

## APPENDIX B8

### WATER ALLOCATION PLAN TABLE

# BIRD IN HAND GOLD PROJECT

## MINING LEASE PROPOSAL MC 4473



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**Table of Western mount lofty ranges Water Allocation Plan Objectives and Terramin plans to meet them as required by section 3.7.8 of the Ministerial Determination**

Western Mount Lofty Ranges Water Allocation Plan Objectives	How Terramin will meet the objectives if s 128 utilised	How Terramin will meet the objectives if water transferred
General allocation criteria How the criteria has been or will be addressed		
<p>4. Water must not be allocated if the taking and/or use of water would, in the opinion of the Minister, have the potential to cause a significant adverse impact on any of the following:</p> <p>a. underground water, surface water or watercourses;</p> <p>b. water-dependent ecosystems;</p> <p>c. other water users;</p> <p>d. the productive capacity of the land, including (but not limited to) causing or exacerbating soil salinity or water logging.</p>	<p>Groundwater modelling of groundwater extraction and MAR shows no adverse impacts to GDE's (Inverbrackie Creek) or existing users from the taking of groundwater (Table 10-12)</p>	<p>Groundwater modelling of groundwater extraction and MAR shows no adverse impacts to GDE's (Inverbrackie Creek) or existing users from the taking of groundwater (Table 10-12)</p>
<p>5. For the purposes of Principle 4.d, the Minister may require an applicant for a water allocation to provide an assessment from a suitably qualified professional to the satisfaction of the Minister, and the Minister may provide guidelines to the applicant outlining requirements for any assessment.</p>	<p>Groundwater assessments (AGT 2017 - MLP App. H1 and Golder 2019 - MLP App. H9) have been undertaken by suitably qualified professional. These assessments have been peer reviewed by an independent expert (Innovative Groundwater Solutions)</p>	<p>Groundwater assessments (AGT 2017 - MLP App. H1 and Golder 2019 - MLP App. H9) have been undertaken by suitably qualified professional. These assessments have been peer reviewed by an independent expert (Innovative Groundwater Solutions)</p>
<p>9. For the purposes of this plan, 'underground water extraction limit' means the total volume of underground water extractions allowed in an underground water management zone (UWMZ).</p>	<p>Bird-in-Hand is situated within the Inverbrackie Creek Adelaidean UWMZ and has an extraction Limit of 940 ML/y. Estimated use in this zone was between 330 and 630 ML/y during 2015/16 and 2016/17. The MLA proposes no net groundwater take from the UWMZ through the use of MAR.</p>	<p>Bird-in-Hand is situated within the Inverbrackie Creek Adelaidean UWMZ and has an extraction Limit of 940 ML/y. Estimated use in this zone was between 330 and 630 ML/y during 2015/16 and 2016/17. The MLA proposes no net groundwater take from the UWMZ through the use of MAR.</p>
<p>10. Underground water must not be allocated if the allocation would cause underground water extractions in the UWMZ in which the water would be allocated to exceed (or further exceed) the underground water extraction limit for that UWMZ.</p>		
Well buffer zones		
<p>11. Subject to principle 14, underground water must not be allocated if the allocation would cause the well buffer zone of the well from which the whole or a part of the allocation would be taken to overlap (or further overlap) the well buffer zone of an operational well.</p>	<p>A 'well buffer zone' has been calculated for the extraction of groundwater from the proposed mine (based on numerical modelling). The maximum extent of this buffer (shown by the 1 m contour) at the end of mining is shown in Golder 2019 - MLP App. H9 together with locations of existing operational wells. Its important to note, that due to MAR, there is a zone of groundwater rise (extent shown by the -1 m contour) which overlaps buffer zones of individual private wells and therefore no potential to cause a significant detrimental impact on water levels or yield in the private wells.</p>	<p>A 'well buffer zone' has been calculated for the extraction of groundwater from the proposed mine (based on numerical modelling). The maximum extent of this buffer (shown by the 1 m contour) at the end of mining is shown in Golder 2019 - MLP App. H9 together with locations of existing operational wells. Its important to note, that due to MAR, there is a zone of groundwater rise (extent shown by the -1 m contour) which overlaps buffer zones of individual private wells and therefore no potential to cause a significant detrimental impact on water levels or yield in the private wells.</p>
<p>12. For the purposes of this plan, 'well buffer zone' means a circular area centred on an operational well, the radius of which is determined in accordance with the table on pg. 127 of the WAP</p>		
<p>13. The well buffer zone of a well will be based on the volume of water that could potentially be taken from that well under the terms of the relevant water licence.</p>		
<p>14. Principle 11 does not apply if an aquifer test undertaken by the applicant in a manner and to a standard acceptable to the Minister, no earlier than five years before the date of the application, demonstrates to the Minister's satisfaction that:</p>		
<p>a. the well from which the allocation would be taken would not (or does not) target water from the same aquifer as the operational well; or</p> <p>b. taking the volume of water would not have the potential to cause a significant detrimental impact on water levels, yield or water quality in the operational well.</p>		
<p>15. Before undertaking an aquifer test, the applicant must give written notification by registered post to each owner and/or occupier of land whose well buffer zone would be overlapped (or further overlapped) as a result of the proposed allocation, seeking :</p> <p>a. to verify the location of the operational well;</p> <p>b. to verify that the well is operational; and</p> <p>c. written permission to access the well to measure water levels in and collect water samples from the well.</p>	<p>Existing groundwater users were identified in the groundwater census undertaken between 2014 and 2017 and these landholders were notified prior to any pumping or injection tests. Investigations into MAR included pumping and injection tests to assess the hydraulic influence / anisotropy. 31 wells (including private wells) were monitored during the tests (Golder 2019 - MLP App. H9).</p>	<p>Existing groundwater users were identified in the groundwater census undertaken between 2014 and 2017 and these landholders were notified prior to any pumping or injection tests. Investigations into MAR included pumping and injection tests to assess the hydraulic influence / anisotropy. 31 wells (including private wells) were monitored during the tests (Golder 2019 - MLP App. H9).</p>
<p>16. If an owner and/or occupier of land given written notification under principle 15.c does not provide written permission to the applicant and Minister to access the well within 30 days of receiving the written notification, the potential of any impact of the allocation of water on those wells will not be considered.</p>	<p align="center">N/A</p>	<p align="center">N/A</p>
Zones of high intensity underground water use		
<p>17. Underground water must not be allocated in a zone of high intensity underground water use.</p>	<p>The MLA proposes no net take of groundwater from the fractured rock aquifer through use of MAR. Therefore groundwater extraction intensity does not alter</p>	<p>The MLA proposes no net take of groundwater from the fractured rock aquifer through use of MAR. Therefore groundwater extraction intensity does not alter</p>
Underground water-dependent ecosystems		

<p>18. For the purposes of this plan, 'buffer zone of an underground water-dependent ecosystem' means an area that extends:</p> <p>a. 5 metres from the edge of a drainage path;</p> <p>b. 10 metres on each side of the centre line of a watercourse;</p> <p>c. 200 metres on each side of the centre line of a watercourse underlain by a Permian Sand aquifer;</p> <p>d. 50 metres from the edge of a wetland in fractured rock systems; or</p> <p>e. 200 metres from the edge of a wetland underlain by a Permian Sand aquifer.</p>	<p>GDE's identified during 2014-2017 census include springs along Inverbrackie Creek. At the closest point the Inverbrackie Creek is 700 m from the proposed underground mine (groundwater extraction point)</p>	<p>GDE's identified during 2014-2017 census include springs along Inverbrackie Creek. At the closest point the Inverbrackie Creek is 700 m from the proposed underground mine (groundwater extraction point)</p>
<p>19. Underground water must not be allocated if the allocation would cause the well buffer zone of the well from which the whole or a part of the allocation would be taken to overlap (or further overlap) the buffer zone of an underground water-dependent ecosystem.</p>	<p>A 'well buffer zone' has been generated for extraction of groundwater from the proposed mine based on numerical modelling. The maximum extent of this buffer (shown by the 1 m contour) at the end of mining is shown in Golder 2019 - MLP App. H9 together with locations of existing GDE identified as the Inverbrackie Creek. It is important to note, that due to MAR, there is a small zone of groundwater rise (-1m) at a distance of about 300 m from the Inverbrackie Creek</p>	<p>A 'well buffer zone' has been generated for extraction of groundwater from the proposed mine based on numerical modelling. The maximum extent of this buffer (shown by the 1 m contour) at the end of mining is shown in Golder 2019 - MLP App. H9 together with locations of existing GDE identified as the Inverbrackie Creek. It is important to note, that due to MAR, there is a small zone of groundwater rise (-1m) at a distance of about 300 m from the Inverbrackie Creek</p>
<b>Rollover allocations</b>		
<p>20. Subject to Principle 21, if the whole or a part of an underground water allocation is not taken in a water use year ('the credit year'), the unused allocation may be taken in the following two water use years (and is referred to in this plan as a 'rollover allocation'), subject to the following:</p> <p>a. no more than 15% of the underground water allocation at the end of the credit year may be taken in the two water use years after the credit year;</p> <p>b. a rollover allocation must not be taken until the full amount of the underground water allocation for the relevant water use year is taken;</p> <p>c. the volume of underground water that may be taken by the holder of a water licence in a water use year must not exceed 115% of their underground water allocation at the start of that water use year;</p> <p>d. if not taken beforehand, a rollover allocation expires at the end of the second full water use year after the credit year; and</p> <p>e. a rollover allocation may be taken only through a meter.</p> <p>21. A rollover allocation may not be taken until the start of the second full water use year after the adoption date</p>	<p>Rollover allocations will be applicable to Terramin's water licence</p>	<p>Rollover allocations will be applicable to Terramin's water licence</p>
<b>Water that has been drained or discharged into a well</b>		
<p>22. For the purposes of Principles 23 and 24:</p>	<p>This rule applies to ASR, however in this case there will be no recovery of injected water.</p>	<p>This rule applies to ASR, however in this case there will be no recovery of injected water.</p>
<p>a. 'recharge period' means the period between 1st October and 30th September in the following calendar year; and</p>	<p>The proposal requires injection to be undertaken 12 months per year.</p>	<p>The proposal requires injection to be undertaken 12 months per year.</p>
<p>b. 'recovery period' means the period between 1st October in the same calendar year that follows the recharge period and 30th September in the following calendar year.</p>	<p>Recovery of injected water will be undertaken from the mine workings</p>	<p>Recovery of injected water will be undertaken from the mine workings</p>
<p>23. Water that has been drained or discharged into a well in a recharge period in accordance with a permit granted pursuant to Section 135 of the NRM Act or an environmental authorisation granted pursuant to the <i>Environment Protection Act 1993</i> may be allocated to be taken in the recovery period (and is referred to in this plan as a 'recharge allocation'), subject to the following conditions:</p> <p>a. the volume of water allocated must not exceed 80% of the volume of water that was drained or discharged into a well, as recorded by a water meter, in the recharge period; and</p> <p>b. the water must be taken from the same allotment and from the same aquifer that the water was drained or discharged into.</p>	<p>Terramin will meet with the objectives of the WAP in the event rollover allocations apply</p>	<p>Terramin will meet with the objectives of the WAP in the event rollover allocations apply</p>
<p>24. Unless taken beforehand, a recharge allocation expires within three years of the end of the recharge period.</p>		
<b>Transfer Criteria</b>		
<p>92. The Minister may refuse to grant an application to transfer a water licence and/or a water allocation between underground water management zones or surface water management zones (as the case may be) in circumstances where the Minister has, pursuant to section 166 of the NRM Act, reserved from allocation excess water that is available for allocation from the relevant underground water management zone or surface water management zone from which the water would be taken following the transfer.</p>	<p>N/A</p>	<p>Terramin have prioritised transfer of underground water allocations are from third party wells within the Inverbrackie Creek Adelaidean UWMZ, however, are able to transfer within the Onkaparinga River Catchment.</p>

93. The whole or part of a water allocation may be transferred without the assessment required by principles 95 or 110 where there is no increase in the volume of water to be allocated, and there is no change to the location of the point of taking and to the conditions relating to the allocation.	N/A	N/A
94. For the purposes of principles 95 to 107 (inclusive), 'underground water' and 'underground water allocation' does not include water that has been drained or discharged into a well in accordance with a permit granted pursuant to section 135 of the Natural Resources Management Act 2004 (NRM Act) or an environmental authorisation granted pursuant to the Environment Protection Act 1993.	N/A	The underground water allocations to be transferred from third party wells is not derived from water that has been drained or discharged into a well.
95. Subject to principles 93 and 101 (inclusive), the transfer of an underground water allocation must be assessed against and comply with the criteria for the allocation of underground water in Sections 6.2 and 6.3 of this plan.	N/A	Addressed above – see principals 4 to 24
96. An underground water allocation may be transferred between underground water management zones (UWMZs; including UWMZs in different catchments delineated in Figure 1.2) or within an UWMZ.	N/A	Terramin have prioritised transfer of underground water allocations are from third party wells within the Inverbrackie Creek Adelaidean UWMZ, however, are able to transfer within the Onkaparinga River Catchment.
97. An underground water allocation must not be transferred to be taken as a surface water or watercourse water allocation.	N/A	N/A
98. An underground water allocation must not be transferred if the Minister is satisfied that the transfer may have the potential to cause a significant adverse effect on an aquifer, including (but not limited to) changes in: a. local water levels; and b. salinity.	N/A	Groundwater modelling shows the project will not cause a significant adverse effect on an aquifer, including changes in local water levels; and salinity, owing to the use of MAR
99. If a part of an underground water allocation is transferred permanently, the well buffer zone around the well (or wells) from which the allocation could be taken immediately before the transfer will be adjusted (where necessary) in accordance with the table in principle 12.	N/A	This calculation will be performed by DEW
100. If the whole of an underground water allocation is transferred permanently, the well buffer zone around the well (or wells) from which the allocation could be taken immediately before the transfer will be adjusted (where necessary) so that it has a radius of 50 metres.	N/A	This calculation will be performed by DEW
101. A maximum volume of 500 kL of underground water may be temporarily transferred for a period within any one water use year without assessment against the criteria for the transfer of underground water allocations in this plan, provided that: a. the transfer would not cause the total volume of underground water extractions in the UWMZ in which the water would be allocated to exceed (or further exceed) the underground water extraction limit for that UWMZ; b. the transfer would not result in an increase to the total volume of underground water allocated in a zone of high intensity underground water use; and c. the transfer would not cause the well buffer zone of the well from which the whole or a part of the transferred allocation would be taken to overlap (or further overlap) the buffer zone of an underground water-dependent ecosystem.	N/A	N/A
102. An underground water allocation that is transferred under principle 101 must not be taken as a rollover allocation in any following water use year.	N/A	N/A

<p>103. Except where an underground water allocation is transferred in accordance with principle 101, if the whole or a part of an underground water allocation is transferred temporarily:</p> <p>a. the well buffer zone around the well (or wells) from which the allocation can be taken after the transfer will be determined in accordance with the table in principle 12; and</p> <p>b. the well buffer zone around the well (or wells) from which the allocation could be taken immediately before the transfer will remain unchanged; and</p> <p>c. the allocation is to be accounted for in both the originating and receiving management zones for the duration of the temporary transfer.</p>	N/A	This calculation will be performed by DEW
<p>104. Subject to principle 105, an allocation from any other prescribed area shall not be transferred to be taken from the Prescribed Area.</p>	N/A	See principal 96
<p>105. An underground water allocation may only be transferred temporarily between the Prescribed Area and any other prescribed area if:</p> <p>a. the allocation will only be transferred within the boundaries of a single property that lies within both the Prescribed Area and any other prescribed area; and</p> <p>b. the water allocation plan for any other prescribed area allows for transfers between that prescribed area and the Prescribed Area; and</p> <p>c. the proposed transfer complies with the relevant allocation and transfer principles in the water allocation plan for that prescribed area that the water allocation would be transferred to or from.</p>	N/A	The boundary of the mineral claim and MLA extends into the EMLR PWRSA. Therefore, any proposed transfer of underground water allocation from the neighbouring EMRPWA will be undertaken in accordance with these principals
<p>106. An allocation transferred in accordance with principle 105 shall not be subsequently transferred, except if:</p> <p>a. there are no changes to the location of taking, the volume of water allocated and any conditions associated with the allocation; or</p> <p>b. the allocation is transferred back to the source or sources on the same property that allocation originally came from (pursuant to principle 105), provided that the proposed transfer complies with the relevant allocation and transfer principles in the water allocation plan for the prescribed area to which the water allocation would be transferred or from.</p>	N/A	N/A
<p>107. An underground water allocation may be transferred within a zone of high intensity underground water use.</p>	N/A	The intensity of water take is not expected to change, owing to MAR.
<p>108. A rollover allocation may only be transferred if there is no change to the location of the point of taking.</p>	N/A	To be assessed by DEW
<p>109. A recharge allocation may be transferred only if the allocation will be taken from the same allotment, and from the same aquifer and under the same conditions from which it was taken before the transfer.</p>	N/A	See principal 94

<p>110. Subject to principle 93, the transfer of a surface water or watercourse water allocation must be assessed against and comply with the relevant criteria for the allocation of surface water and watercourse water in Sections 6.2, 6.4 and 6.5 of this plan.</p> <p>111. A surface water or watercourse water allocation (not from a watercourse across the plains) may only be transferred between surface water management zones (SWMZs) in the same catchment delineated in Figure 1.2 or within an SWMZ.</p> <p>112. An allocation to take water from a watercourse across the plains may only be transferred between watercourse water management zones on the same watercourse or within a watercourse water management zone.</p> <p>113. A surface water or watercourse water allocation must not be transferred to be taken as an underground water allocation.</p> <p>114. A surface water or watercourse water allocation must not be transferred temporarily.</p> <p>115. A surface water or watercourse water allocation for the purposes of stormwater management or water sensitive urban design may be transferred only if there is no increase in the volume of water allocated, and there is no change to the location of the extraction point and to the conditions relating to the allocation. Stock and/or domestic purposes</p> <p>116. A stock and/or domestic allocation may be transferred only where there is no change to the location of the extraction point.</p> <p>Roof runoff allocations</p> <p>117. A roof runoff allocation must not be transferred to be taken as an underground water allocation or a watercourse water allocation, or as a surface water allocation that is not a roof runoff allocation.</p> <p>118. A roof runoff allocation may be transferred only where there is no increase in the volume of water allocated, and there is no change to the location of the extraction point and to the conditions relating to the allocation.</p>	<p>N/A</p>	<p>N/A</p>
<p>119. Activities should not compromise the use or quality of water resources, or the capacity for natural systems to restore or maintain water quality.</p>	<p>N/A</p>	<p>See principal 98</p>
<p>120. Activities should not take place where they are likely to adversely impact on the migration of biota.</p>	<p>N/A</p>	<p>Baseflow to the Invebrackie Creek will be maintained by the proposed MAR system</p>
<p>121. Natural creek and watercourse systems should be retained.</p>	<p>N/A</p>	<p>No modification to natural creek and watercourses are proposed (i.e. Goldwyn Creek and Invebrackie Creek).</p> <p>Baseflow to the Invebrackie Creek will be maintained by the proposed MAR system</p>
<p>122. The design, construction and management of structures and activities must not result in watercourse erosion.</p>	<p>N/A</p>	<p>Modelling shows contribution to Invebrackie Creek not significant (AGT 2017 - MLP App. H1 and Golder 2019 - MLP App. H9)</p>
<p>123. Activities should be designed and located so as not to alter the geomorphology of a watercourse.</p>	<p>N/A</p>	<p>Modelling shows contribution to Invebrackie Creek not significant (AGT 2017 - MLP App. H1 and Golder 2019 - MLP App. H9)</p>
<p>124. Activities should not contribute to dryland salinity or rising watertables</p>	<p>N/A</p>	<p>Injection testing and groundwater modelling showed the aquifer is suitable for MAR and that this activity is not expected to result in excessive groundwater mounding based on the expected mine inflows.</p>
<p>125. Activities should not compromise the integrity of authorised scientific data collection and monitoring facilities related to the assessment and management of water resources.</p>	<p>N/A</p>	<p>The project has significantly enhanced the collection of scientific data within the Invebrackie and Dawsley Creek sub-catchments, through the development of an extensive surface water and groundwater monitoring network (&gt;45 wells) and four years of baseline monitoring. This information has been supplied to DEW.</p>
<p>126. Activities should not:</p> <ul style="list-style-type: none"> <li>a. be located in ecologically sensitive areas;</li> <li>b. cause or exacerbate unnatural waterlogging, or increase underground water induced salinity;</li> <li>c. affect water-dependent ecosystems; or</li> <li>d. impact on ecological diversity and habitats.</li> </ul>	<p>N/A</p>	<p>The MAR system will maintain baseflow to the Invebrackie Creek.</p> <p>Higher saline groundwater from the EMLR PWRA is not expected to migrate into the WMLR PWRA.</p> <p>Groundwater modelling shows that waterlogging is not expected from injection of groundwater at expected inflow rates.</p>

b.	salinity.	
<b>Well construction</b>		
127. Well construction must be in accordance with the General Specification (as may be varied or replaced from time to time) for Well Construction, Modification and Abandonment in South Australia ('General Specification') as provided by the relevant authority.	Criteria met during previous operatins. Drilling and bore completion undertaken in accordance with Minimum Construction Requirements for Water Bores in Australia. Terramin will continue to meet this standard for all future works	Criteria met during previous operatins. Drilling and bore completion undertaken in accordance with Minimum Construction Requirements for Water Bores in Australia. Terramin will continue to meet this standard for all future works
128. The equipment, materials and methods used in well construction must not adversely affect the quality of underground water.		
129. The headworks of a well must be constructed so that water taken for licensed purposes can be metered without interference.		
130. A well must access water only from the target aquifer.		
131. Aquifers must be protected during well construction to prevent adverse impacts on the integrity of the aquifer.		
132. Where a well passes or will pass through more than one aquifer, or into a confined aquifer, the casing must be pressure cemented in accordance with the General Specification.		
<b>New wells</b>		
133. Subject to principle 134, wells for the purpose of taking underground water must not be drilled where the <i>well buffer zone</i> around the proposed well would overlap the well buffer zone of an operational well.	Terramin will apply for drilling permits and drianage and discharge permits for consuction and operation of new MAR wells. Proposed locations for addiroinal MAR are provided in the MLA, based on numerical modeling. The MAR wells will be used for injection only.	Terramin will apply for drilling permits and drianage and discharge permits for consuction and operation of new MAR wells. Proposed locations for addiroinal MAR are provided in the MLA, based on numerical modeling. The MAR wells will be used for injection only.
134. Notwithstanding principle 133, the relevant authority may grant a permit to drill a well from which water will be taken only for <i>non-licensed purposes</i> if:	Terramin will apply for drilling permits and drainage and discharge permits for consuction and operation of new MAR wells. Proposed locations for addiroinal MAR are provided in the MLA, based on numerical modeling. This requirement will be addressed when submitting drilling permits for additional MAR wells	Terramin will apply for drilling permits and drainage and discharge permits for consuction and operation of new MAR wells. Proposed locations for addiroinal MAR are provided in the MLA, based on numerical modeling. This requirement will be addressed when submitting drilling permits for additional MAR wells
a. the relevant authority is satisfied that the aquifer into which the proposed well will be drilled is not directly hydraulically connected to the aquifer that is targeted by the operational well; or		
b. the relevant authority is satisfied that:		
i. it is not reasonably practicable to maintain the specified buffer distance at any point on the allotment on which the proposed well will be drilled; and ii. the well buffer zones of the proposed well and the operational well overlap by no more than 10 metres.		
135. Subject to principle 137, wells for the purpose of taking underground water must not be drilled where the proposed well would be within 300 metres of an operational well into which a person is authorised to drain or discharge water as part of a managed aquifer recharge operation.	Terramin will apply for drilling permits and drainage and discharge permits for consuction and operation of new MAR wells. These are to be sited in areas to offset groundwater impacts. Proposed locations for additional MAR well are provided in the MLA, based on numerical modeling and can be discussed with DEW.	Terramin will apply for drilling permits and drainage and discharge permits for consuction and operation of new MAR wells. These are to be sited in areas to offset groundwater impacts. Proposed locations for additional MAR well are provided in the MLA, based on numerical modeling and can be discussed with DEW.
136. For the purposes of principle 135, a person will be 'authorised to drain or discharge water as part of a managed aquifer recharge operation' if they have been granted a permit pursuant to section 135 of the NRM Act or an environmental authorisation pursuant to the <i>Environment Protection Act 1993</i> .		
<b>New wells</b>		
137. Principle 135 does not apply where:	Terramin will apply for drilling permits and drianage and discharge permits for consuction and operation of new MAR wells. Proposed locations for additional MAR wells are provided in the MLA, based on numerical modeling	Terramin will apply for drilling permits and drianage and discharge permits for consuction and operation of new MAR wells. Proposed locations for additional MAR wells are provided in the MLA, based on numerical modeling
a. the applicant is authorised to drain or discharge water into the operational well;		
b. the proposed well is part of a managed aquifer recharge operation that includes the operational well;		
c. the aquifer into which the proposed well will be drilled is not directly hydraulically connected to the aquifer that is targeted by the operational well;		
d. the proposed well is a replacement well that complies with principles 140 and 141 (inclusive); or		
e. water from the proposed well will be taken only for <i>nonlicensed purposes</i> and:		
i. the relevant authority is satisfied that it is not reasonably practicable to maintain the specified distance at any point on the allotment on which the proposed well will be drilled; or		
ii. the proposed well will be drilled no closer than 290 metres from the well into which a person is authorised to drain or discharge water as part of a managed aquifer recharge operation.	Investigations into MAR are provided in Golder 2018 and Golder 2019 - MLP App. H9	Investigations into MAR are provided in Golder 2018 and Golder 2019 - MLP App. H9
138. For the purposes of principles 134.a and 137.c, the applicant must provide to the relevant authority a technical report undertaken by a qualified hydrogeologist.	GDE's confirmed during groundwater census. The closest GDE (inverbrackie Creek is located 700 m from the proposed mine of 540 m from a proposed MAR well	GDE's confirmed during groundwater census. The closest GDE (inverbrackie Creek is located 700 m from the proposed mine of 540 m from a proposed MAR well
139. A permit to drill a well for the purpose of taking underground water must not be granted if the well buffer zone around the proposed well would overlap the <i>buffer zone of an underground water-dependent ecosystem</i> .		
<b>Draining and discharging water into a well</b>		

145. Water may be drained or discharged into a well for the purpose of a managed aquifer recharge operation where the hydrogeological risk assessment undertaken by the applicant in accordance with principles 146 to 152 (inclusive) shows that:	A risk assessment has been undertaken for the entire mining operation which includes MAR (Appendix E1).	A risk assessment has been undertaken for the entire mining operation which includes MAR (Appendix E1).
a. the source water:		
i. will not contravene the water quality criteria in Schedule 2 of the Environment Protection (Water Quality) Policy 2003 or any subsequent or related policy; or	The water quality of the receiving aquifer has been characterised through three years of baseline sampling and is generally < 1000 mg/L, with a few bores being < 1500 mg/L. The water quality of the source water was monitored during pumping and injection tests at 980 mg/L. This criteria will be addressed again when applying for additional drainage and discharge permits for new MAR wells	The water quality of the receiving aquifer has been characterised through three years of baseline sampling and is generally < 1000 mg/L, with a few bores being < 1500 mg/L. The water quality of the source water was monitored during pumping and injection tests at 980 mg/L. This criteria will be addressed again when applying for additional drainage and discharge permits for new MAR wells
ii. is of equal or better quality than the <i>ambient underground water</i> ; and		
b. a lowering of salinity levels in the ambient underground water will not have the potential to adversely impact on <i>water-dependent ecosystems</i> .		
146. A permit to drain and discharge water into a well must not be granted unless a hydrogeological risk assessment is undertaken to the satisfaction of the <i>relevant authority</i> by a qualified hydrogeologist with experience in managed aquifer recharge operations.	A risk assessment is provided in Appendix E1 which covers the entire mining operation and MAR. A detailed conceptual model and numerical model has been developed to investigate these key elements of this risk assessment (See groundwater Assessment - AGT 2017 - MLP App. H1), and validated via the undertaking of a MAR trial	A risk assessment is provided in Appendix E1 which covers the entire mining operation and MAR. A detailed conceptual model and numerical model has been developed to investigate these key elements of this risk assessment (See groundwater Assessment - AGT 2017 - MLP App. H1), and validated via the undertaking of a MAR trial
<b>Assessment of proposed drainage and discharge operation</b>		
147. For the purposes of principle 146, and subject to principle 148, a hydrogeological risk assessment must be consistent with the National Water Quality Management Strategy Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) and other related documents current at the time, and include:	A risk assessment is provided in Appendix E1 which covers the entire mining operation and MAR. A detailed conceptual model and numerical model has been developed to investigate these key elements of this risk assessment (See groundwater Assessment - AGT 2017 - MLP App. H1), and validated via the undertaking of a MAR trial	A risk assessment is provided in Appendix E1 which covers the entire mining operation and MAR. A detailed conceptual model and numerical model has been developed to investigate these key elements of this risk assessment (See groundwater Assessment - AGT 2017 - MLP App. H1), and validated via the undertaking of a MAR trial
a. an investigation into the suitability of the draining or discharging site, including (but not limited to) tests for transmissivity and storage coefficient, method of injection and maximum injection pressures, calculated likely impacts on the integrity of the well and confining layers, and impacts of potentiometric head changes to other underground water users;	Pumping and injection test have been undertaken (Golder 2018 and 2019) to assess aquifer characteristics (T, K, S, anisotropy) and changes to hydraulic heads over the life of the proposed mine. Safe injection pressures for injection wells have been calculated and tested	Pumping and injection test have been undertaken (Golder 2018 and 2019) to assess aquifer characteristics (T, K, S, anisotropy) and changes to hydraulic heads over the life of the proposed mine. Safe injection pressures for injection wells have been calculated and tested
b. the infrastructure locations, pump levels, standing water levels and depths of all wells located within 1 kilometre of the well into which it is proposed to drain or discharge water;		
c. the thickness of the aquifer and its capacity to accept further water;	Investigations and modelling of MAR shows aquifer has capacity to receive water at the expected inflows	Investigations and modelling of MAR shows aquifer has capacity to receive water at the expected inflows
d. the local underground water gradients within 1 kilometre of the well into which it is proposed to drain or discharge water;		
e. the location of water-dependent ecosystems within 1 kilometre of the well into which it is proposed to drain or discharge water;	The Inverbrackie Creek is located 700 m from the proposed mine and 540 m from the nearest proposed MAR well	The Inverbrackie Creek is located 700 m from the proposed mine and 540 m from the nearest proposed MAR well
f. the potential impacts and consequences of injection on:	3 years of baseline sampling has been undertaken to benchmark native groundwater quality. This criteria will be considered when applying for drainage and discharge permits for each additional MAR wells	3 years of baseline sampling has been undertaken to benchmark native groundwater quality. This criteria will be considered when applying for drainage and discharge permits for each additional MAR wells
i. the water quality characteristics of the ambient underground water;		
ii. the land, including waterlogging or salinisation of soils, and infrastructure;	Modelling shows small 1 m mound from MAR under expected mining / inflow conditions. Safe injection pressure have been calculated to avoid hydraulic fracturing and localised seepage to surface. Groundwater monitoring network will be enhanced to ensure groundwater levels remain below surface and triggers will be set as part of the PEPR.	Modelling shows small 1 m mound from MAR under expected mining / inflow conditions. Safe injection pressure have been calculated to avoid hydraulic fracturing and localised seepage to surface. Groundwater monitoring network will be enhanced to ensure groundwater levels remain below surface and triggers will be set as part of the PEPR.
iii. underground water-dependent ecosystems;	As above	As above
<b>Assessment of proposed drainage and discharge operation</b>		
iv. permanent pools in watercourses;	As above	As above
g. an appropriate operation or management plan demonstrating that operational procedures are in place to protect the integrity of the aquifer on an ongoing basis; and	MLP. Further refined in during PEPR	MLP. Further refined in during PEPR
h. a water quality assessment that identifies hazards in the <i>source water</i> .	Source water has been characterised (see AGT 2017 - MLP App. H1)	Source water has been characterised (see AGT 2017 - MLP App. H1)
148. Principles 147.a, 147.f.i. and 147.h do not apply to <i>roof runoff</i> that is drained or discharged into a well through a closed system of capture and transport, provided that the system is equipped with a mechanism to divert first flush water.	N/A	N/A
149. For the purposes of principle 147, the relevant water quality characteristics shall be measured using sufficient representative samples of:		
a. the source water; and		
b. ambient underground water collected from the proposed point of injection or as near as possible to the proposed point of injection and from the same aquifer into which it is proposed to drain or discharge water.	Groundwater quality assessed by drilling of the source aquifer and receiving aquifer and via ongoing groundwater monitoring.	Groundwater quality assessed by drilling of the source aquifer and receiving aquifer and via ongoing groundwater monitoring.
150. For the purposes of principle 149, 'sufficient representative samples' means suitable samples, collected with equipment appropriate for the substance, material or characteristic to be measured and taken at suitable locations and times to accurately represent the quality of the relevant water.		
<b>Assessment of proposed drainage and discharge operation</b>		



<p>151. A permit to drain or discharge water into a well must not be granted if the draining or discharging of water would have the potential to degrade underground water-dependent ecosystems or to reduce the suitability of the underground water for other purposes for which it might reasonably be used.</p>	<p>Terramin will apply for drilling permits and drainage and discharge permits for construction and operation of new MAR wells. Proposed locations for additional MAR are provided in the MLA, based on numerical model</p>	<p>Terramin will apply for drilling permits and drainage and discharge permits for construction and operation of new MAR wells. Proposed locations for additional MAR are provided in the MLA, based on numerical model</p>
<p>152. If the source water is the ambient underground water, and the infrastructure used to both take and drain and discharge that water into a well is closed to any substance, material or characteristics that may alter the water before or during the draining and discharging of that water into a well, the hydrogeological risk assessment required under principle 147 may be modified with the agreement of the relevant authority.</p>		
<p>153. Draining and discharging water directly or indirectly into a well must be carried out in a manner that does not adversely affect the aquifer or the ability of other underground water users to lawfully take underground water.</p>	<p>Groundwater modelling shows the ability of the surrounding users to take groundwater will not be impacted by the proposed mining and MAR operations. Likewise groundwater mounding is unlikely to result in artesian conditions (where grouting effective at reducing inflows to target rates). Safe injection pressures have been calculated and tested during the MAR tests. Safe injection pressures will be assessed for each new MAR well on a cases by case basis (as this is dependant on local geological conditions)</p>	<p>Groundwater modelling shows the ability of the surrounding users to take groundwater will not be impacted by the proposed mining and MAR operations. Likewise groundwater mounding is unlikely to result in artesian conditions (where grouting effective at reducing inflows to target rates). Safe injection pressures have been calculated and tested during the MAR tests. Safe injection pressures will be assessed for each new MAR well on a cases by case basis (as this is dependant on local geological conditions)</p>
<p>154. Draining and discharging water directly or indirectly into a well must:</p>		
<p>a. be undertaken by gravity drainage only, unless the relevant authority is satisfied that the hydrogeological risk assessment conducted in accordance with principles 146 to 152 (inclusive) demonstrates that there is no potential for an adverse impact on underground water users if some other method of draining and discharging water is used; and</p>		
<p>b. not have the potential to cause <i>artesian conditions</i> in the aquifer.</p>		
<p>155. Where water is to be drained or discharged under pressure, the operational pressures must not have the potential to cause the overlying confining beds to hydraulically fail.</p>		