the sediment control and management strategies outlined within the EIP have been carried over into the MOP to inform the ongoing management of surface water within the Site.

Section 3.9 Silt Control and Drainage summarises the detailed hydrological assessment of the existing and future conditions of the Site undertaken to inform the catchment characteristics of the Site and hydrological parameters in accordance with the IECA BPESC guidelines, refer **Attachment 11 – Stormwater Management Plan**.

A SMP has been developed for the Site, refer to **Attachment 11 – Stormwater Management Plan**. The SMP was developed with the intent to inform the long-term surface water management framework for the Site and will be subject to review throughout the life of Site. Erosion and sediment control measures for the proposed operations are described within **Section 3.9 Silt Control and Drainage**.

Sediment basins were selected as the key sediment control measures due to the area of disturbance and due to their ability to retain a wide range of sediment particle sizes when compared to other types of sediment traps. Type D basins were selected for all sediment basins (excluding SB2) and the quarry sumps due to their required locations resulting

in multiple inflows. Type D basins are designed to retain water for long periods (up to 5 days) allowing extended time for the settlement of finer particles benefiting turbidity control.

A detailed options analysis undertaken for the design of SB2 has been previously assessed and approved for the construction of a Type A sediment basin presenting the optimal sediment basin solution for the SB2 catchment, refer to **Attachment 12 – Sediment Basin 2 - Options Review.** The development of a Type A basin is to provide a HES Basin which incorporates a process to actively treat the water and provide increased settling rates and higher water quality performance. The active treatment of the Type A basin for White Rock Quarry will incorporate the use of flocculation to increase the settling rates of the sediment within SB2 of which the risks and operational requirements associated with the use of flocculants has been assessed within **Attachment 13 – Sediment Basin 2 - Use of Flocculants**.

A water balance assessment undertaken for the Site within **Attachment 11 – Stormwater Management Plan** demonstrates:

- There is adequate capacity to treat contaminated water in the concrete batching plant through harvesting and reuse back into the concrete batching operation
- There is sufficient water available within the sediment basin and the storage dam network to meet the operations demand usage whilst demonstrating that the storage dams are expected to hold water all year round for bush fire management, and
- The sizing of sediment basins for the disturbed catchment areas under the IECA BPESC guidelines will ensure that stormwater that has been contaminated by extracted material on the premises has had as much extracted material removed from it as is reasonably practicable taking into consideration the restrictive footprint of the Site and modelled natural settlement of sediments only.
- Taking into consideration the timing of the simulated overflow releases and the network configuration, specifically where SB2 is the last basin in sequence before the designated Site offsite discharge point, the predicted total overflow release count from the Site is five (5).

The Site has a designated control area to receive concrete return and concrete washout for future processing. The surface water catchment area for the concrete returns and wash out area is physically delineated from the other surface water catchments as detailed within **Attachment 31 – Concrete Returns and Washout Resource Management Plan**.

Section 5 Magill Concrete Batching Plant of the SMP (refer **Attachment 11 – Stormwater Management Plan**) provides a description of the water management for the concrete batching plant located on the Site including a description of the first flush containment system. All pits, storage tanks, pumps and float switches are inspected monthly and routinely maintained. The ability of the first flush system to maintain capacity requires routine maintenance of water storage tanks. A monthly maintenance schedule is in place to inspect and where required remove cementitious silt via an industrial vacuum truck. Alkaline solutions (slurry) are removed by a third-party contractor and disposed at an appropriated licenced facility. Waste tracking forms are completed and retained onsite in accordance with EPA guidelines (EPA 416/07 Waste tracking form).

Hanson have prepared a Surface Water management TARP which forms part of the SMP, refer **Attachment 11 – Stormwater Management Plan**.

6.1.2 Potential Impact Event

Note: Impact event ID nominated with an E has been aligned to match with impact events outlined within the risk assessment within **Attachment 13 – Sediment Basin 2 - Use of Flocculants**.

Contamination of surface waters as a result of offsite discharge of silt laden waters, contamination from wastes, hydrocarbons and chemicals.

(E1) Impacts to downstream environments through the use of chemical flocculants changing the water chemistry of downstream aquatic environments.

(E2) Remobilisation of sediments within the sediment basin resulting in offsite discharge of sediment containing concentrated flocculant chemicals into downstream environments.

(E3) Failure of the dosing system to automatically apply coagulants / flocculants to sediment basin (SB2) resulting in discharge of sediment laden waters to downstream environments.

(E4) Failure of the chemical dosing system resulting in overdosing of flocculants resulting in discharge of flocculation substances to downstream environments.

6.1.3 Impact Assessment

Quarry Phase (Impact event ID)	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational (S1)	Disturbed land, surface water runoff, surface water contamination waste storage areas and from truck wash.	Overland flow.	Receiving waterways, adjacent land, and downstream receptors (Third Creek and City of Burnside MAR Scheme)	(4:4) High
Operational (S2)	Concrete plant wastewater runoff	Overland flow	Receiving waterways and downstream receptors (Third Creek and City of Burnside MAR Scheme)	(3:4) High
Operational (E1)	Flocculation treatment products	Surface water discharge from SB2	Horsnell Gully Creek and Third Creek aquatic environment	(3:4) High
Operational (E2)	Accumulated sediments within the forebay and settling pond of SB2A	Surface water discharge from SB2A	Horsnell Gully Creek and Third Creek aquatic environment	(3:3) Medium
Operational (E3)	Sediment laden waters exceeding water quality turbidity criteria	Surface water discharge from SB2A	Horsnell Gully Creek and Third Creek aquatic environment	(3:2) Medium
Operational (E4)	Flocculant chemicals	Surface water discharge from SB2A	Horsnell Gully Creek and Third Creek aquatic environment	(3:4) High
Closure (S3)	Disturbed land, surface water runoff.	Overland flow on rehabilitated surface areas.	Receiving waterways, adjacent land, and downstream receptors (Third Creek and City of Burnside MAR Scheme).	(3:3) Medium
Control and Management Strategies				
Operational (All Basins) • Undertake items relating to the TARP (refer **Attachment 11 – Stormwater Management Plan**) or subsequently approved version. • Undertake the management and monitoring of surface water within the Site in accordance with **Attachment 11 – Stormwater Management Plan** and **Attachment 14 – Hanson White Rock Quarry Water Quality Monitoring Plan** or subsequent approved version.				

- All surface waters affected by disturbed land will be directed, captured and treated within sediment basins in accordance with IECA BPESC 95th Percentile five (5) day rainfall event, as outlined within **Drawing 9 – Stormwater Management Plan - Stage 1, Drawing 10 – Stormwater Management Plan - Stage 2, Drawing 11 – Stormwater Management Plan - Stage 3, Drawing 12 – Stormwater Management Plan - Stage 3A**
- Undertake regular inspection and maintenance of the surface water infrastructure within the Site in accordance with the surface water management TARP referenced within **Attachment 11 – Stormwater Management Plan** or subsequent approved version.
- Freeboard must be maintained in each sediment basin and clean water dam prior to rainfall events occurring to ensure adequate capture volume is available to meet the design criteria.
- Appropriate pumping infrastructure (or equivalent system) should be identified and maintained in order to manage freeboard.
- Where water is required to be discharged offsite from SB2 water quality shall be assessed against the water quality turbidity criteria of 50 NTU prior to discharge. Where water quality criteria exceeds the 50 NTU trigger, an investigation shall be undertaken to determine the cause of the exceedance and identify any required corrective action required.
- Ensure that the clean water diversion channel for surface water from the Horsnell Gully and Giles Conservation Park does not receive surface water from the operational areas of the Site.
- Establish clean water diversion bunds and drains to divert clean water away from disturbed areas of the Site.
- Erosion and Sediment Control (ESC) structures must be maintained at all times during the period of quarry operation and regularly checked to inform repairs or replacement as required.
- The sediment basins and ponds must be maintained on the Site throughout the quarry operation phase.
- Sediment collected in sedimentation basin(s) must be removed whenever the volume of the basin is reduced by 30 percent, or where a build-up of sediments has occurred or may occur around the outlet structure.
- Effective ESC must be provided and maintained during Site clearing and construction of works. Such measures must include diversion drainage works and temporary sedimentation traps.
- Diversion drains, appropriate earthworks grades or equivalent must be installed to ensure surface waters from disturbed areas, including operational or trafficable areas, are diverted to the sediment control system.
- Establishment of a drive over bund around the new designated controlled area for the receival of concrete returns and concrete washout.
- All runoff from the stockpiles and the areas utilised for the operation of the stockpiles must be directed to the sedimentation pond(s).
- Drainage through and from all trafficable areas and production activities must be designed to minimise surface flow velocities.
- There must be no disturbance to, filling or obstruction of any part of a natural watercourse channel unless authorisation is granted by the Regulator.
- Wherever possible, disturbed areas are to be minimised by:
- Progressive rehabilitation of disturbed areas;
- Increased impervious hardstand areas and roof areas over and around workshop areas;
- Prevention of vegetation clearing wherever practical; and
- Diversion of stormwater around disturbed areas
- All petroleum product storage tanks must be bunded according to Australian Standard (AS) 1940 *The storage and handling of flammable and combustible liquids* and the EPA Guideline: EPA080/16 Bunding and spill management.
- Manage Site entry / exit points to minimise the risk of sediment being tracked onto public roadways.
- Drainage through and from all trafficable areas and production activities must be designed to minimise surface flow velocities.
- Ensure that wastewater derived from the truck wash is contained within a specific waster water treatment system and prevented from entering downstream water environments.

Operational (SB2A)

- Selection of chemical flocculants that have validated ecotoxicity assessments, such as Turbiclear or equivalent.
- Undertake background water quality analysis to determine existing base line water quality of downstream environments, pH, EC, turbidity, Suspended Solids (SS) and metals.
- Undertake jar testing to determine lowest practicable dosing rates to achieve required water quality turbidity criteria.
- Install automatic shutoff valve at the outlet of SB2A and undertake real time pH and Turbidity monitoring to activate valve if water quality criteria is not achieved.
- Undertake monthly validation water quality grab samples from the outlet of SB2A and test for pH, EC, turbidity, SS and metals during the first year of operation.
- Undertake weekly inspection of the SB2A forebay and settling ponds to ensure adequate freeboard is maintained within SB2A and SB2B.
- Install automatic shutoff valve at the outlet of SB2A and undertake real time pH and Turbidity monitoring to activate valve if water quality criteria is not achieved.
- Retention of existing SB2 (SB2B) basin and connection to the new HES Type A Basin to capture additional water during high flow events.
- Ensure that excessive sediment build up is removed from the sediment basin as soon as practicable.
- Automated notification to site staff of equipment failure.
- Install automatic shutoff valve at the outlet of SB2A and undertake real time pH and Turbidity monitoring to activate valve if water quality criteria is not achieved.
- Automated notification to Site management when water quality criteria is not achieved.
- Undertake regular visual inspections of the discharge water during rainfall events when the Site is operational.
- Undertake regular maintenance of the automated dosing system in accordance with manufacturers specifications.

Magill Concrete Plant

- Ensure that surface water drainage infrastructure is regularly maintained and functioning in accordance with the provisions of **Drawing 8 – Hanson Magill Concrete Water Management Plan**.
- Undertake ongoing (daily) monitoring of weather forecasts (BoM) for heavy rainfall events to determine days when additional maintenance activities are required to ensure storage capacity of interceptor pits is available.
- Inspect all pits, storage tanks, pumps and float switches monthly and ensure they are routinely maintained. Inspect and where required remove cementitious silts via an industrial vacuum truck.
- Undertake monthly maintenance inspections of the wedge pits and where required remove cementitious silt via an industrial vacuum truck.
- Alkaline solutions (slurry) are removed by a third-party contractor and disposed at an appropriately EPA licensed facility.

Site Closure

- Ensure the post-extraction landform is safe, stable, non-polluting and suitable for the desired long-term land use. (i.e. suitable erosion and sediment control measures are in place at the completion of quarry operation).

Evaluation of Residual Risk	**Residual Risk***
Operational (S1) The risk associated with surface water management is medium due to the nature of the receiving environment, however, the control and management strategies adopted are considered Best	(2:3) **Low**

Practice within the industry and demonstrate reasonable and practicable measures to reduce the likelihood of the impact event occurring.	
Operational (S2) The risk associated with the surface water management within the Magill Concrete Plant has been reduced through the implementation of industry standard operating procedures for the management of surface water within concrete batching plants. The measures implemented are considered industry standard practice and demonstrate all reasonable and practicable measures to reduce the likelihood of the impact event occurring.	(2:4) **Medium**
Operational (E1) The risk associated with surface water quality impacts to downstream aquatic environments is low due to the nature of the receiving environment and the ecotoxicity of the recommended flocculants. The control and management strategies adopted are considered Best Practice within the industry and demonstrate reasonable and practicable measures to reduce the likelihood of the impact event occurring. Ensuring that water leaving the sediment basin is as clear as possible with a general neutral pH minimises the risk of potential aluminium toxicity to the greatest extent.	(2:3) **Low**
Operational (E2) The risk associated with surface water quality impacts to downstream aquatic environments is low due to the nature of the receiving environment and the ecotoxicity of the recommended flocculants.	(2:2) **Low**
Operational (E3) The risk associated with surface water quality impacts to downstream aquatic environments is low due to the nature of the receiving environment. The control and management strategies adopted are considered Best Practice within the industry and demonstrate reasonable and practicable measures to reduce the likelihood of the impact event occurring.	(2:2) **Low**
Operational (E4) The risk associated with surface water quality impacts to downstream aquatic environments is low due to the nature of the receiving environment. The control and management strategies adopted are considered Best Practice within the industry and demonstrate reasonable and practicable measures to reduce the likelihood of the impact event occurring.	(1:3) **Low**
Site Closure (S3) The risk associated with surface water from the final landform will be further reduced through the implementation of the controls and management strategies the reducing the likelihood of the impact occurring.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.1.4 Justification for Acceptance of Residual Risk

Risk is reduced through ensuring that erosion and sediment controls, and stormwater management devices are installed, routinely visually monitored and maintained. Overland flow is anticipated to be intercepted by a series of sediment basins and harvested for re-use. The control and management strategies implemented to reduce the risk demonstrate reasonable and practicable measures that are industry best practice.

Risk reduced through ensuring automated flocculation dosing devices are routinely monitored and maintained and overflow at the outlet of SB2A can be automatically shut off in the event that water quality does not meet the required turbidity water quality criteria.

6.1.5 Objective and Measurement Criteria

Surface Water (Erosion, Silt and Stormwater Management)	
Quarry Phase	**Objective**
Operational	The PM holder must during the construction and operation ensure no adverse impact on surface water quality within the Horsnell Gully Creek as a result of contamination and sedimentation from quarry operations.
Objective Measurement	
1. Objective Achievement Water quality monitoring undertaken at the point of discharge into Horsnell Gully Creek indicate that water quality achieves the ANZECC default trigger value of 50 NTU above the background water quality. If NTU is greater than 50 NTU, an investigation and report will be undertaken and provided to the Regulator demonstrating the implementation of the surface water management TARP and outlining any additional corrective actions / controls identified where practicable. **2. What will be Measured and the Form of the Measurement** Quarry inspection records and maintenance records. Water quality monitoring records for NTU. **3. Location of Measurement** Water quality monitoring location adjacent SB2. **4. Frequency of Measurement** Continuous monitoring reported annually **5. Control / Baseline Data** Hanson Water Quality Report.	

Surface Water (Erosion, Silt and Stormwater Management)	
Quarry Phase	**Objective**
Operational	The PM Holder must, during construction and operation ensure that reasonable and practicable measures are adopted to prevent contamination by wastes, hydrocarbons and chemicals entering the stormwater system.
Objective measurement	
1. Objective Achievement Quarry records demonstrate that the operations within the Magill Concrete Plant are undertaken in accordance with **Drawing 8 – Hanson Magill Concrete Water Management Plan** and all hydrocarbons and chemicals are appropriately managed. **2. What will be Measured and the Form of the Measurement** Quarry inspection records of Concrete Water Management Plant and chemical storage areas. **3. Location of Measurement** Chemical storage and Fuel storage areas. **4. Frequency of Measurement** Monthly. **5. Control / Baseline Data** N/A	

Surface Water (Erosion, Silt and Stormwater Management)	
Quarry Phase	**Objective**
Closure	No adverse impact on surface water quality within the Horsnell Gully Creek as a result of contamination and sedimentation post closure.
Objective Measurement	
1. **Objective Achievement** Prior to PM revocation a suitably qualified person will inspect the Site and verify in a report that appropriate erosion and sediment control measures are in place to prevent contamination of potential receiving waterways (Third Creek, MAR Schemes etc.) in the long term. 2. **What will be Measured and the Form of the Measurement** Sediment discharge and historic performance of the basins. 3. **Location of Measurement** Sediment basin locations within the Site. 4. **Frequency of Measurement** Prior to PM revocation. 5. **Control / Baseline Data** N/A.	

6.2 Noise

6.2.1 Context

As discussed in **Section 2.6 Topography and Landscape**, the landscape within the PM and surrounding land is undulating. The Site is situated within a natural gully which provides shielding around much of the Site. An overview of the various operating times for activities within the Site is provided within **Section 3.4.4 Modes and Hours of Operation**, including no crushing and screening activities after 6pm Monday to Saturday.

Noise modelling was undertaken for the Site and is provided in **Attachment 6 – White Rock Quarry Operational Noise Assessment**.

The noise model is considered to be conservative, representing a worst-case configuration for noise emissions during each Stage of development. Specific source locations and travel paths are selected based upon proximity to residential receptors and where there would be minimal noise shielding effects from the future pit geometry. Vehicle movements are based upon noise emissions that are expected to occur using current technologies, which may improve into the future and the Site achieving a conservative throughput value of 500 kt per annum noting that future throughputs for the Site are predicted to be in line with the 10 year average demand of 300 kt per annum.

The initial modelling results without noise mitigation in place predict compliance at the majority of receptors. Noise levels at receptors situated in Norton Summit and Teringie are compliant with the noise criteria throughout all Stages of quarry development. During Stage 2 and Stage 3 of the quarry development, minor night time exceedances of the noise criteria are predicted at receptors located in the suburb of Skye (one (1) dB(A) above the criteria of 45 dB(A)). During Stage 3A of the quarry development, minor night time exceedances of the noise criteria are predicted at receptors located in the suburb of Skye (three (3) dB(A) above the criteria of 45 dB(A)) while minor exceedances are also predicted during day time limits for residents located in the suburb of Skye (three (3) dB(A) above the criteria of 52 dB(A)) and a residence located in Horsnell Gully (five (5) dB(A) above the criteria of 50 dB(AT).

Mitigation measures were identified and integrated into the model to inform the identification and implementation of appropriate mitigation strategies that are required to achieve compliance. Key mitigation measures include acoustic shielding of the mobile plant during night time operation for Stage 2, Stage 3 and Stage 3A and acoustic treatment and or shielding of the rock drill during daytime operations for Stage 3A. The noise modelling results indicate that compliance with the noise criteria will be achieved both day time and night time periods at the locations described above when mitigation measures are put in place.

6.2.2 Potential Impact Event

Potential for noise generated from quarry operations to negatively impact on adjacent sensitive receptors (residents).

6.2.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Noise generated from Site machinery (haul trucks, FEL, excavators (HME)), and product extraction and processing activities (crushing and screening).	Air	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(3:2) **Medium**
Control and Management Strategies				
Operational • Equipment is to be maintained in accordance with the original equipment manufacturer's specifications. • Unnecessary operation of plant and / or revving of engines will be avoided. • Equipment is to be shut down when not in use. • Ensure that operational activities within the Site are undertaken in accordance with the hours outlined within **Section 3.4.4 Modes and Hours of Operation**. • Implement noise mitigation for rock drilling during Stage 3A when blast hole drilling on the western extent of the pit, via rock drill noise attenuation that achieves a reduction of at least 10 dB. • Drivers encouraged not to use exhaust brakes and banging tailgates when operating during the night. • Fit broadband reversing alarms, rather than audible sirens or beepers, on mobile equipment. • Complaints from neighbouring residents to be recorded, investigated, and responded to in a timely manner.				
Evaluation of Residual Risk				**Residual Risk***
Operational The risk associated with noise nuisance is reduced through the implementation of the control and management strategies which are considered reasonable and industry standard practices.				(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.2.4 Justification for Acceptance of Residual Risk

Justification for the acceptance of residual risk is not required as the residual risk is low.

6.2.5 Objective and Measurement Criteria

Noise	
Quarry Phase	**Objective**
Operational	No public nuisance impacts from noise emanating from the quarry operations.
Objective Measurement	
1. Objective Achievement Quarry records shall demonstrate that all noise related complaints are acknowledged within 48 hours and closed out within seven (7) days or otherwise to the satisfaction of the Regulator. In the event the additional control measures do not resolve the complaint to the satisfaction of the Regulator, noise measurements will be undertaken in accordance with Part 3 of the *Environment Protection (Noise) Policy 2007* at locations agreed upon by the operator and Mining Regulator to verify compliance with Part 1 Section 5 — Indicative noise levels;	

Zone in which the source and receptors fall within	Noise Criteria ($L_{EQ, 15min}$, dB(A))	
	Day time hours (7.00 am to 10.00 pm)	Night time hours (10.00 pm to 7.00 am)
Hills Face Zone – Rural Industry, Rural Living	52	45
Conservation Zone – Rural Living	50	43

2. **What will be Measured and the Form of the Measurement**
   Quarry management logbook noise related complaint records acknowledged within 48 hours and closed out within seven (7) days.
   Noise monitoring dB records in accordance with Part 3 of the *Environment Protection (Noise) Policy 2007* where monitoring has been undertaken in response to resolving a complaint.
3. **Location of Measurement**
   At the sensitive receptor/s or alternative location as agreed with the Mining Regulator.
4. **Frequency of Measurement**
   Records maintained following a complaint.
   Monitoring if required by the Mining Regulator.
5. **Control / Baseline Data**
   N/A.

6.3 Dust

6.3.1 Context

The Site is located in an area which has experienced urban encroachment (after the establishment of the quarry) to the west (Skye). To the south of the Site are the Horsnell Gully and Giles Conservation Parks.

As discussed within **Section 2.5.2 Air Quality** of this MOP Review report, the Site has undertaken air quality modelling to inform ongoing development. **Attachment 7 – Air Quality Assessment** highlights that achievement of the relative Air Quality criterion can be achieved with mitigation measures put in place to manage dust. Importantly, the modelling is based upon an upper limit of 500 kt per annum which is significantly higher than the typical current extraction rate of 300 kt per annum. To assess the potential for air quality impacts on the nearest sensitive receptors as a result of the ongoing operations, computational air dispersion modelling was undertaken using the CALPUFF modelling system. The model considered the whole of the development within the PM in order to assess the potential cumulative impacts of the operation.

Emission rates were derived for an average throughput operating day and an assumed worst-case operating day. Results for the worst-case operating day were compared to criteria associated with a 24-hour averaging period only as the worst-case throughput scenario was considered as a peak scenario rather than sustained annually.

The modelling has also undertaken a review of RCS by assessing cumulative impacts associated with the proposed quarrying activities by considering background RCS concentrations in addition to a predicted contribution from the Site operations. Based upon the results of the background RCS monitoring, a background concentration of 0.044 µg/m3 has been adopted as an annual average for inclusion in the air quality modelling. To estimate RCS concentrations attributed from the Site operations, a factoring approach was applied where a conservative 70percent proportion of the predicted PM_{10} concentrations was assumed to be comprised of RCS. Subsequent to the Air Quality modelling being undertaken, additional RCS monitoring has been undertaken weekly. As of 14 March 2023, the average RCS concentration has been calculated as 0.049 µg/m3 which is aligned with the background concentration adopted within the modelling demonstrating compliance with the RCS criteria. Notwithstanding this, Hanson will continue undertake RCS monitoring to complete a period of 12 months.

Modelling results were assessed against the air quality criteria defined in the EPA Air Quality EPP and Air NEPM levels. The air quality goals for $PM_{2.5}$ and PM_{10} are based on 24-hour and annual average concentrations and are related to the protection of human health. The EPA has also identified a suggested TSP target limit of 120 µg/m^3 as a 24 hour average to prevent nuisance impacts and an annual average TSP of 90 µg/m^3 was adopted for the assessment (based upon criteria adopted in other Australian states). Reference has also been made to a commonly adopted dust deposition limit of 4 g/m^2/month (e.g. NSW EPA). A summary of the criteria used in the assessment is displayed in **Table 4 – Air Quality Criteria**. Additionally, an RCS air quality goal of three (3) µg/m3 (annual average) for the PM_{10} size fraction of dust in ambient air was assessed in line with the interim RCS criterion currently adopted by the SA EPA.

The results of the modelling demonstrate compliance with the air quality criteria for all the stages of the proposed development for the average and worst-case scenarios including the air quality goal of three (3) µg/m^3 (annual average) ambient air quality for crystalline silica as a conservative 70 percent composition of PM_{10}. The highest predicted concentrations are associated with Stages 1 and 3A, but in general the concentrations are similar across all stages. Concentrations differ due to extraction footprints, which also affect haul road locations and worst-case extraction face locations.

Detailed modelling results can be viewed in **Attachment 7 – Air Quality Assessment** Appendix B.

A TARP has been developed for the Site which outlines appropriate management measures in response to certain triggers in relation to Site based observations, or circumstances onsite requiring action. Triggers include visual cues, observations and regular review of meteorology forecasts and visual observations of airborne dust emissions.

The main dust emission sources associated with the operations at the Site highlighted from the air quality modelling were highlighted as the haul roads, crushing and screening plant, concrete batching plant, extraction activities and wind erosion over disturbance areas.

As a result of engagement and concerns regarding dust exposure, Hanson have undertaken the installation of one (1) real time dust monitoring unit to help inform dust concentrations adjacent to the Site. The results of the air quality monitoring have been used to inform the assessment of air quality impacts from the operations. Detailed air quality modelling has also been undertaken for the Site to inform future air quality modelling scenarios. The air quality modelling scenarios demonstrate achievement of the relevant air quality criteria. Notwithstanding the outcomes of the air quality modelling, air quality monitoring for PM_{10} will continue to be undertaken for the Site as part of the DMP and reviewed on an annual basis.

In November 2020 the Site had an audit conducted from the Regulator (Safework SA) who were satisfied with Hanson's management of RCS exposure within its workforce. Hanson does and will continue to measure workers against the relevant legislative requirements. The current South Australian legislation has a WEL for respirable crystalline silica for an eight (8) hour time weighted average of 0.05 mg/m3 of which the Site achieves compliance.

6.3.2 Potential Impact Event

Dust generated from onsite activities causing dust nuisance and health impacts at sensitive receptors.

6.3.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Dust generated from onsite activities such as vehicle and HME movements, product handling and dry weather	Windblown	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(4:3) **High**

	conditions. Previously operated disturbance areas			
Operational	RCS dust generated from onsite activities associated with crushing and screening plant	Windblown	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(2:5) **High**
Closure	Exposed areas of the rehabilitated landform following quarry completion.	Windblown	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(3:3) **Medium**

Control and Management Strategies

Operational

- Carry out visual wind and weather monitoring to review suitability to proceed with activities that are likely to create high levels of dust due to unsuitable weather conditions.
- Water spraying to be carried out to dampen down working areas and mobile crushing plant.
- Increase water spraying during drier climatic conditions.
- Undertake level 1 < (2L/m^2) watering on active haul roads.
- Undertake progressive rehabilitation to assist in managing dust emissions from the Site.
- Undertake items relating to the TARP (refer **Attachment 8 – White Rock Quarry Dust Management Plan**) or subsequently approved version.
- Regular inspection and cleaning (when required) of the sealed Site access road within the PM and along Horsnells Gully Road to the Intersection of Old Norton Summit Road, to ensure that silt loading is minimised.
- Adherence with the White Rock Quarry Dust Management Plan, refer **Attachment 8 – White Rock Quarry Dust Management Plan** - (or subsequent approved).
- Scheduling of drilling and blasting shall consider geological and meteorological conditions to minimise dust generation.
- All vehicles distributing material offsite are tarped before leaving Site.
- Vegetated areas shall be retained until required ahead of quarry development in order to minimise the area of soil exposed at one (1) time.
- Gradually reduce disturbance areas onsite as illustrated within the QDRP.
- Installation of a truck wheel wash to decrease drag out post exit of the Site within three (3) years of the MOP Review approval refer **Attachment 9 – Conceptual Truck Wheel Wash Details**.
- Progressively rehabilitate the Site as areas become available in accordance with the stages illustrated in **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.

Site Closure

- Rehabilitated areas shall be vegetated as soon as practicable to minimise disturbed areas within the Site.
- Final landform is to be established in accordance with approved conceptual final landform plans, refer **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform Cross Sections A-A to E-E**.

Evaluation of Residual Risk	**Residual Risk***
Operational The risk associated with dust emissions is reduced through the adoption of reasonable and practicable control and management strategies which are considered industry standard practice.	(3:2) **Medium**
Operational RCS Air quality monitoring undertaken at the Site demonstrates that the RCS concentrations recorded to date are well below the annual RCS air quality guideline of three (3) µg/m3 (annual	(1:5) **Medium**

average). The annual average background concentration adopted for the air quality modelling of 0.044 µg/m3 based upon 12 weeks of data. As of 14 March 2023, the average RCS concentration has been calculated as 0.049 µg/m3 which is aligned with the background concentration adopted within the modelling demonstrating compliance with the RCS criteria. Notwithstanding this, Hanson will continue undertake RCS monitoring to complete a period of 12 months. Based upon the air quality modelling for the Site, predicted RCS concentrations are expected to be less than half of the annual average criteria.	
Site Closure The risk associated with dust emissions is low and the risk of an impact occurring is further reduced through the implementation of the control and management strategies which are considered reasonable and industry standard practice.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.3.4 Justification for Acceptance of Residual Risk

Standard control and management measures applied onsite further reduce risk to as low as reasonably practicable.

The air quality modelling scenarios demonstrate achievement of the relevant air quality criteria. Air quality monitoring for PM_{10} will continue to be undertaken for the Site as part of the DMP and reviewed on an annual basis.

RCS Air quality monitoring undertaken at the Site demonstrates that the RCS concentrations recorded to date are well below the annual RCS air quality guideline of three (3) µg/m3 (annual average). The annual average background concentration adopted for the air quality modelling of 0.044 µg/m3 based upon 12 weeks of data. As of 14 March 2023, the average RCS concentration has been calculated as 0.049 µg/m3 which is aligned with the background concentration adopted within the modelling demonstrating compliance with the RCS criteria. Notwithstanding this, Hanson will continue undertake RCS monitoring to complete a period of 12 months. Based upon the air quality modelling for the Site, predicted RCS concentrations are expected to be less than half of the annual average criteria.

6.3.5 Objective and Measurement Criteria

Dust	
Quarry Phase	**Objective**
Operational	No public health and / or nuisance impacts from dust generated by quarrying operations.
Objective Measurement	
1. Objective Achievement Dust related complaints acknowledged within 48 hours and actioned appropriately within seven (7) days or otherwise to the satisfaction of the Regulator. Air quality monitoring is to occur at locations and duration as outlined within the DMP as agreed with the Regulator to demonstrate that air quality conforms with the following, - dust deposition of four (4) g/m^2/month, when monitored in accordance with Australian Standard AS 3580.10.1 *Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method and / or;* - an aerodynamic diameter of less than 10 µm (PM_{10}) suspended in the atmosphere of 50 $µg/m^3$ over a 24-hour averaging time (Air NEPM levels) **2. What will be Measured and the Form of the Measurement** Records of dust complaints acknowledged and actioned with satisfactory resolution with the Regulator. Dust deposition and or PM_{10} Air quality data. **3. Location of Measurement** Locations outlined within the approved DMP. **4. Frequency of Measurement** Records following a complaint Monitoring if required by the Mining Regulator.	

Dust	
Quarry Phase	**Objective**
5. Control / Baseline Data N/A.	

Dust	
Quarry Phase	**Objective**
Closure	No public nuisance and / or health impacts from dust generated on the land, post quarrying operations.
Objective Measurement	
1. Objective Achievement An inspection and report from a suitably qualified person conducted prior to revocation of the PM will verify that a safe, stable and non-polluting final landform has been constructed as per the approved final landform design. **2. What will be Measured and the Form of the Measurement** Inspection records of the final rehabilitated landform demonstrate that the rehabilitated areas have been constructed as per the approved final landform design and are safe, stable and non-polluting. **3. Location of Measurement** Within PM 188. **4. Frequency of Measurement** Once prior to the revocation of the PM. **5. Control / Baseline Data** N/A.	

6.4 Visual Amenity

6.4.1 Context

A description of the visual amenity of the Site and surrounding environment is provided within **Section 2.4 Amenity** and representative sensitive receptor location views are displayed in **Attachment 4 – Visual Assessment Photomontage** when viewed with **Drawing 5 – Visual Assessment**.

The operational aspects of the Site are generally well concealed by the natural topography of the area. The main views of the operations are from the sensitive receptor locations situated immediately to the south west and north of the Site and, to a lesser degree, distant views for receptors that are located to the north east. The progressive rehabilitation plans for the Site have been informed by views at these sensitive receptor locations. As the pit area expands, progressive rehabilitation is undertaken to visually soften views of the pit. The natural topography within the western portion of the Site provides natural screening of the extraction area for receptors located west of the Site. A small portion of receptors located south of Photo Point 5 along Coach Road may experience views of the existing and future operations of the quarry.

The amended QDRP and progressive rehabilitation of the Site has been informed through the outcomes of community consultation and the visual modelling of the Site, of which the designed progressive rehabilitation landform has been developed to achieve the greatest visual benefit to the sensitive receptors located south west and north of the Site. The progressive rehabilitation landform is designed to provide a softened landscape with a benched battered profile that will be revegetated with local provenance native vegetation that is sympathetic to the surrounding environment as outlined within **Attachment 29 − Revegetation Plan**. The incorporation of local provenance plants within portions of the final landform as defined by potential land use opportunities identified within the PMLUP will enable the establishment of a revegetation battered final landform that is sympathetic with the surrounding environment.

6.4.2 Potential Impact Event

Exposure of the quarry landform resulting in a negative impact upon sensitive receptors within close proximity to the Site. Light spill from quarry luminaires resulting in nuisance impacts to adjacent sensitive receptors.

6.4.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Quarry pit, stockpiles, storage area, plant and equipment.	External viewpoints.	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(4:4) **High**
Operational	Operational light sources (fixed floodlights and internally lit Site buildings).	External viewpoints.	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(3:2) **Medium**
Site Closure	Quarry pit, stockpiles, storage area, plant and equipment.	External viewpoints.	Sensitive receptors as outlined in **Drawing 4 – Proximity to Infrastructure and Housing**.	(4:4) **High**

Control and Management Strategies

Operational

- Quarry development and progressive rehabilitation to be undertaken in accordance with **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.
- Minimise the disturbance footprint to that necessary for the quarry development.
- Implement initial rehabilitation design intended to 'fast track' rehabilitation of the eastern faces of the quarry and enable progressive planting to be undertaken as early as possible during the quarry development.
- Undertake revegetation of the rehabilitated landform in accordance with **Attachment 29 – Revegetation Plan**.
- Incorporate locally endemic native vegetation species into the rehabilitation planting of the batters within Site through locally collected seed from within the Site and adjacent conservation areas to ensure rehabilitation blends in with the surrounding environment.
- Undertake replacement infill planting where plant survival is less than 75 percent.
- Light spill assessments to be undertaken at each Stage of quarry development where changes to lighting configuration has occurred and corrective action (if required) be undertaken where exceedances of the criterion (one (1) Lux) occur at sensitive receptor locations.
- Lighting design will meet safe standards without excessively exceeding the minimum requirements.
- Lighting will be reduced in areas where there is no activity for prolonged periods where practicable.

Site Closure

- Ensure sufficient overburden placement and establishment to support vegetation growth.
- Quarry related infrastructure removed at cessation of quarrying (unless otherwise approved to be retained in accordance with landowner agreement).
- Final landform is to be established in accordance with approved conceptual final landform plans, refer **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform Cross Sections A-A to E-E**.

• Utilise flora species provided internally and externally as outlined within **Attachment 29 – Revegetation Plan** to ensure rehabilitation undertaken blends in with the surrounding area. • Undertake visual modelling to inform the pit and rehabilitation design.	
Evaluation of Residual Risk	**Residual Risk***
Operational Risk associated with visual amenity impacts is further reduced through implementation of the Control and Management strategies.	(2:2) **Low**
Closure Risk associated with visual amenity impacts is further reduced through implementation of the QDRP and progressive rehabilitation strategies.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.4.4 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.4.5 Objective and Measurement Criteria

Visual Amenity	
Quarry Phase	**Objective**
Operational	During construction and operation, the form, contrasting and reflective aspects of quarrying operations are visually softened to blend in with the surrounding landscape.
Objective Measurement	

1. **Objective Achievement**
   Photographic visual assessment of the Site and surrounds undertaken annually and at the completion of each Stage of quarry development from visual assessment locations confirms that the quarry has been developed in accordance with the approved QDRP's and demonstrate that the form, contrasting and reflective aspects of quarrying operations are visually softened to blend in with the surrounding landscape.

   Annual inspection of revegetation areas demonstrates that plant survival is equal to or greater than 75 percent.
2. **What will be Measured and the Form of the Measurement**
   Visual assessment and photographic records of progressive rehabilitation.
3. **Location of Measurement**
   In accordance with locations outlined within **Drawing 5 – Visual Assessment**.
   Revegetation areas
4. **Frequency of Measurement**
   Annually and at the completion of each Stage of quarry development.
   Annually at revegetation areas.
5. **Control / Baseline Data**
   Drawing 5 – Visual Assessment, viewed with **Attachment 4 – Visual Assessment Photomontage**.

Visual Amenity	
Quarry Phase	**Objective**
Operational	No public nuisance impacts from light spill generated from fixed quarry light sources.

Objective measurement

1. **Objective Achievement**
   Light spill assessment to be undertaken by a suitably qualified professional at each Stage of development (in the instance where a change in lighting configuration has occurred).
2. **What will be Measured and the Form of the Measurement**
   Lux unit of illuminance.
3. **Location of Measurement**
   In accordance with locations outlined within Figure 3.10 of **Attachment 5 – Light Spill Assessment**.
4. **Frequency of Measurement**
   At each Stage of development where a change in lighting configuration has occurred.
5. **Control / Baseline Data**
   Attachment 5 – Light Spill Assessment with a criterion of one (1) Lux at sensitive receptor locations.

Visual Amenity	
Quarry Phase	**Objective**
Site Closure	During post-mine completion, the form, contrasting and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape.

Objective Measurement

1. **Objective Achievement**
   Photographic visual assessment of the Site and surrounds undertaken post quarry completion confirms the final landform conforms to **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform Cross Sections A-A to E-E** and the form, contrasting and reflective aspects of quarrying operations are visually softened to blend in with the surrounding landscape.
2. **What will be Measured and the Form of the Measurement**
   Visual assessment and photographic records of progressive rehabilitation and the final landform.
3. **Location of Measurement**
   Visual Assessment locations as shown in **Drawing 5 – Visual Assessment**.
4. **Frequency of Measurement**
   Once post quarry completion.
5. **Control / Baseline Data**
   Drawing 32 – Conceptual Final Landform Plan and **Drawing 33 – Conceptual Final Landform Cross Sections A-A to E-E**.

6.5 Native Vegetation

6.5.1 Context

Native vegetation is discussed in **Section 2.11 Vegetation, Weeds and Plant Pathogens**.

The Site and surrounding areas contain native vegetation that supports local wildlife and conservation including areas of Conservation Parks located immediately to the south of the Site. Future development within the Site will be focused on the northern aspects of the Site which will be separated from the Conservation Parks by the existing disturbance areas within the Site. A vegetation buffer will also be retained around the perimeter of the Site as outlined within **Drawing 32 – Conceptual Final Landform Plan**.

Under provisions of the *Native Vegetation Regulations 2017*, clearing of native vegetation is exempt on the PM as the activities were authorised under the *Mining Act 1971* and have not been discontinued for more than 12 months any time after 21 November 1984. Notwithstanding that the clearance of native vegetation within the PM is exempt, the future QDRP have considered the principles of the mitigation hierarchy.

A Native Vegetation Assessment of the Site has been undertaken to inform the extent and quality of native vegetation within the Site and the future extraction areas. **Table 20 − Vegetation Association Impacts** summarises the vegetation impacts and associated condition for each Stage of the future quarry development. Whilst the future quarry development will require the clearance of native vegetation, as outlined in **Table 20 − Vegetation Association Impacts**, the majority of vegetation required for removal is poor quality.

As outlined within **Drawing 13 – Bushland Vegetation Assessment Map**, approximately 15.4 ha of good quality native vegetation has been retained within the south eastern portion of the Site directly adjacent to the Giles CP. Approximately 82 ha of vegetation will not be disturbed around the perimeter of the Site, forming a vegetation buffer of which the vegetation condition varies as outlined within **Drawing 13 – Bushland Vegetation Assessment Map**.

Table 20 – Vegetation Association Impacts

Quarry Development Stage	Vegetation Association	Description	Area (ha) to be impacted
Stage 1	Vegetation Association 1	good condition	0.74
	Vegetation Association 2	Planted moderately poor condition	3.67
	Vegetation Association 3	poor condition	5.17
		Sub-total	**9.58**
Stage 2	Vegetation Association 3	poor condition	4.47
	Vegetation Association 5	moderate condition.	0.6
		Sub-total	***5.07***
Stage 3	Vegetation Association 3	poor condition	3.21
	Vegetation Association 4	good condition	1.92
		Sub-total	***5.13***
Stage 3 – Stockpile Areas	Vegetation Association 3	poor condition	0.71
	Vegetation Association 4	good condition	1.13
	Gully Vegetation	poor condition.	0.34
	Eucalyptus spp. woodland – south-facing slope	good condition.	0.12
		Sub-total	**2.3**
Stage 3a	Vegetation Association 3	poor condition	0.12
	Vegetation Association 5	moderate condition.	4.02
	Degraded *Eucalyptus spp.* woodland	moderate condition.	7.34
		Sub-total	**11.48**
		Total	**33.56**

In summary, vegetation required for removal associated with the future extraction activities by condition class is as follows:

- Good Condition vegetation – 3.79 ha
- Moderate Condition vegetation – 11.96 ha
- Poor Condition vegetation – 17.69 ha
- Total - 33.56 ha

The vegetation proposed to be impacted by the quarry expansion by historical rehabilitated vs new clearance is as follows:

- Historically rehabilitated vegetation – 17.35 ha
- Undisturbed vegetation – 16.21 ha
- Total - 33.56 ha

Historically rehabilitated vegetation clearance areas are defined as where quarry activities have altered the landform and remnant vegetation was historically cleared. While this definition has been applied to all areas relevant to historical quarrying activities in the context of vegetation clearance, a small portion of the area defined as historically rehabilitated vegetation clearance has been considered as additional disturbance area in the context of disturbed area outlined within **Table 14 – Staged Rehabilitation**. The reason for this consideration is because these sections have been left for significant timeframes, where vegetation has been regenerating for long periods of time and have therefore been considered as areas of additional disturbance again.

The remaining vegetation condition type and areas that fall outside of the quarry extraction area forming vegetation buffers around the perimeter of the Site is summarised as follows:

- Good Condition vegetation – 17.96 ha
- Moderate Condition vegetation – 59.92 ha
- Poor Condition vegetation – 4.85 ha
- Total - 82.73 ha

As outlined within **Attachment 29 − Revegetation Plan**, progressive rehabilitation of the Site will include the incorporation of native vegetation species that are local to the area and suitable for use within the rehabilitated landform. The incorporation of local provenance plants within portions of the final landform as defined by potential land use opportunities identified within the PMLUP will enable the establishment of a revegetation battered final landform that is sympathetic with the surrounding environment.

There were no nationally listed flora species observed during the survey or known to occur within the Site.

6.5.2 Potential Impact Event

Clearance or damage to native vegetation as a result of extraction activities or impacts from HME that is not within the staged QDRP or approved operational areas of the Site.

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Vegetation clearance.	HME	Native flora	(3:3) **Medium**
Control and Management Strategies				
Operational • Adherence to development plans (extraction footprint) with **Drawing 19 – Extraction Plan - Stage 1**, **Drawing 22 – Extraction Plan - Stage 2**, **Drawing 25 – Extraction Plan - Stage 3** and **Drawing 28 – Extraction Plan - Stage 3A**. • Training for mobile operators to ensure adherence to designed drawings, reducing risk for incidental clearance. • Vegetation will be progressively cleared in line with the quarry sequence to retain trees and vegetation for as long as possible. • Buffer vegetation located outside of the Extraction Footprint to be protected and excluded from operational activities to assist the retention of vegetation corridors around the quarry. • Prior to vegetation clearance activities being undertaken, the staged extraction area shall be physically surveyed and marked onsite to outline the approved vegetation clearance area. • Prior to the commencement of clearance activities, an assessment shall be undertaken by an appropriately qualified person to identify any areas of habitat and fauna occupation and undertake appropriate fauna relocation in consultation with DEW (or equivalent) and the adjacent conservation park manager to identify suitable relocation locations if required.				

• Clearance or disturbance to rare, vulnerable, and endangered flora species will be avoided outside of the quarry development footprint. • HME traffic shall be restricted to the use of established roads within the extraction area of the Site. • Collection of native seed shall be undertaken ahead of vegetation clearance activities to ensure that native vegetation seed is available to support plant propagation and rehabilitation activities within the Site.	
Evaluation of Residual Risk	**Residual Risk***
Operational The risk associated with native vegetation is low and the likelihood of an impact occurring will be further reduced with the implementation of the control and management strategies.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.5.3 Justification for Acceptance of Residual Risk

Implementation of management strategies will ensure potential for incidental clearing of native vegetation outside of approved areas is reduced. Risk is reduced provided there is adherence to the control and management strategies and where appropriate training and care is undertaken.

6.5.4 Objective and Measurement Criteria

Native Vegetation	
Quarry Phase	**Objective**
Operational	No loss of abundance and / or diversity of native vegetation on or off the land as a result of quarrying activities, unless approved in accordance with the approved QDRP.
Objective measurement	
1. Objective Achievement Visual inspection and / or aerial imagery undertaken by a suitably qualified person confirms that no clearance as a result of quarrying activities has occurred outside of the areas defined in the QDRP (extraction footprint) as shown in **Drawing 19 – Extraction Plan - Stage 1**, **Drawing 22 – Extraction Plan - Stage 2**, **Drawing 25 – Extraction Plan - Stage 3**, **Drawing 28 – Extraction Plan - Stage 3A.** **2. What will be Measured and the Form of the Measurement** Records of Site native vegetation inspections, photographic evidence and survey records. **3. Location of Measurement** Operational and extraction areas within PM 188. **4. Frequency of Measurement** Prior to any clearance activities taking place. **5. Control / Baseline Data** **Attachment 19 – Native Vegetation Assessment**.	

6.6 Weeds, Pests and Plant Pathogens

6.6.1 Context

Section 2.11 Vegetation, Weeds and Plant Pathogens provides a summary of the Declared and environmental weeds that have previously been recorded within the Site and incorporated into the weed control programme for the Site. A large part of the Site is undisturbed and retains native vegetation, however 21 Declared and environmental weeds have been identified within the Site and adjacent land. Annual weed control is undertaken within the Site as outlined within **Attachment 20 − Weed Control Report**.

The Site is located within the Mount Lofty Ranges within a high risk phytophthora threat area based upon the high rainfall and presence of native vegetation within the Region, with confirmed locations of phytophthora recorded within

the Giles and Horsnell Gully Conservation Park, however the phytophthora has not been recorded within the Site. Phytophthora hygiene requirements for the Site are undertaken in accordance with **Attachment 21 - Phytophthora C./Dieback Management Plan**.

Pest fauna species that are known to occur at the Site include *Felis catus* (Domestic Cat), *Oryctolagus cuniculus* (European Rabbit), *Rattus rattus* (Black Rat), *Vulpes vulpes* (Red Fox), and *Capra hircus* (Goat).

6.6.2 Potential Impact Event

Introduction of declared weed or pest species, or plant pathogens as a result of the quarrying activity during operation and post closure.

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Proximity to known locations of weeds, pests and plant pathogens.	Movement of plant and equipment, light vehicles on roads, tracks and rehabilitation areas.	Operational areas, post quarrying landform and onsite vegetation.	(4:3) **High**
Control and Management Strategies				
Operational • Prior to topsoil and overburden stripping campaigns, undertaken an Phytophthora risk assessment of the works area to inform the level of Phytophthora hygiene requirements for the intended works • Implement Phytophthora hygiene requirements for the Site in accordance with **Attachment 21 – Phytophthora C./Dieback Management Plan** (or subsequent revision). • Undertake annual weed control focusing on controlling weed infestations to prevent further spread of weeds as outlined within **Attachment 20 – Weed Control Report**. • Minimising land disturbance at any one (1) time (maintaining ground cover for as long as possible) • Annual weed spraying campaigns (or as required in response to weed growth) throughout Site and rehabilitation, with additional spraying campaigns (e.g. spot spray, bi-annual sprays) undertaken as necessary. • Prioritising weed management according to the status of the weed (establishing cause of infestation to prevent or minimise further introduction and spread). • Appropriate training provided to Site employees to recognise existing and potential weeds present onsite and within the surrounding areas to ensure weeds are not inadvertently brought onto the Site via items contaminated by seed (e.g. light vehicles, HME). • Site haul routes maintained in a weed-free or weed-reduced state, to lessen potential spread via vehicle movements. • Established roads and tracks are to be used whenever possible to control the potential spread of weeds and plant pathogens and weed-infested areas / sites are to be avoided. • Restrict vehicle traffic movement in rehabilitation areas. • Regular inspections of Site for evidence of rabbits / foxes (scats, burrows etc.) • Appropriate control of pests on an annual or as needs basis (baiting, trapping).				
Evaluation of Residual Risk				**Residual Risk***
Operational Quarrying activities by their nature result in the disturbance of land, which is readily colonised by weed species. The risk is reduced through the implementation of mitigation and control measures				(2:2) **Low**

ensuring that all reasonable and practicable measures are taken to reduce the potential for introduction of new weed and pest species at the Site. Majority of quarrying activities will be undertaken outside of areas containing native vegetation reducing the potential for contamination or spread of phytophthora. Where operational activities are required within areas containing native vegetation reasonable and practicable control measures are taken to reduce the risk for the introduction or spread of phytophthora.	

*Residual risk based on implementation of control and management measures.

6.6.3 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.6.4 Objective and Measurement Criteria

Weeds, Pests and Pathogens	
Quarry Phase	**Objective**
Operational	No introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species as a result of quarry operations in the land compared to baseline.
Objective measurement	
1. **Objective Achievement** Records of annual inspections undertaken in spring, are held by the operator to demonstrate no introduction of new weeds, pests or plant pathogens nor an increase in abundance of existing weeds when compared to baseline survey and previous assessments as a result of quarry operations. 2. **What will be Measured and the Form of the Measurement** Records of inspections compared to previous reporting years. 3. **Location of Measurement** Within PM 188. 4. **Frequency of Measurement** Annually. 5. **Control / Baseline Data** Previous weed inspection records.	

6.7 Habitat Native Fauna

6.7.1 Context

Native fauna is discussed in **Section 2.12 Fauna**.

As noted in the existing MOP for the Site, a number of fauna have historically been recorded as being present at the Site, including *Macropus fuliginosus* (Western Grey Kangaroo), *Phascolarctos cinereus* (Koala), *Pseudocheirus peregrinus* (Ringtail Possum), *Trichosurus vulpecula* (Brushtail Possum), *Antechinus flavipes* (Yellow Footed Marsupial Mouse), Rattus fuscipes *(Bush Mouse), Falco peregrinus macropus* (Peregrine Falcon) and unspecified varieties of bat.

The Pizey's Knob area contains cliffs in which a pair of Peregrine Falcons are known to nest. The species is listed as rare under the South Australian *National Parks and Wildlife Act 1972*, however, the quarry development does not disturb Pizey's Knob and the cliff face where the Peregrine Falcons nest.

EBS Ecology have undertaken a review of the threatened species that are likely to occur within the Site and undertaken a fauna risk assessment to help inform the potential impacts to threatened fauna species, refer **Attachment 23 – Fauna Assessment**.

The Chestnut-rumped Heathwren (Mt Lofty Ranges), Scarlet Robin and Painted Buttonquail have been identified as a medium risk from future potential impacts based upon the potential preferred habitat availability within the Site. However, historical vegetation fragmentation within the Site has reduced the connectivity of the preferred habitat located within the north west portion of the Site to the known populations within the Horsenell Gully CP. Additionally, existing quarry operations and degraded native vegetation exist between the potential preferred habitat and the nearest known populations. On this basis it is unlikely that future vegetation clearance will lead to the long-term decrease in the size of the current populations, however vegetation clearance may reduce the area of lower quality habitat for the species within the Site.

6.7.2 Potential Impact Event

Potential of native fauna being injured or killed by mobile vehicle, equipment and / or machinery. Disturbance and / or clearance of preferred rare and endangered native fauna habitat resulting from quarrying operations, causing harm to native wildlife.

6.7.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Vehicle traffic, machinery and equipment.	Collision between machinery and wildlife / habitat or disturbance / clearance of habitat.	Native Fauna, Rare and Endangered species habitat (Peregrine Falcon habitat located at Pizey's Knob). Chestnut-rumped Heathwren (Mt Lofty Ranges), Scarlet Robin and Painted Buttonquail	(3:3) **Medium**
Control and Management Strategies				
Operational • Vehicle access restricted to established roadways and extraction areas. • Visual inspection of work area prior to commencing task (spotter if required). • Relocation of wildlife to be undertaken in consultation with DEW (or equivalent) and conducted by an appropriately qualified contractor. • Vegetation Clearing to be undertaken in accordance with control and management strategies set out NV1. • Retention of a vegetation buffer around the perimeter of the Site. • Prior to vegetation clearance activities being undertaken, the staged extraction area shall be physically surveyed and marked onsite to outline the approved vegetation clearance area. • Prior to the commencement of clearance activities, an assessment shall be undertaken by an appropriately qualified person to identify any areas of habitat and fauna occupation and undertake appropriate fauna relocation in consultation with DEW (or equivalent) and the adjacent conservation park manager to identify suitable relocation locations if required. • Undertake quarry development in accordance with **Drawing 19 – Extraction Plan - Stage 1**, **Drawing 22 – Extraction Plan - Stage 2**, **Drawing 25 – Extraction Plan - Stage 3** and **Drawing 28 – Extraction Plan - Stage 3A**. • Incorporate indigenous native vegetation species into the rehabilitated landform to provide long term native vegetation habitat. • Retain and reuse vegetation material (i.e. mulch and logs) removed during vegetation clearing and place within the rehabilitated landform to enhance natural regeneration and habitat where practicable.				

Evaluation of Residual Risk	Residual Risk*
Operational The residual risk associated with potential impacts to Chestnut-rumped Heathwren (Mt Lofty Ranges), Scarlet Robin and Painted Buttonquail and disturbance to Pizey's Knob Peregrine Falcon habitat is low based upon the proximity of historically fragmented high quality preferred habitat within the Site and implementation of the control and management strategies which are considered reasonable to further reduce the potential for an impact event to occur.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.7.4 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.7.5 Objective and Measurement Criteria

Native Fauna	
Quarry Phase	**Objective**
Operational	No injuries or deaths of Native Fauna resulting from quarrying activity onsite that could have been reasonably prevented.
Objective measurement	

1. **Objective Achievement**
   Records of inspections undertaken by a suitably qualified person prior to stripping / clearing vegetation are held by the operator to demonstrate clearance areas are free from native fauna and / or active nesting sites.

   All incidents injury and / or deaths of fauna resulting from quarrying operations onsite are to be recorded in a quarry management log book and investigated and the results of the investigation show that the incident could not have been reasonably prevented by the quarry operator.
2. **What will be Measured and the Form of the Measurement**
   Records of inspections.
3. **Location of Measurement**
   Within areas required for vegetation clearance.
4. **Frequency of Measurement**
   Prior to vegetation clearance occurring.
5. **Control / Baseline Data**
   N/A.

6.8 Topsoil Management

6.8.1 Context

Section 2.13 Topsoil and Subsoil provides a description of the existing topsoil within the Site. There are presently no topsoil stockpiles available onsite for use in future rehabilitation activities.

In July 2020, ProAg undertook an assessment of overburden and other materials at the Site, to inform rehabilitation strategies, refer to **Attachment 24 – Soil Assessment and Analysis**. The assessment indicates that overburden, sand and PM3 products that are available onsite are sufficient to support the rehabilitation strategy for the Site.

Findings from the assessment of slope stability and suitable stabilisation techniques is presented in **Attachment 24 – Soil Assessment and Analysis** and are incorporated into the rehabilitation planning for the Site.

6.8.2 Potential Impact Event

Failure to strip, stockpile and conserve topsoils and subsoils in an effective manner for re-use in progressive rehabilitation.

6.8.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Quarry development.	Soil stripping activities.	Soil and progressive revegetation.	(3:4) **Medium**
Closure	Disturbed land.	Rehabilitation activities and post quarrying landform.	Onsite revegetation and post quarrying landform.	(3:4) **Medium**

Control and Management Strategies

Operational

- Where present, soils and overburden are to be stripped ahead of quarrying and temporarily stockpiled for reuse.
- Runoff waters external to the areas to be stripped should be diverted away from the working area prior to commencement of stripping.
- Topsoil, subsoil and overburden should be stockpiled separately where possible.
- Wherever possible, soils should be used directly on areas being rehabilitated.
- Stripping of soils should be limited to the minimum area necessary.
- Stockpiling of topsoil should not exceed a height of two (2) m and should be shaped (i.e. batters no greater than 2:1).
- Erosion and drainage controls are to be integrated into soil stockpiles where possible to prevent erosion and saturation.
- Compaction of topsoils by vehicles tracking over stockpiles should be avoided.
- All topsoil stockpiles are to be regularly monitored and managed for weed infestation.
- Rehabilitated batters are to be stabilised as soon as practicable following construction.
- Materials used in rehabilitation as media to support vegetation growth must be demonstrated to be suitable for the intended, prior to application.
- The application of materials shall be undertaken in layers to ensure that the most suitable materials to support plant growth (i.e. eastern overburden) are placed within the upper layers at least 250 mm thick to support vegetation growth.
- Rehabilitation batters are to be prepared as close as possible to the time of seeding.
- Soil conservation and stabilisation techniques are to be undertaken in accordance with **Attachment 24 – Soil Assessment and Analysis** or equivalent plan.

Site Closure

- Where available, ensure soils are spread on rehabilitation areas to support vegetation growth.
- Adherence with rehabilitation plans **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform - Cross Sections A-A to E-E**.

Evaluation of Residual Risk	Residual Risk*
Operational Topsoil will be available from extraction within the Site based upon the location of future operations. Where topsoil is encountered the implementation of the controls and management strategies reduce the risk profile as low as practicable.	(2:2) **Low**

Site Closure Topsoil will be available from extraction within the Site based upon the location of future operations. Where topsoil is encountered the implementation of the controls and management strategies reduce the existing risk profile as low as possible.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.8.4 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.8.5 Objective and Measurement Criteria

Topsoil Management	
Quarry Phase	**Objective**
Operational	Ensure that existing topsoil quality and quantity is contained onsite and is maintained.

Objective Measurement

1. **Objective Achievement**
   Annual inspection and photographic recording of soil stockpiles within the Site will demonstrate that the quantity of topsoil in the stockpile(s) is consistent with the quantity when constructed and incorporates vegetation growth for stabilisation.
2. **What will be Measured and the Form of Measurement**
   Records of topsoil inspection by Site management documenting topsoil stockpile quantity, condition and vegetation cover.
3. **Location of Measurement**
   Stockpile locations.
4. **Frequency of Measurement**
   Annually.
5. **Control / Baseline Data**
   Photographic record of stockpile quantity at construction.

Topsoil Management	
Quarry Phase	**Proposed Objective**
Closure	Ensure the functionality of the ecosystem and landscape is stable and self-sustaining to achieve the agreed post quarry land use.

Objective Measurement

1. **Objective Achievement**
   A Site inspection report undertaken by a suitably qualified person following full rehabilitation work and 12 months post completion will verify that the final landform has been established and maintained in a stable state capable to support vegetation growth within rehabilitation areas and there is no evidence of soil loss occurring from Site.
2. **What will be Measured and the Form of Measurement**
   Records of inspection at quarry completion documenting evidence of final landform establishment with suitable overburden and topsoil application to support vegetation growth.

   Records of inspection 12 months post quarry completion documenting evidence of soil loss i.e. scour within rehabilitation areas, and capability of soil to support plant growth.
3. **Location of Measurement**
   Rehabilitation areas.
4. **Frequency of Measurement**
   At quarry completion and 12 months post quarry completion.
5. **Control / Baseline Data**
   N/A.

6.9 Waste

6.9.1 Context

Industrial and domestic waste generation is outlined within **Section 3.8 Industrial and Domestic Wastes**.

Overburden production and management is discussed in **Section 3.4.6 Overburden Storage**.

As per EPA Licence No. 12714 (expiry 30 November 2023) the Site maintains an approval to receive concrete returns and concrete washout classified as Construction and Demolition Waste (inert) from concrete plants that are operated by Hanson. The purpose for the Construction and Demolition Waste (inert) authorised activity is to facilitate the receival of concrete returns and or concrete washout from Hanson operated operations for recycling and reuse as saleable construction materials with the key benefits of preventing the material from being disposed of in landfills and secondarily reducing the demand on virgin materials and provide alternative recycled products. Hanson has a management plan outlining processes specific to this activity, refer **Attachment 31 – Concrete Returns and Washout Resource Management Plan**.

Oils and other industrial wastes are to be disposed of by an appropriately licensed third-party and relevant EPA waste tracking certificates are retained onsite.

6.9.2 Potential Impact Event

Soil and water contamination caused by inappropriate storage, handling and disposal of wastes.

6.9.3 Impact Assessment

Quarry Phase	**Source**	**Pathway**	**Receptor**	**Initial Risk Assessment** Likelihood: Consequence, Risk
Operational	Commercial and industrial waste (i.e. oils, tyres).	Operational activities causing spill to land.	Land and / or water.	(3:2) **Medium**
Closure	Quarry infrastructure and any residual waste (i.e. oils, tyres).	Land.	Post quarry land users, land and water.	(4:2) **Medium**
Control and Management Strategies				
Operational • Trackable wastes disposed by licensed operator at an approved facility. • All storage and handling of hydrocarbons contained within a bunded area, designed and installed in accordance with Australian Standard AS 1940 - *The storage and handling of flammable and combustible* liquids and EPA Guideline*: EPA080/16 Liquid storage Bunding and spill management*, May 2016. • The net capacity of a bunded compound in a storage facility should be at least 120 percent of the net capacity of the largest tank. • Undertake regular inspections of fuel and oil storages and bunds for integrity and cleanliness. • The operator shall ensure appropriate spill kits are available. • Any spill of potential contaminants shall be cleaned up immediately. • Dispose of contaminated containment and / or absorbent material and any impacted surface soils in accordance with EPA Guideline: *EPA 378/13 Disposal of used hydrocarbon absorbent materials*, August 2013. • Listed wastes must be disposed of offsite by an appropriately licenced third-party (transporter) and relevant EPA waste tracking certificates must be retained onsite to ensure that the waste is properly tracked.				

- Unless otherwise approved, the Site will only receive concrete returns and concrete wash in the form of Construction and Demolition (Inert) waste from plants that are operated by Hanson Construction Materials Pty Ltd as per EPA Licence No. 12714 conditions.
- All concrete returns and wash out shall be undertaken in accordance with **Attachment 31 – Concrete Returns and Washout Resource Management Plan** or subsequent approved version.

Closure

- Remove all items of quarry related infrastructure at the cessation of the operation (i.e. graveyard items scrap metal, parts, tyres, bearings etc.).
- Adherence with rehabilitation plans **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform - Cross Sections A-A to E-E**.

Evaluation of Residual Risk	Residual Risk*
Operational Risk is reduced through ensuring that materials that may cause contamination are appropriately handled, stored and disposed of offsite to an appropriately licenced facility.	(2:2) **Low**
Closure Risk is reduced through ensuring that infrastructure and / or materials capable of resulting in contaminated land are appropriately disposed of or removed from Site and redundant quarry infrastructure is removed unless agreed upon in writing with the landowner.	(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.9.4 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.9.5 Objective and Measurement Criteria

Waste	
Quarry Phase	**Objective**
Operational	All commercial and industrial waste is disposed of in accordance with relevant legislation.

Objective Measurement

1. **Objective Achievement**
   Quarry management records demonstrate that waste materials are removed from Site and disposed of in accordance with legislative requirements.
2. **What will be Measured and the Form of Measurement**
   Quarry management records of waste removal and EPA waste tracking receipts.
3. **Location of Measurement**
   Within PM 188.
4. **Frequency**
   Annually.
5. **Control / Baseline Data**
   N/A.

Waste	
Quarry Phase	**Objective**
Operational	No adverse impacts to the environment from Construction and Demolition Waste (inert) waste brought onto the land unless authorised through the relevant legislation.
Objective Measurement	

1. **Objective Achievement**
   Quarry management records demonstrate that Construction and Demolition Waste (inert) waste materials imported to the Site comprised of concrete returns and concrete washout are stockpiled, documented and re-used in accordance with **Attachment 31 – Concrete Returns and Washout Resource Management Plan** or subsequent approved version.
2. **What will be Measured and the Form of Measurement**
   Quarry management records of Construction and Demolition Waste (inert) reprocessing activities.
3. **Location of Measurement**
   Within PM 188.
4. **Frequency**
   Annually.
5. **Control / Baseline Data**
   N/A.

Waste	
Quarry Phase	**Objective**
Closure	No industrial or commercial waste and infrastructure is left onsite post closure.
Objective Measurement	

1. **Objective Achievement**
   Inspection of the Site post quarry completion confirms that no industrial or commercial waste and infrastructure accumulated through the course of quarrying operations is left onsite (unless otherwise approved to be retained in accordance with Landowner Agreement).
2. **What will be Measured and the Form of Measurement**
   Site inspection records and photographic evidence demonstrates that no industrial or commercial waste and infrastructure is left onsite (unless otherwise approved to be retained in accordance with Landowner Agreement).
3. **Location of Measurement**
   Within PM 188.
4. **Frequency of Measurement**
   Once post quarry completion and prior to PM revocation.
5. **Control / Baseline Data**
   N/A.

6.10 Public Safety

6.10.1 Context

The Site is situated in proximity to the residential areas of Skye, Horsnell Gully and Teringie, surrounded by agricultural, rural residential and conservation areas. Access gates are closed and locked, and the Site is not readily accessed by members of the public.

As discussed in **Section 2.14 Heritage (Aboriginal, European, Geological)**, the State listed Heritage Place, Pizey's Knob, falls within the northern portion of the PM. The area contains cliffs, accessed by members of the public for rock

climbing purposes. Rock climbing is presently undertaken outside of the operational areas of the Site and is confined within the two (2) geological features referred to as Pizey's Knob and the Bachelor Pad.

The proximity of the nearest sensitive receptors is discussed in **Section 2.3 Proximity to Infrastructure and Housing**. Due to the Site proximity to populated areas it is considered possible that the Site could be affected by trespassers.

6.10.2 Potential Impact Event

Public injury and / or death due to members of the public entering the Site and interacting with quarry development / infrastructure.

Public safety risks due to the degradation of road condition along Horsnells Gully Road from the accumulation of sediment drag out.

6.10.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Onsite infrastructure and landform.	Unauthorised public access to quarry.	Member of the public.	(3:4) **High**
Operational	Quarrying operations including blasting.	Access to rock climbing location by members of the public, fly rock, vibration and overpressure.	Member of the public.	(4:4) **High**
Operational	Exposed sediment build up within trafficked areas of quarry	Vehicles leaving the Site.	Horsnells Gully Road.	(4:3) **High**
Closure	Onsite infrastructure and landform.	Unauthorised public access to quarry.	Member of the public.	(3:4) **High**
Control and Management Strategies				
Operational • Regular inspection of Site fencing, signage, and gates to ensure they are adequately maintained and that gates are locked at close of business. • Ensure adequate signage is in place and maintained at the perimeters of the Site so as to warn of risk and the prohibition of public access to the Site. • Maintain continuing relationships with the Climbing Club of SA who manage the rock climbing location and activities and ensure that points of access to, and limits of, the climbing area are adequately signed to inform persons accessing the climbing location of the risks associated with quarrying operations and that proceeding beyond that location is prohibited. • Access to the area known as (and leading to) the "*Bachelor Pad*" is to be prohibited due to its proximity to future quarry operations and its significance to Aboriginal Heritage. • Adhere to the Hanson Quarry blast management plan and associated blast exclusion zones, refer **Attachment 34 – Blast Management Plan** (or subsequent revision). • Maintain notification process with Climbing Club of South Australia so that rock climbing activities are not undertaken during blast events. • Inspect Pizeys Knob and lock gate prior to blast events. • Rock climbing by members of the public shall not be undertaken outside of daylight, during Peregrine Falcon nesting season nor during total fire ban days. Regular inspection of the climbing Site during operating hours shall be undertaken to ensure adherence.				

- Blast procedure to require sign off by Quarry Manager or delegate that the blast has been designed to avoid vibration and overpressure limit exceedance.
- Regular inspection and cleaning (when required) of the sealed Site access road within the PM and along Horsnells Gully Road to the Intersection of Old Norton Summit Road, to ensure that silt loading is minimised.

Site Closure

- Fencing, gates and signage around Site perimeter where reasonably practicable.
- Adherence with progressive and final landform rehabilitation plans **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.
- Ensure the post-extraction landform is constructed in accordance with approved rehabilitation plans designed to provide safe, stable, non-polluting landform and is suitable for the desired long-term land use.

Evaluation of Residual Risk	Residual Risk*
Operational Where human interference is apparent with Site security fencing, the likelihood of unauthorised entry and resultant injury / death is increased hence immediate repairs and monitoring will be required to reduce the likelihood of trespass leading to public injury and / or death due to members of the public entering the Site and interacting with quarry development / infrastructure during operational phase.	(2:3) **Medium**
Operational Through implementation of the Blast Management Plan and the agreement with the Climbing Club of South Australia.	(2:2) **Low**
Operational Historically street sweeping has been occurring within the Site and along Horsnells Gully Road which has been proven to be effective in reducing sediment build up helping to maintain the condition of the road.	(3:2) **Medium**
Closure Risk associated with trespass to the Site post closure is reduced provided operator adheres to Site development and rehabilitation plans which are designed to provide a safe and stable landform and reduce the risk of public injury and / or death due to members of the public entering the Site and interacting with the post extraction landform post closure.	(2:3) **Medium**

*Residual risk based on implementation of control and management measures.

6.10.4 Justification for Acceptance of Residual Risk

While it is not practicable to protect the entire Site with fencing, it is reasonable that person would be deterred from trespass and exposing themselves to risk of injury through the implementation of signage and fencing / gates at key access points to the Site. Where human interference is apparent with Site signage and fencing / gates, the likelihood of unauthorised entry and resultant injury / death is increased hence immediate repairs and monitoring will be required.

Risk associated with trespass to the Site post closure is reduced provided the operator adheres to Site development and rehabilitation plans which are designed to provide a safe and stable landform.

6.10.5 Objective and Measurement Criteria

Public Safety	
Quarry Phase	**Objective**
Operational	No public injuries and / or deaths resulting from quarrying activities that could have been reasonably prevented.
Objective measurement	
1. **Outcome Achievement** All incidents involving public injury and / or deaths resulting from unauthorised access to the Site are to be recorded in a quarry management log book and investigated by a suitably qualified third-party within one (1) calendar month (or other time as agreed with the Mining Regulator) and the results of the investigation show that the incident could not have been reasonably prevented by the operator. 2. **What will be Measured and the Form of Measurement** Record of incidents in quarry management logbook, and results of investigations. 3. **Location of Measurement** Within PM 188. 4. **Frequency of Measurement** Within one (1) month (or other time as agreed with Mining Regulation) after each incident. 5. **Control / Baseline Data** N/A.	

Public Safety	
Quarry Phase	**Objective**
Closure	No public injuries and / or deaths resulting from the completed final landform post quarry completion.
Objective Measurement	
1. **Objective Achievement** A Site inspection and report from a suitably qualified person upon completion of each Stage of quarry development and final landform rehabilitation verifies that all slopes have been constructed in accordance with **Drawing 32 – Conceptual Final Landform Plan** and **Drawing 33 – Conceptual Final Landform - Cross Sections A-A to E-E**. 2. **What will be measured and the Form of Measurement** Progressive rehabilitation slope angles and geotechnical stability through inspection and report from a suitably qualified person. 3. **Location of Measurement** Within PM 188. 4. **Frequency of Measurement** At the completion of each Stage of quarry development. Once post quarry completion prior to revocation of the PM. 5. **Control / Baseline Data** N/A.	

6.11 Traffic

6.11.1 Context

Site access is discussed in **Section 3.10.2 Access, Public Roads, Services and Utilities Used by the Operation**.

The main entry and exit point to the Site is off of Horsnells Gully Road. Hanson owns some of the residences on Horsnells Gully Road and therefore the majority of the traffic using Horsnells Gully Road will be attributed to Hanson.

6.11.2 Potential Impact Event

Public safety risks associated with collision between trucks and vehicles resulting from quarry vehicles entering and exiting the Site along Horsnells Gully Road.

Public safety risks associated with drag out from the quarry creating a hazard to members of the public.

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Vehicles entering and exiting the Site.	Site access point.	Member of the public.	(3:4) **High**
Operational	Exposed sediment build up within trafficked areas of quarry	Vehicles leaving the Site.	Member of the Public.	(4:3) **High**
Control and Management Strategies				
Operational • All personnel are to comply with the Site traffic management policies / procedures / plan. • Site management must ensure that all personnel operating vehicles are licenced to do so. • All personnel are to be inducted onto the Site through the appropriate Hanson Induction processes. • Site management are to ensure all personnel are aware of their responsibilities in relation to vehicle use through undertaking inductions, issuing notices, and through use of directives. • All contractors and visitors must report to the Site office as directed upon arrival to the Site. • Two-way radios must be readily accessible in all Site vehicles. • Vehicles must be in a roadworthy condition and fit for purpose. • Road trucks transporting materials are to be fitted with tarping systems and loads tarped prior to leaving the Site. • Adherence with the White Rock Quarry Hanson's Logistics Safety Manual • Regular inspection and cleaning (when required) of the sealed Site access road within the PM and along Horsnells Gully Road to the Intersection of Old Norton Summit Road, to ensure that silt loading is minimised. • Installation of a truck wash to decrease drag out post exit of the Site within three (3) years of the MOP Review approval. • Comply with all relevant traffic laws.				
Evaluation of Residual Risk				**Residual Risk***
Operational Risks associated with traffic will be reduced with operators adhering to and complying with company traffic management policies / procedures to ensure safe vehicular access and egress between the Site and Horsnells Gully Road and Norton Summit Road.				(2:3) **Medium**
Operational Historically street sweeping has been occurring within the Site and along Horsnells Gully Road which has been proven to be effective in reducing sediment build up helping to maintain a safe travelled way.				(3:2) **Medium**

*Residual risk based on implementation of control and management measures.

6.11.3 Justification for Acceptance of Residual Risk

The actions of other road users on public roads is out of the control of Site management; however, Site personnel are responsible for ensuring Site vehicles are operated in accordance with company policy to ensure that the likelihood of public injury or death through a collision and / or accident is reduced.

6.11.4 Objective and Measurement Criteria

Traffic	
Quarry Phase	**Objective**
Operational	No traffic accidents involving the public at the quarry access point that could have been reasonably prevented by the operator.
Objective measurement	

1. **Objective Achievement**
   All traffic accidents resulting in injury and / or death at or near quarry access points will be investigated by a suitably qualified independent third-party as agreed with the relevant Regulator (or other time as agreed with the Mining Regulator) and the results of the investigation show that the incident could not have been reasonably prevented by the operator.

2. **What will be Measured and the Form of Measurement**
   Quarry management logbook records, and traffic accident and investigation reports.
3. **Location of Measurement**
   At or near quarry access points.
4. **Frequency of Measurement**
   As agreed with the relevant Regulator following an accident.
5. **Control / Baseline Data**
   N/A.

6.12 Heritage

6.12.1 Context

Aboriginal, European and Geological Heritage is discussed in **Section 2.14 Heritage (Aboriginal, European, Geological)**.

A search of the Government of South Australia Enviro Data application '*NatureMaps'* (2022) identified "Pizey's Knob" (Heritage Place No. 14120), is located within the northern portion of the Site adjacent the Norton Summit Road boundary and the *'NatureMaps'* results represented within **Drawing 14 – Heritage and Conservation Areas Map**. The place is registered as "Natural feature – Wellington Rock or Pizey's Knob". A copy of the SA Heritage Places data base search, the map linked to the data base, and a copy of the map identifying the place on the South Australian Government Location SA map server is provided within **Attachment 47 – SA Heritage Places Database Search and Maps**.

Pizey's Knob is comprised of a rock formation, situated approximately 250 m from Old Norton Summit Road. As part of a process undertaken in 1989, the place was recommended for inclusion in the Register as "Pizey's Knob (Wellington Rock) and abutting escarpment" as outlined within **Attachment 22 – Heritage Register Assessment Report Pizey's Knob**. However, the ultimate listing of the place does not include reference to the "escarpment" which includes the Norton Summit Road ridgeline and other land not owned by Hanson. This is reflected in the search and the map outlined within **Attachment 47 – SA Heritage Places Database Search and Maps**. In any event, the MOP Review designs do not encroach on the registered place, or the larger area shown in **Drawing 14 – Heritage and Conservation Areas Map**. Planning and design of the MOP review has ensured that the whole of this area is located outside of the quarry development area ensuring that the Pizey's Knob natural rock feature is retained.

As described in **Section 2.14.1 – Aboriginal Heritage**, an Aboriginal Cultural Heritage Survey of the future quarry development areas did not identify any Aboriginal cultural heritage sites or objects within the future extraction area. Based upon the landform and the historical disturbance of the Site, the Aboriginal Cultural Heritage Survey informed that the future extraction areas contained low risk of discovering Aboriginal Cultural Heritage sites or objects. There are two (2) geological features comprised of Pizey's Knob and the Bachelor Pad that are outside of the QDRP.

The Bachelor Pad has a 50 m buffer around the perimeter of the feature which will be undertaken during Stage 3A. Pizey's Knob is located approximately 240m from the closest point of the future extraction area which will be undertaken during Stage 2.

6.12.2 Potential Impact Event

Disturbance and / or destruction of Aboriginal and / or European Heritage sites, objects or remains through development and operation of the Site.

6.12.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Quarry development activities.	Plant and equipment.	Aboriginal and / or European Heritage sites, objects or remains, Pizey's Knob and the Bachelor Pad	(2:4) **Medium**
Control and Management Strategies				
Operational • All relevant personnel at the Site are to be inducted and trained on the obligations regarding the geological features. • Undertake Aboriginal Cultural awareness training for Hanson staff and include within Site inductions for contractors. • No quarry excavation to be undertaken within the 50 m buffer around the Bachelor Pad as outlined within the QDRP's, refer **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**. • Undertake blast monitoring activities when blasting within 300 m of the geological features in accordance with the parameters set out within **Section 6.14 Blasting**. • In the event that any cultural heritage Sites or objects are identified the following is to occur: - Immediately stop work in the vicinity of find. - Notify the relevant authority and the local Aboriginal Heritage Group and SA Heritage Council of the find / potential find at the Site. - No activities are to recommence in the vicinity of the find until such time that liaison with the relevant authority and authority to proceed has been granted. • Survey control of extraction boundaries as detailed within the Extraction Plans.				
Evaluation of Residual Risk				**Residual Risk***
Operational The Site has previously been cleared and subject to historical ground disturbance activities and the outcomes of the Aboriginal Cultural Heritage survey has informed that the likelihood of the occurrence of heritage artefacts (Aboriginal and / or European) on Site is considered low.				(2:2) **Low**

*Residual risk based on implementation of control and management measures.

6.12.4 Justification for Acceptance of Residual Risk

Justification is not required as residual risk is low.

6.12.5 Objective and Measurement Criteria

Heritage	
Quarry Phase	**Objective**
Operational	No disturbance to Aboriginal and / or European heritage sites, objects or remains unless prior approval under the relevant legislation is obtained.
Objective measurement	

1. **Objective Achievement**
   Quarry management logbook records demonstrate that, upon discovery within the Site of any possible Aboriginal, European and / or Geological Heritage Sites; and / or objects or remains;
   - Work ceased until the relevant authorities were notified and work recommenced only once authorisation was received.
   - Documented evidence of potential or actual finds of heritage objects and evidence of consultation with the relevant authority.

   Annual visual inspection and / or aerial imagery undertaken by a suitably qualified person confirms that no quarrying activity is undertaken within 50 m of the Bachelor Pad.
2. **What will be Measured and the Form of Measurement**
   Quarry management logbook records of discovery and evidence appropriate procedures followed upon discovery. If discoveries are made, a Site inspection report undertaken by a suitably qualified specialist.
3. **Location of Measurement**
   Within PM 188.
4. **Frequency of Measurement**
   Following discovery.
5. **Control / Baseline Data**
   Attachment 26 – Confidential - Aboriginal Heritage Report PM 188
   Attachment 27 – Confidential - Archaeological Test Pits Excavations Report.

6.13 Protection of Third-Party Property

6.13.1 Context

As outlined within **Section 2.3 Proximity to Infrastructure and Housing**, the Site is situated within proximity to four (4) areas containing residences comprised of Horsnell Gully (west), Skye (West), Teringue (north) and Norton Summit (north east), however there is an absence of residential development located south of the Site as outlined within **Drawing 4 – Proximity to Infrastructure and Housing**.

The Site is located within the Mount Lofty Ranges within a high bushfire risk area of which the Bushfire Danger Period for the Mount Lofty Ranges commences on 1 December and run until 30 April. The CFS can declare a Total Fire Ban at any time requiring additional fire restrictions and measures. A Bushfire Management Plan has been prepared for the Site in consultation with the CFS and covers activities that may impact on or influence the risk of bushfire occurrence and / or management within the Site as outlined within **Attachment 3 − Bushfire Management Plan**.

The Site also contains an 11 kV SAPN overhead transmission line providing power to a transformer powering the concrete plant and pugmill and a 275 kV ElectraNet overhead transmission line that traverses the western portion of the Site in a north to south direction.

Separation distances of the transmission line located within the Site up until the cessation of Stage 3 are outlined within **Diagram 1 – Separation Distances to Power Infrastructure** of which the closet point of the quarry development prior up until Stage 3 is approximately 100 m. Hanson are in discussion with ElectraNet regarding feasibility investigations into potential future relocation of the transmission line.

The scope of the MOP review considers the establishment of the full quarry development up to and including Stage 3A as there is a reasonable prospect that the transmission lines could be relocated, however, the relocation of the transmission lines will be subject to a separate approvals process outside of the *Mining Act 1971*.

For the Site to transition into Stage 3A, the existing transmission line within the Site will be required to be removed. A decision point has been nominated during Stage 2 to determine whether Stage 3A will proceed defined as 50 percent depletion of Stage 2 estimated resource detailed in **Table 11 – Onsite Resource (t)**.

Due to the proximity of utility infrastructure and sensitive receivers there is a potential for operational activities i.e. excavation and hot works to impact upon third-party property.

6.13.2 Potential Impact Assessment

Damage to third-party infrastructure, residential structures, adjacent land holdings and Conservation Parks from operational activities.

6.13.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Quarry operations i.e. hot works, excavation, blasting and HME.	Ground	Nearby dwellings and infrastructure as shown in **Drawing 4 – Proximity to Infrastructure and Housing**, adjacent land holdings and Conservation Parks	(4:4), **High**
Control and Management Strategies				

Operational
• Adhere to the Hanson Quarry Bushfire Management Plan, refer **Attachment 3 – Bushfire Management Plan (or subsequent revision)**.
• All earth moving equipment will be maintained in good working order with efficient exhaust systems.
• Regular inspections shall be undertaken with all earth moving machinery and mobile equipment will be fitted with appropriately sized, regularly maintained and approved fire extinguishers suitable for the control of flammable liquid and electrical fires.
• Selected heavy machinery will be fitted with independent fire suppression systems in addition to the standard fire extinguisher.
• Prior to any mobile equipment working in vegetated areas, it shall be inspected to ensure they are clean and free of any vegetative, oil, grease and dirt build up, is fitted with a securely fixed, spark-free exhaust in good condition, and if fitted with a catalytic converter, it will not come into contact with dry and flammable material while in use.
• Any mobile equipment working in vegetated areas will not be left unattended within vegetated areas and will be parked in approved park up or cleared areas. If mobile equipment must be left unattended within vegetated areas, eg break downs, the equipment shall be inspected and made fire safe (e.g. through cleaning of vegetation debris etc.) before personnel leave the work area.
• No burning off to clear vegetation unless a special requirement is determined, in that case, a complete risk assessment is to be undertaken and approved by State manager in consultation with the CFS.
• Prior to the Bush Fire Season each year, the Quarry Manager shall ensure that the maintenance of the matters listed below is undertaken in readiness for the Bushfire season
  • Check that trees and shrubs around potential sources of ignition still have space between them (horizontally and vertically) so they don't form a continuous canopy. Prune if needed.
  • Check and service all mechanical equipment, including water pumps, any sprinkler systems and fire extinguishers.
  • Check extinguisher and associated equipment every six (6) months,			

- Ensure the Bushfire Management Plan is up to date and been reviewed every three (3) years or as required.
- All vehicle movements within the quarry boundary will be confined to defined roads or tracks other than during controlled activities.

- Any blasting operations will be carried out and confined to the face area of the quarry. All flammable materials within the blast area will be removed by pre-stripping the topsoil prior to any drilling and blasting operations taking place.
- All welding activities will be conducted in accordance with the Hanson Hot Works Standard Operating Procedure, refer **Attachment 44 – Standard Operating Procedure Hot Work**
- All workshops and offices will be equipped with approved fire extinguishers. Their locations will be indicated by appropriate signage. The approved extinguishers will be installed at the following locations:
  - Fuel and Oil Storage areas.
  - Offices: Reception and Administration.
  - Lunchrooms.
  - Process Plant.
  - Workshops.
- All fire extinguishers will comply with Australian Standards and kept in a serviceable condition and inspected and tested to meet legislation requirements.
- The quarry will maintain a water truck onsite, primarily for dust suppression that could be used for water supply or / and fire suppression. The water truck shall have the capability for rapid fill from the current standpipe.
- Water for fire-fighting purposes will be sourced from the water storages within the quarry boundaries comprising of SD1/SD2 and Giles Dam outlined within **Drawing 2 − Site Layout Plan**.
- Access to the Property will be maintained for emergency service vehicles and designated fire tracks shall be clearly signed within the Site.
- Earthworks Works within proximity to the SAPN and ElectraNet overhead transmission lines to be undertaken in accordance with *Electricity (General) Regulations 2012* Schedule 5, Table 1 – *Distance to operation of machinery, vehicle or vessel with elevating component or shear legs and aerial lines.*
- Seek approval from ElectraNet, undertake a risk assessment and use a spotter when working with machinery closer than six (6) m to the Electranet Transmission Line.
- No excavations within 10 m horizontally from the base of any SAPN infrastructure and 30 m from the base of ElectraNet infrastructure unless approved by the infrastructure owner.
- Undertake blast monitoring for blasting activities within 250 m of the 275 KV ElectraNet transmission line tower location to inform future blasting design.

Evaluation of Residual Risk	**Residual Risk***
Operational The risk associated with damage to third party infrastructure is reduced provided that the operator adheres to the implementation of the proposed control and management strategies for the Site which are considered reasonable and practicable adhering to Regulatory requirements.	(2:3), **Medium**

*Residual risk based on implementation of control and management measures.

6.13.4 Justification for Acceptance of Residual Risk

Implementation of management strategies will reduce potential for damage to third-party property.

6.13.5 Objective and Measurement Criteria

Protection of Third-Party Property	
Quarry Phase	**Objective**
Operational	No adverse impact to third-party land and infrastructure as a result of quarrying (including uncontrolled fires), that could have been reasonably prevented.
Objective Measurement	
1. Objective Achievement All incidents involving damage to third-party property resulting from the quarry Site are recorded in quarry management logbook and investigated by a suitably qualified person within one (1) calendar month (or other time as agreed with the Mining Regulator and the results of the investigation show that the incident could not have reasonably been prevented by the quarrying activity. **2. What will be Measured and the Form of Measurement** Records of incidents involving third-party property in quarry management logbook and results of investigations. **3. Location of Measurement** Within PM 188. **4. Frequency of Measurement** Within one (1) month (or other time as agreed with Mining Regulator after each incident). **5. Control / Baseline Data** N/A.	

6.14 Blasting

6.14.1 Context

Blasting is required at White Rock Quarry to assist with the dislodgement of in situ rock and to enable a usable particle size for the loading tool (Excavator and / or FEL) to manage and handle and transport to the crushing and screening in a safe manner.

The Site will undertake blasting approximately once per month. As outlined within **Section 3.4.5 Use of Explosives** a blasting assessment has been undertaken for the Site in accordance with the *AS2187.2 – Explosives – Storage and Use, Part 2 – Use of Explosives*, refer to **Attachment 32 – Blast Parameters Evaluation**. An overview of the sensitive receptors located within proximity to the Site is provided within **Drawing 4 – Proximity to Infrastructure and Housing**. The assessment evaluated the potential blast vibration, airblast overpressure and flyrock impacts for the sensitive receptors and infrastructure located closest to the staged extraction plans and concluded that blasting across the staged extraction plans will meet the required limits by adopting the recommended blast parameters and design techniques within closer proximity to receptors within future stages. The recommended blast parameters and design techniques have been incorporated into the Site's Blast Management Plan, refer to **Attachment 34 – Blast Management Plan**.

The two (2) geological features comprising of Pizey's Knob and the Bachelor Pad are outside of the QDRP as outlined within **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.

The Bachelor Pad has a defined 50 m buffer around the perimeter of the feature which will be undertaken during Stage 3A. Pizey's Knob is located approximately 240 m from the closest point of the future extraction area which will be undertaken during Stage 2. A review of the proximity of the geological features and an assessment of the associated blasting parameters required to protect the features is provided within **Attachment 35 − Geological Features - Blasting Assessment Study**.

All blasting activities are undertaken by a third-party contractor under a National agreement.

6.14.2 Potential Impact Event

There could be the potential for flyrock, vibration and air overpressure causing damage to nearby infrastructure and / or environmental nuisance to nearby sensitive receptors and geological features.

6.14.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Blasting Vibrations, Flyrock and Air overpressure	Air and ground	Nearby receptors (dwellings and infrastructure) highlighted on **Drawing 4 – Proximity to Infrastructure and Housing**, Norton Summit road users, Geological Features (Pizey's Knob and Bachelor Pad) and ElectraNet powerlines located within the western portion of the Site.	(3:5), **High**

Control and Management Strategies

Operational

- All development onsite is to adhere to the QDRP's per stage.
- All faces are to be face profiled, bore tracked and burdens are to be known prior to loading.
- Adhere to the Hanson Quarry Blast Management Plan, refer **Attachment 34 –Blast Management Plan** (or subsequent revision).
- Ensure that all blasting activities are undertaken by trained, competent and appropriately licenced personnel.
- Undertake drilling and rock breaking during normal operating hours.
- Ensure that blast procedures include consideration of potential impact upon neighbouring properties and take the distance and orientation of the proposed blast into consideration in designing the blast.
- Design process to consider the Maximum Instantaneous Charge (MIC) and drill hole diameter to ensure that maximum ground vibration and overpressure of each blast does not exceed the specified limits.
- Accurately measure face burdens for all blasts within 500 m of public sensitive receptors to enable airblast evaluation and increase face burden or reduce bulk density of explosives if airblast is high.
- Use flyrock prediction equations suitable for quarry / close proximity blasting as outlined within Figure 1 and Equation 3 of **Attachment 32 – Blast Parameters Evaluation**.
- Blast procedure to require sign off by Quarry Manager that the blast has been designed to avoid vibration and overpressure limit exceedance.
- Undertake monitoring of blast events for vibration and air over pressure at locations specified within the Blast Management Plan and outlined within **Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1**, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.
- Where quarry development is undertaken towards the geological features, sequence blasting activities to initially commence greater than 200 m from the geological features to enable verification of the blasting assessments and design parameters to occur prior to blasting within 200 m of the features.
- Store and maintain Site blast monitoring records to enable Site specific blast prediction equations to be developed and used to inform future blast designs.

• Establish a Site-specific blast vibration equation using recorded results to improve prediction capability during Stage 1 and refine the blasting practices to be adopted within Stage 2. • Ensure that minimum stemming heights as per the blast design are maintained. • Undertake blast monitoring of blast events at the two (2) geological features known as Pizey's Knob and Bachelor Pad when blasting activities are located within 300 m of the features. • Undertake periodic photographic inspection of the geological features when blasting occurs within 300 m of the features to verify the blast events are suitable for the purpose and monitor for changes in the conditions of the geological features. • Undertake monitoring of blast events at the ElectraNet transmission lines when blasting is undertaken within 250 m of the transmission line tower.	
Evaluation of Residual Risk	**Residual Risk***
Operational The risk associated with blast vibration, flyrock and overpressure is reduced provided that the operator adheres to the implementation of the proposed control and management strategies and blast standards determined through the blast assessments for the Site which are considered reasonable and industry best practice.	(2:3) **Medium**

*Residual risk based on implementation of control and management measures.

6.14.4 Justification for Acceptance of Residual Risk

Control measures reduce the likelihood of an impact occurring to unlikely, however given the consequence associated with the impact is still moderate, the residual risk cannot be reduced to low. The residual risk is considered appropriate in the context of the operations for the Site.

6.14.5 Objective and Measurement Criteria

Blasting	
Quarry Phase	**Objective**
Operational	No infrastructure, public health and / or nuisance impacts from air blast, flyrock and vibration caused by blasting.
Objective measurement	

1. Objective Achievement

All blasts to comply with *AS2187.2 – Explosives – Storage and Use, Part 2 – Use of Explosives* limits for human comfort at any residential and public sensitive site external to the quarry.

- The peak sound pressure limits are currently 115 dB for 95 percent of blasts per year. 120 dB maximum for any blast.
- The ground vibration limits are five (5) mm/s for 95 percent of blasts per year, with a maximum vibration of 10 mm/s for any blast.
- No evidence of fly rock outside the quarry due to blasting.

No incidents of fly rock leaving the PM or causing impacts to infrastructure within the PM.

Ground vibration limits for blasts within 300 m of the geological features (Pizey's Knob and Bachelor Pad) are within 50 mm/s at the closest part of the feature to the blast for 95percent of blasts per year.

Ground Vibration limits for blasts within 250 m of the ElectraNet transmission lines are within 100 mm/s for 95 percent of blasts per year.

2. What will be Measured and the Form of the Measurement

Flyrock, Ground Vibration and Air Overpressure.

3. Location of Measurement

Flyrock will be measured with the use of captured video of each blasting event.
Ground Vibration and Air Overpressure will be monitored at the locations highlighted within QDRP's

Ground Vibration and Air Overpressure will be monitored at the geological features (Pizey's Knob and Bachelor Pad) when blasting activities are within 300 m of the features.
Ground Vibration and Air Overpressure will be monitored at the ElectraNet transmission lines when within 250 m of the ElectraNet tower.

4. **Frequency of Measurement**
   Each blasting event.
5. **Control / Baseline Data**
   Attachment 32 – Blast Parameters Evaluation.
   Attachment 35 − Geological Features - Blasting Assessment Study.
   Drawing 21 – Quarry Development and Rehabilitation Plan - Stage 1, **Drawing 24 – Quarry Development and Rehabilitation Plan - Stage 2**, **Drawing 27 – Quarry Development and Rehabilitation Plan - Stage 3**, **Drawing 30 – Quarry Development and Rehabilitation Plan - Stage 3A (progressive)**, **Drawing 31 – Quarry Development and Rehabilitation Plan - Stage 3A**.

6.15 Groundwater

6.15.1 Context

The Site falls within the CAPWA in which groundwater extraction requires a licence. Hanson hold a groundwater licence for 12,280 kl (Licence No. 137780) associated with Well No 6628-06231 for the supply of groundwater to the Site, refer **Drawing 2 – Site Layout Plan**. The Site does not fall within a PWRA.

In October 2020, a groundwater assessment was undertaken to determine the groundwater elevations at the Site and inform the pit design, refer **Attachment 15 – Groundwater Assessment**. The assessment used data from publicly available data sources and the August 2019 groundwater monitoring and hydraulic test investigation that was conducted at the Site following the exploratory program.

In March 2022, a further groundwater assessment was undertaken to provide additional groundwater information to support the MOP Review pit designs, refer **Attachment 16 – Request for Alteration - Groundwater Related Tasks**. The assessment findings indicate that the groundwater elevation at the Site ranges between 237 and 323 mAHD based upon the available drillhole data. It is highest at topographic highpoints in the central and eastern portions of the Site while elevations are lower beneath drainage lines to the north and south of the existing pit.

A groundwater contour map has been developed for the Site through the use of measured water levels which has been used to inform the development of the QDRP's which have been designed to remain four (4) m above the contour map, increasing to five (5) m above the contour map in areas of increased uncertainty. An annual groundwater monitoring program has been recommended for the Site to validate the groundwater modelling and reduce the uncertainties that have informed the conservative groundwater buffer distances. A groundwater monitoring program will be implemented in accordance with the recommendations outlined within **Attachment 16 – Request for Alteration - Groundwater Related Tasks** Section 4.

As noted in Section 4.6 of **Attachment 15 – Groundwater Assessment**, a search of the BoM Atlas for GDE returned no results for aquatic GDE with a high potential for groundwater interaction. The search returned results for potential terrestrial GDE at the Site and immediate surrounds, identified as being eucalyptus woodland with low to moderate potential for groundwater interaction. This vegetation is likely to be dependent upon rainfall and / or surface water as opposed to groundwater. It is noted that onsite observations and data obtained at the onsite observation well indicate that standing water levels are at least six (6) m below creek lines throughout the year.

6.15.2 Potential Impact Event

Potential for groundwater interception if QDRP's are not adhered to or significantly differing groundwater levels are presented over the life of the quarry.

6.15.3 Impact Assessment

Quarry Phase	Source	Pathway	Receptor	Initial Risk Assessment Likelihood: Consequence, Risk
Operational	Quarry Operations	Interception of Groundwater by Quarry Extraction.	External users.	(3:3), **Medium**
Control and Management Strategies				
Operational • All development onsite is to adhere to the QDRP's and associated levels onsite. • Six (6) monthly monitoring of the monitoring well network as outlined within **Attachment 16 – Request for Alteration - Groundwater Related Tasks** including existing well onsite and monitoring well (to be installed to inform future RL's and confirm any trends overtime in relation rainfall deviation). • Survey of the Site to be undertaken annually to confirm RL's on the floor and ensure they correspond with the relevant QDRP. • Meter groundwater usage from the onsite well. • Ongoing MOP Review is to inform future staged planning.				
Evaluation of Residual Risk				**Residual Risk***
Operational The risk associated with groundwater is low and with the implementation of the controls and management strategies the likelihood of the impact occurring is further reduced.				(2:2), **Low**

6.15.4 Justification for Acceptance of Residual Risk

The associated methodology in identifying groundwater levels onsite are recent and known. The mitigation measures include the implementation and construction of another monitoring well that will provide additional context and accuracy to the already known dataset. Offset to groundwater contours of four (4) m provides a conservative buffer distance above industry standard practice.

6.15.5 Objective and Measurement Criteria

Groundwater	
Quarry Phase	**Objective**
Operational	No adverse impact to the quality and quantity of groundwater to existing uses caused by quarrying operations.
Objective measurement	
1. **Objective Achievement** Annual survey confirms quarry extraction is within parameters presented within the approved QDRP's Six (6) monthly monitoring of groundwater monitoring network. 2. **What will be Measured and the Form of the Measurement** Ground Elevations (RL's). Groundwater Levels. 3. **Location of Measurement** Extraction area. Current bore location and monitoring well network as outlined within **Attachment 16 – Request for Alteration - Groundwater Related Tasks**. 4. **Frequency of Measurement** Annual survey. Six (6) monthly monitoring of groundwater monitoring well network. 5. **Control / Baseline Data** **Attachment 15 – Groundwater Assessment**. **Attachment 16 – Request for Alteration - Groundwater Related Tasks**.	

7. Mine Completion Plan

7.1 Introduction

This Mine Completion Plan (MCP) has been developed in accordance with the requirements of Regulation 80 (3) (c) of the *Mining Regulations 2011*, which states that the following must be addressed:

(c) ongoing and final rehabilitation of the Site, site closure, and future use of the Site.

Given the estimated extraction life for the Site, the MCP is conceptual in nature and is designed to be flexible and adaptable to expectations at the time. A PMLUP for the Site has been prepared for the Site to help inform the potential Post Mining Land Use options for the Site post closure, refer **Attachment 45 − Post Mining Land Use Plan**. The ongoing extraction and rehabilitation of the Site outlined within the Extraction Plans and QDRP will occur over an extended period of time of which the final land form goals and expectations may change over time, and the PMLUP and associated MCP will need to be reviewed to accommodate these changes prior to the establishment of a final MOP.

This MCP has been developed with reference to Section 3.5 *Mine completion plan of the Guidelines for miners: preparation of a mine operations plan (MOP) (Minerals Regulatory Guidelines MG12, Version 1.4)* dated May 2012.

In accordance with the MOP guideline (MG12), Section 3.5.1, it is noted that:

where mine closure is not anticipated in the near future (<7 years) this plan will of necessity, be conceptual only. It will be revised over the mine life, and only be finalised close to mine completion.

Therefore, the purpose of this MCP is to provide:

- Objectives for the mine completion
- A set of measurable completion criteria for the mine closure
- Rehabilitation strategies likely to be implemented for the closure of the Site
- An overview of any previous rehabilitation activities
- The conceptual final landform design
- A completion residual risk assessment for the rehabilitation strategies.

As part of the MCP, it is important to identify the high level stakeholders that should be informed at differing trigger points along the quarry life journey, so, that if any legislative change is enacted that prompt review of the land use options are reviewed regularly and closer to mine completion the ultimate MCP will drive a mutually beneficial outcome.

7.2 Objectives for Mine Completion

Section 6 Potential Impact Risk Assessment provides objectives and measurable completion criteria for the mine completion activities at PM 188. The completion criteria have been developed with reference to the requirements of Regulation 80(4) of the *Mining Regulations 2011*.

Fundamentally, the main objective of the MCP is to document a commitment and planned approach to ultimately closing the Site and transitioning from an operational extractive quarry to that of a future land use. The MCP document provides a platform for the operations to work toward a conceptual design that in time will be required to be finalised closer to the time of cessation of activities onsite (five (5) years from closure).

This section of the MCP sets out objectives for the MCP. The main three (3) key objectives that are highlighted include:

- ***Stakeholder Involvement****: to enable all stakeholders to have their interests considered during the mine closure process*
- ***Planned Closure****: to ensure the process of closure occurs in an orderly, sustainable, cost-effective and timely manner*

- ***Implementation****: to ensure there is clear accountability, and adequate resources, for the implementation of the closure plan*

In addition, importance in future MOP Reviews should be centred around the below two (2) objectives which will become more apparent as time passes:

- ***Closure Indicators****: to establish a set of indicators which will demonstrate the successful completion of the mine closure process*
- ***Relinquishment****: to reach a point where the company has met agreed completion criteria to the satisfaction of the Responsible Authority.*

7.3 Closure Objectives

7.3.1 Stakeholder Involvement

Throughout the development of this MOP Review report, consultation and engagement with stakeholders has been paramount to identifying the needs and concerns of the surrounding stakeholders. The identification of stakeholders that have an interest of the Site was important and has been provided for in commentary throughout this MOP Review report. These stakeholders included:

- Local State and Federal Ministers
- Minister for Energy and Mining
- Representatives from the City of Burnside and Adelaide Hills Councils (CEO, elected members etc)
- Government and interested agencies and groups including:
    - DEM
    - EPA
    - DEW
    - Kaurna
    - Representatives from the Hills and Fleurieu Landscape Board
    - Local community groups
    - Adjacent landowners
    - ElectraNet.

Throughout the life of this MOP Review, it is imperative to keep abreast of the stakeholders who have an interest within this Site. Interests will change over time however at each of the MOP Review timelines it is important to review and reflect on who the main stakeholders are and upon gaining closer to the end of extractive life, closer interest into the use of the land post extraction will be encouraged to be sought from the stakeholders who have an interest in the area.

7.3.2 Planned Closure

The staged QDRP presented within this MOP Review report reflect a long-term view from Hanson. The pit shell has been reverse engineered to ensure items such as the environment, regulatory and social parameters are taken into account.

The planned staged QDRP do present options for planned closure however given the term to achieve closure it is important that constant review of the QDRP in alignment with regulatory, social, economic, and environmental impacts are undertaken to align with a planned closure approach.

7.3.2.1 Rehabilitation Strategies

Rehabilitation strategies are highlighted within the staged QDRP presented within this MOP Review document. Extraction and rehabilitation activities are aligned to the MCP and Long-Term Plans for the Site.

The interest and feedback from external stakeholders showed that the surrounding area is of great interest to the community. Horsnell Gully and Giles Conservation Parks to the immediate south of the Site (including land that Hanson own) presents opportunities for post extraction activities. The potential final land uses identified within the PMLUP and

rehabilitation strategy presented throughout the text and drawings within this MOP Review document support for the potential to establish a final landform that can complement the conservation parks and support other complementary land uses within the Site. The batter angles that have been designed on the Site are not only designed with the assistance of a technical report but also provides for a landform that will complement the surrounding landform. This strategy provides an opportunity for a multitude of post extraction uses including:

1. **Cultural Heritage / Recreational**
   Open space allocated towards preserving cultural heritage values of the area while also supporting controlled recreational activities such as bushwalking and rock climbing through consultation and management with Traditional Owners.
2. **Rock climbing Recreational**
   Open space set aside to support potential rock climbing and recreational activities within the modified landscape of the quarry development.
3. **Open Space Revegetation**
   Establishment of geotechnically safe and stable rehabilitation of the quarry to support open space revegetation and low impact recreational (i.e. Bushwalking) areas to support local revegetation planting designed to be sympathetic with the surrounding natural environments.
4. **Open Space Vegetation Retention**
   Retention of higher quality native vegetation which is within close proximity or adjoins Conservation Parks and provides retention or enhancement of habitat and native vegetation buffers.
5. **Open Space / Multi Use**
   Open space recreational areas set aside with the potential for supporting infrastructure and community amenity facilities to enhancing access and connectivity to the surrounding land uses, i.e. community gardens, recreational facilities, BBQ's, picnic shelters, walking trails, bike tracks and amenity facilities.

7.3.2.2 Disturbed Area Management

The management of disturbed areas (historic and future) is important in the achievement of the final landform and associated use.

7.3.2.3 Progressive Rehabilitation Planting

The staged QDRP support the motion of a progressive rehabilitation strategy. As detailed within **Attachment 24 – Soil Assessment and Analysis**, batter surface stabilization for a 1:2 batter will be implemented through the application of a Hydromulching BFM to provide erosion control until the seeding roots have established. Hydromulching will include sterile Ryecorn and native grass seed (where available) for the establishment of a grassed cover crop prior to revegetation planting occurring. Once the rehabilitation batters have been stabilised with a cover crop, revegetation planting will occur progressively over the landform including a mixture of local provenance understorey and tree species from locally sourced seed. The species mix, composition of the planting is intended to be sympathetic with the surrounding environment which will vary across the landform depending upon the aspect of the revegetation works as outlined within **Attachment 29 − Revegetation Plan** and **Drawing 15 − Conceptual Revegetation Plan**. The rate and extent of revegetation works undertaken each year will vary depending upon the establishment and stabilisation of the progressive rehabilitation landform.

7.3.2.4 Redundant Roads and Tracks

Any roads and tracks located within areas to be rehabilitated that are no longer required for the operational functionality of the Site, or for ongoing access to rehabilitated areas, are to be removed and allowed to regenerate with vegetation. Further access is to be prevented to these roads and tracks to avoid compaction.

Importantly, CFS access and tracks will remain unless requested otherwise by CFS representatives.

7.3.2.5 Areas not Available for Rehabilitation

The concrete paving area adjacent to the weighbridge and at the entrance to the Site and the area designated as the Transport Office shall be excluded from rehabilitation planning for the purpose of the MCP to provide for a future parking area for visitors to Site.

7.3.2.6 Infrastructure Removal and Waste Management

Hanson will remove items of fixed and mobile quarry related infrastructure at the cessation of the quarrying operation unless a beneficial use of infrastructure is negotiated prior to closure. This may include, but will not necessarily be limited to the following:

- Crushing and screening plant
- Concrete Batching Plant
- Maintenance Shed
- Lunchrooms
- Offices, etc

7.4 Implementation

This MOP Review begun in 2020 will not be the last MOP Review for this Site. The Site will undertake extraction and rehabilitation in alignment with the requirements and parameters within this MOP Review document and associated plans.

Hanson will implement the reviewed MOP and therefore will ensure no additional risks are realised in achieving the overarching MCP objectives.

The last two (2) objectives of a MCP include *Closure Indicators and Relinquishment* of the PM. Given the timeframe to reach the final closure of the Site it is recommended that these items are addressed closer to the cessation of the Site operations.

7.4.1 Completion Risk Assessment

The completion residual risk assessment has been undertaken to consider any potential residual risk to the Site following completion of the rehabilitation activities and subsequent closure of the Site. The assessment of potential residual risk has been based on the risk assessment methodologies outlined in **Section 6 Potential Impact Risk Assessment**.

Table 21 – Identification of Potential Risks and Management Measures, various aspects relating to Site closure activities have been tabulated against potential risks to provide a focus for any ongoing management strategies.

7.4.2 Summary of Residual Closure Risks

The assessment of potential closure residual risks has outlined that all potential risks will be managed appropriately provided the management measures / control strategies outlined in **Table 21 – Identification of Potential Risks and Management Measures** are implemented.

Provided sufficient control strategies are implemented by operator, the rehabilitation of the Site is likely to be self-sustainable in the long term.

Table 21 – Identification of Potential Closure Risks and Management Measures

Aspect / Risk	Description	Likelihood	Consequence	Residual Risk Rating	Management Measures / Control Strategies
Financial Vulnerability	Insufficient funding to undertake rehabilitation activities.	1	3	**Low**	Undertake progressive rehabilitation as QDRP's.
Failure to Undertake Progressive Rehabilitation	Progressive rehabilitation not managed correctly or undertaken in a timely manner, commensurate with the staged extraction plans.	2	4	**Medium**	Progressive rehabilitation is to be undertaken where areas become available in accordance with the QDRP and final landform plan. Topsoil and Overburden material is to be qualified to ensure suitability for rehabilitation activities. Annual Compliance reporting to the Regulator.
Ongoing Maintenance	Ongoing maintenance of rehabilitation to repair areas of potential failure.	2	3	**Medium**	Maintenance of areas that are progressively rehabilitated is to be scheduled to ensure any repairs are undertaken in a timely manner to ensure efficacy and success of Site rehabilitation activities are efficient.
Changing Surrounding Land Uses	Surrounding land use becomes inconsistent with the final landform design.	2	2	**Low**	Monitor adjacent surrounding land uses and liaise with local government to ensure the final landform design is compatible with the development plan for the local area. The final land use for the Site is to be determined in consultation with stakeholders prior to the preparation of the final MOP.
Landform Instability	Instability of the final landform (e.g. slope failures, landslip).	2	4	**Medium**	Ensure all final landform slopes are of an appropriate angle and revegetated. Final landform slopes are to be monitored following completion of the landforming activities. A geotechnical stability assessment is to be undertaken to verify stability.
Visual Amenity Degradation	Degraded visual amenity as a result of residual disturbed areas.	3	3	**Medium**	Rehabilitate the Site in accordance with the conceptual final landform plan to ensure visual amenity is protected / enhanced at cessation of the activity. No unspecified residual disturbed quarry areas are to remain at the completion of the rehabilitation activities (with the exception of any quarry related infrastructure that is to remain for ongoing beneficial use in accordance with an approved Landowner Agreement).
Air Quality Impact	Impact on air quality through dust emission	1	1	**Low**	Rehabilitate the Site in accordance with the conceptual final landform

Aspect / Risk	Description	Likelihood	Consequence	Residual Risk Rating	Management Measures / Control Strategies
	generation as a result of disturbed quarry areas.				plan to ensure no undue air quality emissions are generated at cessation of the activity as a result of residual disturbed land. No residual disturbed areas are to remain at the completion of the rehabilitation activities (with the exception of any quarry related infrastructure that is to remain for ongoing beneficial use in accordance with an approved Landowner Agreement).
Land Contamination	Land contamination as a result of hydrocarbon or chemical spills.	2	2	**Low**	Undertake an assessment of areas identified as being potentially contaminated where necessary and remediate and / or lawfully dispose of any contaminated materials / soils. Engage the services of a suitably qualified person to undertake the assessment where necessary.
Weeds	Infestation / spread of environmental weeds or declared weeds in the surrendered areas.	2	2	**Low**	Progressive rehabilitation is to be undertaken where possible in areas of the Site which have reached the terminal extraction limits to minimise potential for weed colonisation. Revegetation is to be established at the completion of the activities to ensure potential for weed infestation is minimised. Weed control at the completion of the activity will be the responsible of the landowner.
Drought	Future periods of drought are not able to be controlled, therefore this is a potential threat to the long term grass growth.	3	3	**Medium**	Drought and prolonged dry periods have the potential to impact upon vegetation. As with the current arrangements regarding drought, management of the land at the cessation of the activity will be the responsibility of the landowner.
Bushfires	Bushfires may potentially damage established vegetation communities.	3	3	**Medium**	Bushfires are a natural climatic phenomenon and would be managed as an ongoing landowner responsibility following cessation of the activity.
High Rainfall / Flood Event	High rainfall or flood events resulting in impacts to the rehabilitated landform.	1	2	**Low**	Quarry rehabilitation batters have been designed and specified within this MOP Review, refer to **Drawing 17 – Typical Quarry Rehabilitation Detail**. Revegetation is to be with species endemic to the region where

Aspect / Risk	Description	Likelihood	Consequence	Residual Risk Rating	Management Measures / Control Strategies
					possible which are inherently capable of withstanding regional climates.
Experimental or Novel Rehabilitation Techniques	Application of untested rehabilitation techniques.	1	2	**Low**	Only rehabilitation techniques which are proven are to be used to minimise potential for failure.

8. Procedures and Action to be Taken in the Event of an Emergency or Incident

8.1 Introduction

Attachment 46 – White Rock Quarry Site Emergency Plan has been developed to ensure that Site personnel understand their duties in the event of an emergency onsite that may have a detriment effect on plant, people or the environment. Once the potential emergency / incident has been highlighted a series of actions have been developed to mitigate further risk and protect the plant, people and environment from further harm.

The Site Emergency Plan clearly highlights the personnel in control and sets measures to ensure that all of the relevant Emergency Team personnel have clear defined roles in the event of an emergency. The plan also sets out where personnel can find First Aid Kits onsite and provides details on what to do in the event of an emergency onsite.

In the event of an Emergency occurring, after the event, Hanson reports Incidents through the Integrated Risk Information System (IRIS). All incidents will be reported on an IRIS form and / or registered in an electronic database. Incidents will be tracked to ensure that the appropriate corrective actions and measures are taken to prevent the incident from reoccurring. Environmental Incidents will be reviewed on a monthly and annual basis to determine incident trends. This will enable targeting of areas that require further management and will assist in preventing future incidents.

8.2 Potential Emergency Situations or Incidents

Given the Site is located within a metropolitan area and the Site has an general extraction method that has been developed for standard open cut extraction, most of the risks involved with the general day to day operations are considered to be low. The Emergency Plan has been developed to mitigate further harm to people, plant, and the environment.

All incidents causing or threatening serious or material environmental harm, the Site must report the incident to the EPA as soon as practicable on becoming aware of the incident.
EPA Emergency Hotline: 1800 100 833 or (08) 8204 2004

Records must be kept including full details of the incident and any subsequent actions taken.

Material environmental harm is of an environmental nuisance of a high impact or on a wide scale or that involves actual or potential harm to the health or safety of human beings that is not trivial, or if it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding five (5) thousand dollars.

Serious environmental harm is of actual or potential harm to the health or safety of human beings that is of a high impact or on a wide scale, or other actual or potential environmental harm that is of a high impact or on a wide scale or if it results in actual or potential loss or property damage of an amount, or amounts in aggregate, exceeding fifty thousand dollars.

8.3 In the Event of an Emergency

In the event of an emergency at the Site, the Site has a current Site Emergency Plan, Principal Mine Hazard Management Plan and Safety Management System.

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drawings

attachments