

## Appendix G – Water Management Plan Summary

Ashton Coal Operations Ltd has revised its site-wide Water Management Plan (WMP), which includes the PG LW6B Extraction Area. This plan outlines the management of surface water and groundwater related impacts associated with mining at the ACP. The WMP includes a site water balance; erosion and sediment control plan; Bowmans Creek diversion management plan, surface and ground water monitoring plans; and surface and groundwater Trigger Action Response Plans (TARPs).

The revised WMP was prepared in consultation with relevant government agencies and was approved in accordance with condition 4.7 to Schedule 2 of DA 309-11-2001-i on 10 August 2012. This plan has also been approved under condition 3.12(h) to Schedule 2 of DA 309-11-2001-i as part of the approved Extraction Plan for ULD LW1 – 4.

The primary aim of the WMP is to provide a suitable mechanism to enable ACOL to manage and minimise the impact of ACP mining operations on surrounding and overlying surface water and groundwater sources. The objectives of the WMP are to:

- detail water sources, their use and management on and off site;
- identify erosion and sediment control risks;
- describe measures taken to manage erosion and sediment contamination onsite;
- identify potential contamination risks to surface water and groundwater;
- detail surface water and groundwater quality and quantity (flow/level) in terms of baseline data, identification of trigger levels, and a monitoring program for ongoing assessment;
- specify response protocols for exceedances in surface water and groundwater assessment criteria;
- provide measures to manage and mitigate adverse impacts to watercourse baseflows, privately-owned water supplies, groundwater dependant ecosystems and riparian vegetation;
- provide for the management of the Bowmans Creek diversion; and
- comply with conditions of development consent DA 309-11-2001-i.

The key components of the WMP as relevant to secondary extraction of LW6B in the PG Seam include:

- revised impact assessment criteria to identify potential impacts to water quality;
- a detailed monitoring program to determine changes to water quality, level and flow information; and
- Trigger Action Response Plans (TARPs).

Separate TARPs, with appropriate trigger and response actions, have been developed for the management or mitigation of impacts on local surface water and groundwater sources. Aspects of the TARPS relevant to LW6B extraction are reproduced in **Table G.1** and **Table G.2** below.

Further detail on ACOL's responsibilities, notification procedures and contingency response measures is provided in the Water Management Plan, included electronically on CD as an attachment to this EP.

**Table G.1 Summary of Surface Water Trigger Action Response Plan (as relevant to LW6B)**

TRIGGER	ACTION	TIMING	RESPONSIBILITY	REPORTING
<b>Surface Water Flows</b>				
Observed altered surface drainage topography due to subsidence causing surface ponding.	The affected areas are rehabilitated and landscaped to minimise the risk of ingress of surface runoff into subsidence fractures, restore surface drainage and minimise the risk of uneven surfaces to livestock.	Immediately where risk to people, surface infrastructure or livestock is identified.  Where impacts are not causing risk to people, surface infrastructure or livestock schedule in consideration of predicted subsidence from subsequent panels and seams.	UG Technical Services Manager / Environmental Coordinator	Report at End of Panel (EoP) to inform relevant agencies of results of monitoring.  Reporting of observed parameter variations within AEMR.
Observation of sudden variation in flow connectivity between surface and groundwater within a flowing stream (unexpected change in relative flow quantities of water as it moves downstream, based on periods of low flow and relative depths of water between successive monitoring sites and monitoring periods).  (Baseline conditions for this type of comparison of low flow conditions have not been developed previously at ACOL and monthly comparisons of such data and its associated trends are being initiated. Trigger values will initially be set at a 10% change in the comparisons of relative depths of low flow amounts along river reaches between each successive monitoring point. Trigger values will be refined as spatial relations between various depths and flows develop over time. Reliance on calibrated groundwater model projections of baseflow impacts will be continued in parallel with calibrations being updated at least once each five years unless	Engage a hydrogeologist / hydrologist to undertake a preliminary investigation and report on any identified changes.  Inspect channel beds, check for visible subsidence cracks or flow paths of water indicating likelihood of such cracks.  To confirm trends, repeat water quantity measurements. To identify likely water sources and flow directions conduct water quality sampling and initiate laboratory water quality sampling of adjacent bores on a monthly basis.  Where appropriate, identify contingency measures such as:  Remediation inclusive of infilling with layers of impervious material such as clay and layers of protective material (rocks).  Ensure as a precaution, sufficient stockpiles of raw materials (clay, rock etc.) and earth moving equipment are kept readily available for use in closing large unforeseen subsidence cracks that extend below channel beds of rivers and creeks.	Immediately repair any visual subsidence cracks across drainage lines.  <b>BOWMANS CREEK – Redundant Creek sections</b>  Immediately repair any visual subsidence cracks across water ways and drainage lines.  Where not already constructed immediate construction of full height block banks.  Submit EoP report within 3 months of longwall completion.	UG Technical Services Manager / Environmental Coordinator	Report at End of Panel (EoP) to inform relevant agencies of results of monitoring.  Reporting of observed parameter variations within AEMR.

TRIGGER	ACTION	TIMING	RESPONSIBILITY	REPORTING
<p>significant connectivity changes are observed.</p>	<p>Check flow measurement results and repeat measurements if differences in low flows are likely to be due to other factors such as recent rainfall.</p> <p>Where investigations determine that impacts are the result of ACOL operations, offset the loss of any baseflow to the surrounding watercourses and/or associated creeks caused by ACOL as per DA condition 4.2. May also secure additional licences where required to account for increased baseflow reductions.</p> <p>Where loses are associated with Bowmans Creek, return flows from year 6 of the HUAWS WSP during cease to pump conditions.</p> <p>Where investigations determine that impacts are the result of ACOL operations or may potentially impact on adjacent bores or surface water users, implement actions per WMP.</p> <p><b>BOWMANS CREEK – Redundant Creek sections prior to full diversion</b></p> <p>If there is any indication that significant drainage of the alluvium is occurring, or there is a loss of stream flow, due to cracking, the full height block banks will be constructed immediately.</p>			

TRIGGER	ACTION	TIMING	RESPONSIBILITY	REPORTING
<b>Baseflow</b>				
<p>Baseflow impact greater than predicted in the WMP.</p> <p>A water table drawdown in Bowmans Creek alluvium in excess of the predicted drawdown.</p>	<p>Engage a hydrogeologist / hydrologist to undertake a preliminary investigation and report on any identified changes.</p> <p>Inspect channel beds, check for visible subsidence cracks or flow paths of water indicating likelihood of such cracks.</p> <p>Ensure as a precaution, sufficient stockpiles of raw materials (clay, rock etc.) and earth moving equipment are kept readily available for use in closing large unforeseen subsidence cracks that extend below channel beds of rivers and creeks.</p> <p>Check flow measurement results and repeat measurements on a monthly basis.</p> <p>Where investigations determine that impacts are the result of ACOL operations, offset the loss of any baseflow to the surrounding watercourses and/or associated creeks caused by ACOL as per DA condition 4.2. May also secure additional licences where required to account for increased baseflow reductions.</p> <p>Where loses are associated with Bowmans Creek, return flows from year 6 of the HUAWS WSP during cease to pump conditions.</p> <p>Where investigations determine that impacts are the result of ACOL operations or may potentially impact on adjacent bores or surface water users, implement actions per WMP. Recalibrate groundwater model and revise predictions.</p> <p><b>BOWMANS CREEK – Redundant Creek sections prior to full diversion</b></p> <p>If there is any indication that significant drainage of the alluvium is occurring, or there is a loss of</p>	<p>Immediate implementation of remediation of large visible cracks in channel. If reduction is not due to obvious cracking then initiate preliminary investigation within 1 week of impact being confirmed. If reduction is significant immediately notify agencies and discuss strategy.</p> <p>EoP report within 3 months of longwall completion.</p>	<p>Environmental Coordinator</p>	<p>Report at EoP to inform relevant agencies of results of monitoring.</p> <p>Reporting of observed parameter variations within AEMR.</p>

TRIGGER	ACTION	TIMING	RESPONSIBILITY	REPORTING
	stream flow, due to cracking, construction of the full-height block banks will commence as soon as practicable.			
<b>Surface Water Quality</b>				
Monitoring results outside of the impact assessment criteria stated in the WMP, with reference to upstream background water quality levels.	<p>Investigate potential causes:</p> <ul style="list-style-type: none"> <li>Conduct visual inspection to ascertain if any obvious causes are visible (e.g. broken pipe, discharge from dam etc.).</li> <li>If cause identified implement immediate repairs.</li> </ul> <p>If no obvious visible cause then:</p> <ul style="list-style-type: none"> <li>Engage a Hydrologist to undertake a preliminary investigation and report on any identified changes if required.</li> <li>Confirm trends or anomalies by repeating water quality and sampling of impacted streams as required.</li> <li>Compare exceedance with climatic conditions.</li> </ul> <p>Where investigations determine that impacts are the result of ACOL operations and may potentially impact down stream surface water users, implement actions as per Section 10.1 of the Water Management Plan.</p>	<p>Immediate visual inspection. If likely cause is due to failure of infrastructure or equipment implement immediate repairs.</p> <p>If not due to visible infrastructure failure then arrange preliminary investigation and initiate within 1 week of trends being confirmed.</p> <p>EoP report within 3 months of longwall completion.</p>	Environmental Coordinator	<p>Monthly updates of investigation progress.</p> <p>If related to underground operations report at EoP to inform relevant agencies of results of monitoring.</p> <p>Reporting of observed parameter variations within AEMR.</p> <p>If hazardous substances are involved or licence criteria are breached then report immediately.</p>

TRIGGER	ACTION	TIMING	RESPONSIBILITY	REPORTING
<b>Flooding and Surface Drainage Reporting to Underground Mine</b>				
<p>Mine inflow rates greater than those predicted in the WMP.</p>	<p>Undertake an initial investigation to assess if unforeseen ponding of floodwaters on the Bowmans Creek alluvial plain may be reporting to the underground mine workings as a result of subsidence.</p> <p>Where investigations determine that this may be the case, identify and implement contingency measures such as:</p> <p>For subsidence in low lying areas that are prone to flooding and any ponded areas or channels used for drainage of water then priority is given to rapid identification of subsidence cracks, ripping, backfilling and compaction of subsidence troughs and addressing the drainage of ponded water through actions such as opening drainage lines across ridges between subsidence troughs, creating drains and/or local diversion bund to route flowing water to drainage lines to achieve a free draining landform, and reduce ponding, and therefore mine infiltration. Evacuate underground workings if significant inrush of water occurs underground or appears likely to occur.</p> <p>Where there is no identified surface ponding, Engage a hydrogeologist / hydrologist to undertake a preliminary investigation and report on any identified changes.</p> <p>Where investigations determine that the result of the increased inflow may potentially impact on adjacent bores or surface water users, implement actions per WMP.</p>	<p>Opportunistic, however immediate attention is needed if flooding is forecast by the Bureau of Meteorology. Immediate attention must also be given to repairing the impacts of subsidence on significant drainage lines.</p>	<p>UG Technical Services Manager / Environmental Coordinator</p>	<p>Reporting of predicted parameter variations within AEMR.</p>

**Table G.2 Summary Groundwater Trigger Action Response Plan (as relevant to LW6B)**

TRIGGER LEVELS	ACTION	TIMING	RESPONSIBILITY	REPORTING
<b>Groundwater Level</b>				
Water table decline greater than predicted drawdown.	<p>Investigate potential contributing factors:</p> <ul style="list-style-type: none"> <li>▪ Confirm trends or anomalies by repeating water level sampling as required.</li> <li>▪ Compare exceedance with climatic conditions.</li> <li>▪ Engage a Hydrologist to undertake a preliminary investigation and report on any identified changes if required.</li> <li>▪ Engage a hydrogeologist to undertake a preliminary investigation and report on any identified changes.</li> </ul> <p>Where investigations determine that impacts are the result of ACOL operations or may potentially impact on adjacent bores or surface water users, implement actions per WMP.</p> <p>Proposed actions following findings of investigations specific to areas.</p>	Preliminary investigation initiated within 1 week of trends being confirmed.	Environmental Coordinator	Report at EoP to inform relevant agencies of results of monitoring.  Reporting of predicted parameter variations within AEMR.
Hydraulic Connection with Bowmans Creek and connected alluvium greater than predicted.	<p>If the monitoring and investigation shows impacts associated with Hydraulic Connection with Bowmans Creek and connected alluvium greater than predicted levels:</p> <ul style="list-style-type: none"> <li>▪ Increase licence allocation to account for addition loss.</li> <li>▪ Modify mine plan to mitigate future impact.</li> </ul>			

TRIGGER LEVELS	ACTION	TIMING	RESPONSIBILITY	REPORTING
<b>Groundwater Quality</b>				
Changing trend in measured parameters outside limits of baseline levels.	<p>Confirm trends by repeating water level sampling of impacted and adjacent bores as required.</p> <p>Engage a hydrogeologist to undertake a preliminary investigation and report on any identified changes.</p> <p>Where investigations determine that impacts are the result of ACOL operations or may potentially impact on adjacent bores or surface water users, implement actions per WMP.</p>	<p>Preliminary investigation initiated within 1 week of trends being confirmed.</p> <p>EoP Report within 3 months of longwall completion.</p>	Environmental Coordinator	<p>Report at EoP to inform relevant agencies of results of monitoring.</p> <p>Reporting of predicted parameter variations within AEMR.</p>
<b>Mine Inflow</b>				
<p>Observable increases in flow rate above prediction.</p> <p>Sudden inrush of groundwater into underground workings.</p>	<p>Immediate reporting to UG Technical Services Manager, Environmental Coordinator and Mine Manager.</p> <p>Repeat water quality sampling and initiate laboratory water quality sampling on a fortnightly basis.</p> <p>Engage a hydrogeologist to undertake a preliminary investigation and report on any identified changes.</p> <p>Where investigations determine that impacts are the result of ACOL operations or may potentially impact on adjacent bores or surface water users, implement actions per WMP.</p>		UG Technical Services Manager / Environmental Coordinator	<p>Report at EoP to inform relevant agencies of results of monitoring.</p> <p>Reporting of predicted parameter variations within AEMR.</p>