MALABAR COAL

MAXWELL PROJECT

SECTION 7

Rehabilitation and Mine Closure

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7 REHABILITATION AND MINE CLOSURE

A Preliminary Rehabilitation and Mine Closure Strategy has been prepared for the Project and is provided in Appendix U.

The Preliminary Rehabilitation and Mine Closure Strategy has been prepared to satisfy the rehabilitation requirements of the SEARs, regulatory input to the SEARs and relevant rehabilitation guidelines, including:

- *ESG3: Mining Operations Plan (MOP) Guidelines* (the MOP Guidelines) (NSW Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy [DRE], 2013);
- *Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth of Australia, 2016a);
- *Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry* (Commonwealth of Australia, 2016b); and
- *Strategic Framework for Mine Closure* (Australian and New Zealand Minerals Council and the Minerals Council of Australia [ANZMEC-MCA], 2000).

Where relevant, the Preliminary Rehabilitation and Mine Closure Strategy considers the outcomes of consultation with relevant stakeholders (Section 3 of Appendix U) and the relevant EIS technical studies.

The Preliminary Rehabilitation and Mine Closure Strategy is summarised in the following sub-sections.

7.1 EXISTING REHABILITATION AT THE MAXWELL INFRASTRUCTURE

Rehabilitation at the Maxwell Infrastructure is managed in accordance with an approved 2015 - 2020 MOP and Rehabilitation and Offset Management Plan (the approved MOP).

Rehabilitation occurred progressively at the Maxwell Infrastructure as ancillary disturbance areas and final mine landforms became available for revegetation. The approved revegetation strategy (as documented in the MOP) recognises the alternative land uses that exist in the region, with the aim of establishing the potential for sustainable grazing lands and enhancing the local and regional habitat corridors.

Progressive rehabilitation activities have been conducted at the Maxwell Infrastructure (formerly known as the Drayton Mine) since 1983. Approximately 644 ha of the Maxwell Infrastructure area has been rehabilitated to date.

Malabar formally took control of the Maxwell Infrastructure on 26 February 2018. Malabar resumed rehabilitation work on former mining areas as quickly as possible, with the first bulldozer commencing work on the mine site in early March 2018.

An area of rehabilitation at the Maxwell Infrastructure waste emplacement is shown on Plate 7-1.

Plate 7-1 – Rehabilitated Maxwell Infrastructure Waste Emplacement – April 2019

Routine ecological monitoring is conducted across the existing offset areas and rehabilitated lands at the Maxwell Infrastructure. Monitoring during 2017 indicated that most pasture rehabilitation monitoring sites were meeting relevant performance criteria. Monitoring during 2018 showed that the pasture species listed in the approved MOP were being naturally supplemented by non-target perennial grass species, providing greater diversity (Appendix U).

Monitoring of woodland rehabilitation sites during 2018 indicated that the ground cover diversity was generally trending towards the reference sites (i.e. sites located on natural ground). The diversity of canopy and mid-storey species, in particular at the Southern Offset Area, was moderately representative of the reference sites; however, foliage cover was low (Appendix U).

Various rehabilitation trials have been conducted at the Maxwell Infrastructure over the life of the mine, including:

- a native grassland establishment trial;
- implementation of a landform designed in GeoFluv™ natural landform software in an 11.5 ha area of mine rehabilitation;
- a horse grazing trial; and
- a cattle grazing trial.

The outcomes of these rehabilitation trials are discussed in Appendix U.

7.2 REHABILITATION OF THE PROJECT

As an underground mine, the Project would result in minimal changes to existing landforms. Malabar would continue rehabilitation of the former mining areas at the Maxwell Infrastructure as part of the Project.

7.2.1 Landform Design and Post-mining Land Use Objectives

The design and post-mining land use objectives for the Project are as follows:

- Provide a landscape that is safe, stable and non-polluting.
- Minimise potential environmental impacts and liability arising from mine closure.
- Remove any waste or potentially hazardous materials from site.
- Minimise the potential impacts of decommissioning.
- Develop landforms that return land affected by mining to a condition that is suitable for a range of sustainable land uses.
- Create a stable post-mining landform that is compatible with the surrounding landscape, and that is capable of productive land use that achieves the nominated land capability.
- Establish vegetation that is self-sustaining, is perpetual and provides a sustainable habitat for local fauna and successive flora species.
- Create a post-mining landform that enhances the local and regional habitat corridors as presented in the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (DMR, 1999).
- Develop land uses that benefit the future use of the site for the local community.
- Develop a landscape that reduces the requirement for long-term monitoring and management.
- Minimise the impacts on surface and groundwater when compared to pre-mining conditions.
- Continue to engage with the local community and regulatory stakeholders on key environmental and socio-economic issues during the closure and post-mining phase.

The Project would utilise substantial elements of the existing infrastructure, resulting in the delay of some undertakings of the approved MOP until the end of underground mining production.

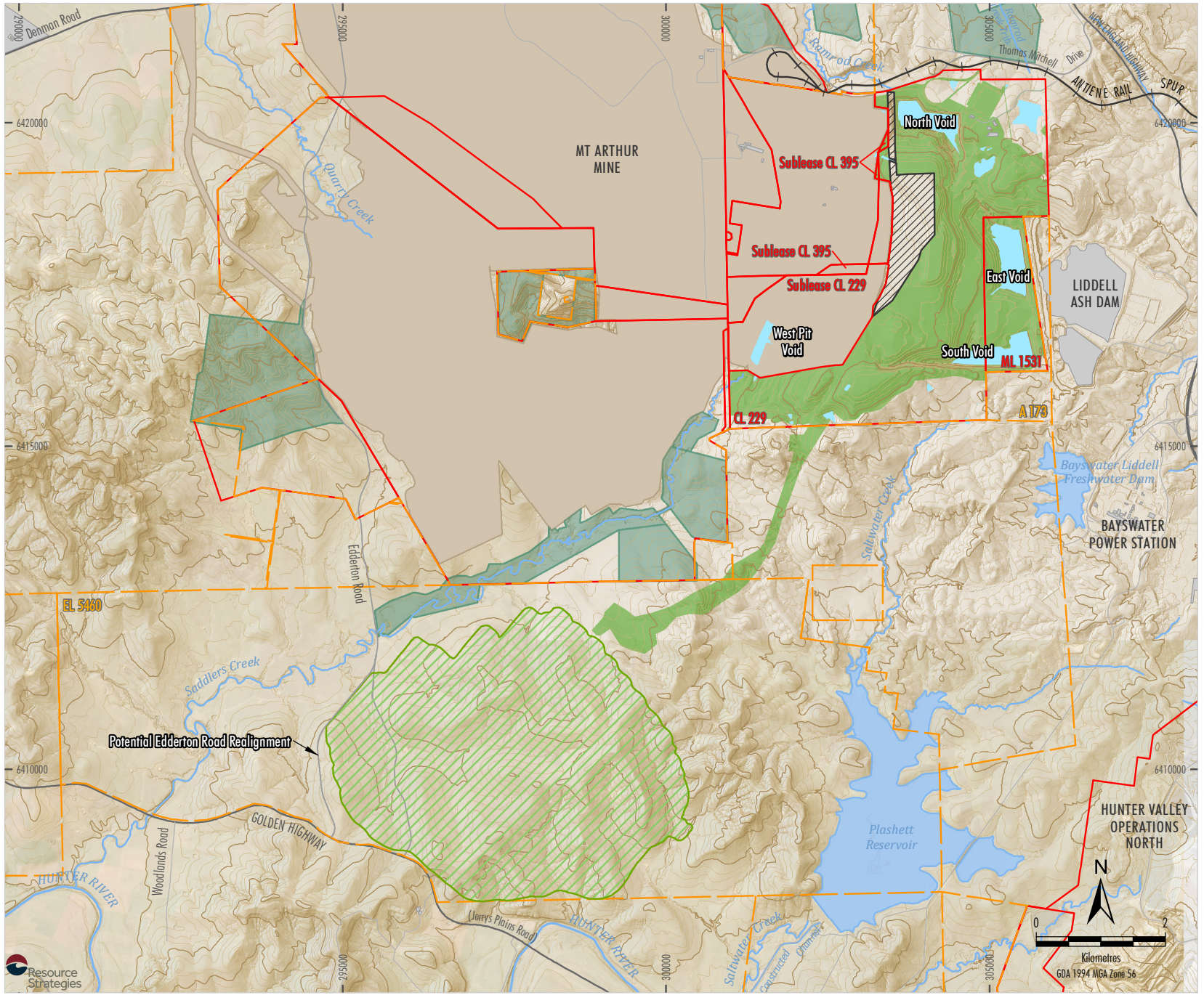
7.2.2 Conceptual Final Landform

The proposed final landform, incorporating the approved Maxwell Infrastructure, proposed Maxwell Solar Project and the Project, is shown on Figure 7-1.

Project Infrastructure Areas

Following the completion of mining, Project surface infrastructure areas would be decommissioned according to the procedures described in Appendix U.

Project surface infrastructure areas would be returned to Pasture or Woodland as described in Section 7.2.3.



LEGEND

- Railway
- Approximate Exent of Existing/Approved Mt Arthur Mine
- Existing Conservation/Offset Area
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Maxwell Solar Project Infrastructure
- Rehabilitated Surface Disturbance Area (including Approved Maxwell Infrastructure)
- Water Management Area
- Remediated Underground Mining Area

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019); MSEC (2019)

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Conceptual Final Landform

Figure 7-1

SHM-18-03 Maxwell_EIS_Sect 7_201C

Project Underground Mining Areas

Following the completion of mining, Project underground portals and ventilation shafts would be sealed in accordance with the requirements of *MDG6001 Guideline for the Permanent Filling and Capping of Surface Entries to Coal Seams* (NSW Trade and Investment, 2012) (or its latest version at the time).

Surface impacts from subsidence would be progressively remediated in accordance with the procedures referenced in Section 7.3.7. Post-mining, subsidence monitoring would continue for a period agreed with the NSW Resources Regulator, and any observed surface impacts would continue to be remediated by Malabar.

Maxwell Infrastructure

Malabar is undertaking rehabilitation at the Maxwell Infrastructure. Earthworks have been undertaken to establish final landforms in accordance with the approved MOP. Where possible, landform designs have been modified to create more natural landscapes, incorporating dams and natural drainage lines on rehabilitation to result in a more visually appealing outcome.

Some consultees have raised the potential for Malabar to further incorporate micro-relief and the principles of GeoFluv™ into the existing Maxwell Infrastructure final landform. The primary objective of GeoFluv™ is to design stable landforms that convey water in the same way as natural landforms.

The key principles of GeoFluv™ include:

- Creation of a natural-looking landscape with ridges that transition from convex to concave slopes.
- Maximising the number of sub-catchments (or watersheds) to reduce the catchment area of individual constructed drainage lines. This reduces reliance on contour banks and engineered drop structures (such as rock drains).
- Designing larger water channels with the required cross-sectional profile and sinuosity to handle variable flows.

The retrospective broad-scale application of micro-relief and the principles of GeoFluv™ to existing shaped landforms at the Maxwell Infrastructure is not considered to be feasible, given that:

- Open cut mining activities have ceased on the site and any material changes to the landform would involve significant rehandling of waste material, resulting in disturbance to the establishing ecosystems, and noise and air quality effects during the implementation along with prohibitive cost.
- The existing landforms are providing safe and stable areas for the planned future land uses. These areas will be maintained as part of the ongoing management of the site.
- The Maxwell Solar Project is proposed to be located on the upper surface of the existing waste emplacement, delivering an intensive long-term land use that is considered superior to an undulating grazing area.

As far as is practical, Malabar seeks to develop drainage features in the post-mine landform that mitigate erosion potential. These include:

- incorporating natural landscapes into landform design rather than engineered structures;
- reshaping areas to integrate seamlessly with adjacent landforms;
- creating undulating landforms over predominately flatter areas;
- redesigning drainage structures to appear less intrusive; and
- establishing a mix of gentle slope gradients and steeper slopes up to a maximum of 18 degrees.

Malabar undertakes regular consultation with BHP regarding potential interactions between the Maxwell Infrastructure and Mt Arthur Mine final landforms. The approved MOPs for the Mt Arthur Mine and the Maxwell Infrastructure both show potential integration between the final landforms.

Final Voids

The proposed final landform includes the three remaining voids at the Maxwell Infrastructure, although the Project would involve the partial backfilling of the East Void with CHPP reject material.

As described in Section 6.5.3, the accumulation of surface runoff combined with groundwater inflows may result in the formation of a pond of water in the voids at the Maxwell Infrastructure, which would rise until the average rate of inflow is balanced by evaporation from its surface (Appendix C).

HydroSimulations (Appendix B) evaluated the potential impacts of the Project on groundwater resources using a numerical regional groundwater model. Groundwater modelling included predictive modelling over the life of the Project as well as recovery modelling for a 1,000-year period post-mining.

Initial pit lake equilibrium levels were determined by WRM (Appendix C) based on direct rainfall to the void surface and catchment runoff, less evaporation losses. These pit lake levels were then implemented in the recovery groundwater model using a series of constant heads over time. The recovery groundwater modelling predicts that net groundwater inflows to the voids at the predicted equilibrium level would be negligible (Appendix B). Accordingly, further refinement of the final void modelling was not required (Appendix C).

The simulated water levels within all three voids reach equilibrium between 160 mAHD and 164 mAHD after 100 years and generally remain at these levels throughout the remainder of the 400-year simulation (Appendix C). The maximum modelled water level is approximately (Appendix C):

- 44 m below the North Void overflow level;
- 9 m below the East Void overflow level; and
- 11 m below the South Void overflow level.

HydroSimulations (Appendix B) simulated the long-term behaviour of the final voids and determined that they would remain as permanent and localised groundwater sinks.

7.2.3 Post-mining Land Use and Rehabilitation Domains

Post-mining land use objectives and rehabilitation domains for the Maxwell Infrastructure are described in the approved MOP. These rehabilitation domains were developed following an assessment of potential post-mining land uses (e.g. nature conservation, agriculture), taking into account relevant strategic land use objectives in the region and the potential benefits of the post-mining land use to the environment, future landholders and the community.

The existing rehabilitation domains have been developed in consultation with NSW regulatory agencies, Muswellbrook Shire Council and local landholders. The existing rehabilitation domains have been augmented to incorporate the Project (Appendix U).

Malabar recognises that government and community stakeholders may identify final land uses that provide greater net benefits to the locality. Malabar would encourage and be supportive of other community and government proposals or initiatives for the use of Malabar land or infrastructure that can co-exist with the Project. These alternative final land uses would be subject to separate assessments and approval, and do not form part of the Project.

Malabar, through a subsidiary, is seeking approval to develop a solar farm on a portion of the existing Maxwell Infrastructure site (the Maxwell Solar Project) (Section 2.3.2). If approved, the Maxwell Solar Project would remain following completion of mining; therefore, the solar infrastructure is considered both a primary and secondary domain.

The provisional primary and secondary rehabilitation domains for the Maxwell Infrastructure, the Project and the Maxwell Solar Project are summarised in Tables 7-1 and 7-2. The primary domains would develop over time into the proposed secondary domains shown on Figures 7-2 and 7-3. These provisional rehabilitation domains would be reviewed in consultation with key stakeholders as part of the development of an updated MOP (Section 7.6).

The location of the Woodland domains has been selected to provide a long-term woodland corridor that aligns with the *Synoptic Plan: Integrated Landscapes for Coal Mine Rehabilitation in the Hunter Valley of New South Wales* (DMR, 1999).

Table 7-1
Primary Rehabilitation Domains

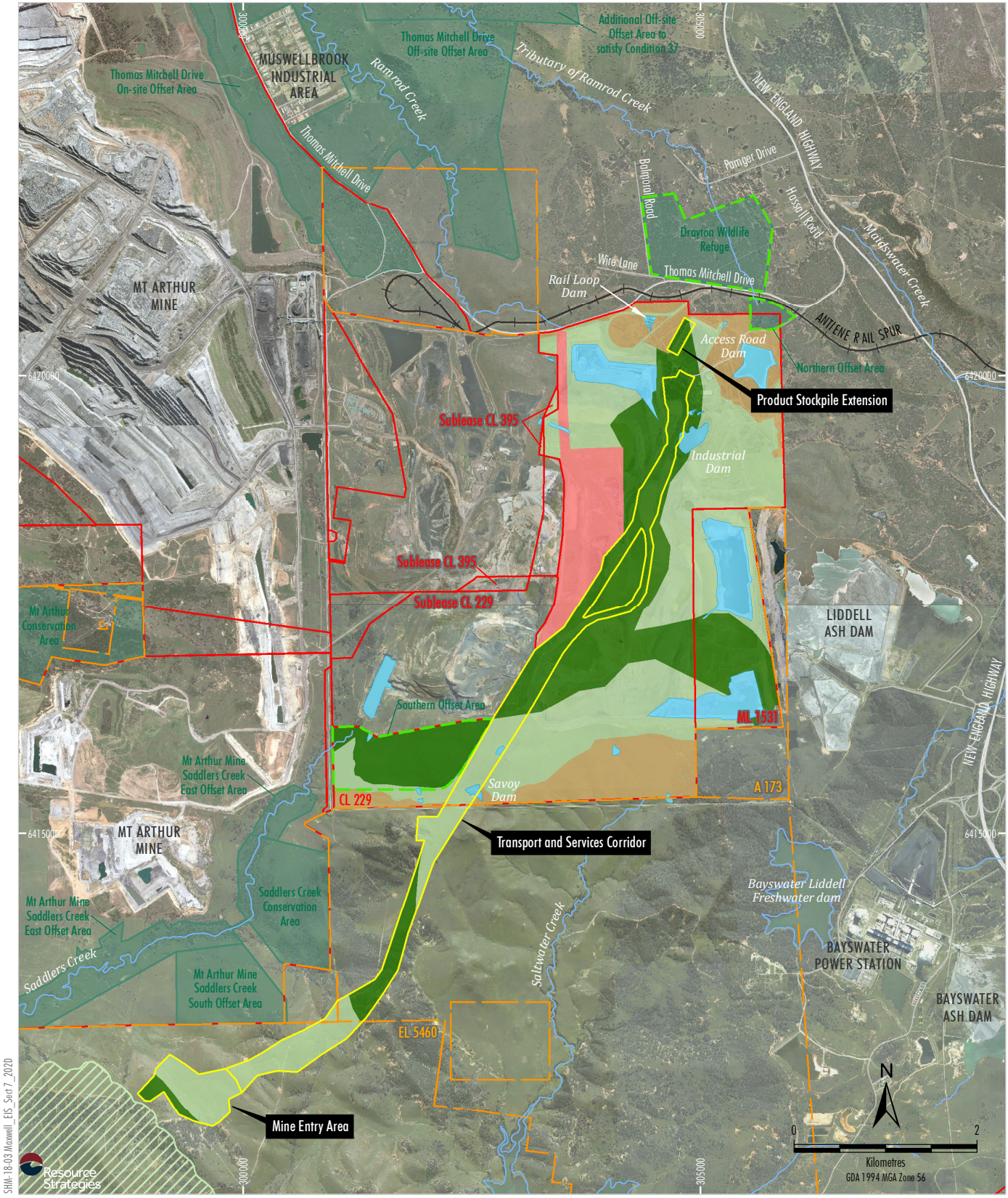
Code	Domain	Description
1	Legacy Open Cut Pit	Residual open cut pits previously used for operational purposes including highwalls, benches, pit floor, end walls and low walls.
2	Overburden Emplacement Area	Areas previously utilised for the emplacement of overburden and interburden material.
3	Water Management Area	All major water management dams and other structures. Water management structures and features used for the operational storage and conveyance of raw water, mine water and mine-affected water storage.
4	Infrastructure Area	Disturbed land modified by civil works and or the construction of operational structures, such as internal roads, laydown areas, hardstands and carparks, coal stockpile pads, fixed buildings, coal processing facilities, conveyors and gantries, rail loop, train load-out facilities.
5	Tailings Emplacement	Areas utilised for operational tailings management and emplacement.
6	Biodiversity Offset	Consists of all areas set aside and managed primarily for long-term biodiversity conservation purposes, regardless of protection status.
7	Existing Rehabilitation	Mine rehabilitation of sufficient age and or development (at MOP commencement), that requires no further rehabilitation or closure planning other than monitoring and routine maintenance.
8	Buffer Land	Malabar-owned land within the Maxwell Infrastructure area and EL 5460 not currently subject to mining related disturbance. This may include pasture or native vegetation (established or regrowth) and is primarily utilised for non-conservation purposes, such as livestock grazing.
9	Maxwell Project Underground Mining Area	Areas that would be actively managed for potential subsidence from the Maxwell Project underground mining activities (i.e. those areas within the subsidence angle of draw).
10	Maxwell Solar Project Infrastructure Area	Infrastructure areas associated with the Maxwell Solar Project as shown on Figure 7-1. These areas would be excised from the Maxwell Infrastructure and Project rehabilitation areas.

Source: Appendix U.

Table 7-2
Secondary Rehabilitation Domains

Code	Domain	Description
A	Biodiversity Offset	Areas in the post-mining landscape designed and managed as Biodiversity Offsets, including the Southern Offset Area, Northern Offset Area, Wildlife Refuge and any biodiversity offset areas required for the Project.
B	Water Management Area	Water storages and watercourses remaining in the final landscape, including dams and voids.
C	Rehabilitation Area - Pasture	Rehabilitation areas re-established with an exotic pasture vegetation cover suited for livestock grazing land use.
D	Rehabilitation Area - Woodland	Rehabilitation areas re-established with a native vegetation community suited for faunal habitat / movement and general ecological enhancement.
E	Buffer Land	Malabar-owned land within the Maxwell Infrastructure area and EL 5460 not currently subject to mining related disturbance. This may include pasture or native vegetation (established or regrowth) and is primarily utilised for non-conservation purposes, such as livestock grazing.
F	Remediated Underground Mining Area	Subsided underground mining areas that would be subject to remediation of subsidence effects (e.g. cracking).
G	Maxwell Solar Project Infrastructure Area	Infrastructure areas associated with the Maxwell Solar Project that would remain following completion of mining at the Project. These areas would be excised from the Maxwell Infrastructure and Project rehabilitation areas.

Source: Appendix U.



LEGEND

- Railway
- Existing Conservation/Offset Area
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Indicative Surface Development Area

Secondary Domains

- A Biodiversity Offset
- B Water Management
- C Pasture
- D Woodland
- E Buffer Land
- F Remediated Underground Mining Area
- G Maxwell Solar Project Infrastructure

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019); MSEC (2019) Orthophoto Mosaic: 2018, 2016, 2011

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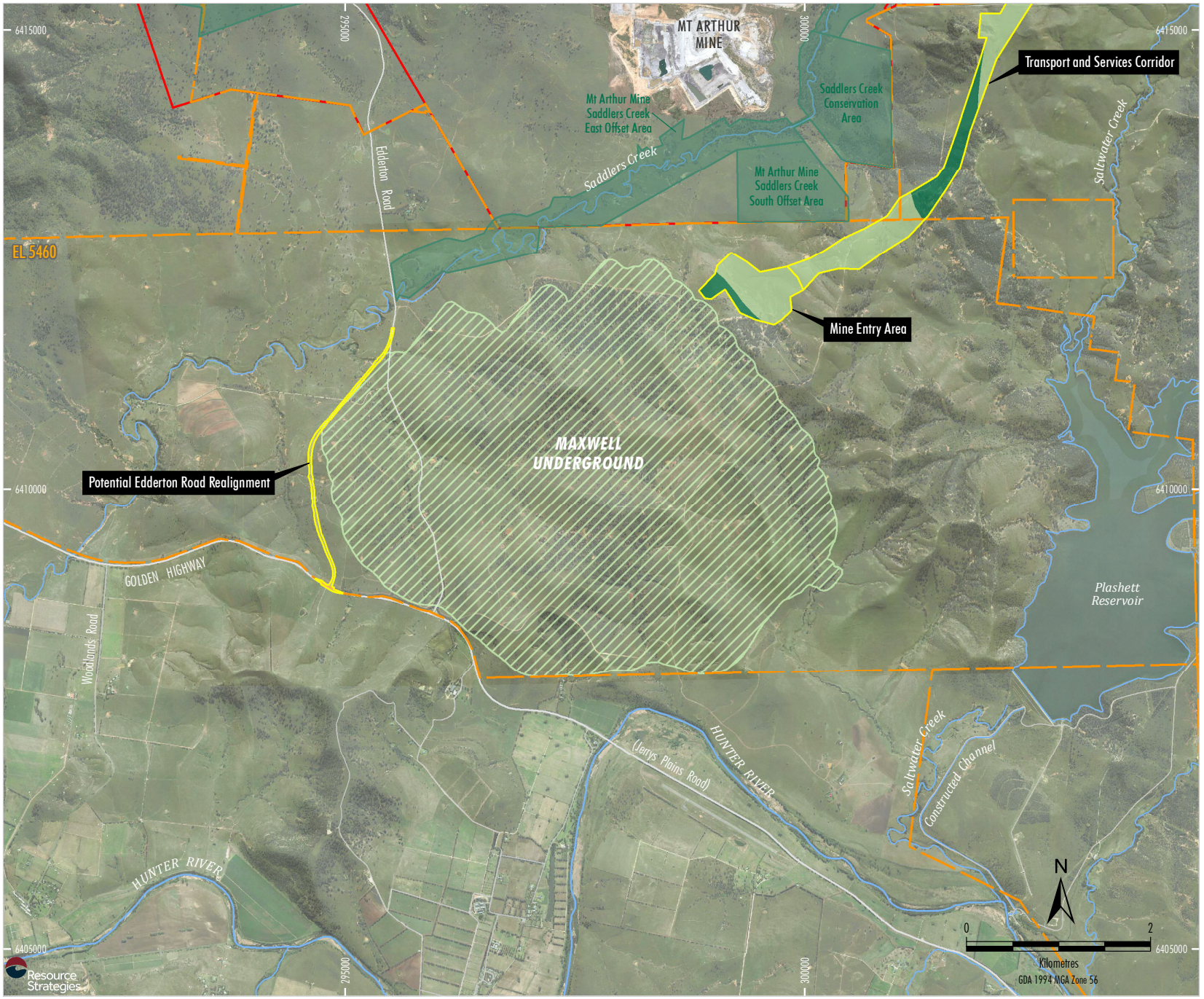
Rehabilitation Domains - Maxwell Infrastructure Area

Figure 7-2



LEGEND

- Existing Conservation/Offset Area
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Indicative Surface Development Area

Secondary Domains

- C Pasture
- D Woodland
- F Remediated Underground Mining Area

Source: © NSW Department of Planning and Environment (2019); NSW Department of Finance, Services & Innovation (2019); MSEC (2019)
Orthophoto Mosaic: 2018, 2016, 2011

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Rehabilitation Domains – Maxwell Underground Mining Area

Figure 7-3

SHM-18-03 Maxwell_EIS_Sect 7_203C

Potential subsidence impacts on Edderton Road may be managed through either road maintenance along the existing alignment, or the construction of a realignment of the road around the Maxwell Underground area. Any realignment of Edderton Road would be subject to necessary approvals under the NSW *Roads Act, 1993* and consultation with RMS and Muswellbrook Shire Council. Should Edderton Road be realigned, it would be transferred to Muswellbrook Shire Council and remain in the revised alignment for the long-term. Accordingly, Edderton Road is excluded from the Project rehabilitation domains.

7.2.4 Rehabilitation Phases

The rehabilitation phases for the Project are summarised below. Progress for relevant rehabilitation domains would continue to be measured against these rehabilitation phases in the MOP.

1. Decommissioning – includes the removal of buildings, CHPP, portals, ventilation shafts, mine entrances, hardstand areas, rail infrastructure (if no longer required), contaminated materials and hazardous materials.
2. Landform Establishment – incorporates gradient, slope, aspect, drainage, substrate material characterisation and capping of carbonaceous materials.
3. Growing Media Development – incorporates physical, chemical and biological components of the growing media and ameliorants that are used to establish vegetative cover.
4. Ecosystem and Land Use Establishment – incorporates habitat augmentation, species selection, species presence and growth, together with weed and pest management and establishment of flora.
5. Ecosystem and Land Use Development – incorporates components of floristic structure, nutrient cycling recruitment and recovery, community structure and function.
6. Relinquishment – secondary domains meet completion criteria and can be relinquished in accordance with a Mine Closure Plan.

7.3 GENERAL REHABILITATION PRACTICES AND MEASURES

The following sub-sections summarise the general rehabilitation practices and measures that would be implemented for the Project. Further detail is provided in Appendix U, where relevant.

The success of progressive rehabilitation activities would be regularly evaluated throughout the Project life and the results would be used to inform future rehabilitation initiatives.

7.3.1 Vegetation Clearing

The clearance of vegetation would be undertaken progressively, with the area of vegetation cleared at any particular time generally being no greater than that required to accommodate projected development activities for the next 12 months.

Vegetation clearance activities would be undertaken in accordance with a Ground Disturbance Permit (GDP) Procedure. The GDP Procedure requires activities to be planned and designed to minimise disturbance impacts.

Control measures would be documented in the GDP and approved by an environmental specialist. Depending on the identified risks of the activity, approval may be conditional on controls being verified prior to or at specified stages during works. Controls may include consideration of avoiding or reducing disturbance (Appendix U).

Prior to the clearing of woodland vegetation (trees and shrubs) an assessment of habitat value would be conducted and habitat structures (e.g. hollow logs, large trees and rocky habitat) may be retained or conserved for use on rehabilitation areas. Native trees and shrubs would also be assessed for potential seed sources and any available seed harvested for distribution on completed rehabilitation areas where possible.

Further detail on the management of potential impacts on flora and fauna during clearing is provided in Appendix E.

7.3.2 Soil Stripping and Handling

Recovered topsoil and, if appropriate, subsoil, would be used in the rehabilitation of the Maxwell Infrastructure or stockpiled for later use in rehabilitation. Long-term soil stockpiles would be managed to maintain long-term soil viability through the implementation of the following management practices:

- soil stockpiles would be located outside of active operational areas and away from drainage lines, operational water areas and steeply sloped areas;
- stockpiles would be no greater than 3 m in height;
- surface drainage in the vicinity of stockpiles would be diverted to minimise run-on and managed to minimise sediment-laden run-off;
- stockpiles that would be inactive for extended periods would be ripped, fertilised and seeded, to maintain soil structure, organic matter and microbial activity;
- stockpiles that would be inactive for extended periods would be mounded to avoid ponding;
- silt fences would be installed around soil stockpiles to control potential loss of soil where necessary;
- long-term soil stockpiles would be deep-ripped to establish aerobic conditions prior to soil use in rehabilitation; and
- periodic inspection of stockpiles and treatment for weed infestation, if required.

7.3.3 Geotechnical Stability

A geotechnical assessment of the final void highwalls was undertaken by Coffey (2014) for the approved MOP to address issues raised during consultation with DRE (now the NSW Resources Regulator). The geotechnical assessment concludes that the existing highwalls in their current conditions are modelled as having a demonstrable factor of safety greater than 1.5 and Coffey (2014) considered the highwalls to be adequate. Notwithstanding, Coffey (2014) makes several recommendations for the proposed mine closure, including highwall blasting, to improve overall and sustained stability.

A Peer Review of the Coffey (2014) report was undertaken by Sherwood Geotechnical and Research Services (2014), which concurred that the final void highwalls would be sustainable in the long-term.

The Coffey (2014) recommendations have been included in the approved Final Void Management Plan (which forms part of the approved MOP). Further detail regarding the closure plan for final voids is provided in Appendix U.

7.3.4 Decommissioning of Surface Infrastructure

Subject to the agreed final land use, decommissioning of surface infrastructure would include, but not be limited to, the following actions:

- de-energising equipment (e.g. removing connections to power, water, gas, compressed air and sewerage) and isolation of power to the site (if appropriate);
- removal of underground infrastructure, such as mining equipment and service infrastructure;
- sale of underground equipment or transfer to other Malabar sites;
- demolition and removal of buildings and other infrastructure (such as the CHPP, conveyors and train load-out facilities);
- demolition and removal of infrastructure from ventilation shaft site;
- removal of roadways, concrete footings, drainage structures, hardstand and foundations up to 1.5 m below ground level, if not required for the post-mining land use;
- removal and disposal of any hazardous materials such as fuel, lubricants, chemicals or other substances of concern;
- filling and/or sealing portals, ventilation shafts and underground roadways in accordance with the Mine Closure Plan and NSW Resources Regulator requirements;
- demolition and removal of concrete slabs, bitumen surfaces, redundant pipelines and services and redundant power lines;
- removal of rail line and sleepers, if not required for the post-mining land use; and
- excavation and removal of rail ballast (this may be emplaced in the final voids).

7.3.5 Selection of Vegetation

A woodland or pasture seed mix would be used to rehabilitate any disturbed areas. The selection of vegetation would be consistent with the approved MOP and based on flora species endemic to the local area.

Appendix U provides an example of the native woodland seed mix that would be used for revegetation, and a provisional list of PCTs that would be considered for on-site use in rehabilitation activities.

The woodland seed mix may be modified to target species that are more likely to germinate and successfully grow using the methods and equipment available. Native species that require heat treatment to break dormancy mechanisms would be treated with either boiling or smoke water. Where appropriate, seed would be chemically treated to limit ant predation and inoculated with mycorrhiza to promote faster establishment. Suitable native tube stock would also be planted if in-fill planting is required.

Flora species endemic to the local area would be preferentially used for rehabilitation, except where seed or tubestock supply may be a limiting factor. In this case, other appropriate native species that have performed well in the region would also be considered.

Native plant species to be planted in revegetation areas would be selected on a site-by-site basis, depending on nearby remnant vegetation associations, soil types, aspect and site conditions. The species selected would aim to establish vegetation that reflects the composition and structure of vegetation communities present in the area.

7.3.6 Establishment of Agricultural Land

The rehabilitated Project final landform would include mixed pasture areas for agricultural production. These agricultural land use areas would predominately be located on lower elevation lands.

Appropriate management and amelioration measures would be implemented so that rehabilitated pasture areas would be comparable in productivity to pre-mining pasture conditions. This may include the application of gypsum and fertiliser to topsoil in order to address potential acidity, organic carbon and/or nutrient deficiency constraints.

Approximately 630 ha of agricultural land would be re-established as pasture (inclusive of the former mining areas at the Maxwell Infrastructure) following the closure of the Project. The grass species used for pasture rehabilitation areas are summarised in Appendix U.

7.3.7 Remediation of Subsidence Impacts

MSEC has undertaken a review of potential subsidence impacts of the Project and the consequences for land overlying the Maxwell Underground (Section 6.3 and Appendix A).

Remediation measures for potential subsidence consequences (e.g. increased ponding on drainage lines and surface cracking) are discussed in Section 6.5.4 and Appendices A, E, Q and U.

7.3.8 Erosion and Sediment Control Measures

An Erosion and Sediment Control Plan would be progressively developed and approved as part of the Water Management Plan (Section 6.5.4). Sediment and erosion controls would be periodically updated and regularly reviewed.

Operational sediment and erosion control works would be maintained during the establishment of revegetation. However, once self-sustaining stable final landforms have been achieved within an area, key elements of the operational sediment control structures would be either left as passive water control storages or removed to allow the area to become free-draining.

7.3.9 Management of Offset Areas

Management measures to be implemented by Malabar within any biodiversity offset areas would be described in a management plan (or plans). As a minimum, management of the offset areas would include:

- weed control;
- feral animal control;
- progressive removal of livestock grazing;
- removal of disused infrastructure; and
- revegetation of exotic pasture/cultivation.

7.3.10 Land Contamination Measures

Investigations would be undertaken at mine closure to identify and remediate any contaminated soil that may exist (e.g. in infrastructure areas), in accordance with the requirements of the NSW *Contaminated Land Management Act, 1997*. Contaminated land would be remediated by removal and disposal at an appropriately licensed facility, encapsulation, or appropriate remediation treatment on-site.

ERM previously prepared a Preliminary Site Investigation to commence the process of mine closure at the Maxwell Infrastructure (ERM, 2017). The Preliminary Site Investigation included a number of recommendations to be completed prior to mine closure, which would be integrated with the decommissioning of site infrastructure.

7.3.11 Weed and Pest Control

Weed control is an important factor in the success or failure of revegetation plantings and is a large component of long-term management in rehabilitation and offset areas, including the Wildlife Refuge. Malabar currently undertakes weed control in accordance with the existing Rehabilitation and Offset Management Plan.

Weed control measures include a combination of herbicide application, biological controls and manual weeding. Weed species are controlled on an ongoing basis as needed.

All weeds are ideally removed prior to flowering, or at flowering prior to seed set. Flowering or fruiting plants are a high priority, particularly due to the connected nature of ecosystem components downstream. Preventing greater weed invasion off-site is mitigated by the strategic efforts employed on-site (such as the washdown of vehicles and mechanical equipment to minimise seed transport off-site).

Rehabilitation and the existing offset areas are periodically assessed for weeds. All weeds treated on-site are mapped each year. Where possible, weeding is carried out in consideration of seasonal variations in rainfall and weed growth, botanical flowering times and treatment effectiveness.

Weed outbreaks in the rehabilitation and existing offset areas are monitored, and control measures undertaken are reported in the Annual Reviews.

An updated MOP, including the weed control measures from the existing Rehabilitation and Offset Management Plan, would be prepared for the Project.

Malabar would maintain a clean, rubbish-free environment to discourage scavenging and reduce the potential for colonisation of Project areas by non-endemic fauna. Humane control methods would be implemented for pest species control if periodic visual monitoring identifies over-grazing on young rehabilitation by pest species (e.g. rabbits).

7.3.12 Bushfire Management

Potential bushfire risk and proposed management measures are discussed in Section 6.20.

7.3.13 Post-closure Maintenance

The management and maintenance of rehabilitation areas post-closure would be determined in consultation with relevant government authorities and stakeholders, and would be outlined in the MOP and Mine Closure Plan (Sections 7.6 and 7.7).

7.4 MONITORING, INVESTIGATIONS AND TRIALS

7.4.1 Rehabilitation Monitoring

A rehabilitation monitoring program would be developed for the Project that, along with the application of adaptive management, would allow the desired outcomes to be achieved. It is expected that the rehabilitation monitoring would include (subject to final land use agreement):

- Baseline monitoring to determine conditions pre-mining and during mining.
- Documentation of all rehabilitation activities undertaken.
- Initial monitoring for a period of one to two years post-closure and comparison with control sites.
- Ongoing monitoring (less frequently) from two years post-mining until lease relinquishment.
- Post-lease relinquishment monitoring (to be negotiated with future landholders).
- Use of adaptive management techniques and facilitation of research trials where appropriate.

7.4.2 Subsidence Monitoring

Subsidence monitoring would be conducted for approximately two to five years following completion of mining in an area. Timeframes for subsidence monitoring would be detailed within the Extraction Plans specific to the Project.

7.4.3 Rehabilitation Investigations and Trials

Malabar would undertake field investigations to identify appropriate control/reference sites for each secondary rehabilitation domain and collect monitoring data, which would be used to assess status against completion criteria. Parameters to be investigated in the identified control/reference sites would be subject to input from a suitably qualified and experienced rehabilitation/biodiversity expert but may include:

- Composition of key overstorey and ground cover species.
- Recruitment and succession of long-lived and short-lived species.
- Vegetation community structures.
- Canopy cover.
- Weed presence.
- Water quality (where relevant).

The effectiveness of subsidence remediation practices would be monitored and the outcomes used to inform the application of subsidence remediation in future.

7.5 POTENTIAL BARRIERS AND LIMITATIONS TO EFFECTIVE REHABILITATION

An internal risk assessment was conducted during preparation of the approved MOP to assess the potential risks associated with rehabilitation and mine closure.

An environmental risk assessment was also conducted for the EIS in November 2018 (Appendix S).

A consolidated summary of these risk assessments, with a focus on potential barriers and limitations to effective rehabilitation and mine closure, is provided in Appendix U.

7.6 MINING OPERATIONS PLAN

A MOP describes how rehabilitation is undertaken, provides rehabilitation performance and completion criteria and addresses aspects of rehabilitation including mine closure, final landforms and final land use.

Preliminary rehabilitation objectives, performance indicators and completion criteria for the Project are provided in Appendix U. These would be reviewed as part of an update to the MOP for the Project, which would be undertaken in consultation relevant government agencies, and in accordance with the relevant NSW rehabilitation and mine closure guidelines.

7.7 MINE CLOSURE PLAN AND LEASE RELINQUISHMENT

A Mine Closure Plan would be developed for the Project in consultation with relevant regulatory authorities and community stakeholders. The Mine Closure Plan would be developed over the Project life, with more detailed measures developed closer to Project completion.

The Mine Closure Plan would include consideration of amelioration of potential adverse socio-economic effects due to the reduction in employment at Project closure (Section 6.16.4).

Upon cessation of mining operations, it would be expected that tenure of the mining leases would be maintained by Malabar until such time as mining lease and other statutory approval relinquishment criteria were satisfied. These criteria would be formulated and prescribed in consultation with relevant regulatory authorities and stakeholders. Malabar would transfer to the relevant regulators any documents required to preserve the history of the site, once closed, to facilitate future land use planning.

The *Strategic Framework for Mine Closure* published by the ANZMEC-MCA (2000) (or its contemporary version) would be used as a guide for mine closure.

Further detail regarding the mine closure process is provided in Appendix U.