Centennial Coal

Response to Submissions

Newstan Colliery

Subsidence Management Plan

Longwalls 101 – 103

February 2013

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1. INTRODUCTION

Newstan Colliery (Newstan) is an underground coal mine owned and operated by Centennial Newstan Pty Limited (Centennial Newstan), part of Centennial Coal, a wholly owned subsidiary of Banpu Public Company Limited. Underground mining at Newstan is undertaken utilising both bord and pillar, and longwall mining methods. Newstan is regionally located approximately 25 kilometres south-west of Newcastle and approximately 140 kilometres north of Sydney within the Lake Macquarie Local Government Area (LGA). The Newstan pit top and surface facilities are located approximately four kilometres north of the township of Toronto.

In August 2012, a Subsidence Management Plan (SMP) application was prepared and submitted to the Department of Trade and Investment, Regional Infrastructure and Services – Division of Resources and Energy (DTIRIS – DRE) seeking approval for the development and extraction of Longwall Panels LW101 to LW103.

The proposed mining targets the Young Wallsend seam (which comprises the Nobby's and Dudley seams) and part of the Yard seam with depth of cover ranging from 210 metres in the north-west to approximately 350 metres in the south-east.

2. SCOPE

This report has been prepared in response to submissions received during the public exhibition of the Subsidence Management Plan for Longwall Panels LW101 to LW103. This report builds on information presented in the Subsidence Management Plan and is to be read in conjunction with the Subsidence Management Plan.

3. OVERVIEW OF SUBMISSIONS

Three (3) submissions were received by the DTIRIS – DRE following public exhibition of the Subsidence Management Plan. Submissions were received from:

- Individuals (1);
- Community groups (1); and
- Eraring Energy (1).

Table 1 provides a summary of the issues raised in the submissions received and identifies the section within this report which addresses these concerns.

Table 1 – Summary of Issues Raised in Submissions

Concern	Raised By	Summary of Concern	Where Addressed
Watercourses and Endangered Ecological Communities	Community Individual	Concerned about the potential effects and damage on the watercourses that run through site, in particular Kilaben Creek and the Endangered Ecological Community, Swamp Mahogany Paperbark Forest. The existing integrity of Kilaben Creek, its tributaries and the Swamp Mahogany Paperbark Forest should be maintained and protected.	Section 4.1
Water Quality	Community Group	The SMP does not include an assessment of the cumulative impacts from the existing Awaba Waste Management Facility (AWMF), the disused Rathmines tip and the disused Kilaben Bay tip on water quality entering Lake Macquarie. Concern over water quality parameters greater than the default ANZECC/ARMCANZ water quality guidelines.	Section 4.2
Awaba Waste Management Facility	Community Group	The SMP does not take into consideration the type and quantities of material contained within the AWMF which could leach into the groundwater. The risk of environmental impact from mining beneath the AWMF is considerable.	Section 4.3
Geology	Community Group	The location of fault lines identified on plans in the SMP Application, are not consistent with fault lines identified on plans in the Newstan Colliery Life Extension Project Environmental Impact Statement (Umwelt	Section 4.4

		1998).	
Heritage	Community Group	The SMP does not include an assessment of impacts on the heritage listed Radio Bunkers at Rathmines.	Section 4.5
Management Pans	Community Individual	Centennial Coal is to release their Water Management Plan, Watercourse Management Plan and Flora and Fauna Management Plan as soon as possible. Opportunities should be provided for the community to comment on the plans prior to them being finalised and the SMP application being approved.	Section 4.6
	Eraring Energy	No Private Road Management Plan has been developed in consultation with Centennial Newstan. No document was lodged with the SMP application. An effective and informed dialogue should be established to develop and finalise the Private Road Management Plan.	
Private Haul Road	Eraring Energy	There is no history of longwall mining under the haul road as such there is concern over Centennial Newstan being able to maintain safe, serviceable and repairable criteria. Up to 1200 mm of subsidence is predicted above longwalls 101-103 and it is difficult to believe that it is possible to maintain safe and serviceable conditions using normal road maintenance conditions. Concern regarding anticipated impacts to the haul road efficiency, drainage and safety as a result of the subsidence predicted beneath the haul road. Sufficient material was not made available to Eraring during the consultation process for Eraring to make an informed assessment about subsidence impacts on the haul road and about effective measures proposed to manage risks. The Awaba Colliery Environmental Assessment to support the Awaba Colliery Mine Project Application (PA 10_0038) requires Centennial Coal to provide buffer zones to manage the risk of plug failure and protect infrastructure including the haul road. Similar conditions or requirements should be applied to this application where subsidence is predicted to be much higher than those predicted by the Awaba Colliery Mine Project	Section 4.7

		Application. Longwall mining under the haul roads angle of draw should be avoided and a block of coal should remain to reduce or avoid impacts to the haul road. The SMP Application proposes the installation of a subsidence monitoring line along the haul road however no detail is provided as to actual work programmes and remediation measures	

4. RESPONSE TO SUBMISSIONS

Centennial Newstan provides the following responses to the submissions and key issues summarised in Section 3.

4.1. Watercourses and Endangered Ecological Communities

Concern over the potential effects and damage on the watercourses that run through site, in particular impacts on Kilaben Creek and the Endangered Ecological Community Swamp Mahogany Paperbark Forest. The existing integrity of Kilaben Creek, its tributaries and the Swamp Mahogany Paperbark Forest should be maintained and protected.

As is identified by the Surface Water Impact Assessment prepared by GHD to support the SMP application (GHD 2012c), there are several waterways within the predicted subsidence affectation zone. The drainage lines occurring within the predicted subsidence affectation zone are generally first and second order. Third and fourth order streamlines also occur in the subsidence affectation zone and include:

- Stony Creek (WC1).
- The unnamed waterways of WC2, WC6, WC10, WC11, WC12.
- Kilaben Creek (WC5).

The watercourses in the mining area are ephemeral, but have ponds in the flatter sections along the lower reaches of the streams. The watercourses are located across the mining area and, therefore, are expected to experience the full range of predicted subsidence movements.

Kilaben Creek or WC5, extends across the Longwalls LW101, 102 and 103 and directly mined beneath. It receives inflow from a number of 1st and 2nd order tributaries that are within the mining areas of Longwalls LW102 and 103.

The maximum predicted conventional subsidence and tilt for Kilaben Creek is provided in Table 2 below.

Table 2 - Maximum Predicted Total Conventional Subsidence and Tilt for Kilaben Creek (WC5)

Waterway	Longwall	Maximum Predicted Total Conventional Subsidence (mm)	Maximum Predicted Total Conventional Tilt (mm/m)
WC5	After LW101	<20	<0.5
	After LW102	750	6.0
	After LW103	975	10.0

The findings of the Surface Water Impact Assessment (GHD, 2012c), which are relevant to the environmental impacts within the SMP Study Area, are as follows:

- From the assessment of the predicted maximum subsidence impacts, changes are likely to occur in the alignment of minor drainage channels within the upper catchment positions, but catchment boundaries are unlikely to be affected by subsidence.
- Areas of increases in waterway gradient and flow velocities were observed in two watercourses. The increases observed in waterway gradient due to subsidence,

resulted in flow velocity increases in the order of 0.4 m/s for the 2 year Average Recurrence Interval (ARI) event. The hydraulic modelling also indicated instances of reduction in waterway gradients and subsequent flow velocity. From the geomorphic investigation of the subsided results, flow velocities were found to be maintained above 0.2 m/s for the flow events modelled. Given that the waterways traversing the SMP Study Area are typically fine-grained systems that predominantly transport suspended sediments, it is unlikely that any aggradation of sediment along waterways will occur due to the subsidence impacts.

- The impact on flood depth, due to predicted subsidence, was found to be greatest in the 2 year ARI event. This indicated that the flooding inundation had a maximum increase of 3.7% within the subsidence project area. The areas indicating the greatest impact were identified as Kilaben Creek and the unnamed creek. The greatest increase in flood depth was in the order of 0.5 m for the 100 year ARI and 0.35 m for the 2 year ARI.
- Flood velocities were assessed for change between the existing and subsided model. Velocities remained consistent in the subsided surface with instances of reductions in velocity. Change in velocity was greatest within Kilaben Creek and the unnamed watercourse. The change in velocity is due to the reduction in bed grade of the waterway which in turn increases the flood depth.
- Increased ponding could occur along the flatter sections of the Schedule 2 streams, as a result of mining, however, natural ponding was evident along these watercourses due to the relatively flat natural grades. Fracturing of the exposed bedrock along the upper reaches of the watercourses could result in some spalling or dislodgement of loose rocks. Continuous fracturing is not expected between the seam and the surface.

Given the subject waterways are densely vegetated, particularly with the long native grass gahnia sp., the modelled flow velocity increases for subsided conditions are considered to be non-scouring. Hence, assuming riparian vegetation conditions are maintained, the potential for increased instability along the waterway sections subject to a gradient increase, is considered to be low.

Additionally the reach of Kilaben Creek, which is subject to a gradient increase, is a chain of ponds system. In the absence of a continuous, well defined channel, there is a risk that subsidence could initiate incision and the development of a continuous channel in response to an increase in gradient. The existing gradient along this waterway section was defined to be between 1.0% and 1.5% for the existing conditions. Under the subsided conditions, it was predicted that the gradient would likely increase to up to 2.0%. The chain of ponds systems are known to exist within the area on gradients of up to 2.5%. Given the post subsidence gradients are lower than this value, it is not expected that the chain of ponds that reach along Kilaben Creek will be subject to incision as result of the predicted maximum subsidence if existing vegetation associations are maintained.

The findings of the Groundwater Impact Assessment report (GHD, 2012a), which are relevant to the environmental impacts within the SMP Study Area are as follows:

- An analysis of the shallow aquifers suggests that there would be a negligible movement in groundwater from the top 5 m of strata (including alluvium and outcropping rock) to the underlying strata as a result of extraction of coal within the SMP Study Area. For all hydraulic conductivity increase scenarios, this change is predicted to be less than 0.2 ML/year throughout the entire SMP Study Area. It is noted that an annual extraction of less than 3 ML/year from an aquifer is considered by the NSW Office of Water to be typical of use under basic landholder rights and generally low impact.

- Groundwater Dependant Ecosystems (GDEs) located within the SMP Study Area may experience a drawdown of up to 0.2 m as a result of mining. It is not anticipated that GDEs located outside the SMP Study Area will be impacted.

One vegetation unit mapped within the SMP Study Area (Swamp Mahogany Paperbark Forest) is an Endangered Ecological Community and may potentially be influenced by groundwater or be partially groundwater dependent. This vegetation type is associated with drainage lines and floodplains within the site.

The impact expected from the longwall mining under this Groundwater Dependent Ecosystem is expected to be a maximum subsidence of 1200 mm (MSEC 2012. Continuous fracturing is not expected between the seam and the surface and, therefore, no loss of water from the catchment is anticipated (MSEC 2012). It is expected that the effects of the predicted maximum subsidence may have minor ponding effects within this Groundwater Dependent Ecosystem. It is also expected that the Groundwater Dependent Ecosystem will adjust over time to accommodate the changed levels through natural sedimentation of hollows and the natural hydrology of the Groundwater Dependent Ecosystem will be maintained.

The following mitigation measures have been committed to by Centennial Newstan to minimise the potential impacts of the proposal:

- Monitoring of stream bed morphology within the Swamp Mahogany / Paperbark Forest should be undertaken to detect any changes in the stream bed from subsidence. Likely indicators are the formation of new cracks, changes in direction of the stream bed and ponded areas;
- Newstan Colliery will develop a Watercourse Management Plan for the SMP study area (or adopt equivalent principles in the Newstan Flora and Fauna Management Plan - FFMP); and
- Where subsidence cracks are found that require remediation, then remediation will be undertaken in accordance with the Newstan Colliery Watercourse Management Plan or FFMP and in consultation with relevant regulatory agencies.

4.2. Water Quality

The SMP does not include an assessment of cumulative impact assessment from the existing Awaba Waste Management Facility, the disused Rathmines tip and the disused Kilaben Bay tip on water quality entering Lake Macquarie.

The SMP Study Area used for the SMP application for longwalls LW101-LW103 has been conservatively defined beyond the minimum requirements of the SMP Guidelines. The SMP Study Area incorporates the areas bounded by the following limits:

- A 26.5 degree angle of draw from the panel edge (limit of proposed extraction) of the proposed LW101, LW102 and LW103 for the depth of cover (as per Section 6.2 of the SMP Guidelines). Additionally, the study area also includes a 26.5 degree angle of draw from associated first workings (mains headings and associated mine development roads) adjacent to the longwalls, acknowledging that these areas do not significantly contribute to subsidence but have been conservatively included; and
- The predicted limit of vertical subsidence, taken as the 20mm subsidence contour resulting from the extraction of the proposed longwall panels (as per Appendix A of the SMP Guidelines). Additionally, the footprint of potential direct impact by subsidence parameters including tilt, strain and curvature has been considered in establishing the SMP Study Area.

The location of the disused tips at Rathmines and Kilaben Bay are located approximately 600m and 1.2 km from the boundary of the SMP Study Area. These disused waste disposal

sites are not considered to be at any risk of impact from the proposed extraction of longwalls 101-103 and as such are predicted to have no impact on the existing leachate situation.

A Surface Water Impact assessment was undertaken by GHD as part of the SMP Application. The Surface Water Impact Assessment included an assessment of the impacts on water quality as a result of undermining the existing Awaba Waste Management Facility (AWMF). Wherever mining is undertaken underneath a waste disposal facility there are potential effects of subsidence on the water quality of the surrounding environment.

- Firstly, the subsidence could cause surface cracking of the capping layer, which would allow surface water to flow into the waste emplacement area and collect pollutants. To prevent this occurrence the AWMF has established procedures that aim to maintain the integrity of the capping layer.

  The capping layer is subject to natural settlement of the waste as a result of the decomposition of the organic materials. This natural settlement would be larger than the mining related subsidence (MSEC; 2012). Therefore, subsidence impacts are unlikely to have a detrimental effect on water quality due to potential surface cracking of the capping layer.

- Secondly, the extraction of the longwalls may result in fracturing and dilation of the topmost bedrock layers which will increase permeability of near surface strata layers (MSEC; 2012). As the original waste disposal areas are unlined there is potential for leachate to drain from the waste area and enter the groundwater system. Professional advice (MSEC) based on extensive modelling and historical evidence indicates that continuous cracking would not extend from the mined seam up to the surface.

  For this reason leachate would be expected to be confined near the surface strata, where it is managed in accordance with the existing AWMF procedures. Therefore, subsidence impacts are unlikely to have a detrimental effect on water quality due to increased permeability of the underlying strata.

As such, the proposed extraction of longwalls LW101-103 is unlikely to have any significant impacts on existing water quality within the SMP Study Area that enters Lake Macquarie. The water quality will be monitored as part of the extraction process.

Concern over water quality parameters greater than the default ANZECC/ARMCANZ water quality guidelines.

Baseline water quality monitoring of the streams that pass specifically through the SMP Study Area has been undertaken for a period of approximately 7 months. A total of ten (10) locations (including upstream and downstream of the SMP Study Area) have been sampled and analysed for a number of water quality parameters including: pH; electrical conductivity; total suspended solids (TSS); oil & grease; turbidity and total metals during this period. The monitoring undertaken to date is designed to provide information on the existing (baseline) water quality prior to undermining.

Australian and New Zealand Environment and Conservation Council (ANZECC) / Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) default trigger values that apply to this site are outlined in Table 5-4 of the Surface Water Impact Assessment. They include stressor trigger values for Lowland or Coastal Rivers and default Freshwater and Coastal trigger values for the protection of 95% of aquatic species.

To develop site specific trigger values in accordance with the guidelines, 24 months of monitoring data is required to be obtained. Prior to secondary extraction of LW101, it is anticipated that approximately 24 months of monitoring will have been undertaken. At this time a better understanding of site specific triggers will be available.

It is expected that there will be minimal impacts on water quality within the SMP Study Area as a result of the extraction of longwalls LW101-103. There is a potential for, with any destabilisation and movement of creeks that a minor increase in TSS, and turbidity may occur from time to time due to areas of erosion.

Ongoing monitoring will be undertaken to assess any potential changes that may occur within the subsidence zone. Areas of potential impact during the course of the proposed longwall mining and any management actions undertaken will be reported on annually in the sites Annual Environmental Management.

4.3. Awaba Waste Management Facility

The SMP does not take into consideration the type and quantities of material contained within the Awaba Waste Management Facility which could leach into the groundwater.

Regardless of the type of material contained within the Awaba Waste Management Facility (AWMF), a leachate management system has been incorporated into the design and operation of the facility to contain leachate material onsite and to minimise the potential for leachate to enter the surrounding soil and groundwater resources.

The leachate collection system consists of a number of ponds that store water runoff from the AWMF site. The subsidence assessment undertaken on the leachate management system of the AWMF as part of the SMP application concluded that it is unlikely that the leachate management system, including ponds, would be adversely impacted by the proposed extraction of longwalls 101-103. Taking this into consideration, further and more detailed analysis of the types and quantities of material within the AWMF is not considered material to the effectiveness of the leachate management system.

The risk of environmental impact from mining beneath the Awaba Waste Management Facility is considerable.

A Preliminary Risk Assessment for the Awaba Waste Management Facility (AWMF) was undertaken by a Joint Technical Group comprising representatives from Centennial Newstan, Lake Macquaire City Council (LMCC), the Mine subsidence Board (MSB) and project consultants over a two day period on 15 May 2012 and 21 May 2012. The Preliminary Risk Assessment was designed to assess the potential subsidence impact of extraction of the longwalls on the existing facility.

The Preliminary Risk Assessment also included an assessment of the potential impact of secondary extraction to the proposed extension of the landfill as well as on the proposed Alternative Waste Treatment Facility (AWTF). This assessment considered risks associated with mine subsidence impacts on the AWMF and AWTF and assessed them based on conservative worst case scenario outcomes. This was used to conservatively determine the need for further studies or the need to establish additional strategies to manage potential risks.

A total of 74 potential risks aspects were identified and assessed. It was agreed by the Joint Technical Group that the potential subsidence impacts were all manageable, and that further investigations would include assessment of a range of technical options for management to identify preferred paths for LMCC and Centennial Newstan.

Management strategies for the AWMF will be developed through the ongoing consultation with LMCC and the Joint Technical Group established for the project. In order to ensure the effective management strategies are implemented for the AWMF, an Action Plan is currently being developed with LMCC which will consider, but may not necessarily be limited to, the following further investigations:

- Establish the appropriate monitoring above the earlier LW101 or LW102 panels, to confirm the outcomes of the impact assessments, prior to mining directly beneath the facility, which could include:
    - Extensometers and/or piezometers in equivalent locations above the initial extraction longwalls to confirm the height of fracturing above the seam and the changes in the hydraulic conductivity of the near surface strata, and

  - Ground monitoring lines above the earlier longwalls, so that the observed surface movements can be compared with those predicted and, so that, the impact assessments can be reviewed in light of the measured data.
- Develop the appropriate preventive or remediation measures, if the outcomes of the detailed studies or monitoring over earlier longwalls indicate potential impacts, which could include:-
  - Methods of reducing the permeability of the capping layer over the waste emplacement area and, hence, to reduce the ingress of water and production of leachate, and/or
  - Upgrade the existing leachate collection well, if required, or the establishment of additional leachate collection wells downslope of the waste emplacement area;
- Develop a Trigger Action Response Plan (TARP), in consultation with the LMCC and its consultants, based on the outcomes of the detailed studies, monitoring above earlier longwalls and the established preventive or remediation measures.
- Install the appropriate monitoring at the AWMF site to measure the subsidence movements resulting from mining, which could include:
  - Extensometers or/and piezometers to monitor the heights of fracturing and changes in hydraulic conductivity,
  - Ground monitoring in areas as agreed to in consultation with LMCC and contained in the AWMF Management Plan to measure the movements at the natural surface level, and/or Monitoring line over the completed area of waste emplacement to measure the movements resulting from both mine subsidence and immediate settlement.
  - Continued monitoring of groundwater levels and quality at the existing monitoring locations at the AWMF;
  - Confirm and delineate potential existing impacts (pre-mining) to groundwater from leachate at the AWMF, and the likely increase to these impacts/risks (if any) resulting from subsidence cracking and appropriate controls required; and
  - The preliminary AWMF risk assessment showed that it is technically feasible to undermine the AWMF.

Following the outcomes of the Action Plan and a revised detailed risk assessment, the AWMF will be managed through the development of an Awaba Waste Management Facility Management Plan (AWMF Management Plan). This management plan will be developed in consultation with LMCC and submitted to DTIRIS-DRE prior to the potential for subsidence impact to the AWMF caused by secondary extraction of LW102.

4.4. Geology

The location of fault lines identified on plans in the SMP Application, are not consistent with fault lines identified on plans in the Newstan Colliery Life Extension Project Environmental Impact Statement (Umwelt 1998).

In 2008 Centennial Newstan commenced an exploration drilling programme across the area currently proposed for mining as part of this SMP application and the larger Extension of Mining Project currently being investigated by Centennial Newstan.

The exploration drilling programme consisted of 56 exploration boreholes being drilled across the area. This information has been used to update the geological model used by the Project team during the mine planning phase.

The mine plan proposed by the SMP application has taken into consideration the latest geological information. It is this latest and most up to date information that has been depicted

on plans shown in the SMP. The location of geological constraints; including the exact location of fault lines, will be further refined as mining progresses.

4.5. Heritage

The SMP does not include an assessment of impacts on the heritage listed Radio Bunkers at Rathmines.

The SMP Study Area used for the SMP Application for longwalls LW101-LW103 has been conservatively defined beyond the minimum requirements of the SMP Guidelines. The SMP Study Area incorporates the areas bounded by the following limits:

- A 26.5 degree angle of draw from the panel edge (limit of proposed extraction) of the proposed LW101, LW102 and LW103 for the depth of cover (as per Section 6.2 of the SMP Guidelines). Additionally, the study area also includes a 26.5 degree angle of draw from associated first workings (mains headings and associated mine development roads) adjacent to the longwalls, acknowledging that these areas do not significantly contribute to subsidence but have been conservatively included; and
- The predicted limit of vertical subsidence, taken as the 20mm subsidence contour resulting from the extraction of the proposed longwall panels (as per Appendix A of the SMP Guidelines). Additionally, the footprint of potential direct impact by subsidence parameters including tilt, strain and curvature has been considered in establishing the SMP Study Area.

The location of the heritage listed Radio Bunkers at Rathmines are beyond the SMP Study Area and are not considered likely to be impacted by subsidence relating from the extraction of longwalls 101-103.

4.6. Management Plans

Centennial Coal is to release their Water Management Plan, Watercourse Management Plan and Flora and Fauna Management Plan as soon as possible. Opportunities should be provided for the community to comment on the plans prior to them being finalised and the SMP Application being approved.

The Watercourse Management Plan, Flora and Fauna Management Plan and Watercourse Management Plan are currently being drafted. As identified in the SMP, these management plans will be developed and approved prior to the extraction of longwall 101. These management plans will be developed in consultation with the relevant government authorities. In addition, Centennial Newstan will commit to providing draft copies of these management plans to the Newstan Colliery Community Consultative Committee for review, with consideration of comments prior to being finalised.

No Private Road Management Plan has been developed in consultation with Centennial Newstan. No document was lodged with the SMP Application. An effective and informed dialogue should be established to develop and finalise the Private Road Management Plan.

As identified in the SMP application, the preparation of a draft Private Road Management Plan has commenced. This Management Plan will be developed in consultation with Eraring Energy and submitted to DTIRIS – DRE prior to secondary extraction in longwall 101. Centennial Newstan will continue to engage with Eraring Energy on the development of this Management Plan.

4.7. Private Haul Road

There is no history of longwall mining under the haul road as such there is concern over Centennial Newstan being able to maintain safe, serviceable and repairable criteria. Up to 1200 millimetres of subsidence is predicted above longwalls 101-103 and it is difficult to believe that it is possible to maintain safe and serviceable conditions using normal road maintenance conditions.

Centennial Newstan (at that stage Elcom) has previously undermined the haul road in the Fassifern seam. The depth of cover was between 40 metres and 50 metres, the extraction height was 2.96 metres and the longwall width was 206.3 metres. These factors would have contributed to an increased subsidence profile when compared to the current mine design, which has a significantly higher depth of cover (210 m to 350 m) and a slightly lower average extraction height (2.7 metres) in the SMP Study Area.

The previous mining in the Fassifern Seam is not superimposed with the proposed mine workings, thus precluding the possibility of compound subsidence effects. The extent of the undermining can be seen in Figure 1, shown below, with the haul road crossing longwall 1.

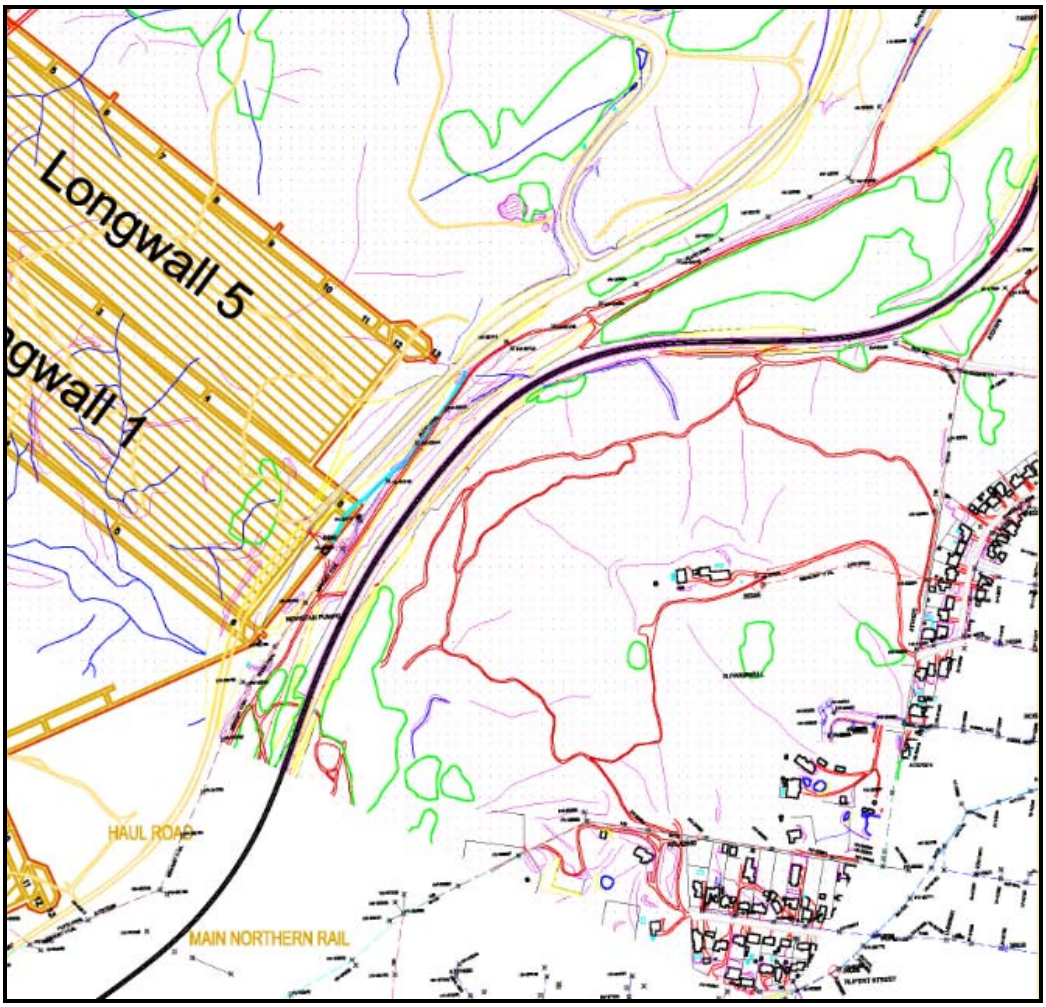

Figure 1 - Fassifern Seam longwalls below Haul Road

There is sufficient case history of undermined roadways in the Newcastle Coalfields to support the prediction that the Haul Road will remain safe, serviceable and repairable given the current subsidence predictions for the Haul Road.

Examples of roadways undermined in the area include Wakefield Road, Charlton Road and George Booth drive. All of these public roads were undermined, with similar subsidence predictions as the Newstan Proposal, without causing major service interruptions during the mining process.

The subsidence predictions for the Haul Road are shown in Table 3.

Table 3 - Maximum Predicted Total Conventional Subsidence, Tilt and Curvature for the Haul Road

Longwall	Maximum Predicted Total Conventional Subsidence (mm)	Maximum Predicted Total Conventional Tilt (mm/m)	Maximum Predicted Total Conventional Hogging Curvature (km^{-1})	Maximum Predicted Total Conventional Sagging Curvature (km^{-1})
After LW101	775	8.0	0.10	0.20
After LW102	975	11.0	0.15	0.45
After LW103	1175	13.0	0.25	0.55

Based on the case history and the data from three independent subsidence reports (MSEC 2012; PSM 2012 and SPGL 2011) completed during the feasibility study for the project, Centennial Newstan believes that the Haul Road can be safely undermined.

Centennial Coal further seeks to consult with Eraring Energy to develop a Private Road Management Plan (PRMP) prior to the extraction of longwall 101 in the SMP area. The results of the subsidence monitoring of LW101 will be used to validate the subsidence model and thus provide more accurate data for Longwalls 102 and 103.

Concern regarding anticipated impacts to: 1) haul road efficiency, 2) drainage and 3) Road safety as a result of the subsidence predicted beneath the haul road.

Based on the experience gained from the previous undermining of roads within the Newcastle Coalfields, and the subsidence advice received from consultancies during the development of the Newstan Extension of Mining project and SMP, the evidence suggests that this road can be safely undermined whilst allowing the Haul Road to remain in operation. The study further referenced the works of: Holla,L (1987); McNally,G, Willey,P, Creech,M.(1996); Mills,K.(1998); Tobin,C.(1997); Waddington, A.A. Kay, D.R. (1998) and Whitaker and Reddish (1989), in the determination of the subsidence predictions.

Any proposed works will be carried out in consultation with Eraring Energy and scheduled so as to minimise any potential interruption to the safe operation of the Haul Road. Centennial Newstan proposes to monitor subsidence and consult with Eraring Energy, in accordance with the guidelines on the development of a Private Road Management Plan (PRMP).

Sufficient material was not made available to Eraring during the consultation process for Eraring to make an informed assessment about subsidence impacts on the haul road and about effective measures proposed to manage risks.

As part of the consultation process, the documentation and studies that were available at that time were made available to Eraring Energy during meetings on the 19th June, 5th July and 15th July 2012.

Centennial Newstan undertakes to share relevant studies, documents and information with Eraring Energy as part of the consultation process during the development of a Private Road Management Plan (PRMP).

The Awaba Colliery Environmental Assessment to support the Awaba Colliery Mine Project Application (PA 10_0038) requires Centennial Coal to provide buffer zones to manage the risk of plug failure and protect infrastructure including the haul road. Similar conditions or requirements should be applied to this application where subsidence is predicted to be much higher than those predicted by the Awaba Colliery Mine Project Application.

Mining in areas with shallow depth of cover, can cause localised plug failure, as experienced at Awaba and other shallow mines. The depth of cover between the Awaba Colliery workings and the haul road varies between 25 metres and 60 metres with an average depth of cover of 40 metres between the surface and the workings in the vicinity of the haul road.

In the SMP Study Area the conditions are significantly different, as the depth of cover ranges between 210 metres and 350 metres, which in the absence of superimposed mining panels, will preclude the risk of plug failure. The modelling done during the impact assessment indicates that the Haul Road will remain safe, serviceable and repairable for the duration of the undermining and beyond.

Longwall mining under the haul roads angle of draw should be avoided and a block of coal should remain to reduce or avoid impacts to the haul road.

As mentioned above, modelling of the subsidence impacts in terms of vertical subsidence, tilts and strains has indicated that the undermining of the Haul Road can be completed, with the Haul Road remaining in a safe serviceable and repairable state.

To not mine the coal would sterilise State coal resources as well as reduce tax income to both the State and Federal budgets. This reduction in coal reserve would also reduce the offset base, for the large capital spends required for the development of modern coal mines.

The SMP Application proposes the installation of a subsidence monitoring line along the haul road however no detail is provided as to actual work programmes and remediation measures

The exact location and frequency of monitoring will be developed in consultation with Eraring Energy and DTIRIS-DRE as part of the Private Road Management Plan (PRMP).

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