

Dendrobium Area 3 Environmental Performance

Aspect	Performance Measure	How Measured	Our Performance	Document Reference
Area 3B SMP Approval				
Condition 9, Table 1 (Department of Planning and Environment, 6th February 2013)				
Condition 13, Table 1 (Department of Trade and Investment, 5th February 2013)				
Swamps 1a, 1b, 5, 8, 11, 14 and 23	<p>Minor environmental consequences including:</p> <ul style="list-style-type: none"> • <i>negligible</i> erosion of the surface of the swamps; • <i>minor</i> changes in the size of the swamps; • <i>minor</i> changes in the ecosystem functionality of the swamp; • <i>no significant</i> change to the composition or distribution of species within the swamp; and • <i>maintenance or restoration</i> of the structural integrity of the bedrock base of any significant permanent pool or controlling rockbar within the swamp. 	<ul style="list-style-type: none"> • Observation of swamps for new erosion or changes to existing erosion • Identification and measurements of erosion via ALS and on ground survey • Repeat mapping of swamp boundaries • Repeat mapping of groundwater dependent community boundaries • Statistical analyses of species richness and diversity • Observation of swamps, streams and pools • Measurements of pool water level 	<p>No erosion of the surface of the swamps as a result of mining observed to date</p> <p>The size of swamps and vegetation responses to changes in swamp hydrology are likely to be over the medium to long term.</p> <p>Within previous mining areas, observations and modelling of ecological data collected for Coastal Upland Swamps suggests that all monitored (mining and non-mining) sites have experienced a decline in vegetation species richness and diversity since 2005. Given that only 3 years of data has been collected at Swamp 1A/B and Swamp 5, formal statistics to assess patterns and quantify the changes in richness and diversity cannot be applied. There has been no visual evidence of any temporal trends at post-mining site, Swamp 1B has eight years of data collected to date. Monitoring is continuing to further define any vegetation changes resulting from reduced groundwater levels.</p> <p>CMAs have been proposed in the Swamp Rehabilitation Research Plan, including the Swamp 5 and 15B rockbars.</p>	<ul style="list-style-type: none"> • Longwall 10 End of Panel Report, Section 6 (May 2015) • Longwall 9 End of Panel Report, Section 6 (September 2014) • Swamp Impact Monitoring and Contingency Plan, Section 3.5 (June 2015) • Dendrobium Area 3B Longwall 10 End of Panel: Terrestrial Ecology Review, Section 3.2, (March 2015) • Swamp Rehabilitation Research Plan, version 1, Section 5
Swamps 3, 4, 10, 13, 35a and 35b	No significant environmental consequences beyond predictions in the Subsidence Management Plan.	<ul style="list-style-type: none"> • Observation of swamps for new erosion or changes to existing erosion • Identification and measurements of erosion via ALS and on ground survey • Observation of swamps, streams and pools • Measurements of pool water level 	No significant environmental consequences beyond predictions to date.	<ul style="list-style-type: none"> • Longwall 10 End of Panel Report, Section 6 (May 2015) • Longwall 9 End of Panel Report, Section 6 (September 2014)
Waterfall WC-WF54	Negligible environmental consequences including: <ul style="list-style-type: none"> • <i>no</i> rock fall occurs at the 	<ul style="list-style-type: none"> • Observation of Waterfall WCWF54 for rock falls, impacts on structural 	No impacts – current and past longwalls are not in close proximity to the waterfall.	

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	<p>waterfall or from its overhang;</p> <ul style="list-style-type: none"> • <i>no</i> impacts on the structural integrity of the waterfall, its overhang and its pool; • <i>negligible</i> cracking in Wongawilli Creek within 30 m of the waterfall; and • <i>negligible</i> diversion of water from the lip of the waterfall. 	<p>integrity and cracking</p> <ul style="list-style-type: none"> • Measurement of pool water levels 	<p>Implementation of a TARP, similar to that which was implemented for Sandy Creek Waterfall, will be part of the management strategy for WC-WF54.</p>	
Wongawilli Creek Donalds Castle Creek	<p>Minor environmental consequences including:</p> <ul style="list-style-type: none"> • <i>minor</i> fracturing, gas release and iron staining; and • <i>minor</i> impacts on water flows, water levels and water quality. 	<ul style="list-style-type: none"> • The longwalls have been setback between 75m and 500m from Wongawilli Creek • Observation of Wongawilli Creek and Donalds Castle Creek for fracturing, gas release and iron staining • Measurement of pool water levels • Measurement of surface water flow • Measurement of surface water quality 	<p>No impacts greater than minor.</p> <p>Impacts observed to date:</p> <ul style="list-style-type: none"> - A fracture observed in Wongawilli Creek, associated with Longwall 9. No flow diversion associated with the fracture. - Fracturing and uplift observed in Donalds Castle Creek (RB 33, basal step Swamp 5), exfoliation from the step and associated flow diversion. <p>The observed impacts on surface water quality, shallow groundwater levels, and catchment hydrologic performances due to the mining of Longwall 9 and 10 have been consistent with the nature of predicted impacts set out in the Dendrobium Area 3B Subsidence Management Plan (December 2012) and Dendrobium Area 3B Watercourse Impact, Monitoring, Management and Contingency Plan (May 2015).</p>	<ul style="list-style-type: none"> • Longwall 10 End of Panel Report, Section 6 (May 2015) • Longwall 9 End of Panel Report, Section 6 (September 2014)
Avon Reservoir	<p>Negligible environmental consequences including:</p> <ul style="list-style-type: none"> • <i>negligible</i> reduction in the quality or quantity of surface water inflows to the reservoir; • <i>negligible</i> reduction in the quality or quantity of groundwater inflows to the reservoir; and • <i>negligible</i> leakage from the reservoir to underground mine workings 	<ul style="list-style-type: none"> • The longwalls have been setback between 230m and 310m from the full supply level of Lake Avon • Measurement of surface water flow • Measurement of water quality • Groundwater model calibrated to groundwater levels, surface water flows and mine water budget • The water chemistry, algae and level of water in Avon Reservoir is monitored and compared to the mine water. The locations of the samples and the testing procedure were developed with the Dams Safety Committee (DSC) prior to mining within the DSC Notification Area. 	<p>Due to the standoffs from Lake Avon of the Area 3B longwalls, it is not expected there will be a reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows to Lake Avon. In addition, due to the substantial size of the Lake Avon system, it is predicted that there will be no measurable reduction in the quality or quantity of water in Lake Avon resulting from surface water or groundwater inflows.</p> <p>All observed surface water quality impacts from the mining of Longwall 9 and 10 were fully consistent with predicted impacts set out in the Dendrobium Colliery Area 3B Subsidence Management Plan (December 2012) and Dendrobium Area 3B Watercourse Impact, Monitoring, Management and</p>	<ul style="list-style-type: none"> • Watercourse Impact Monitoring, Management and Contingency Plan, Section 3.6 and Table 5-1 (May 2015) • Longwall 10 End of Panel Report, Section 6 (May 2015) • Longwall 9 End of Panel Report, Section 6 (September 2014) • Avon and Cordeaux Reservoir DSC Notification Area Management Plan, Section 7 (December 2014)

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			Contingency Plan (May 2015).	
Dendrobium Development Consent (DA 60-03-2001), Schedule 3				
Sandy Creek Waterfall	<p>Condition 1: The Applicant shall ensure that, as a result of the development:</p> <p>(a) no rock fall occurs at Sandy Creek Waterfall or from its overhang;</p> <p>(b) the structural integrity of the waterfall, its overhang and its pool are not impacted;</p> <p>(c) cracking in Sandy Creek within 30 m of the waterfall is of negligible environmental and hydrological consequence; and</p> <p>(d) negligible diversion of water occurs from the lip of the waterfall to the satisfaction of the Director-General.</p>	<p><i>Post-mining monitoring of Sandy Creek Waterfall has ceased (in accordance with Sandy Creek Waterfall Management Plan)</i></p>	<p>No rock fall occurred at Sandy Creek Waterfall or from its overhang as a result of mining.</p> <p>The structural integrity of the waterfall, its overhang and pool has not been impacted. No cracking observed in Sandy Creek within 30m of the waterfall.</p> <p>No diversion of water from the lip of the waterfall.</p>	<ul style="list-style-type: none"> • Longwall 8 End of Panel Report, Section 6.1.2.4 (April 2013) • Longwall 7 End of Panel Report, Section 5.1.3 (May 2012) • Longwall 6 End of Panel Report, Section 5.1.3 (July 2011)
Sandy Creek and Wongawilli Creek	<p>Condition 2: The Applicant shall ensure that underground mining operations do not cause subsidence impacts at Sandy Creek and Wongawilli Creek other than “minor impacts” (such as minor fracturing, gas release, iron staining and minor impacts on water flows, water levels and water quality) to the satisfaction of the Director-General.</p>	<ul style="list-style-type: none"> • Observation of Wongawilli Creek for fracturing, gas release and iron staining • Measurement of pool water levels • Measurement of surface water flow • Measurement of surface water quality 	<p>No impacts greater than minor. No impacts observed in Sandy Creek. One fracture observed in Wongawilli Creek, associated with Longwall 9. No flow diversion associated with the fracture.</p>	<ul style="list-style-type: none"> • Longwall 8 End of Panel Report, Section 6.1.2 (April 2013) • Longwall 7 End of Panel Report, Section 5.1.2 and 5.1.3 (May 2012) • Longwall 6 End of Panel Report, Section 5.1.2 and 5.1.3 (July 2011) • Longwall 9 End of Panel Report, Section 6 (September 2014)
Lake Cordeaux & Lake Avon	<p>Condition 3: The Applicant shall ensure the development does not result in reduction (other than negligible reduction) in the quality or quantity of surface water or groundwater inflows to Lake Cordeaux or Lake Avon or surface water inflow to the Cordeaux River at its confluence with Wongawilli Creek, to the satisfaction of the Director-General.</p>	<ul style="list-style-type: none"> • The longwalls have been setback between 75m and 500m from Wongawilli Creek • The longwalls have been setback between 230m and 310m from the full supply level of Lake Avon • Observation of Wongawilli Creek and Donalds Castle Creek for iron staining • Measurement of surface water flow • Measurement of surface water quality • Groundwater model calibrated to groundwater levels, surface water flows and mine water budget 	<p>Hydrologic evidence indicates that Longwall 9 and 10 have had negligible impact on the hydrologic performance of the Donalds Castle Creek catchment, Wongawilli Creek catchment, and the LA4 catchment, i.e. two major catchments which report to Cordeaux River, and a subcatchment which reports to Lake Avon.</p>	<ul style="list-style-type: none"> • Longwall 10 End of Panel Report, Section 6.5 (May 2015) • Longwall 9 End of Panel Report, Section 6.5 (September 2014)
Swamp 15a	<p>Condition 5: The Applicant shall ensure that subsidence does not cause erosion of the surface or</p>	<p>Swamp 15a, as defined in the Dendrobium Area 3 Modified Approval (Schedule 3/Conditions 5, 6a and 6b), is</p>	<p>No erosion of the surface, changes in ecosystem functionality, or compromised integrity of the controlling</p>	<ul style="list-style-type: none"> • Longwall 8 End of Panel Report, Section 6.1.3.2

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	changes in ecosystem functionality of Swamp 15a and that the structural integrity of its controlling rockbar is maintained or restored, to the satisfaction of the Director-General.	not within the defined area of study relative to Dendrobium 3B.	rockbar in Swamp 15a to date.	(April 2013)