



ENVSTD4.3.03.01.01.013

Beltana Subsidence Monitoring Plan Longwalls 12 to 14

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1 PURPOSE

The purpose of this strategy is to ensure that appropriate baseline data collection and field investigation of subsidence is collected to monitor the multi-seam subsidence associated with the Bulga Coal Continued Underground Operations DA 376-8-2003. Subsidence monitoring is required to aid the assessment and mitigation of safety and environmental hazards.

2 SCOPE

The scope of this plan is to provide specific subsidence monitoring for the Beltana Mine Lower Whybrow Longwall panels 12 to 14.

This document has been updated to reflect the requirements contained in the Beltana LW12 - PSE agreement (dated 31/7/09). In particular, to update Figure 1 to show the addition of further monitoring lines. Furthermore, this document still compliments the Beltana Survey Subsidence Monitoring Strategy – Longwall 10 to 14 ([ENVSTD4.3.03.01.01.009](#)), in particular to provide details about Longwalls 12 to 14, and the Beltana Longwall 4-14 Subsidence Management Plan – October 2006 ([ENVSTD4.3.03.01.01.001](#)). Survey subsidence monitoring prior to Longwall 12 is covered by the Beltana Survey Subsidence Monitoring Strategy – Longwall 10 to 14 ([ENVSTD4.3.03.01.01.009](#)).

Additionally the pertinent groundwater monitoring points from the Bulga Coal Environmental Monitoring Program [ENVSTD4.4.01.001](#) are included, in order to display the piezometer locations in relation to the subsidence survey monitoring lines.

3 KEYWORDS

Subsidence, survey, monitoring.

4 PLAN

This plan contains the surveying strategy, field inspections and additional data collection relating to subsidence caused by mining Beltana Mine Lower Whybrow Longwall panels 12 to 14.

4.1 Survey Subsidence Monitoring Strategy

4.1.1 Survey Methodology

A total station shall be the primary source to take measurements to obtain an xyz for each mark. Along the Highwall, the levels will be verified with a precision level run. The total station used for the survey has an accuracy of 5mm +/- 2ppm/klm for a single prism. Each strain measurement shall have an accuracy of +/-2mm/bay. A pre and post mining precision level will be run over stations up to the edge of the Longwall block.

Data collected will be then presented in a spreadsheet format accompanied with a plan showing the correlation of the survey and the retreating face.

4.1.2 Survey Monitoring Station

Generally the stations will be from 2400mm to 900mm (minimum) steel rods, or similar, where geology allows, driven into the ground centre punched and spaced at intervals of 1/20th of cover, with a minimum spacing of 6m.

Near the Wollombi Brook they will be 1.6m steel or galvanized pickets, driven in their full length or to refusal whichever comes first.

4.1.3 Survey Line/Station Maintenance

Survey line maintenance will be conducted as required for each specific situation depending on the likelihood of disturbance. As a general rule the survey lines will be inspected once a year documenting which sites, if any, have been disturbed and what maintenance measures are required. Completed maintenance work should also be documented after completion.

4.1.4 Lower Whybrow Longwalls 12 to 14 Survey Program.

Western end of blocks 12 to 14 (Longwall start): These lines at the start of the Longwall panels (down dip end) are designed to provide sufficient data to validate the predicted angle of draw. Where the selected lines fall on private property, they must be installed in consultation with the landowner. Figure 1 shows the installed and proposed locations of the longitudinal lines at the commencement of Longwall mining, 11 through 14. The start of Longwall 12 is complicated by agriculture practices on private property (improved pasture which is regularly ploughed). Therefore there is no starting line for Longwall 12.

Mid Panel Transverse Subsidence Line: These lines where possible will be located adjacent to an existing feature to provide protection for them from disturbance (e.g. roads or fence lines). Consideration and preference will be given to including transverse lines which are suitable for monitoring multiple seams. These mid panel transverse survey lines are aimed at validating the predicted subsidence. The mid panel transverse line named Eastx1cr shown on Figure 1 cannot extend beyond longwall 9 because of interaction with the Northern Drainage Line. Longwalls 11 to 14 do not extend east of Charlton Road and as such the transverse survey line is similarly located west of Charlton Road.

Highwall Monitoring Lines: Both transverse and longitudinal monitoring lines were installed up to Longwall 9, taking into account other features requiring minimal disturbance or rehabilitation. A longitudinal line has been installed for Longwall 1 and will be installed for Longwalls 12 and 13. A longitudinal line will not be installed for longwall 14 because it would require clearing vegetation in the Warkworth Sands Endangered Ecological Community.

The purpose for the Highwall transverse lines is to assist in monitoring the stability of the Highwall, and as Longwalls 12 to 14 do not cross Charlton Rd, Highwall transverse lines are not planned for these Longwalls.

For all monitoring lines, pre-mining survey will take place and be followed up by a post-mining survey with measurements taken to obtain subsidence, strain and tilt of the marks.

4.2 Subsidence Inspection Strategy

Field inspections of areas actively being undermined will be performed by the Mine's Environmental Officer. The frequency of inspections will vary according to the depth of cover, i.e. as the longwall retreats towards the Highwall the frequency of inspections will increase. At minimum, inspections will take place every fortnight.

Inspections will include a location and description of surface cracking. This information will be collected in the field using inspection sheets and georeferenced digital photographs, and stored in the Mine's Environment and Community Geographical Information System.

4.3 Additional Data Collection

Saxonvale Fault Survey Lines: The Saxonvale Fault is located west south west of Longwall 10. Additional survey lines were monitored to measure any potential movement around the fault in response to subsidence. The details of these lines are contained in the Beltana Survey Subsidence Monitoring Strategy – Longwall 10 to 14 ([ENVSTD4.3.03.01.01.009](#)). There has not been any measured response to subsidence at the Saxonvale Fault.

Airborne LiDAR Surveying: Airborne LiDAR surveys were flown over the Whybrow Longwalls in 2008 and 2009. The intention is to fly a survey each year over the newly subsided ground in order to further validate subsidence predictions and assess larger scale surface drainage requirements. These surveys will also be of value when predicting the impacts of multi-seam mining on the land surface. Data collected by airborne LiDAR will be provided to the Principal Subsidence Engineer, Department of Primary Industries – Mineral Resources.

Angle of Draw Investigations: An angle of draw investigation was undertaken at the commencement end of Longwalls 6 to 9. Details about this investigation are contained in the Beltana Survey Subsidence Monitoring Strategy – Longwall 10 to 14 ([ENVSTD4.3.03.01.01.009](#)). The angle of draw for Longwalls 6 to 9 was found to have not encroached on the Wollombi Brook alluvial limit.

4.4 Reporting

Weekly Longwall Status Report: A snapshot of the longwall position will be sent to relevant stakeholders weekly. This will be a single figure showing the shearer position in relation to surface features, on an aerial photograph, and the distance mined in the preceding week.

Monthly Consolidated Mine Planning Schedule (CMPS): Activities associated with the management of infrastructure and remediation of the landscape impacted by subsidence will be contained in the environmental section of the mine CMPS.

Quarterly Subsidence Status Report: A status report on the previous 3 months of mine subsidence will be distributed to relevant stakeholders. This report will contain management actions undertaken to mitigate or remediate subsidence impacts due to extraction of the subject longwall panel.

Annual Environmental Management Report (AEMR): Monitoring and mitigation work undertaken on subsidence impacted mine areas will be reported annually in the AEMR. This will include the location of subsidence surface cracking repairs on a suitable plan.

Subsidence Surveys: Subsidence Survey Monitoring data will be provided to the Department of Primary Industries – Mineral Resources, within one month of the completion of the survey, or at the request of the Principal Subsidence Engineer. Explanations will accompany the data if there are any observed movements from those predicted.

5 ACCOUNTABILITIES TABLE

Role	Accountabilities for this document
Environmental Coordinator	The Beltana Environment and Community Coordinator is responsible for the review of proposed mining subsidence requirements and development of the associated Subsidence Management Plans. These plans shall include the survey monitoring requirements.
Mine Surveyor	The Beltana Registered Mining Surveyor is responsible for the development and implementation of the Survey Subsidence Monitoring Strategy section of the Plan.

6 REFERENCES

Beltana Mine Longwall 4- Longwall 14 Lower Whybrow Seam Longwall Management Plan – September 2004 ([ENVSTD4.3.03.01.01.001](#))

Longwall 4-14 Access and Highwall Stability Management Plan – August 2004 ([ENVSTD4.3.03.01.01.002](#))

Longwall 9-10 Charlton Road Safety and Environment Plan
[ENVSTD4.3.03.01.01.010](#).

Environmental Monitoring Program [ENVSTD4.4.01.001](#).

Beltana Survey Subsidence Monitoring Strategy – Longwall 10 to 14 ([ENVSTD4.3.03.01.01.009](#)).

