MALABAR COAL

MAXWELL PROJECT

ATTACHMENT 8

Aquifer Interference Policy and Water Licensing Considerations

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A8 AQUIFER INTERFERENCE POLICY AND WATER LICENSING CONSIDERATIONS

This attachment provides further discussion on the requirements and application of relevant water licensing and associated approvals under the New South Wales (NSW) *Water Management Act, 2000* for the Maxwell Project (the Project). It also provides a discussion of relevant requirements of the *NSW Aquifer Interference Policy* (the AIP) (NSW Government, 2012).

References to Sections 1 to 9 in this attachment are references to the sections of the Main Report of the Environmental Impact Statement (EIS). References to Appendices A to V in this Attachment are references to the Appendices of the EIS. Internal references within this attachment are prefixed with "A8".

A8.1 AQUIFER INTERFERENCE POLICY CONSIDERATIONS

A8.1.1 Aquifer Interference Policy Overview

The AIP (NSW Government, 2012) was developed by the NSW Government as a component of the NSW Government's Strategic Regional Land Use Policy. The AIP applies state-wide and details water licence and impact assessment requirements.

The AIP has been developed to ensure equitable water sharing between various water users and proper licensing of water that is taken by aquifer interference activities, so that the take is accounted for in the water budget and water sharing arrangements.

The *Water Management Act, 2000* defines an aquifer interference activity as an activity involving any of the following:

(a) the penetration of an aquifer,

(b) the interference with water in an aquifer,

(c) the obstruction of the flow of water in an aquifer,

(d) the taking of water from an aquifer in the course of carrying out mining, or any other activity prescribed by the regulations,

(e) the disposal of water taken from an aquifer as referred to in paragraph (d).

Examples of aquifer interference activities include mining, coal seam gas extraction, injection of water, and commercial, industrial, agricultural and residential activities that intercept the watertable or interfere with aquifers (NSW Government, 2012).

The AIP applies to all aquifer interference activities but has been developed in particular to address the following activities (NSW Government, 2012):

- ***mining activities*** *such as open cut voids, underground mine workings and the disposal of water taken from an aquifer including water taken as part of coal seam gas extraction;*
- *other* ***extractive industries****, such as sand and gravel extraction, as defined in the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007;*
- ***coal seam gas activities****, including those related to both exploration and production*
- *other large projects which require* ***dewatering*** *such as for the construction and maintenance of associated works, such as buildings, roads and other civil works;*
- ***injection works*** *used to transmit water into an aquifer; and'* [sic]
- *activities with the potential to contaminate groundwater or result in unacceptable loss of storage or structural damage to an aquifer.*

Licensing Requirements

Under the *Water Management Act, 2000*, it is an offence to "take" water without a water licence unless a statutory exemption applies.

The AIP requires that all water taken by aquifer interference activities be accounted for within the extraction limits set by the relevant water sharing plan. A water access licence is required where water is taken either incidentally or for consumptive use, or where any act by a person carrying out an aquifer interference activity causes (NSW Government, 2012):

- *the removal of water from a water source; or*
- *the movement of water from one part of an aquifer to another part of an aquifer; or*

- *the movement of water from one water source to another water source, such as:*
  - *from an aquifer to an adjacent aquifer; or*
  - *from an aquifer to a river/lake; or*
  - *from a river/lake to an aquifer.*

The AIP also requires consideration of the continued take of water from groundwater or connected surface waters following cessation of an aquifer interference activity. For example, the post-mining inflow that occurs until a groundwater system (e.g. a final void) reaches equilibrium following cessation of open cut mining must be considered.

The AIP states that licences are required to be held to adequately account for the ongoing take of water until the system returns to equilibrium, or alternatively, sufficient licences to account for the ongoing take of water are to be surrendered to the NSW Minister for Water (the Minister).

Minimal Impact Considerations

Water access licences and approvals under the *Water Management Act, 2000* are not to be granted unless the Minister is satisfied that adequate arrangements are in place to ensure that "no more than minimal harm" is caused to a water source. In this regard, the AIP includes minimal impact considerations relating to watertable and groundwater pressure drawdown and changes in groundwater and surface water quality.

The AIP provides (NSW Government, 2012):

> *…Aquifer interference approvals are not to be granted unless the Minister is satisfied that adequate arrangements are in force to ensure that no more than minimal harm will be done to any water source, or its dependent ecosystems, as a consequence of its being interfered with in the course of the activities to which the approval relates.*
>
> *While aquifer interference approvals are not required to be granted, the minimal harm test under the Water Management Act 2000 is not activated for the assessment of impacts. Therefore, this Policy establishes and objectively defines minimal impact considerations as they relate to water-dependent assets and these considerations will be used as the basis for providing advice to either the gateway process, the Planning Assessment Commission or the Minister for Planning.*

The requirement to obtain an "aquifer interference approval" (under section 91 of the *Water Management Act, 2000*) is triggered only when a proclamation is made (under section 88A of the Act) specifying that aquifer interference approvals apply to a particular part of the State (or to the whole State) or water source.

To date, no proclamation has been made specifying that aquifer interference approvals are required in any part of NSW. As such, aquifer interference approvals are not required to be obtained for the Project.

The AIP establishes minimal impact considerations for groundwater categories of both 'highly productive' and 'less productive' groundwater. 'Highly productive groundwater' is defined by the AIP as (NSW Government, 2012):

> *…a groundwater source that is declared in the Regulations and will be based on the following criteria:*
>
> *a) has total dissolved solids of less than 1,500 mg/L, and*
>
> *b) contains water supply works that can yield water at a rate greater than 5 L/sec.*

The AIP further groups 'highly productive groundwater' into the following categories:

- Alluvial.
- Coastal sands.
- Porous rock, including:
  - Great Artesian Basin – Eastern Recharge and Southern Recharge;
  - Great Artesian Basin – Surat, Warrego and Central; and
  - other porous rock.
- Fractured rock.

Groundwater that does not meet the AIP requirements for 'highly productive' are considered 'less productive'. The AIP similarly defines categories for 'less productive groundwater' which include the following:

- Alluvial.
- Porous rock.
- Fractured rock.

A8.1.2 Aquifer Interference Policy Requirements

An assessment of the Project against the licensing requirements and minimal impact considerations of the AIP is provided in the sub-sections below.

Relevant Water Sharing Plans

The AIP requires all water taken by aquifer interference activities to be accounted for within the extraction limits set by the relevant water sharing plan.

Water sharing plans relevant to the Project are:

- *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*
- *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009.*
- *Water Sharing Plan for the Hunter Regulated River Water Source 2016.*

The Maxwell Underground is wholly located within the Sydney Basin-North Coast Groundwater Source, with land at the Maxwell Infrastructure located on the boundary of the Sydney Basin-North Coast Groundwater Source and the New England Fold Belt Coast Groundwater Source (Figure A8-1). Both groundwater sources are regulated under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*

With regard to unregulated surface water, the majority of the Project is located within the Jerrys Water Source, with a portion of the Maxwell Infrastructure area located within the Muswellbrook Water Source (Figure A8-1).

The unconsolidated alluvial sediments associated with Saddlers Creek to the north and west of the Maxwell Underground are mapped within the Jerrys Management Zone of the Jerrys Water Source. The Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) is located to the south of the Project area (Figure A8-1). There are no alluvial water sources associated with the Muswellbrook Water Source mapped in the vicinity of the Project.

The Jerrys Water Source (Jerrys Management Zone), Muswellbrook Water Source and Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) are regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

The portion of the Hunter River located to the south of the Project area is included in the Hunter River Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction), which is regulated under the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* (Figure A8-1).

Water Licensing Requirements

Details of the current water access licences (WALs) held by Malabar Coal Limited (Malabar), under the *Water Management Act, 2000*, are provided in Table A8-1.

The predicted annual groundwater licensing volumes required for the Project, based on groundwater modelling by HydroSimulations (2019), are summarised in Table A8-3.

Malabar currently holds sufficient licences to cover the modelled groundwater inflows for all water sources, with the exception of the 'less productive' Sydney Basin-North Coast Groundwater Source (Table A8-3).

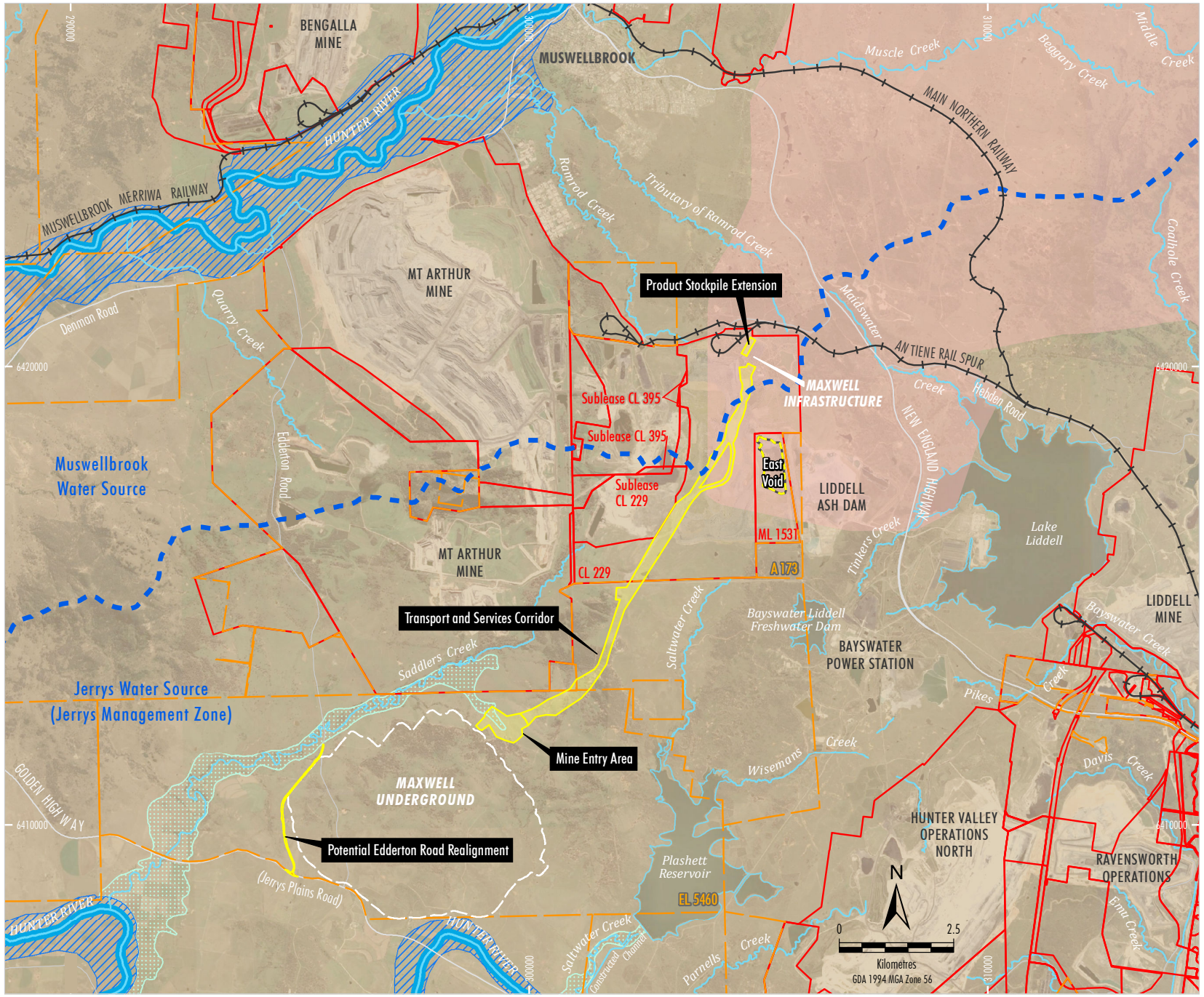
Subclause 26(14) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* states:

> *(14) The long-term average annual extraction limit for the Sydney Basin-North Coast Groundwater Source is 90,000 ML/year.*
>
> *Note. The long-term average annual extraction limit for the Sydney Basin-North Coast Groundwater Source is equal to the estimated long-term average rainfall recharge minus the amount of recharge reserved as planned environmental water under clause 17(1)(a)(xiii).*

Clause 17(1)(a)(xiii) defines planned environmental water in the Sydney Basin-North Coast Groundwater Source as equal to:

- 50% of the long-term average annual rainfall recharge in areas that are not high environmental value areas;
- 100% of the long-term average annual rainfall recharge in high environmental value areas; and
- 99.998% of the long-term groundwater storage.

There is approximately 20,000 ML/year of unassigned water in the Sydney Basin-North Coast Groundwater Source (Table A8-2).



LEGEND

- Railway
- Exploration Licence Boundary
- Mining and Coal Lease Boundary
- Indicative Surface Development Area
- CHPP Reject Emplacement Area
- Extent of Conventional Subsidence (20 mm subsidence contour)

North Coast Fractured and Porous Rock Groundwater Sources

- Sydney Basin - North Coast Groundwater Source
- New England Fold Belt Coast Groundwater Source

Hunter Unregulated and Alluvial Water Sources

- Management Zone Boundary
- Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone)
- Groundwater Sources in Jerrys Water Source#

Hunter Regulated River Water Source

- Hunter Regulated River Water Source

 # As per Department of Primary Industries (2018) database of groundwater sources (Water Sharing Plan Groundwater Sources) based on mapping of unconsolidated alluvial sediments sourced from geological data created by the Resources and Geoscience Division and Soil Landscape Units from the Department of Planning and Environment. Only water within actual alluvial sediments is covered within this source. Alluvial sediments are absent from the mine entry area.

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

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Water Sharing Plan Boundaries in the Vicinity of the Project

Figure A8-1

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Table A8-1
Existing Water Licensing Summary for the Project

Water Sharing Plan	Water Source	Licence Category	Licence	Entitlement (units)
Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016	New England Fold Belt Coast Groundwater Source	Aquifer	Refer Note 1	860
	Sydney Basin-North Coast Groundwater Source	Aquifer	Refer Note 1	527
		Aquifer	Refer Note 2	64
Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009	Upstream Glennies Creek Management Zone of the Hunter Regulated River Alluvial Water Source	Aquifer	WAL 18196	120
		Aquifer	WAL 18201	5
	Jerrys Management Zone of the Jerrys Water Source	Aquifer	Refer Note 3	50
	Muswellbrook Water Source	Aquifer	WAL 30212	207
Water Sharing Plan of the Hunter Regulated River Water Source 2016	Management Zone 1A (Hunter River from Glenbawn Dam to Goulburn River Junction) of the Hunter Regulated River Water Source	Regulated River (High Security)	WAL 769	3
		Regulated River (General Security)	WAL 771	632
		Regulated River (General Security)	WAL 1143	200
		Regulated River (General Security)	WAL 1220	90
	Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) of the Hunter Regulated River Water Source	Regulated River (General Security)	WAL 1066	99
		Regulated River (General Security)	WAL 31439	90
		Regulated River (General Security)	WAL 31440	9

1 WAL 41491 and WAL 41559 were converted from 20BL111869/20BL122620. Anglo American plc wrote to DPI Water on 13 September 2017 indicating that 527 units were incorrectly assigned to the New England Fold Belt Coast Groundwater Source instead of the Sydney Basin-North Coast Groundwater Source. Malabar is consulting with relevant NSW Government agencies to resolve this administrative issue.

2 Malabar has reached an agreement for the transfer of 64 units with existing WAL holders in the Sydney Basin-North Coast Groundwater Source.

3 Malabar has reached an agreement for the transfer of 50 units with the owner of WAL 23925 in the Jerrys Water Source.

Table A8-2
Summary of Unassigned Water in the Sydney Basin-North Coast Groundwater Source

Category	Number of Licences	Annual Usage (ML/year)	Source
Aquifer Licences	165	63,575.5[1]	NSW Water Register for the 2018/19 period, (WaterNSW, 2019).
Local Water Utility Licences	9	1,300.0	NSW Water Register for the 2018/19 period, (WaterNSW, 2019).
Domestic and Stock Rights	N/A	5,087.0	Subclause 19(m) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.
Subtotal of Assigned Water	***174***	***69,962.5***	
Long-term Average Annual Extraction Limit	N/A	90,000.0	Subclause 26(14) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*.
Total Unassigned Water	***N/A***	***20,037.5***	

1 Aquifer licences in the Sydney Basin-North Coast Groundwater Source received an allocation of 1 ML per unit share of entitlement in the 2018/19 period (Department of Industry – Lands and Water Division, 2018).

Table A8-3
Project Indicative Water Licensing Requirements

Water Sharing Plan	Water Source	Total Entitlements (units)	Existing Malabar Entitlements available for the Project (units)	Predicted Annual Water Take Requiring Licensing for the Project (ML per annum)		Maximum Project Licensing Requirement (units)	Additional Entitlements Required (units)	Percentage of Total Water Source Required to Obtain
				During Project Operation	Post-Mine Closure			
Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016	New England Fold Belt Coast Groundwater Source	12,623	860	-	-	-	-	-
	Sydney Basin-North Coast Groundwater Source	64,673.5[1]	591	1,096	-	846[2]	255	0.4%
Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009	Upstream Glennies Creek Management Zone in the Hunter Regulated River Alluvial Water Source	15,937	125	15	35	38[3]	-	-
	Jerrys Management Zone of Jerrys Water Source	2,861	50	12	25	25	-	-
	Muswellbrook Water Source	1,893	207	-	-	-	-	-
Water Sharing Plan of the Hunter Regulated River Water Source 2016	Management Zone 1A (Hunter River from Glenbawn Dam to Goulburn River Junction) of the Hunter Regulated River Water Source	52,533	925	-	-	-	-	-
	Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) of the Hunter Regulated River Water Source	34,177	198	5	19	55[4]	-	-

Source: Table A8-1 and after HydroSimulations (2019).

1 In the 2018/19 period, a total of 182 Aquifer WALs with a total share component of 64,673.5 units were available in the Sydney Basin-North Coast Groundwater Source (WaterNSW, 2019).

2 Based on annual water take and carry over provisions for the Sydney Basin-North Coast Groundwater Source (Section A8.2.6).

3 Based on minimum historical water determination of 0.92 ML per unit share (Section A8.2.5).

4 Based on minimum historical water determination of 0.35 ML per unit share (Section A8.2.4).

Under section 65 of the *Water Management Act, 2000*, the Minister for Water can make a controlled allocation order to make new access licences available in water sources with unassigned water (DPI Water, 2017a). Malabar is of the view that a controlled allocation is justified given the inherent conservatism in the calculation of the planned environmental water and associated long-term average annual extraction limit for the Sydney Basin-North Coast Groundwater Source.

In the absence of a controlled allocation order, Malabar would seek and obtain the appropriate water licences for the Sydney Basin-North Coast Groundwater Source on the open market in accordance with the appropriate trading rules of the relevant water sharing plan. Relevant trading rules are discussed further in Section A8.2.

Relevant entitlements under these licences would be retired at the completion of the Project to account for groundwater take during the recovery of the groundwater system to the final voids post-mining.

The numerical groundwater model would be refined over the progression of the mine life in order to confirm the post-closure licensing requirements associated with the Project.

Minimal Impact Considerations

The AIP establishes minimal impact considerations for 'highly productive groundwater' and 'less productive groundwater'.

The alluvial sediments associated with the Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) are considered 'highly productive' in accordance with the AIP (Appendix B).

The Saddlers Creek alluvium is mapped as 'highly productive' (Department of Industry – Water [DI – Water], 2018). However, analysis of the unconsolidated alluvial sediments in the vicinity of the Maxwell Underground found that these do not satisfy the AIP requirements for 'highly productive' groundwater because (Appendix B):

- The average total dissolved solids in the Saddlers Creek alluvial sediments is greater than the 1,500 milligrams per litre (mg/L) criteria in the AIP (recorded concentrations average 3,400 mg/L).
- Results recorded during a previous bore census suggest the long-term yield from the bores/wells in the Saddlers Creek alluvium is less than 5 litres per second.
- Few registered bores exist in the unconsolidated alluvial sediments of Saddlers Creek, likely due to its lower yield and poorer water quality.

Notwithstanding, in accordance with the DI – Water advice (DI – Water, 2018), the unconsolidated alluvial sediments associated with Saddlers Creek have been conservatively assessed against the 'highly productive' minimal impact considerations in the AIP.

The Permian hard rock groundwater associated with the New England Fold Belt Coast Groundwater Source and Sydney Basin-North Coast Groundwater Source are considered 'less productive' in accordance with the AIP (Appendix B).

Tables A8-3, A8-4 and A8-5 provide an assessment of the watertable, water pressure and water quality minimal impact considerations for the following water sources associated with the Project:

- Hunter Regulated River Alluvial Water Source;
- unregulated alluvial water sources; and
- hard rock water sources.

The Project meets Level 1 minimal impact consideration classification (as defined in the AIP) for the 'highly productive' alluvial water sources (Tables A8-4 and A8-5). The 'less productive' Permian hard rock water sources meet Level 2 minimal impact consideration classification for watertable and water pressure (Table A8-6).

A8.2 WATER MANAGEMENT ACT, 2000

Consideration of the Project against the objects, water management principles and access licence dealing principles under the *Water Management Act, 2000* and a discussion of the licences and approvals required for the water source associated with the Project is provided below.

Table A8-4
Minimal Impact Considerations for Hunter Regulated River Alluvial Water Source

Aquifer	Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) *(Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009)*
Category	Highly Productive Groundwater Source
Minimal Impact Consideration	**Assessment**
Watertable 1. Less than or equal to a 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 metres (m) from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan; or A maximum of a 2 m decline cumulatively at any water supply work. 2. If more than 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 m away from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2 m decline cumulatively at any water supply work then make good provisions should apply.	The nearest high priority groundwater dependent ecosystem listed in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* to the Project area is Wappinguy Spring, near Merriwa, more than 50 kilometres (km) to the north-west. As such, it would not be affected by drawdown from the Project. There are no listed high priority culturally significant sites in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. The Groundwater Assessment (Appendix B) for the Project predicted that no water supply work within the Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) would incur more than 2 m drawdown due to the Project. **The Project meets the Level 1 minimal impact consideration classification.**
Water Pressure 1. A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the base of the water source to a maximum of a 2 m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	This criterion is not applicable as only unconfined conditions are present in the alluvial water source, therefore, only the above watertable consideration is relevant (Appendix B). **The Project meets the Level 1 minimal impact consideration classification.**

Table A8-4 (Continued)
Minimal Impact Considerations for Hunter Regulated River Alluvial Water Source

Aquifer	Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) *(Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009)*
Category	Highly Productive Groundwater Source
Minimal Impact Consideration	**Assessment**
Water Quality 1. (a) Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity; and (b) No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. Redesign of a highly connected surface water source that is defined as a "reliable water supply" is not an appropriate mitigation measure to meet considerations 1.(a) and 1.(b) above. (c) No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (or the three-dimensional extent of the alluvial water source – whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply". (d) Not more than 10% cumulatively of the three-dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200 m laterally from the top of high bank and 100 m vertically beneath a highly connected surface water source that is defined as a "reliable water supply". 2. If condition 1.(a) is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works. If condition 1.(b) or 1.(d) are not met then appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity. If condition 1.(c) or (d) are not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that: – there will be negligible river bank or high wall instability risks; – during the activity's operation and post-closure, levee banks and landform design should prevent the Probable Maximum Flood from entering the activity's site; and – low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply;	The Groundwater Assessment for the Project (Appendix B) concluded that there would be no change to beneficial use categories of the alluvial water source as a result of the Project or any predicted increase in the salinity of the Hunter River. No mining activity within the specified proximities to the alluvial water source is proposed. No excavation of the highly productive alluvial sediments associated with the Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) is proposed. **The Project meets the Level 1 minimal impact consideration classification.**

Table A8-5
Minimal Impact Considerations for Unregulated Alluvial Water Sources

Aquifer	Jerrys Water Source (Jerrys Management Zone) and Muswellbrook Water Source *(Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009)*
Category	Highly Productive Groundwater Source[#]
Minimal Impact Consideration	**Assessment**
Watertable 1. Less than or equal to a 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan; or A maximum of a 2 m decline cumulatively at any water supply work. 2. If more than 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 m away from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan then appropriate studies will need to demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than 2 m decline cumulatively at any water supply work then make good provisions should apply.	The nearest high priority groundwater dependent ecosystem listed in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* to the Project area is Wappinguy Spring, near Merriwa, more than 50 km to the north-west. There are no listed high priority culturally significant sites in the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*. The Groundwater Assessment (Appendix B) for the Project predicted that no water supply within the Jerrys Water Source (Jerrys Management Zone) would incur drawdown in excess of the criteria. There are no alluvial water sources associated with the Muswellbrook Water Source mapped in the vicinity of the Project. **The Project meets the Level 1 minimal impact consideration classification.**
Water Pressure 1. A cumulative pressure head decline of not more than 40% of the "post-water sharing plan" pressure head above the base of the water source to a maximum of a 2 m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	This criterion is not applicable as only unconfined conditions are present in the alluvial water source. No drawdown of more than 2 m at any water supply work is predicted to occur due to the Project (Appendix B). **The Project meets the Level 1 minimal impact consideration classification.**

Table A8-5 (Continued)
Minimal Impact Considerations for Unregulated Alluvial Water Sources

Aquifer	Jerrys Water Source (Jerrys Management Zone) and Muswellbrook Water Source *(Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009)*
Category	Highly Productive Groundwater Source[#]
Minimal Impact Consideration	**Assessment**
Water Quality 1. (a) Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity; and (b) No increase of more than 1% per activity in long-term average salinity in a highly connected surface water source at the nearest point to the activity. Redesign of a highly connected surface water source that is defined as a "reliable water supply" is not an appropriate mitigation measure to meet considerations 1.(a) and 1.(b) above. (c) No mining activity to be below the natural ground surface within 200 m laterally from the top of high bank or 100 m vertically beneath (or the three-dimensional extent of the alluvial water source – whichever is the lesser distance) of a highly connected surface water source that is defined as a "reliable water supply". (d) Not more than 10% cumulatively of the three-dimensional extent of the alluvial material in this water source to be excavated by mining activities beyond 200 m laterally from the top of high bank and 100 m vertically beneath a highly connected surface water source that is defined as a "reliable water supply". 2. If condition 1.(a) is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works. If condition 1.(b) or 1.(d) are not met then appropriate studies are required to demonstrate to the Minister's satisfaction that the River Condition Index category of the highly connected surface water source will not be reduced at the nearest point to the activity. If condition 1.(c) or (d) are not met, then appropriate studies are required to demonstrate to the Minister's satisfaction that: – there will be negligible river bank or high wall instability risks; – during the activity's operation and post-closure, levee banks and landform design should prevent the Probable Maximum Flood from entering the activity's site; and – low-permeability barriers between the site and the highly connected surface water source will be appropriately designed, installed and maintained to ensure their long-term effectiveness at minimising interaction between saline groundwater and the highly connected surface water supply;	The Groundwater Assessment for the Project (Appendix B) concluded that there would be no change to beneficial use categories of the alluvial water source or any predicted increase in the salinity of Saddlers Creek as a result of the Project. Malabar has surveyed the top of the high bank of Saddlers Creek, which indicates it is located at a minimum distance of 210 m from the Maxwell Underground. Underground mining in the vicinity of Saddlers Creek would be at depths of cover greater than 125 m. Broad-scale regional mapping indicates there are some unconsolidated sediments associated with Saddlers Creek within the disturbance footprint of the mine entry area. However, site-specific alluvial investigations, including drilling transects, indicates there is no alluvium within the footprint of the mine entry area. Updated alluvial mapping reflecting the site-specific investigations has been prepared by Dr Chris Gippel and is presented in the Geomorphology Assessment by Fluvial Systems (2019) (Appendix D). Accordingly, no excavation of the highly productive alluvial sediments associated with the Jerrys Water Source (Jerrys Management Zone) is proposed. There are no alluvial water sources associated with the Muswellbrook Water Source mapped in the vicinity of the Project. **The Project meets the Level 1 minimal impact consideration classification.**

[#] Conservatively assessed as 'highly productive' although site-specific data indicates the unconsolidated sediments associated with Saddlers Creek do not satisfy the 'highly productive' criteria in the AIP.

Table A8-6
Minimal Impact Considerations for Hard Rock Water Sources

Aquifer	Sydney Basin-North Coast Groundwater Source and New England Fold Belt Coast Groundwater Source *(Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016)*
Category	Less Productive Groundwater Source
Minimal Impact Consideration	**Assessment**
Watertable 1. Less than or equal to 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 m from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan. A maximum of a 2 m decline cumulatively at any water supply work. 2. If more than 10% cumulative variation in the watertable, allowing for typical climatic "post-water sharing plan" variations, 40 m away from any: (a) high priority groundwater dependent ecosystem; or (b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan if appropriate studies demonstrate to the Minister's satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem or significant site. If more than a 2 m decline cumulatively at any water supply work then make good provisions should apply.	There are no high priority groundwater dependent ecosystems listed in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* within 20 km of the Project. The nearest high priority groundwater dependent ecosystem listed in the Plan to the Project area is Parnell Spring in the Wollemi National Park, located approximately 27 km to the south-southeast. There are no listed high priority culturally significant sites in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*. The Groundwater Assessment for the Project (Appendix B) predicts cumulative drawdowns due to the Project and other approved mining operations of greater than 2 m at one privately-owned bore. A Groundwater Management Plan would be developed and implemented for the Project, and would define a groundwater monitoring strategy, groundwater level triggers and a trigger action response plan. **The Project meets the Level 2 minimal impact consideration classification.**
Water Pressure 1. A cumulative pressure head decline of not more than a 2 m decline, at any water supply work. 2. If the predicted pressure head decline is greater than requirement 1. above, then appropriate studies are required to demonstrate to the Minister's satisfaction that the decline will not prevent the long-term viability of the affected water supply works unless make good provisions apply.	The Groundwater Assessment for the Project (Appendix B) predicts cumulative drawdowns due to the Project and other approved mining operations of greater than 2 m at one privately-owned bore. Malabar would develop and implement a Groundwater Management Plan for the Project that would define a groundwater monitoring strategy, groundwater level triggers and a trigger action response plan. **The Project meets the Level 2 minimal impact consideration classification.**

Table A8-6 (Continued)
Minimal Impact Considerations for Hard Rock Water Sources

Aquifer	Sydney Basin-North Coast Groundwater Source and New England Fold Belt Coast Groundwater Source *(Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016)*
Category	Less Productive Groundwater Source
Minimal Impact Consideration	**Assessment**
Water Quality 1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity. 2. If condition 1 is not met then appropriate studies will need to demonstrate to the Minister's satisfaction that the change in groundwater quality will not prevent the long-term viability of the dependent ecosystem, significant site or affected water supply works.	HydroSimulations (2019) (Appendix B) concluded that there would be no change to beneficial use categories of the Permian hard rock groundwater sources as a result of the Project. **The Project meets the Level 1 minimal impact consideration classification.**

A8.2.1 Objects of the Act

Section 3 of the *Water Management Act, 2000* outlines the objects of the Act:

> *The objects of this Act are to provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations and, in particular:*
>
> *(a) to apply the principles of ecologically sustainable development, and*
>
> *(b) to protect, enhance and restore water sources, their associated ecosystems, ecological processes and biological diversity and their water quality, and*
>
> *(c) to recognise and foster the significant social and economic benefits to the State that result from the sustainable and efficient use of water, including:*
>
> *(i) benefits to the environment, and*
>
> *(ii) benefits to urban communities, agriculture, fisheries, industry and recreation, and*
>
> *(iii) benefits to culture and heritage, and*
>
> *(iv) benefits to the Aboriginal people in relation to their spiritual, social, customary and economic use of land and water,*
>
> *(d) to recognise the role of the community, as a partner with government, in resolving issues relating to the management of water sources,*
>
> *(e) to provide for the orderly, efficient and equitable sharing of water from water sources,*
>
> *(f) to integrate the management of water sources with the management of other aspects of the environment, including the land, its soil, its native vegetation and its native fauna,*
>
> *(g) to encourage the sharing of responsibility for the sustainable and efficient use of water between the Government and water users,*
>
> *(h) to encourage best practice in the management and use of water.*

The Project is considered to be consistent with the objects of the *Water Management Act, 2000*, given:

- The Project would be consistent with the principles of ecologically sustainable development (Section 9.3).
- The Project has been designed to avoid direct subsidence impacts on the Hunter River alluvium and Saddlers Creek (Section 9.3).
- A cumulative assessment of potential impacts of the Project on groundwater and surface water has been conducted as part of this EIS (Appendices B and C). No material adverse impacts on urban communities, regional agriculture, fisheries, industry or recreation are predicted to occur due to the Project.
- Mitigation measures, management and monitoring would be implemented to minimise potential impacts on downstream surface water flows, aquifers, water quality, soils, groundwater dependent ecosystems and biodiversity (Sections 3.10 and 6).
- The cost benefit analysis of the Project in the Economic Assessment (Appendix M) indicates a significant net economic benefit would be foregone if the Project's licensed use of water resources was not to occur.
- Community consultation regarding the Project is described in Section 5 and Appendix L, including, where relevant, feedback received from the community regarding Project water use and water management.
- Potential groundwater inflows and surface water containment requirements are described in Sections 3.10 and 6. Water licensing approval requirements for the Project are described in Section A8.1.2.
- The Project Groundwater Assessment, Surface Water Assessment, Biodiversity Development Assessment Report and Agricultural Impact Assessment (Appendices B, C, E and Q) have been prepared in an integrated manner.
- The objectives for the Project site water management systems include protecting the integrity of local and regional water resources and maximising the re-use of water on-site.
- A Water Management Plan would be developed for the Project that describes measures/procedures to respond to potential exceedances of water-related criteria, and contingent mitigation, compensation and/or offset options that are enacted in the event that downstream surface water users or groundwater users are adversely affected by the Project.

A8.2.2 Water Management Principles

Section 9(1) of the *Water Management Act, 2000* makes it the duty of all persons exercising functions under the Act to take all reasonable steps to do so in accordance with the water management principles of the Act.

Section 5 of the *Water Management Act, 2000* sets out the water management principles:

5 Water management principles

(1) The principles set out in this section are the water management principles of this Act.

(2) Generally:

(a) water sources, floodplains and dependent ecosystems (including groundwater and wetlands) should be protected and restored and, where possible, land should not be degraded, and

(b) habitats, animals and plants that benefit from water or are potentially affected by managed activities should be protected and (in the case of habitats) restored, and

(c) the water quality of all water sources should be protected and, wherever possible, enhanced, and

(d) the cumulative impacts of water management licences and approvals and other activities on water sources and their dependent ecosystems, should be considered and minimised, and

(e) geographical and other features of Aboriginal significance should be protected, and

(f) geographical and other features of major cultural, heritage or spiritual significance should be protected, and

(g) the social and economic benefits to the community should be maximised, and

(h) the principles of adaptive management should be applied, which should be responsive to monitoring and improvements in understanding of ecological water requirements.

(3) In relation to water sharing:

(a) sharing of water from a water source must protect the water source and its dependent ecosystems, and

(b) sharing of water from a water source must protect basic landholder rights, and

(c) sharing or extraction of water under any other right must not prejudice the principles set out in paragraphs (a) and (b).

(4) In relation to water use:

(a) water use should avoid or minimise land degradation, including soil erosion, compaction, geomorphic instability, contamination, acidity, waterlogging, decline of native vegetation or, where appropriate, salinity and, where possible, land should be rehabilitated, and

(b) water use should be consistent with the maintenance of productivity of land in the long term and should maximise the social and economic benefits to the community, and

(c) the impacts of water use on other water users should be avoided or minimised.

…

(8) In relation to aquifer interference activities:

(a) the carrying out of aquifer interference activities must avoid or minimise land degradation, including soil erosion, compaction, geomorphic instability, contamination, acidity, waterlogging, decline of native vegetation or, where appropriate, salinity and, where possible, land must be rehabilitated, and

(b) the impacts of the carrying out of aquifer interference activities on other water users must be avoided or minimised.

Cumulative assessments for potential impacts on groundwater and surface water have been prepared for the Project as a part of this EIS (Appendices B and C).

The Project water management system is described in Section 3.10. A simulated site water balance has been prepared by WRM (2019) to simulate the performance of the water management system over the life of the Project (incorporating the Maxwell Infrastructure and the Maxwell Underground). The site water balance modelling is presented in Appendix C.

Mitigation measures, management and monitoring would be implemented to minimise potential impacts on water sources (Sections 3.10, 6 and 8). With the proposed management and monitoring measures in place, dealings associated with the Project are not expected to adversely affect the ability of a person to exercise their basic landholder rights.

Section 7 and Appendix U present the rehabilitation strategy for the Project.

Section 6 summarises the proposed Project biodiversity offset strategy and compensatory measures that would assist in maintaining the biodiversity of the region, including consideration of native vegetation and fauna species.

Section 6 summarises the potential impacts of the Project on groundwater, surface water, and Aboriginal cultural heritage and outlines the proposed management and mitigation measures where relevant.

Sections 6.16 and 9.4 summarise the expected economic outcomes if the Project is approved.

Section A8.1 describes how aquifer interference activities associated with the Project have been assessed in accordance with the AIP.

A8.2.3 Access Licence Dealing Principles

Based on the groundwater modelling and site water modelling for the Project (Appendices B and C), Malabar will have a shortfall in licensed volumetric entitlements in the Sydney Basin-North Coast Groundwater Source (Table A8-3).

Malabar currently holds sufficient entitlements in all other water sources, or has demonstrated that the predicted volumetric take would be such that a water access licence is not required to be held (i.e. negligible) (Table A8-3).

Malabar is currently seeking to obtain sufficient water access licences in the Sydney Basin-North Coast Groundwater Source.

The NSW *Access Licence Dealing Principles Order, 2004* outlines the access licence dealing principles that prevail over the access licence dealing rules of water sharing plans to the extent of any inconsistency.

Clause 7 of the *Access Licence Dealing Principles Order, 2004* relevantly states:

> ***7 Impacts on water sources***
>
> *(1) Dealings should not adversely affect environmental water and water dependent ecosystems as identified in any relevant management plan.*
>
> *(2) Dealings should be consistent with any strategies to maintain or enhance water quality identified in any relevant management plan.*
>
> *(3) In unregulated river water sources, dealings should not increase commitments to take water from water sources or parts of water sources identified in any relevant management plan as being of high conservation value.*
>
> *(4) In unregulated river water sources or a groundwater sources, dealings should not increase commitments to take water from water sources or parts of water sources above sustainable levels identified in any relevant management plan.*
>
> *(5) In regulated river water sources, dealings should not increase daily demand for water delivery at those locations and times where it is identified in any relevant management plan that demand exceeds delivery capacity.*
>
> *(6) In this clause, **commitments to take water** refers, in relation to all access licences with nominated works in that water source or part of a water source, to:*
>
> *(a) the total volume of water allocations in water allocation accounts, or*
>
> *(b) where relevant, the sum of limits on rates of extraction in extraction components.*

Dealings associated with the Project would involve the acquisition of share components that existed at the commencement of the relevant water sharing plan or were released as part of a controlled release allocation (Sections A8.2.4 and A8.2.5). As the share components would be acquired from other users within the water source, the Project would not adversely affect environmental water.

There are no high priority groundwater dependent ecosystems identified in the relevant water sharing plans in the vicinity of the Project and as such no high priority groundwater dependent ecosystems would be impacted by the Project.

The Groundwater Assessment for the Project concluded that there would be no changes in the beneficial uses of groundwater in or around the Project area as a result of mining, including in the long-term. With the implementation of the Project site water management system, there would be negligible impact on surface water quality in local watercourses (i.e. Hunter River, Saddlers Creek and Ramrod Creek) (Appendix C). Mitigation measures, management and monitoring to minimise potential impacts on water quality are described in Sections 6.4, 6.5 and 8.

The Project would not involve extraction from water sources identified in any relevant water sharing plan as being of high conservation value.

A cumulative assessment of the potential impacts on groundwater and surface water has been conducted as part of this EIS (Appendices B and C). Access licences for the Project would be obtained in accordance with the applicable water sharing plans (Sections A8.2.4 and A8.2.5) and the *Water Management Act, 2000*, and therefore the Project would not increase commitments to take water from water sources above sustainable levels (i.e. the sustainable use of water is integrated in the objects of the *Water Management Act, 2000* and the visions and objectives of the relevant water sharing plans).

The following sections provide detail on each of the water sharing plans relevant to the licensing requirements of the Project.

A8.2.4 Water Sharing Plan for the Hunter Regulated River Water Source 2016

Under the *Water Management Act, 2000*, the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* commenced on 1 July 2016.

Applicable Waters

Subclause 4(2) of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* provides that the plan applies to the following waters:

> *(2) Subject to subclause (3), this water source includes:*
>
> *(a) all water between the bed and banks of all rivers, from the Glenbawn Dam water storage downstream to the Hunter River, and from Glennies Creek Dam water storage downstream to the junction with the Hunter River, which have been declared by the Minister to be regulated rivers, and*
>
> *(b) all water contained within the unconsolidated alluvial sediments underlying the waterfront land of all rivers referred to in paragraph (a).*

The Hunter River Management Zone 1B (Hunter River from Goulburn River Junction to Glennies Creek Junction) is located to the south of the Project area.

Water Supply Works

Clause 67 of Part 11 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* provides mandatory conditions on water supply works approvals.

Section 4.41 of the NSW *Environmental Planning and Assessment Act, 1979* (EP&A Act) provides that water use approvals under section 89, water management work approvals under section 90 (which include water supply work approvals), or an activity approval (excluding an aquifer interference approval) under section 91 of the *Water Management Act, 2000* are not required for State Significant Development that is authorised by a development consent under Division 4.7 of Part 4 of the EP&A Act (Section 4.3.3).

Notwithstanding, metering equipment would be installed and maintained in accordance with the *NSW Non-Urban Water Metering Policy* (NSW Government, 2018) on all works used for the extraction of water under an access licence.

Access Licensing and Dealing Rules

Malabar currently holds adequate licences in the Hunter Regulated River Water Source (Table A8-3).

Part 10 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016* outlines the access licence dealing rules that apply to dealings under the *Water Management Act, 2000*.

Under clause 59 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*, dealings under section 71O of the *Water Management Act, 2000* are prohibited unless the conversion is from:

> *(a) a regulated river (general security) access licence to a regulated river (high security) access licence, or*
>
> *(b) a regulated river (high security) access licence to a regulated river (general security) access licence.*

Additionally, the dealing would be subject to the application of a conversion factor and a limit on the amount of access licence share component that can be converted, established by the Minister and published in an Order made under section 71Z of the *Water Management Act, 2000*.

No Orders have been made to this effect to date, however, if such an Order is made in the future, Malabar may propose to undertake a dealing under section 71O of the *Water Management Act, 2000* in accordance with clause 59 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

Management of Access Licences

In accordance with Division 1 of Part 9 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*, the following rules apply to the management of water allocation in the water allocation accounts of:

- Regulated river (high security) access licences:
  - the maximum volume that may be held in the account of a regulated river (high security) access licence at any time is equal to 1 megalitre (ML) per unit of share component;
  - subject to subclause 53(8) of the Plan, the water allocation taken must be assessed as the volume of water extracted by the approved water supply works nominated by the access licence; and
  - the maximum water allocation that can be carried over from one water year to the next is equal to 0.25 ML per unit share component.
- Regulated river (general security) access licences:
  - subject to subclause 53(8) of the Plan, the water allocation taken must be assessed as the volume of water extracted by the approved water supply works nominated by the access licence; and
  - water allocation remaining in a water allocation account of a regulated river (general security) access licence may be carried over into the next water year subject to the volume carried over not exceeding 0.25 ML per unit of access licence share component.

The volume of water licenced users can extract (i.e. allocation or available water determination) varies from year to year depending upon a range of factors including dam storage levels, river flows and catchment conditions.

Malabar would manage its high security and general security access licences so that extraction does not exceed the water allocation account in any water year in accordance with rules outlined in Part 9 of the *Water Sharing Plan for the Hunter Regulated River Water Source 2016*.

Since 1 July 2004, the available water determinations in the Hunter Regulated River Water Source for regulated river (high security) and regulated river (general security) access licences have been 1 ML per unit share in all years excluding the 2006/07 period, where the available water determinations for regulated river (high security) and regulated river (general security) access licences were 0.92 ML per unit share and 0.35 per unit share, respectively (NSW Department of Primary Industries – Water, 2017b; WaterNSW, 2019).

Malabar holds sufficient regulated river (general security) access licences to account for the Project incidental take from the Hunter Regulated River in the event of severe drought conditions (three times the estimated take during normal conditions).

A8.2.5 Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009

Under the *Water Management Act, 2000*, the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* commenced on 1 August 2009.

Applicable Waters

Subclause 4(3) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* provides that the plan applies to the following waters:

> *(3) Subject to subclause (4), these water sources include:*
>
> *(a) all water occurring naturally on or below the surface of the ground shown on the Plan Map for these water sources, and*
>
> *(b) all water in rivers, lakes and wetlands in these water sources, and*

> (c) *all water contained within all alluvial sediments below the surface of the land shown on the Plan Map for these water sources (hereafter the **alluvial sediments in these water sources**), including any water contained in those unconsolidated alluvial sediments underlying the waterfront land within 1 meter of works taking water pursuant to licences issued under Part 5 of the Water Act 1912 or their equivalent aquifer access licence issued under the Act, that are not part of the Hunter Regulated River Water Source.*
>
> ***Note.** The Hunter Regulated River Water Source is defined in the Water Sharing Plan for the Hunter Regulated River Water Source 2003.*

The Maxwell Underground is situated in the Jerrys Water Source (Jerrys Management Zone), with land at the Maxwell Infrastructure located on the boundary of the Jerrys Water Source (Jerrys Management Zone) and Muswellbrook Water Source (Figure A8-1).

The unconsolidated alluvial sediments associated with Saddlers Creek to the north and west of the Maxwell Underground are mapped within the Jerrys Management Zone of the Jerrys Water Source. The Hunter Regulated River Alluvial Water Source (Upstream Glennies Creek Management Zone) is located to the south of the Project area (Figure A8-1). There are no alluvial water sources associated with the Muswellbrook Water Source mapped in the vicinity of the Project.

Subclause 4(4)(c) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* provides that the Plan does not apply to any water contained in fractured rock aquifers and basement rocks in these water sources. The licensing requirements for the proposed extraction of water from porous rock aquifers under the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* are discussed in Section A8.2.6.

Water Supply Works

Under section 4.41 of the EP&A Act, a water management work approval under section 90 of the *Water Management Act, 2000* is not required for State Significant Development that is authorised by a development consent under Division 4.7 of Part 4 of the EP&A Act (Section 4.3.3).

Notwithstanding, clause 39 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* provides that a water supply work approval shall not be granted under section 95 of the *Water Management Act, 2000* or amended under section 107 of the Act, where a water supply work to be constructed or used to take water from the alluvial sediments in these water sources, is located within the prescribed set distances for particular existing water supply works, property boundaries or Departmental observation or monitoring bores.

However, subclause 39(6) relevantly states:

> *(6) The distance restrictions specified in subclauses (1), (3) and (4) do not apply where:*
>
> *(a) a hydrogeological study undertaken by the applicant, and assessed as adequate by the Department, demonstrates that the water supply work will have no more than minimal impacts on the existing licensed taking of water from the water source,*
>
> *(b) all potentially affected persons in the near vicinity of the water supply work, holding an access licence or having a right under the Act to take water, have been notified by the applicant, and*
>
> ***Note**. These persons may include neighbouring access licence, approval holders or other persons having a right to take water in the near vicinity of the water supply work.*
>
> *(c) any approval granted contains conditions setting out a process for remediation in the event that any more than minimal impact on extraction from the water source occurs in the future.*
>
> ***Note**. In some water sources the general size of properties means that the application of exclusion distances would result in no new or replacement bores being able to be installed. Applicants must apply to the Department for special consideration in these instances.*

Groundwater modelling has been undertaken in accordance with the Secretary's Environmental Assessment Requirements as well as the Murray-Darling Basin Commission *Groundwater Flow Modelling Guideline* (Murray-Darling Basin Commission, 2000) and *Australian Groundwater Modelling Guidelines* (Barnett *et al*., 2012).

No groundwater drawdown exceeding the AIP minimal harm criterion of 2 m at any privately-owned water supply work is predicted to occur due to the Project (Appendix B).

Management of Surface and Groundwater Connectivity

Under subclause 68(1) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, any aquifer access licence in the Muswellbrook Water Source or Jerrys Management Zone of the Jerrys Water Source which nominate a water supply work which may be used to take water from the alluvial sediments, located at or less than 40 m from the top of the high bank of a river are subject to the same access rules as unregulated river access licences. Total daily extraction limits have not been established for the Muswellbrook or Jerrys Water Source.

Malabar has surveyed the top of the high bank of Saddlers Creek, which indicates it is located at a minimum distance of 210 m from the Maxwell Underground.

Access Licensing and Dealing Rules

Based on groundwater modelling (Appendix B) and site water balance modelling (Appendix C), Malabar currently holds sufficient licences in the sources regulated under the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* to cover the estimated licensing requirements for the Project (Table A8-3).

Part 12 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* outlines the access licence dealing rules that apply for dealings under the *Water Management Act, 2000*. Potentially relevant subclauses are addressed below.

Rules Relating to Constraints Within These Water Sources

Clause 70 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* relates to any dealings under sections 71Q, 71S, 71T and 71W of the *Water Management Act, 2000*.

Subclause 70(2) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* provides that in specified circumstances, dealings under sections 71Q, 71S, 71T and 71W are prohibited within the water sources defined by the Plan.

Should Malabar seek to assign rights of an access licence under section 71Q of the *Water Management Act, 2000,* this would be in accordance with the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, in particular subclauses 70(2)(f) and 70(2)(g).

Rules for Conversion of Access Licence Category

Clause 72 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* relates to dealings under section 71O of the *Water Management Act, 2000*.

Section 71O dealings are the mechanism by which the holder of an access licence can convert the access licence category to a different category or subcategory.

Should Malabar seek to convert an access licence in the Jerrys Water Source and Hunter Regulated River Alluvial Water Source it would be in accordance with subclause 72(2) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

Management of Access Licences

In accordance with subclause 56(1) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, water taken under an access licence will be debited against the water allocation account for the access licence. Malabar would maintain the relevant water allocation accounts at or above zero at all times.

Additionally, in accordance with subclause 56(3) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, the maximum volume that may be taken under domestic and stock, local water utility, unregulated river, unregulated river (high flow) and aquifer access licences in the Jerrys Water Source, Muswellbrook Water Source and Hunter Regulated River Alluvial Water Source, in any three consecutive water years would not exceed a volume equal to the lesser of:

- The sum of:
  - water allocations accrued to the water allocation account for the access licence from available water determinations in those three water years;
  - the water allocations carried over from the water year prior to those water years under subclause 56(8);

  - the net amount of any water allocations assigned to or from the water allocation account for the access licence under section 71 of the *Water Management Act, 2000* in those three water years; and
  - any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the *Water Management Act, 2000* in those three water years; or
- The sum of:
  - the share component of the access licence at the beginning of the first of those three water years;
  - the share component of the access licence at the beginning of the second of those three water years;
  - the share component of the access licence at the beginning of the third of those three water years;
  - the net amount of any water allocations assigned to or from the water allocation account for the access licence under section 71T of the *Water Management Act, 2000* in those three water years; and
  - any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the *Water Management Act, 2000* in those three water years.

In accordance with subclause 56(8) and 56(10) of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*, the maximum water allocation that can be carried over in the accounts of domestic and stock, local water utility, unregulated river, unregulated river (high flow) and aquifer access licences, from one water year to the next, for the:

- Jerrys Water Source and Muswellbrook Water Source, is equal to:
  - 100% of access licence share component, for access licences with share components expressed as ML/year; or
  - 1 ML per unit share of access licence share component, for access licences with share components expressed as a number of unit shares.
- Hunter Regulated River Alluvial Water Source, is equal to:
  - 10% of access licence share component for access licences with share components expressed as ML/year; or
  - 0.1 ML per unit share of access licence share component, for access licences with share components expressed as a number of unit shares.

Malabar would manage its access licences so that extraction does not exceed the water allocation in any water year in accordance with the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009*.

Division 2 of Part 10 of the *Water Sharing Plan for the Hunter Unregulated and Alluvial Water Sources 2009* relates to the available water determinations in these water sources. Relevant subclauses are:

> ***52 Available water determinations for unregulated river access licences***
>
> *…*
>
> *(2) The available water determination made at the commencement of each subsequent water year for unregulated river access licences in these water sources and should, where possible, be equal to 1 megalitre per unit share of access licence share component, or such lower amount resulting from clause 47*
>
> *…*
>
> ***54 Available water determination for aquifer access licences***
>
> *(1) An available water determination shall be made at the commencement of each water year for aquifer access licences in these water sources, excluding the Hunter Regulated River Alluvial Water Source, equal to 1 megalitre per unit of access licence share component or such lower amount resulting from clause 47.*
>
> *(2) An available water determination shall be made at the commencement of each water year for all aquifer access licences in the Hunter Regulated River Alluvial Water Source and should be equivalent to the available water determination made for regulated river (high security) access licences under the Water Sharing Plan for the Hunter Regulated River Water Source 2003 or such lower amount resulting from clause 47.*

In accordance with subclause 54(2), the available water determination for the Hunter Regulated River Alluvial Water Source is equivalent to the available water determination for regulated river (high security) access licences in the Hunter Regulated River Water Source, the lowest of which has been 0.92 ML per unit share in 2006/07 (Section A8.2.4).

Available water determinations for unregulated river and aquifer access licences in the Jerrys Water Source and Muswellbrook Water Source have been 1 ML per unit share for all years between 2010 to the present, with an available water determination of 2 ML per unit share in the 2009/10 period (WaterNSW, 2019).

A8.2.6 Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016

Under the *Water Management Act, 2000*, the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* commenced on 1 July 2016.

Applicable Waters

Subclauses 4(12) and 4(15) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* provide that the plan applies to the following waters:

> *(12) Subject to subclauses (3), (4), (5), (6), (7), (11), (13) and (16), the New England Fold Belt Coast Groundwater Source includes all water below the surface of the ground within the outcropped and buried areas within the boundary of the New England Fold Belt Coast Groundwater Source shown on the Plan Map.*
>
> *…*
>
> *(15) Subject to subclauses (16) and (17), the Sydney Basin-North Coast Groundwater Source includes all water below the surface of the ground within the outcropped and buried areas within the boundary of the Sydney Basin-North Coast Groundwater Source shown on the Plan Map.*
>
> *(16) These groundwater sources do not include unconsolidated sediments of Quaternary and Tertiary age.*

Buried and outcropped are defined in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* as:

> ***buried** means a groundwater system that is overlain or partly overlain by another groundwater system.*
> *…*
> ***outcropped** means a groundwater system that occurs at the earth's surface.*

The Maxwell Underground is wholly located within the Sydney Basin-North Coast Groundwater Source, with land at the Maxwell Infrastructure located on the boundary of the Sydney Basin-North Coast Groundwater Source and the New England Fold Belt Coast Groundwater Source (Figure A8-1).

Water Supply Works

Section 4.41 of the EP&A Act states that a water use approval under section 89, a water management work approval under section 90 or an activity approval (other than an aquifer interference approval) under section 91 of the *Water Management Act, 2000* are not required for State Significant Development that is authorised by a development consent under Division 4.7 of Part 4 of the EP&A Act (Section 4.3.3).

Notwithstanding, Division 1 of Part 9 of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* relates to the management of interference between water supply works. Relevant provisions of Division 1 of Part 9 are outlined below:

> ***40 Rules to minimise interference between water supply works***
>
> *(1) A water supply work approval must not be granted or amended to authorise the construction of a water supply work used to take water from the Alstonville Basalt Plateau Groundwater Source, Comboyne Basalt Groundwater Source, Dorrigo Basalt Groundwater Source, Liverpool Ranges Basalt Coast Groundwater Source, New England Fold Belt Coast Groundwater Source or North Coast Volcanics Groundwater Source which, in the Minister's opinion, is or is proposed to be located within:*
>
> *(a) 200 metres of a water supply work located on another landholding that is authorised to take water from the same groundwater source pursuant to basic landholder rights only, or*

(b) 200 metres of a water supply work located on another landholding that is authorised to take water from the same groundwater source and is nominated by another access licence, or

(c) 400 metres of a water supply work located on another landholding that is authorised to take water from the same groundwater source and is nominated by another access licence, unless the water supply work approval includes a condition providing that the water supply work must not be used to take more than 20 ML in any water year, or

(d) 100 metres from the boundary of the landholding on which the water supply work is located, unless the owner of the landholding adjoining the boundary has provided consent in writing, or

(e) 500 metres of a water supply work that is authorised to take water from the same groundwater source and is nominated by a local water utility access licence or a major utility access licence, unless the licence holder has provided consent in writing, or

(f) 400 metres of a Department observation or monitoring bore, unless the Minister has provided consent in writing.

(2) A water supply work approval must not be granted or amended to authorise the construction of a water supply work used to take water from the Bulahdelah Sandstone Groundwater Source, Clarence Moreton Basin Groundwater Source, Gloucester Basin Groundwater Source, Kulnura Mangrove Mountain Groundwater Source, Lorne Basin Groundwater Source, Oxley Basin Coast Groundwater Source or Sydney Basin-North Coast Groundwater Source which, in the Minister's opinion, is or is proposed to be located within:

(a) 100 metres of a water supply work located on another landholding that is authorised to take water from the same groundwater source pursuant to basic landholder rights only, or

(b) 400 metres of a water supply work located on another landholding that is authorised to take water from the same groundwater source and is nominated by another access licence, or

(c) 50 metres from the boundary of the landholding on which the water supply work is located, unless the owner of the landholding adjoining the boundary has provided consent in writing, or

(d) 1,000 metres of a water supply work that is authorised to take water from the same groundwater source and is nominated by a local water utility access licence or a major utility access licence, unless the licence holder has provided consent in writing, or

(e) 200 metres of a Department observation or monitoring bore, unless the Minister has provided consent in writing.

(3) The distance restrictions specified in subclauses (1) and (2) do not apply to the grant or amendment of a water supply work approval if the Minister is satisfied that:

(a) the water supply work is solely for basic landholder rights, or

(b) the water supply work is a replacement groundwater work, or

(c) the water supply work is for the purpose of monitoring, environmental management or remedial works, or

(d) the location of the water supply work at a lesser distance would result in no more than minimal impact on existing extractions within these groundwater sources.

(4) For the purpose of subclause (3)(d), the Minister may require the applicant to submit a hydrogeological study to demonstrate to the Minister's satisfaction that the location of the water supply work at a lesser distance will result in no more than minimal impact on existing extractions within these groundwater sources.

…

Groundwater modelling by HydroSimulations (2019) concluded that the Project and other approved mining operations would cumulatively exceed the AIP minimal harm criterion of 2 m drawdown at one privately-owned bore (Appendix B).

A Groundwater Management Plan would be developed and implemented for the Project, and would define a groundwater monitoring strategy, groundwater level triggers and a trigger action response plan. Malabar would implement appropriate contingency measures (i.e. make good provisions) for Project-related drawdown greater than 2 m at the privately-owned bore so that the Project would result in no more than minimal impact on existing extractions.

Appropriate contingency measures for an impact on a groundwater supply user may include:

- deepening the affected groundwater supply;
- construction of a new groundwater supply; or
- provision of a new alternative water supply.

Access Licences and Dealing Rules

Malabar is seeking to obtain appropriate water access licences in the Sydney Basin-North Coast Groundwater Source.

There are a number of dealing mechanisms within the *Water Management Act, 2000* (as outlined in Division 4 of Part 2 of Chapter 3 of the Act) that allow changes to access licences, for example, changes to the holder of an access licence, or the location within a water source at which water can be extracted.

Relevant access licence dealing rules in the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* are described below.

Rules for Conversion of Access Licence Category

Clause 47 of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* provides that dealings under section 71O of the *Water Management Act, 2000* are prohibited in these groundwater sources.

Rules for Assignment of Water Allocations

Clause 51 of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* prohibits dealings under section 71T of *the Water Management Act, 2000* between different groundwater sources.

Section 71T dealings are the mechanism by which water allocations currently credited to an access licence may be assigned to another access licence.

Should Malabar choose to undertake dealings under section 71T of the *Water Management Act, 2000*, these would only be undertaken between access licences in the same groundwater source.

Rules for Nomination of Water Supply Works

Subclause 53(2) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* provides that dealings under section 71W of the *Water Management Act, 2000* are prohibited if the dealing involves an access licence being amended to nominate a water supply work located in a different groundwater source to that specified in the share component of the access licence.

Section 71W dealings are the mechanism by which access licences can nominate water supply works or extraction points.

In accordance with subclause 53(2), Malabar would not seek to amend an access licence to nominate a water supply work located in a different groundwater source to that specified in the share component of the access licence.

Management of Access Licences

In accordance with Part 8 of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016,* water taken under an aquifer access licence in the New England Fold Belt Coast Groundwater Source or Sydney Basin-North Coast Groundwater Source will not exceed a volume equal to:

- the sum of water allocations accrued to the water allocation for the access licence from available water determinations in that water year;
- the water allocations carried over in the water allocation account for the access licence from the water year prior to that water year under subclause 37(3) or 38(3) of the Plan;
- the net amount of any water allocations assigned to or from the water allocation account for the access licence under section 71T of the *Water Management Act, 2000* in that water year; and
- any water allocations re-credited to the water allocation account for the access licence in accordance with section 76 of the *Water Management Act, 2000* in that water year.

With regard to the New England Fold Belt Coast Groundwater Source, subclause 37(3) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* relevantly states:

> *(3) The maximum water allocation that can be carried over from one water year to the next in the water allocation account for an aquifer access licence is equal to:*
>
> *(a) 20% of the access licence share component for access licences with share components expressed as ML/year, or*
>
> *(b) 0.2 ML per unit share of the access licence share component for access licences with share components expressed as a number of unit shares.*

With regard to the Sydney Basin-North Coast Groundwater Source, subclause 38(3) of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* relevantly states:

> *(3) The maximum water allocation that can be carried over from one water year to the next in the water allocation account for an aquifer access licence is equal to:*
>
> *(a) 100% of the access licence share component for access licences with share components expressed as ML/year, or*
>
> *(b) 1 ML per unit share of the access licence share component for access licences with share components expressed as a number of unit shares.*

Malabar would manage its access licences so that extraction does not exceed the water allocation account in any water year in accordance with the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.*

Division 2 of Part 6 of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016* relates to the available water determinations for access licences in these groundwater sources. With regard to aquifer access licences, subclause 33(2) relevantly states:

> *(2) At the commencement of this Plan and at the commencement of each water year after the first water year in which this Plan has effect, an available water determination of 1 ML per unit of share component, or such lower amount that is determined under Division 1 of this Part, should be made for aquifer access licences with a share component that specifies one of these groundwater sources.*

Since the commencement of the *Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016*, the available water determination for aquifer access licences in the North Coast Fractured and Porous Rock Groundwater Sources has been 1 ML per unit share component (WaterNSW, 2019).

A8.2.7 Excluded Works under the *Water Management (General) Regulation, 2018*

As described in Section 3.10, an objective of the Project site water management system is to separate runoff from undisturbed, rehabilitated and mining-affected areas. This will be achieved through the following structures:

- clean water up-catchment diversion structures, which divert runoff water from undisturbed areas around the underground mine entry area and transport and services corridor;
- drainage works around rehabilitation areas, which divert runoff into mine voids at the Maxwell Infrastructure; and
- contained water storages to prevent opportunities for untreated release to downstream watercourses.

Item 12 of Schedule 4 of the *Water Management (General) Regulation, 2018* provides access licence exemptions in relation to water take from or by means of an ‘excluded work’ specified in Schedule 1.

Items of relevance to the Project in Schedule 1 of the *Water Management (General) Regulation, 2018* are as follows:

> *1 Dams solely for the control or prevention of soil erosion:*
>
> *(a) from which no water is reticulated (unless, if the dam is fenced off for erosion control purposes, to a stock drinking trough in an adjoining paddock) or pumped, and*
>
> *(b) the structural size of which is the minimum necessary to fulfil the erosion control function, and*
>
> *(c) that are located on a minor stream.*
>
> *…*
>
> *3 Dams solely for the capture, containment and recirculation of drainage and/or effluent, consistent with best management practice or required by a public authority (other than Landcom or the Superannuation Administration Corporation or any of their subsidiaries) to prevent the contamination of a water source, that are located on a minor stream.*

WRM Water & Environment Pty Ltd (2019) has reviewed the above excluded work exemptions in the *Water Management (General) Regulation, 2018* and concluded that no water access licences would be required for the Project surface water containment/interception structures.

A8.2.8 Harvestable Rights

Harvestable rights orders made by the Minister under section 54 of the *Water Management Act, 2000* give a landholder the right to capture 10% of the average regional rain water runoff on the land by means of a dam or dams not having more than the total capacity calculated in accordance with Schedule 1 of the order, which are located on minor streams (as defined in Schedule 1 of the order). This water may be used for any purpose, except where a harvestable rights dam is also used for holding water taken in accordance with:

- a domestic and stock right conferred on a landholder by section 52 of the *Water Management Act, 2000*;
- a right to take water from a river or lake in accordance with a licence issued under Part 2 of the *Water Act, 1912*, which is subject to a condition restricting its use to stock and/or domestic purposes; or
- a right to take water from a river or lake in accordance with an access licence granted under Part 2 of Chapter 3 of the *Water Management Act, 2000.*

The capacity of other dams located on minor streams, are within the harvestable rights calculated for the Project (Appendix C).

An assessment of the potential impacts on surface water flows is provided in Appendix C and summarised in Section 6.5.

A8.3 REFERENCES

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