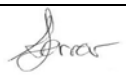
Built Features Management Plan LW101 to LW106

Edition	Rev.	Comments	Author	Authorised By	Date
A	28-Sep-2011	For NCOPL review	Peter Horn Associate Director		
B	29-Nov-2011	For Consultation	Peter Horn Associate Director		
C	16-Feb-2012	NCOPL Review	Peter Horn Associate Director		
D	24-Feb-2012	Consultation Amendments	Amanda Kerr Principal Environmental Engineer		
E	14-Mar-2012	Final	Amanda Kerr Principal Environmental Engineer		
F	18 May 2016	LW106 Update	Steve Farrar Environmental Superintendent		18/05/2016

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1 INTRODUCTION

This Built Features Management Plan (BFMP) has been prepared as part of the Extraction Plan for Longwalls (LW) 101 to 106 in the Hoskissons Seam at the Narrabri Mine. This plan sets out the management objectives and performance measures proposed to manage potential subsidence impacts to the built features that are located within the Extraction Plan area. The original plan was developed by AECOM and related to the extraction of LW101 to LW105. This revision has been developed to incorporate LW106 into this BFMP.

Subsidence predictions by Ditton Geotechnical Services (DGS) have been used as a basis for developing the performance measures, management actions and monitoring contained within this BFMP (DGS, 2015). DGS' analysis and results are contained, in full, as an appendix to the Extraction Plan.

This BFMP has been prepared in accordance with the Project Approval for Narrabri Mine, the supporting Environmental Assessment (EA) and relevant legislation and guidelines.

1.1 Scope

This BFMP applies to built features that are considered likely to be adversely affected by subsidence associated with secondary extraction of LW101 – 106. The purpose of this document is to ensure that impacts to these features are managed in accordance with the Project Approval (PA) 08_0144, as modified, in particular the subsidence impact performance measures stipulated by Schedule 2 Clause 2 which require that:

- Any infrastructure affected by subsidence will be always maintained as safe; and
- Where possible, serviceability will be maintained and any loss of serviceability will be compensated. Damage will be fully repaired, or else replaced or fully compensated.

The proposed mine plan and affected built features is shown on Figure 1 and also described further below.

1.1.1 Description of Underground Mining

Longwall panels at the Narrabri Mine are oriented in a north-south layout and radiate out from the mains headings which are oriented East-West (refer to Figure 1). Longwall panels vary in length, but are approximately 306 metres wide, with depth of cover ranging from approximately 160m to 270m. The longwall will recover the lower 4.3m of the Hoskissons Seam, which ranges from around 4.6m to 10.5m thick. A detailed description of the mine plan, anticipated extraction schedule, along with local geology, overburden description and resource recovery is provided in the Coal Resource Recovery Plan (also a sub-set to the Extraction Plan).

Table 1 below outlines the proposed mine schedule and completed longwall panels to date.

Table 1 Proposed Mining Schedule (Secondary Extraction)

Panel	Start Date	Duration	Completion Date
101	June 2012	12 months	June 2013
102	July 2013	7 months	January 2014
103	March 2014	8 months	October 2014
104	November2014	10 months	August 2015
105	September 2015	9 months	May 2016
106	June 2016	8 months	March 2017

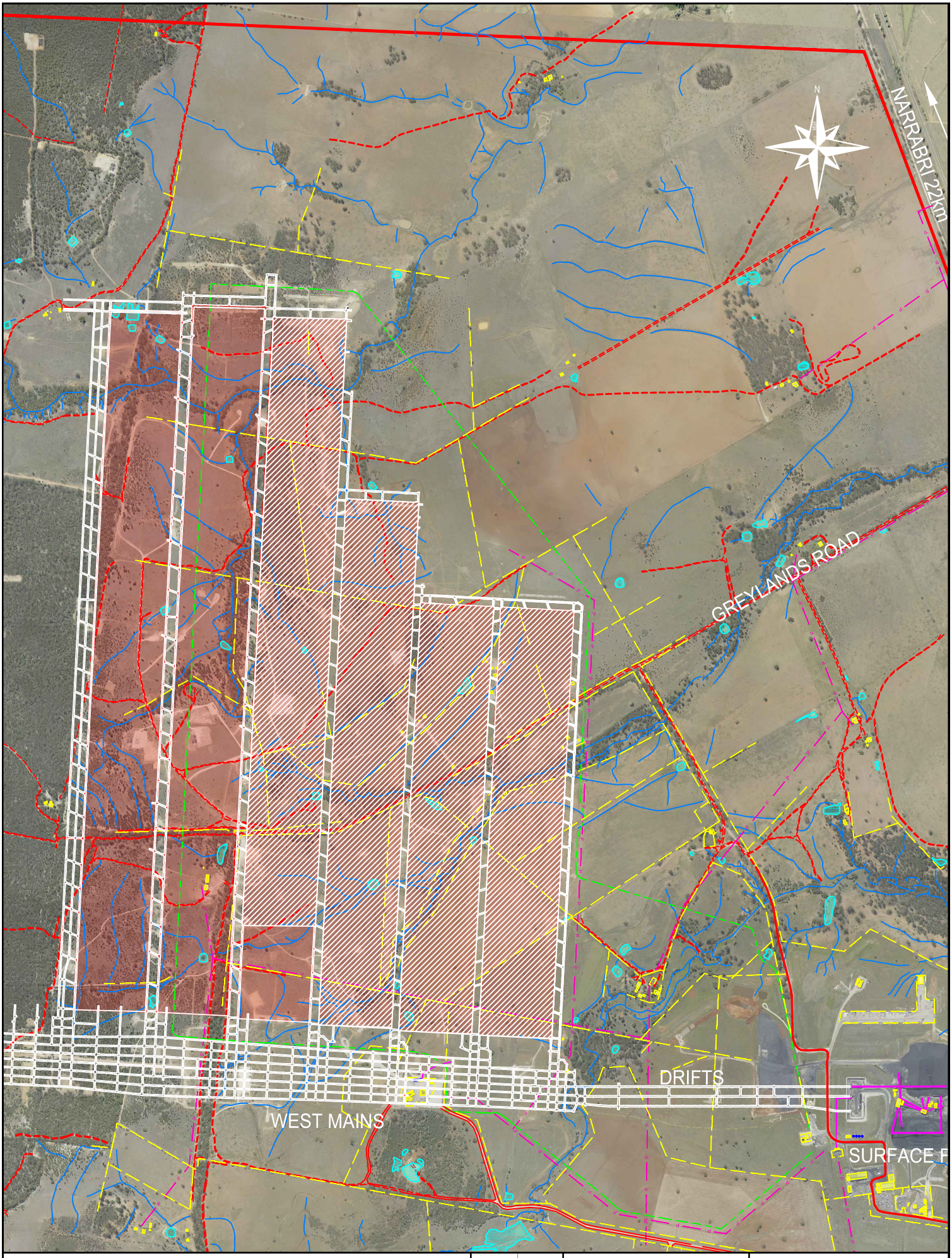
1.1.2 Affected Built Features

LW101 - 106 lies within the boundaries of Mining Lease 1609. The land has been historically used for livestock grazing and cereal crop farming. The surface terrain is generally undulating with slopes between 2° and 5°, with localised increases in the vicinity of the ephemeral tributaries to Pine Creek, which drains the project area to the north east.

1.1.3 Risk Assessment

A subsidence risk assessment has been undertaken to identify the risks associated with subsidence at the Narrabri Mine. The initial risk assessment was undertaken during February 2012 for LW101 to LW105. This risk assessment has since been reviewed and updated to include LW106, refer to Appendix K of the Extraction Plan.

The initial risk assessment ranked two items as having a high risk level and both related to the 11kV power line that traverses the mining area above LW101 to LW105. This line has since been disconnected and as such, these risk ratings have been reduced to low. As a result, there are no high level risk ratings remaining and the risks associated with subsidence above LW101 to LW106 for the Narrabri Mine have been assessed as low to moderate.



LEGEND

- First Workings
- Mine Lease Boundary
- Secondary Extraction
- Buildings
- Dams
- Over Land Water Path
- Unsealed Road
- Mine Infrastucture
- Ped Cable
- Overhead Powerline
- Fence
- Tank

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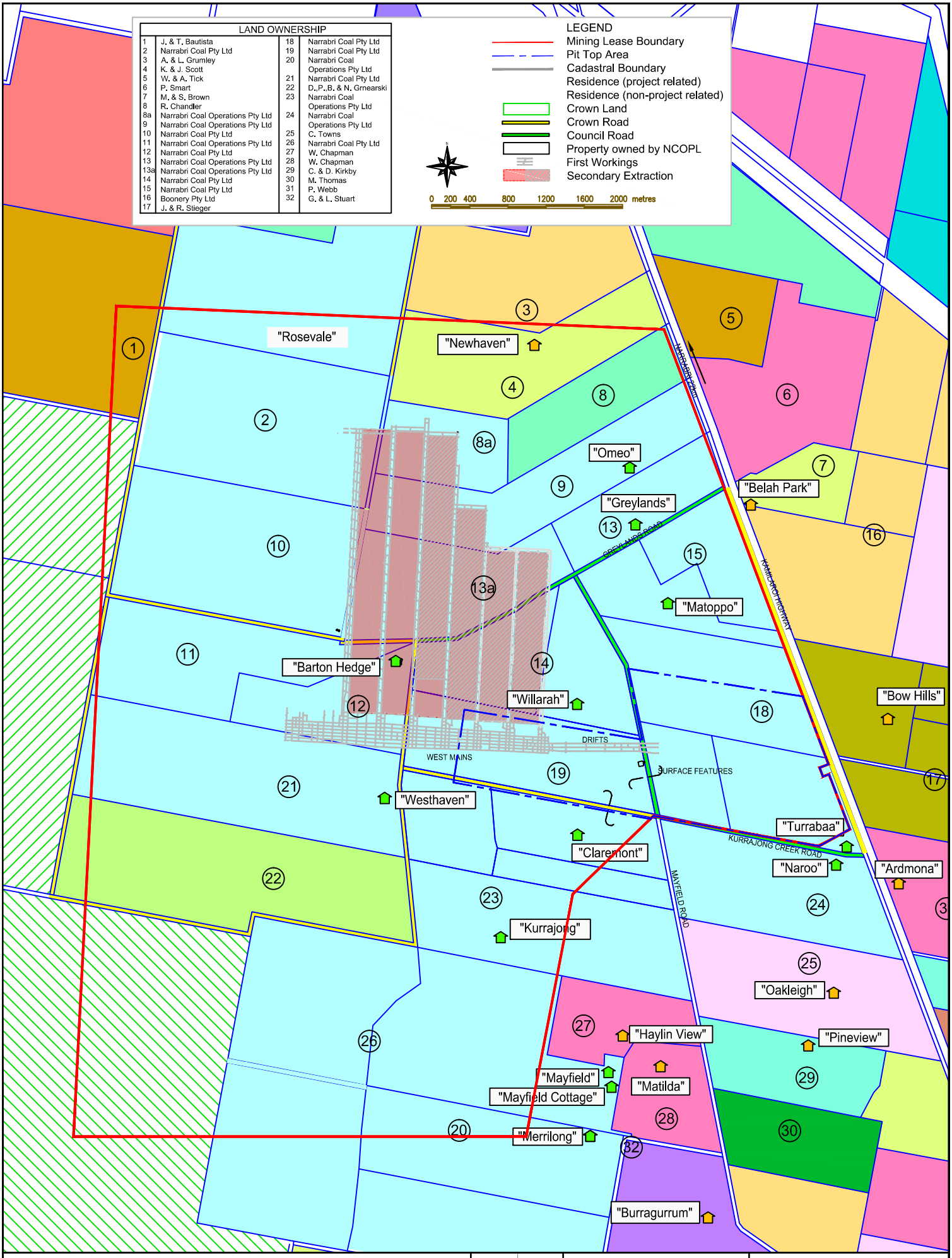
Mine Plan and Built Features

Plan No: APN.05.06

WHITEHAVEN COAL

NARRABRI MINE



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LAND OWNERSHIP

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WHITEHAVEN COAL

NARRABRI MINE

A range of built features are located within the potential mine subsidence area. These can generally be described as the following built form elements:

- Roads and access tracks, including unsealed gravel access tracks;
- Water storage dams (earth embankments) and associated soil conservation banks;
- Property and livestock fences;
- Residential dwelling and machinery sheds (owned by NCOPL);
- Public utility infrastructure consisting of:
    - Essential Energy electricity power supply (suspended 11kV transmission line) servicing two dwellings – both owned by NCOPL.
- Mine infrastructure, consisting of:
    - Surface to in seam gas drainage wells and associated surface plant;
    - Groundwater monitoring bores; and
    - PED cable.

Predictions of subsidence impacts and potential consequences to the above built features are described in Section 2.

The Narrabri Mine is not located within a declared Mine Subsidence District under the Mine Subsidence Compensation Act.

1.2 Statutory Requirements

This document has been prepared in accordance with Project Approval (PA) 08_0144 (as modified), relevant legislation and guidelines, and in consultation with relevant government agencies and affected infrastructure owners as discussed below.

1.2.1 Project Approval

The Project Approval requires that NCOPL prepare a Built Features Management Plan to the satisfaction of the Division of Resources and Energy (DRE). Specifically, Condition 4(g) of Schedule 3, states inter alia:

4. The Proponent shall prepare and implement Extraction Plans for any second workings to be mined to the satisfaction of the Secretary. Each Extraction Plan must:

(g) include the following to the satisfaction of DRE:

- *A Built Features Management Plan to manage the potential subsidence impacts and/or environmental consequences of the proposed second workings, and which:*

- *Addresses in appropriate detail all items of public infrastructure and all classes of other built features; and*
- *Has been prepared following appropriate consultation with the owner/s of potentially affected feature/s.*

The Project Approval also requires the preparation of subsidence impact performance measures, as per Condition 2 of Schedule 3 which states:

Performance Measures – Built Features

2. The proponent shall ensure that the project does not cause any exceedances of the performance measures in Table 2, to the satisfaction of the Secretary of DRE.

Table 2: Subsidence Impact Performance Measures

Built Features	
All built features	*Always safe.* *Serviceability should be maintained wherever practicable. Loss of serviceability must be fully compensated.* *Damage must be fully repairable, and must be fully repaired or else replaced or fully compensated.*
Public Safety	
Public Safety	*No additional risk*

Notes to the above condition require NCOPL to define more detailed performance indicators for each of the above performance measures. These indicators are defined within Section 3.2 of this BFMP. Public safety risks are (in part) addressed by some of the management measures proposed in this BFMP and are discussed and addressed specifically in the Public Safety Management Plan.

It is also noted that performance measure requirements do not prevent preventative or mitigatory actions being undertaken in order to achieve these objectives. Any compensation payable includes that which may be applicable under the *Mine Subsidence Compensation Act 1961* and/or the *Mining Act 1912*.

Schedule 3, Condition 3 of the Project Approval includes provisions for dispute resolution between the Narrabri Mine and the owner of any built features affected by mining. In the event of a dispute, the matter may be settled by the Secretary of, Division of Resources and Energy, with any such settlement being final under the Project Approval.

Annual Review

In accordance with Schedule 6 Condition 6, Narrabri Mine must prepare an Annual Review of the performance of the mine. The Annual Review is required to be prepared to review the performance of the mine against its Environmental Management Strategy, the relevant Mining Operations Plans, the conditions of this consent, and other licences and approvals

relating to the mine. Further details on this requirement are provided in the Extraction Plan and Environmental Management Strategy.

Subsidence Reports

Narrabri Mine has committed (Statement of Commitments 5.20 and 5.21) to reporting of subsidence impacts in regards to built features within an Individual Property Subsidence Management Plan "*or similar as required under any Extraction Plan requirements*"., This BFMP has been prepared to satisfy the requirements of an Individual Property Subsidence Management Plan (IPSMP) and as such includes the following information (as nominated in Commitment 5.21): issues:

- Timing and scale of predicted impacts (refer to Section 1.1 and Section 2.2);
- Monitoring of the effected property during mining (refer to Section 3.3);
- Timing for any remaining disconnection of services (refer to Section 3.3); and
- Post-mining inspection and reporting (refer to Section 3.3 and Section 4.3).

As the above commitments and requirements of an IPSMP has been addressed by this document, IPSMPs will not be prepared for LW101 – 106.

1.2.2 Mining Act 1992

The proposed underground mine lies within the boundaries of Mining Lease (ML) 1609, which imposes a number of conditions on the operator (NCOPL) This BFMP has been prepared to partially address statutory requirements of the Narrabri Mine ML 1609 with regard to the preparation of Subsidence Management Plans. Narrabri Mine's ML 1609 was amended to include a reference to Extraction Plans. However, as the existing Extraction Plan is in a transition period, this BFMP has been prepared in accordance with the Division of Resources and Energy's (DRE) *Guideline for Applications for Subsidence Management Approvals* (Department of Mineral Resources, 2003), also referred to as the "SMP Guidelines".

The SMP Guidelines (Item 7.5) recommends the preparation of Specific Management Plans for potential subsidence impacts with high risk levels and/or potentially severe consequences. Subsidence impacts and affected features under this plan do not all have a high risk or potentially severe consequence, however this BFMP is intended to meet the requirements of a Specific Management Plan under the SMP Guidelines for the management of subsidence-affected man-made surface features.

Other conditions of the Mining Lease of relevance to this BFMP include:

Safety

16 *Operations must be carried out in a manner that ensures the safety of persons or stock in the vicinity of the operations. All drill holes, shafts and excavations must be appropriately protected, to the satisfaction of the Director-General, to ensure that access to them by persons and stock is*

restricted. Abandoned shafts and excavations opened up or used by the leaseholder must be filled in or otherwise rendered safe to a standard acceptable to the Director-General.

Transmission lines, Communication lines and Pipelines

19 Operations must not interfere with or impair the stability or efficiency of any transmission line, communication line, pipeline or any other utility on the lease area without the prior written approval of the Director-General and subject to any conditions he may stipulate.

Fences, Gates

20 (a) Activities on the lease must not interfere with or damage fences without the prior written approval of the owner thereof or the Minister and subject to any conditions the Minister may stipulate.

(b) Gates within the lease area must be closed or left open in accordance with the requirements of the landholder.

Roads and Tracks

21 (a) Operations must not affect any road unless in accordance with an accepted Mining Operations Plan or with the prior written approval of the Director-General and subject to any conditions he may stipulate.

(b) The lease holder must pay to the designated authority in control of the road (generally the local council or the Roads and Traffic Authority) the cost incurred in fixing any damage to roads caused by operations carried out under the lease, less any amount payable from the Mine Subsidence Compensation Fund.

22 Access tracks must be kept to a minimum and be positioned so that they do not cause any unnecessary damage to the land. Temporary access tracks must be ripped, topsoiled and revegetated as soon as possible after they are no longer required for mining operations. The design and construction of access tracks must be in accordance with specifications fixed by the Department of Climate Change and Environment.

Trigonometrical Stations and Survey Marks

28 A person must not remove, damage, destroy, displace, obliterate or deface any marks in connection with any trigonometrical station, permanent mark or survey mark unless authorised to do so by the Surveyor-General.

1.2.3 Commonwealth Approvals

The Narrabri Mine is subject to an approval issued under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The conditions of this approval include the development / implementation of an Extraction Plan (of which this BFMP forms part)

according to NSW Secretary's Assessment Report and approval conditions (26 July 2010). A copy of the Extraction Plan must be submitted to the Department of Environment (DoE), (formerly the Department of Sustainability, Environment, Water, Population and Communities (DSEWPC)).

The EPBC Referral documentation, on which the approval was granted, included various comments regarding management of the environment, including that "surface cracks repair works may be required, in particular along access tracks and roads and along watercourses where cracks do not infill naturally with sediment".

1.2.4 Roads Act 1993

The *Roads Act 1993* sets out the procedures by which parties, other than a recognised road authority (i.e. RTA or Council) may (among other things) undertake works to a public road (i.e. with the permission of the roads authority), or apply for a public road to be closed.

1.2.5 Work Health and Safety Legislation

This Extraction Plan has been developed to comply with the Work Health and Safety legislation including but not limited to:

- The Work Health and Safety Regulation 2011; and
- The Work Health and Safety (Mines) Regulation 2014.

2 SUBSIDENCE AND ENVIRONMENTAL CONSEQUENCES

2.1 Revised Subsidence Predictions

Revised predictions of subsidence were prepared by DGS (2011) in response to minor changes to the mine plan that were made subsequent to the EA and Project Approval. To include LW106 in the Extraction Plan, the subsidence predictions have been modelled and predictions updated, which includes using the measured levels for LW101 to LW104 (DGS, 2015). Overall, minimal change in subsidence estimates between the EA assessment and the mine plan assessed by DGS were noted (DGS, 2015).

Predicted and observed maximum subsidence levels are summarised in Table 2. The DGS (2015) report is provided as an Appendix to the Extraction Plan.

Table 2 Subsidence effect predictions for access roads (DGS, 2015).

LW	Cover Depth (m)	Maximum Subsidence S_{max}(m)	Tilt T_{max} (mm/m)	Tensile Strain (mm/m)	Compressive Strain (mm/m)
101	160 - 170	2.69	47	26	33
102	170 - 180	2.69	45	23	30
103	170 - 200	2.75	41	20	26
104	210 - 215	2.75	43	22	28
105	200 - 240	2.75	38	18	23
106	210 - 270	2.75	31	14	18

Based on a review of the observed surface cracking for LW101 to LW104, surface cracks have typically ranged from 50 mm to 100 mm wide, with some cracking up to 200 mm. The measured cracks have therefore been within the predicted crack width ranges of between 40 mm and 220 mm in the approved Extraction plan for LW101 to LW105. The revised cracking width range of 40 mm to 260 mm for LW101 to LW106 is therefore likely to be conservative. It is noted that the largest cracks are predicted over LW101 to LW104, with cracking over LW106 expected to range between 40 mm to 110 mm (DGS, 2015).

DGS (2015), Appendix B, outlines that based on reference to ACARP, 2003, the cracks will probably have developed by the time the longwall face has retreated past a given location for a distance equal to 1 to 2 times the cover depth. Cracks will usually develop within several days after a mine has retreated beneath a given location, with some of the cracks closing in the compression zone in the middle of the fully developed subsidence trough, together with new cracks developing in the tensile zones along and inside the panel sides several weeks later.

The cracks in the tensile strain zones will probably be tapered and extend to depths ranging from 5 to 15 m, and possibly deeper in near surface rock exposures. Cracks within compressive strain zones are generally low-angle shear cracks caused by failure and shoving of near surface strata. Some tensile type cracks can also be present due to buckling and uplift of near surface rock, if it exists (DGS, 2015).

The cracks usually develop in groups of two or three over a tensile zone of 20 m in width. Once the cracks develop, the strain is usually relieved in the adjacent ground, however, the topography and near surface geology also can influence the extent of cracking (DGS, 2015).

The final extent of vertical subsidence for a given built structure is dependent on its location relative to the longwall panel. Vertical subsidence is typically greatest in the centre of the panel, whilst final tilts and strains tend to be greater nearer to the goaf edges. However, structures near the centre of the panel will also be affected temporarily by tilts and strains as the longwall passes in the same order of magnitude as those presented in Table 2. A 'travelling' subsidence wave follows behind the retreating longwall face and it is therefore likely that the (temporary) maximum tilts and strains will also be at their maximum values at the centre of the panel.

Significant damage to buildings is considered likely to occur where tilts exceed 7mm/m and/or compressive strains are greater than 2mm/m (Holla & Barclay, 2000 in DGS, 2015). The severity of damage depends on the type, geometry and materials of each structure.

Predicted subsidence contours and the location of built features relative to the mine plan are shown in Figure 3.

2.2 Potential Environmental Consequences: Built Features

A brief description of built features likely to be affected by potential subsidence impacts and environmental consequences is provided below. Management actions have been developed for each of the identified built features asset groups and are detailed within individual tables in Appendix A.

2.2.1 Roads and Access Tracks

Unsealed access roads and tracks occur across all six longwall panels, and include Greylands Road, which is a public road. Based on investigations undertaken as part of the EA, the majority of the affected length of Greylands Road is owned by Narrabri Shire Council. To manage impacts to Greylands Road Narrabri Mine has implemented a Greylands Road Management Plan, in consultation with Narrabri Shire Council, which outlines the road will be closed to the public until NCOPL purchase the land. The road is maintained to allow access for mine-related traffic.

Approximately above LW105, Greylands Road reaches a junction and diverges into two roads – one continuing west to the Jacks Creek State Forest and one that heads south towards the property 'Westhaven'. The roads cease to be owned by Narrabri Shire Council at the junction and are Crown Land road reserves from that point on (refer to Figure 2). The remaining tracks occur on private property, providing internal access.

Greylands Road provides access across the Mining Lease, predominantly to properties owned by NCOPL, however it also provides an access route to Property No. 22 (privately owned) and the Pilliga East and Jacks Creek State Forests.

The unsealed gravel access roads and tracks above the proposed longwall panels are likely to be damaged by cracking and 'shoving' at tensile and compressive strain zones. Cracking and compression humps are likely to reduce the safe trafficability of all unsealed access roads, and impact the effectiveness of any longitudinal drainage (i.e. swales) or transverse pipe culverts that may be present.

Potential risks to traffic may result from either the cracking or compression humps, or through inadequate drainage resulting in aquaplaning during wet weather or accelerated erosion / pothole damage during wet weather.

2.2.2 Water Storage Dams

Numerous water storage dams and small sedimentation basins exist above LW101 - 106 (none are located above LW101).

The expected phases of tensile and compressive strain development may result in breaching of the dam walls or water losses through the floor of the dam storage area via surface cracks. Loss or increase of storage areas may also occur due to the predicted tilting. Maximum tensile crack widths across dam walls or storage areas are estimated to range between 40 mm and 260 mm. Surface 'steps' or humps due to compressive shear failures are estimated to range between 60 mm and 330 mm. Damage to windmills (pumping water at the dams) may also occur and require repairing.

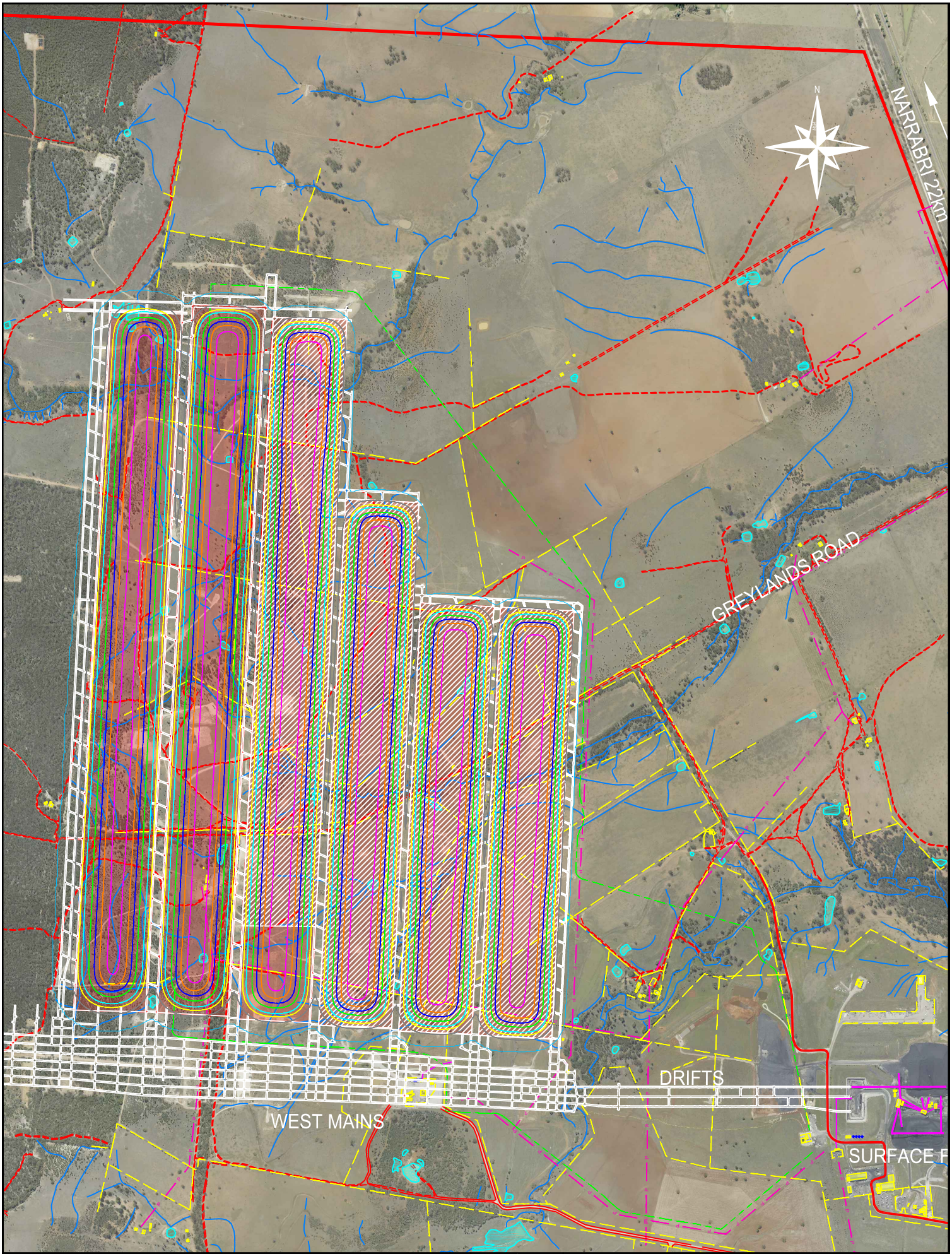
Were any dams to fail, damage is likely to be limited to access tracks and fences due to their location, size and general lack of other infrastructure in the Extraction Plan area.

2.2.3 Soil Conservation Banks

A number of contour banks exist across the area covered by the Extraction Plan, particularly in cleared areas which have been historically used for cropping. These banks act to manage water flow across the site, minimise erosion and reduce sediment transport.

Generally speaking, contour banks are constructed to have very low longitudinal gradients (i.e. less than 0.5%) or even zero grade. The banks are generally constructed from local soil material (i.e. either a back-push or front-push bank).

Subsidence of sections of contour banks are likely to prevent the banks performing their intended purpose by altering the longitudinal grade, either steepening the grade, or causing a section to pond (i.e. unable to drain). Cracking and ground deformations may also cause damage to the bank, resulting in possible erosion or bank failure.



LEGEND

- First Workings
- Mine Lease Boundary
- Secondary Extraction
- Buildings
- Dams
- Tank
- Over Land Water Path
- Unsealed Road
- Mine Infrastucture
- Ped Cable
- Overhead Powerline
- Fence
- 0.0m Subsidence Contour
- -0.1m Subsidence Contour
- -0.3m Subsidence Contour
- -0.5m Subsidence Contour
- -1.0m Subsidence Contour
- -1.5m Subsidence Contour
- -2.0m Subsidence Contour
- -2.0m Subsidence Contour

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Scale:	1:20,000	

Predicted Subsidence

Plan No: APN.05.09

WHITEHAVEN COAL

NARRABRI MINE

2.2.4 Property and Livestock Fences

The fence lines above LW 101 - 106 will be subject to the maximum predicted subsidence tilt of between 25 – 71 mm/m.

Damage to fences is likely to include the following:

- Straining and possibly tensile failure of fencing wire strands in tensile strain zones;
- Sagging of fencing wire strands and possibly loss of fence serviceability in compressive strain zones;
- Loss of gate function in either tensile or compressive strain zones; and
- Tilting of fence, gate and strainer posts, leading to the outcomes mentioned above.

The above impacts would potentially lead to the escape of livestock onto public roads, and would hinder movement across the property (i.e. if gates won't readily open).

2.2.5 Residential Dwellings and Machinery Sheds

The existing buildings within the limits of LW 101-106 include an existing rural dwelling, septic tank, one machinery shed and one water storage tank, all of which are owned by Narrabri Mine (and associated with property 'Barton Hedge'). All other existing buildings are located outside a 26.5° angle of draw to the longwall panels and are unlikely to be impacted by subsidence effects. Buildings and dwellings located on the 'Westhaven' property will not be affected by subsidence associated with LW101 – 106.

Based on Holla & Barclay (2000), significant damage to the existing buildings and tank is likely where tilts > 7 mm/m and tensile and/or compressive strains > 2 mm/m. The severity of the damage will also be dependent on the type and geometry of each structure.

The affected dwelling is located within the centre of the LW105 panel (refer to Figure 3). The affected NCOPL-owned dwelling and associated structures is expected to be significantly damaged as a result of subsidence. Associated potential consequences include: building(s) no longer fit for purpose, personal safety risk (as a result of structural failure / damage), and release or stored effluent from the septic tank. These structures will be vacated and secured prior to undermining as described in Section 3.3.

2.2.6 Utility infrastructure

Telstra – No Telstra line exists within the extraction plan area above LW101 – 106. It is believed that if a line was in service in the past it has since been damaged or is otherwise inoperable. The service also doesn't appear on the plans provided by Telstra using the 'Dial Before You Dig' service.

The Telstra line that connects to the "Westhaven" property is not located within the extraction plan area for LW101 to LW106. Consultation undertaken with the occupants of 'Westhaven' also confirmed that a landline service at this property was not in use and that when in residence, the tenants use their personal mobile phones for communications.

Essential Energy – An 11kV transmission line supported on fifteen timber power poles (P1 to 15) lies within the angle of draw above LW101 – 105. The line provides (domestic) power to only two customers: the residence and machinery shed adjacent to the orchard above LW105 'Barton Hedge' and south of the subsidence area at 'Westhaven'. The poles are approximately 15m high and 85m apart on average (distances vary from 31m to 132m).

The poles will also be subject to tensile and compressive strains associated with the subsidence 'wave' as it passes underneath the poles. The transient tilts and strains will be dependent on longwall face retreat rates.

Conductor clearances are estimated to be decreased by between 0.00m and 1.96m along the easement. The conductors are supported by relatively inflexible ceramic insulators that will probably not be able to tolerate the predicted pole movements.

Potential consequences of subsidence include: damage to the asset resulting in loss of electricity to 'Barton Hedge' and 'Westhaven', risk of electric shock due or risk of grassfire due to fallen wires / reduced overhead clearances. Narrabri Mine has implemented the Essential Energy Management Plan, in consultation with Essential Energy, which outlines the mitigation measures to be implemented to minimise impacts to the powerline as a result of subsidence, refer to Section 3.3.

2.2.7 Mine Infrastructure

NCOPL has installed a series of surface to in-seam (SIS) gas drainage bores and associated surface infrastructure to allow for pre-drainage coal seam gases ahead of mining. These bores are installed and operate in advance of the mining operations to assist in reducing gas concentrations within the underground workings. These bores will be decommissioned prior to undermining by the longwall, with surface infrastructure being removed and the bores being sealed/grouted. Therefore, no adverse consequences are predicted to the SIS gas drainage infrastructure as a result of subsidence.

Gas drainage pipelines are also located over the longwall panels, the location of which varies as mining progresses. These pipelines lie across the surface, are constructed using flexible polypipe, with flexible seals/joints. As they are located on the surface (not buried) they will not be subjected to strains and shear forces and therefore damage as a result of subsidence ground movements are not anticipated.

A small number of groundwater monitoring bores are located over the longwall goaf. These will be damaged as a result of subsidence and will be reinstalled where required for ongoing groundwater monitoring purposes (refer to Water Management Plan).

A PED cable is located around the periphery of LW101 to 104, however is located over LW105. Where located over longwall panels, this cable is expected likely to experience

damage. Section 3.3 details the relocation of the affected sections of cable prior to undermining.

3 SUBSIDENCE MANAGEMENT

3.1 Objectives

The objective of the BFMP is to provide for the adequate management of built features within the Extraction Area that will be potentially affected by subsidence.

This objective will be achieved through:

- Monitoring of subsidence and environmental consequences to:
    - Confirm predicted impacts/consequences are within predicted ranges;
    - Identify impacts or exceedances that require additional management or response; and
    - Inform future subsidence prediction and consequence management.
- Management of potentially affected features to:
    - Mitigate potential consequences prior to subsidence occurring;
    - Minimise the risk of service disruption to residents and road users;
    - Prevent personal injury; and
    - Remediation of impacts following active subsidence.
- Effectively communicating with potentially affected stakeholders;
- Implementing appropriate contingency response measures in the event of adverse consequences or impacts outside predicted range; and
- Implementing a process of reporting and review of subsidence management measures to allow for continual improvement.

3.2 Performance Measures and Indicators

General performance measures for built features are defined under the Project Approval. These measures require that NCOPL must ensure that:

- Built features are always safe;
- Serviceability be maintained wherever practicable, and that loss of serviceability be fully compensated; and
- Damage is fully repairable, must be fully repaired, or else replaced or fully compensated.

Additional, specific performance indicators for individual built features have been developed and are listed in Table 3.

Table 3 Built Features Performance Measures

Feature	Performance Measure / Indicator
Roads and access tracks	
Roads (all)	Access to properties is maintained (either by management of existing road or provision of alternate access)
Culverts	Any culverts fully functional after active subsidence
Water storage dams and soil conservation banks	
Farm dams	Capacity and function of existing dams is restored post-subsidence and no unplanned discharge of water downstream due to subsidence damage
Soil conservation works	Capacity and function of existing contour banks is restored post-subsidence
Property and livestock fences	
Fences	Functionality of fencing remediated after active subsidence.
Livestock	No unplanned stock movements as a result of subsidence damage
Residential dwellings and machinery sheds	
Farm buildings and sheds	Buildings repaired and returned to use if practicable, cost-effective and safe, otherwise demolished Safety risk to staff or public as a result of subsidence-related structural damage managed to prevent injury Septic tank managed to prevent release or stored effluent
Utility infrastructure	
Electricity transmission lines	Maintain electricity to farm residences / buildings if required by tenants. Subsidence damage to infrastructure and line clearances is identified and repaired to Essential Energy standards. No increased risk of bushfire or personal safety risk as a result of subsidence effects
Mine Infrastructure	
SIS gas drainage infrastructure	Decommissioned and made safe prior to being affected by subsidence
Surface gas pipelines	No impact anticipated
PED cable	Located / relocated outside subsidence extent prior to undermining

3.3 Subsidence Monitoring and Management

The built features managed under the scope of this BFMP have been grouped into the following asset groupings:

- Roads and access tracks;
- Dams and soils conservation banks (including windmills);
- Property and livestock fences;
- Residential dwellings and machinery sheds;
- Utility infrastructure; and
- Mine infrastructure.

Detailed subsidence monitoring and management actions have been developed for each of the identified built features asset groups and are detailed within individual tables in **Appendix A**.

Each management table includes specific actions for the mitigation of subsidence impacts, categorised into:

1. Monitoring;
2. Management; and
3. Notification and Consultation.

3.4 Incident and Contingency Response

A general procedure for contingency responses for an exceedance of any performance measures under the Extraction Plan is described in Section 4.3 of the Extraction Plan.

Potential risks and controls associated with subsidence of affected built features were identified as part of a risk assessment workshop conducted on the 7th February 2012, refer to Section 1.1.3. **Appendix B** includes a Trigger Action Response Plan tables for all of the asset groups and foreseeable potential incidents identified under this BFMP.

In particular, more detailed contingency response procedures for undertaking road repairs are outlined in **Appendix C**.

4 IMPLEMENTATION AND OPERATION

4.1 Resources and Responsibilities

To ensure adequate implementation of this management plan, the following Narrabri Mine responsibilities have been assigned to relevant Narrabri Mine personnel (see Table 4). It is also noted that additional responsibilities are referred to within Appendix A.

Table 4 Roles and Responsibilities

Roles	Responsibilities
General Manager	Ensure this Built Features Management Plan is implemented and adhered to.
	Ensure that adequate resources are available to NCOPL personnel to facilitate the completion of their responsibilities under this management plan.
Technical Services Manager	Ensure that all monitoring and reporting is carried out within the timeframes specified, checked, processed and filed appropriately.
	Liaise with stakeholders regarding subsidence impact management.
	Authorise changes to this BFMP.
Environment Officer	Ensure that the ongoing community consultation processes detailed in this Built Features Management Plan are carried out.
	Prepare, maintain and distribute a stakeholder contact register.
	Keep documentation and undertake reporting for the Annual Environmental Management Report (AEMR) regarding subsidence management activities on the site.
	Ensure that audits and reviews are carried out as detailed in this Plan.
Mine Surveyor	Undertake survey monitoring as identified in this plan, and in accordance with any relevant survey procedures contained in the Subsidence Monitoring Program.
Earthworks Supervisor	Undertake daily road inspections, direct the Earthworks Contractor to undertake remediation as required and document and report to the Technical Services Manager.

4.2 Communications/Consultation

Details of contacts relevant to this BFMP are provided in Table 5, including land owners, asset owners, utilities and government.

Table 5 Stakeholder Contact Details

Organisation	Representative	Phone	Postal Address
Division of Resources and Energy (DRE)	Director, Mine Safety Operations	02 4931 6644	PO Box 344 Hunter Regional Mail Centre, NSW 2310
Narrabri Mine	Technical Services Manager Environmental Officer	02 6794 4151 02 6794 4167	Locked Bag 1002, Narrabri NSW 2390
Narrabri Shire Council	Planning & Development Manager	02 6799 6866	Narrabri Shire Council PO Box 261 NARRABRI NSW 2390

Organisation	Representative	Phone	Postal Address
Property No. 12 'Barton Hedge'	Tenant (NCOPL contractors)	*Refer to internal contacts register*	*Refer to internal contacts register*
Property No. 21* 'Westhaven'	Mr & Mrs Castro (Occupants / Leaseholders)	*Refer to internal contacts register*	*Refer to internal contacts register*
Property No. 22	D, P, B & N Grncarski (Landowners)	*Refer to internal contacts register*	*Refer to internal contacts register*
Crown Lands		02 6764 5100	25-27 Fitzroy Street (PO Box 535) Tamworth NSW 2340
State Forests NSW	Forests NSW - Baradine	02 6843 1607	Cnr Lachlan & Darling Streets PO Box 63 Baradine NSW 2396
Essential Energy	Stephen Robinson	02 6701 7595	Network Planning Group, Northern Section Electra Street, Tamworth NSW
Telstra	Project Administration, Network Integrity Services	1800 653 935	Locked Bag 5035 Parramatta NSW 2124

**Property 12 ('Barton Hedge') and Property 21 (''Westhaven'') are owned by NCOPL however 'Barton Hedge' is utilised by contractors and 'Westhaven' is subject to a long-term lease with the current occupants.*

4.3 Reporting

The primary reporting mechanism will be through the Narrabri Mine - Environmental Management System. Statutory reporting requirements are described in Section 1.2.

4.4 Review

An internal review of this BFMP will be conducted in response to:

- An incident recorded as a result of the operations that affects built features, for example
    - Safety incidents that can be attributed to subsidence effects on built features i.e. road accident due to cracking or compression hump, electric shock from damaged transmission lines; or
    - Observed consequences to built features outside those predicted in this plan (i.e. exceedance of performance measures).
- A significant change in operation, that may result in increased/amended subsidence and consequence predictions to affected built features, or construction of infrastructure within the LW101-106 footprint that is not currently addressed by this plan;

- Statutory requirements or directions/conditions of approvals requiring such action; or
- Recommendations as a result of internal or external audits.

This BFMP may be audited (if required) under the scope of any external environmental compliance audits.

A complete review and update of the BFMP and sub plans will be undertaken prior to second workings progressing in subsequent longwalls. The review process should allow for plan cessation where objectives and performance measures are met and where further significant subsidence impacts addressed by the BFMP are unlikely.

5 REFERENCES

Alt S, Jenkins A, Lines-Kelly R (2009) Saving Soil – A landholder's guide to preventing and repairing soil erosion, NSW Department of Primary Industries. Available at: http://www.dpi.nsw.gov.au/agriculture/resources/soils/erosion/saving-soil/

Department of Environment & Climate Change (2008) Managing Urban Stormwater: Soils and Construction, Volume 2c - Unsealed Roads. Available at: http://www.environment.nsw.gov.au/resources/stormwater/0802soilsconststorm2c.pdf

Department of Mineral Resources (2003) A Guideline for Applications for Subsidence Management Plan Approvals. Available at http://www.dpi.nsw.gov.au/minerals/environment/mining/subsidence-management/guidelines/edg17-Applications-for-Subsidence-Management-Approvals.pdf

Ditton Geotechnical Services (DGS) (2015) Mine Subsidence Assessment for the Proposed Addition of Longwall (LW) 106 to the Approved LW101 to LW105 Extraction Plan at the Narrabri Mine, Narrabri

Ditton Geotechnical Services (DGS) (September 2011) Mine Subsidence Effect Predictions and Impact Assessment for the Proposed Longwalls 1 to 5 at the Narrabri Coal Mine, Narrabri

Landcom (2004) Managing Urban Stormwater - Soils and Construction: Volume 1

Appendix A
Built Features Management

Roads Access Tracks

Table 6 Management of Roads and Access Tracks

Built Features Management Plan – Roads & Access Tracks				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1	**Monitoring**			
1.01	Survey monitoring of Greylands Road, including: - Photographic records of the condition of the road and any drainage structures; - Survey to locate drainage structures; confirm road location/widths; and direction and capacity of table drains.	Pre-subsidence (baseline). & Following completion of active subsidence affecting Greylands Road (after *each* longwall pass).	Mine Surveyor	Provide copy to Narrabri Shire Council.
1.02	Visual monitoring of Greylands Road and any affected internal access tracks to note any subsidence impacts that require remediation or implementation of additional traffic controls.	Daily (morning and afternoon) whilst longwall is operating within 100m of the road and until any required remediation works are completed.	Environment Officer	Document internally – see checklist in Appendix C.
1.03	Narrabri Mine has implemented a Greylands Road Management Plan, in consultation with Narrabri Shire Council, which outlines the road will be closed to the public until NCOPL purchase the land. As such, no Narrabri Shire Council inspections are required for the road.	N/A	Environment Officer	Document internally.
2	**Management**			
2.01	Narrabri Mine has implemented a Greylands Road Management Plan, in consultation with Narrabri Shire Council, which outlines the road will be closed to the public under a Traffic Control plan (TCP) until NCOPL purchase the land. The TCP requires signage to indicate the road is closed.	Complete	Environment Officer	Narrabri Shire Council approved 9 April 2015.
2.02	Where practicable, gates to NCOPL properties will be kept locked to prevent unauthorised access, and/or alternatively, signage placed noting access restrictions (i.e. authorised persons only) and potential hazards.	Prior to LW101, maintain throughout mining.	Environment Officer	Document internally.

Built Features Management Plan – Roads & Access Tracks				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
2.03	For mine traffic, temporary signage will be erected on Greylands Road during active subsidence (at both approaches to the subsiding section), advising of potential subsidence risks. The signage may be removed following the completion of active subsidence and subsequent remediation works.	Prior to longwall progressing below public access roads.	Environment Officer	Document internally.
2.04	Grade road(s) during active subsidence to temporarily remediate subsidence impacts to the road surface and to maintain traffic ability (refer to **Appendix C**).	Daily (if required) during active subsidence.	Environment Officer	Document internally.
2.05	Construction of new, or remediation of existing tracks, will aim to maintain or improve the current standard of tracks, with consideration to the minimisation of erosion and the recommendations made in *Managing Urban Stormwater: Soils and Construction, Volume 2c Unsealed Roads* (Department of Environment and Climate Change, 2008) where appropriate.	As required.	Environment Officer	Document internally.
3	**Notification/Consultation**			
3.01	Narrabri Mine has implemented a Greylands Road Management Plan, in consultation with Narrabri Shire Council, which outlines the road will be closed to the public until NCOPL purchase the land. As such, no Narrabri Shire Council inspections are required for the road.	Complete.	Environment Officer	Document internally.
3.02	Provide written notification to potentially affected road users of the impending subsidence impacts to Greylands Road, advising of potential hazards, and including relevant contact details for further information the reporting of potential issues.	At least two weeks prior to subsidence effects occurring to road reserve.	Environment Officer	Document internally
3.03	NCOPL has applied to purchase the Crown Land comprising Greylands Road within ML 1609. Consultation has been undertaken as part of this process which Narrabri Shire Council agreed to on 9 April 2015. Following purchase NCOPL will manage Greylands Road as a private road (including maintaining access rights if required by affected properties).	Commence consultation prior to commencement of LW101.	Environment Officer	Document internally.

Water Storage Dams and Soil Conservation Contour Banks

Table 7 Management of Water Storage Dams and Soil Conservation Contour Banks

Built Features Management Plan – Water Storage Dams and Soil Conservation Contour Banks				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1.0	**Monitoring**			
1.01	Survey to obtain xyz coordinates along contour banks and water storage dams. Survey to be completed in accordance with the Subsidence Monitoring Program	Pre-mining (baseline) and post-mining.	Mine Surveyor	Document internally.
1.02	Photographic records of all dams and contour banks within the Extraction Plan area.	Pre-mining (baseline) and post-mining.	Environment Officer	Document internally.
1.03	Visual inspections of dams noting their condition and any changes in accordance with the Subsidence Monitoring Program.	Daily during undermining of structure.	Environment Officer	Document internally.
2.0	**Management**			
2.01	Maintain safe access to the water storage dams and contour banks to allow for personnel to undertake inspection, maintenance and remediation works (if required).	Ongoing.	Environment Officer	Document internally.
2.02	Assess each dam prior to undermining to determine need to drain (fully or partially) each dam prior to subsidence to reduce risk of dam wall failure or mine inflows, or if any modifications are required to dam wall and spillway. If lowered/drained –water level will be maintained for duration of undermining until assessment and repairs are completed (i.e. excess water pumped out following rainfall).	Complete assessments prior to undermining, with modifications to be completed prior to subsidence impacts occurring.	Technical Services Manager	Document internally.
2.03	Assess each dam to determine any required remediation works (which may include): - Repairs or reconstruction of earth dam wall(s) to ensure stability - Repair or reinstatement of level spillways for dam overflows - Repair of cracking in / around dam to prevent future erosion Repairs will aim to restore as close as practicable the pre-mining storage capacity of each dam, unless otherwise identified under a site management plan regarding the final land-use/rehabilitation strategy.	Post-subsidence.	Technical Services Manager	AEMR
2.04	Reconstruct contour banks affected by subsidence to a similar grade, capacity,	Post-subsidence.	Environment	AEMR

Built Features Management Plan – Water Storage Dams and Soil Conservation Contour Banks				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
	spacing and location as the pre-mining condition (baseline) *or* in accordance with recommendations provided in the guideline *Saving Soil: A landholder's guide to preventing and repairing erosion* (Alt *et al*, 2009) or similar.		Officer	
3.0	**Notification, Consultation & Reporting**			
3.01	None proposed for LW101 to 106.			

Property and Livestock Fences

Table 8 Management of Property and Livestock Fences

Built Features Management Plan – Property And Livestock Fences				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1.0	**Monitoring**			
1.01	Survey to identify all existing fence lines and location / type of gates or access points (i.e. cattle grids).	Pre-subsidence (baseline).	Mine Surveyor	Document internally.
1.02	Inspect and document condition of all fences adjoining any property not owned by NCOPL (including road reserves) within the Extraction Plan area	Pre-subsidence (baseline) and after subsidence.	Environment Officer	Document internally.
1.03	Visual inspections of fences and gates/cattle grids within active subsidence area noting their condition and functionality.	Fortnightly during mining until the completion of active subsidence.	Environment Officer	Document internally.
2.0	**Management**			
2.01	Exclude stock from areas of active subsidence by relocation and/or temporary fencing as required.	In advance of longwall face.	Environment Officer	Document internally.
2.02	NCOPL or nominated contractor to rectify any impacts to property or livestock fences/gates.	Post-subsidence.	Environment Officer	Document internally.
3.0	**Notification, Consultation & Reporting**			
3.01	Notify potentially affected landowners regarding potential impacts to property and stock fences prior to mining.	Pre mining.	Environment Officer	Document internally.

Dwellings and Machinery Sheds

Table 9 Management of Buildings / Structures

Built Features Management Plan – Residential Dwelling And Machinery Sheds				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1	**Monitoring**			
1.01	Dilapidation surveys of any building / structure not owned by NCOPL.	Prior to and following undermining.	Mine Surveyor	Provide copy to owner.
1.02	Undertake assessment of potentially affected building(s) to identify the presence of asbestos or other hazardous building materials/substances unable to remain in situ.	Prior to undermining.	Environment Officer	Document internally.
2	**Management**			
2.01	All habitable buildings will be vacated prior to subsidence impacts occurring. These buildings and surrounding area will then be secured to prevent unauthorised access or use, and minimise risk of personal injury.	Prior to undermining.	Technical Services Manager	Document internally.
2.02	Entry to all farm machinery and storage sheds will be restricted prior to and throughout active subsidence.	Prior to undermining.	Technical Services Manager	Document internally.
2.03	Services to subsidence-affected buildings to be disconnected.	Prior to undermining.	Technical Services Manager	Notify utility owner.
2.04	Septic tank(s) will be pumped out and effluent disposed of to an appropriately licensed treatment facility prior to subsidence to prevent unplanned release of effluent due tank damage.	Prior to undermining.	Environmental Officer	Document internally.
2.05	Where buildings/structures are to be retained they will be inspected by a person(s) suitably qualified to assess their structural stability. Structures will only be returned to use once it is confirmed that the structures are sound and fit for purpose.	Following completion of active subsidence.	Technical Services Manager	Document internally.
2.06	Buildings affected by subsidence will remain secured to prevent unauthorised access until such time as they are structurally assessed, demolished or repaired.	Following completion of active subsidence.	Technical Services Manager	Document internally.
3	**Notification/Consultation**			
3.01	None proposed for LW101 to 106.			

Utility Infrastructure

Table 10 Management of Utility Infrastructure

Built Features Management Plan – Utility Infrastructure				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1.0	**Monitoring**			
1.01	Survey of power lines for tilt, strain and line clearance of electrical utility infrastructure.	Pre-mining (baseline) and following each longwall pass.	Mine Surveyor	Copy to be provided Essential Energy.
1.02	Inspection of powerline by Essential Energy to document current condition of asset to determine any mitigation works to minimise/prevent damage during mining, and any remediation required post-mining (e.g. installation of rollers, stays)	At least one month prior to undermining.	Technical Services Manager	Document internally / correspondence
1.03	Inspection of powerline by suitably qualified person(s) to document current condition of asset to determine any mitigation works to repair subsidence damage.	Post-subsidence.	Technical Services Manager	Document internally / correspondence
1.04	Determine location, type and condition of telecommunications infrastructure affected by LW101 to 105. Confirm location and number of all potentially affected customers (or otherwise).	Pre-mining.	Technical Services Manager	Copy to be provided to Telstra.
2.0	**Management**			
2.01	Essential Energy has de-energised the transmission line for the duration of active subsidence and until such time as the line has been inspected post-subsidence (Item 1.03) and remediation works are completed to Essential Energy's satisfaction, in accordance with the Essential Energy Management Plan.	Complete.	Technical Services Manager	Document internally / correspondence
2.02	Maintain safe access to the electricity transmission easements and infrastructure for Essential Energy personnel to undertake normal line maintenance and remediation works (if required).	Ongoing.	Technical Services Manager	N/A
2.03	Installation of pre-mining mitigation works to the power line (i.e. by isolating lines in temporary sheaves/rollers) has been undertaken. Alternate short-term power has been supplied to the two affected mine-owned properties, in accordance with	Complete.	Technical Services Manager	Document internally.

Built Features Management Plan – Utility Infrastructure				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
	the Essential Energy Management Plan.			
2.04	Notify Essential Energy and obtain approval to undertake required repair works on 11kV lines in accordance with normal line maintenance procedures.	Following completion of active subsidence.	Technical Services Manager	Document internally.
2.05	Initiate the implementation of any remediation works that may be required to power line (i.e. including removal of temporary sheaves/rollers) – as determined under Item 1.02 and re-energise line.	Following completion of active subsidence.	Technical Services Manager	Document internally.
2.06	Replace / install clearance signage to reflect any changes/reduction in line clearance if required.	Following completion of active subsidence.	Technical Services Manager	Document internally.
2.07	'Westhaven' has been provided with suitable alternative (e.g. diesel-powered generators) power supply, in accordance with the Essential Energy Management Plan, which will be maintained until repairs are complete and line is re-energised.	Complete.	Technical Services Manager	Document internally.
3.0	**Notification, Consultation & Reporting**			
3.01	Notify Essential Energy and obtain approval to undertake required repair works on 11kV lines in accordance with normal line maintenance procedures. All works to powerlines affected by subsidence to be undertaken by Essential Energy or approved contractor (by arrangement with and approval of Essential Energy) at NCOPL cost.	Prior to undermining and prior to undertaking any works.	Technical Services Manager	Document internally.
3.02	Consultation with the affected residents ('Westhaven') has been undertaken and an alternate power supply provided, , in accordance with the Essential Energy Management Plan. -	Complete.	Environment Officer	Document internally.
3.03	Consult with Telstra regarding the disused telecommunications cable potentially affected by subsidence to determine appropriate remediation to meet any future requirements.	Complete.	Technical Services Manager	Document internally.

Mine Infrastructure

Table 11 Management of Mine Infrastructure

Built Features Management Plan – Mine Infrastructure				
Item	**Action**	**Trigger/Timing**	**Responsibility**	**Reporting**
1.0	**Monitoring**			
1.01	Inspect decommissioned SIS gas drainage sites to confirm all structures have been safely decommissioned and site is stable and safe.	Prior to undermining and following completion of subsidence.	Technical Services Manager	Document internally.
1.02	Survey collars of all affected piezometers and groundwater monitoring bores to confirm accurate levels for monitoring of groundwater	Prior to and following completion of subsidence.	Environmental Officer	Document internally and inform groundwater monitoring personnel of any RL changes.
2.0	**Management**			
2.01	Decommission SIS gas drainage sites prior to impact by subsidence	Prior to undermining.	Technical Services Manager	Document internally.
2.02	Replace damaged groundwater monitoring piezometers to original specifications (or as otherwise determined by hydrogeologist / or agreed in consultation with agencies)	Within 3-months post-subsidence.	Environmental Officer	Notify the Department of Primary Industries – Water (DPI Water).
2.03	Relocate PED cable to areas outside chain pillars (i.e. LW105)	Prior to undermining.	Technical Services Manager	Document internally.
3.0	**Notification, Consultation & Reporting**			
3.01	Notify DPI Water of any works undertaken to replace piezometers or changes in collar levels	Following installation.	Environmental Officer	Correspondence

Appendix B
Trigger Action Response Plan (TARP)

Table 12 Trigger Action Response Plan

Built Features Management Plan – TRIGGER ACTION RESPONSE PLAN					
Aspect	**Monitoring**	**Purpose**	**Trigger**	**Action**	**Responsibility**
Roads and Access Tracks					
Roads and tracks	**Sites** Visual monitoring of affected roads and tracks. **Parameters** Note any damage to roads that may cause traffic hazard (i.e. cracks, compression humps, ponded water on road surface) **Analysis:** Visual identification and/or refer to road management response tables in **Appendix C**. **Frequency** Twice daily (morning and afternoon) whilst active subsidence is affecting the road(s) and until any required remediation works are completed.	To note any subsidence impacts that require remediation or implementation of additional traffic controls	If daily inspections note that road is no longer trafficable or safe.	Implement appropriate traffic control (may include hazard signs or temporary road closure). Notify potentially affected road users and Narrabri Shire Council (if a public road is affected). Review potential detour options and provide alternative access (if available). Initiate road repairs/reconstruction as soon as practicable to restore affected section to a trafficable standard (refer to **Appendix C**.	Environment Officer
			If vehicle accident occurs	Apply appropriate emergency / first aid treatment if required. Implement appropriate traffic control and notification if required (as per response above). Record and report incident in accordance with Narrabri Mine health and safety protocols. Identify cause of accident If subsidence impact related, review the effectiveness of the management/monitoring actions under this BFMP and revise accordingly if required.	Environment Officer

Built Features Management Plan – TRIGGER ACTION RESPONSE PLAN					
Aspect	**Monitoring**	**Purpose**	**Trigger**	**Action**	**Responsibility**
Water Storage Dams and Soil Conservation Banks					
Water storage dams	**Sites:** All dams **Parameters** Obtain xyz coordinates along of water storage dam embankments/spillways and along contour banks. Photographic records. **Analysis:** Pre and post mining comparison **Frequency** Pre and Post subsidence	To document pre and post subsidence condition and allow identification of required remedial works	Post-subsidence survey identifies that spillway and dam wall not likely to operate as intended (i.e. spillway no longer lowest point on wall)	Reduce stored water level (if not already reduced), assess and undertake repairs to wall or spillway as required (see **Appendix A**, Table 7, Table 7, Item 2.04)	Environmental Officer
			Post-subsidence survey identifies that contour bank not likely to operate as intended (i.e. damaged due to cracking, areas no longer able to drain, or lengths with increased slope)	Reconstruct or repair as per **Appendix A**, Table 7, Item 2.05.	Environmental Officer
Water storage dams	**Sites** All dams **Parameters:** Visual inspections noting their condition, water level, cracking or recent erosion of earth embankment. **Analysis:** Visual identification of changes **Frequency**: Daily during undermining of structure	To observe possible subsidence effects to dam wall and identify potential risk of impending dam failure	Minor superficial surface cracking observed – no apparent water leaking through wall.	No further action, continue to observe.	Environmental Officer
			Sudden drop in water level noted that is not attributable to other recent activities or use	Notify Technical Services Manager and implement refer to Water Management Plan	
			Extensive or deep cracking observed and/or water seepage through wall is visible (i.e. damp areas or signs of increased grass growth within embankment or immediately	Reduce stored water level by pumping water out (release downstream) and maintain lowered water level until post-subsidence assessment and repairs can be carried out	

Built Features Management Plan – TRIGGER ACTION RESPONSE PLAN					
Aspect	**Monitoring**	**Purpose**	**Trigger**	**Action**	**Responsibility**
			downstream,).		
			Severe cracking and visible signs of water discharging through earth embankment	Immediately prevent access (as above). Reduce stored water level to below toe of embankment on upstream side and maintain lowered water level until post-subsidence assessment and repairs can be carried out	
Property and Livestock Fences					
Fences (property boundaries), including gates and cattle grids	**Sites:** All panels (LW101-106) **Parameters:** Document condition of all fences adjoining property not owned by NCOPL (including road reserves) **Analysis:** Compare pre and post mining **Frequency:** Pre and post subsidence	To map location and condition of all boundary fences and associated gates / grids and identify subsidence-related damage requiring repair	Damage observed to fences that can be attributed to subsidence movements.	Undertake repairs as per **Appendix A**, Table 8, Item 2.02.	Environment Officer
Fences (all) including gates and cattle grids	**Sites:** All panels (LW101-106) **Parameters:** Fortnightly visual inspections of fences and gates/cattle grids within active	To note the condition and functionality of affected fences to ensure effective	If fencing/gates along Greylands Road appear damaged/ unable to contain livestock.	Take necessary measures, including relocation of livestock or provision of temporary / electric fencing to prevent livestock egress onto Greylands Road.	Environment Officer

Built Features Management Plan – TRIGGER ACTION RESPONSE PLAN					
Aspect	**Monitoring**	**Purpose**	**Trigger**	**Action**	**Responsibility**
			Observation of livestock on public roads or exclusion areas	Capture stock and remove to a secure paddock any stock as soon as practicable. Inspect fences to identify potential breach and respond as above.	
			Post-subsidence inspections: damage observed to fences etc.	Undertake repairs as per **Appendix A**, Table 8, Item 2.02.	
Residential Dwelling And Machinery Sheds					
All buildings	**Sites:** All subsidence-affected buildings and structures **Parameters:** Hazardous materials (i.e. asbestos) identification survey **Analysis:** - **Frequency:** Prior to subsidence	To identify presence of potentially harmful substances that may be released as a consequence of subsidence	Survey reveals presence of asbestos or other hazardous material within the buildings or surrounds and that is considered a potential risk to the environment in the event of subsidence damage	Remove any potentially hazardous building materials that would potentially pose a health or environmental threat as a result of subsidence impacts (i.e. damage to asbestos) prior to subsidence impacts in accordance with applicable safe work methods and statutory requirements. Such materials will be removed and disposed of to an approved and licensed facility by appropriately qualified contractors.	Environmental Officer
All buildings	**Sites:** All subsidence-affected buildings and structures **Parameters:** Post-subsidence structural assessment **Analysis:** - **Frequency:** Post subsidence	To assess post subsidence condition of structure and determine if repair is practicable, cost-effective and safe	Structure collapses and/or is considered to be uneconomic to repair	Maintain safety fencing / exclusion of property to prevent access. Demolish structure(s) and recycle/dispose of materials to a licensed waste facility.	
Utility Infrastructure					

Built Features Management Plan – TRIGGER ACTION RESPONSE PLAN					
Aspect	**Monitoring**	**Purpose**	**Trigger**	**Action**	**Responsibility**
Electricity transmission lines	**Sites:** 11kV line across LW101-106 **Parameters:** Pre and post subsidence inspection in conjunction with Essential Energy representative. Survey of lines/poles by mine surveyor **Analysis:** Inspection for damage/changes **Frequency:** Pre and post subsidence.	To document pre and post mining condition, line clearances and identify preventative and remediation works required	Damage to conductors, poles etc observed, or reduction in line clearances below Essential Energy standards as a result of subsidence impact.	Essential Energy to undertake subsidence related repairs to line to its satisfaction (at NCOPL cost). All repairs to be completed and confirmed adequate prior to re-energising of line as per Essential Energy standards and protocols.	Technical Services Manager, Mine Surveyor, Essential Energy representative
Mine Infrastructure					
SIS gas drainage wells	Pre and post-mining inspection of decommissioned sites	To confirm site has been decommissioned and is stable and safe	Not fully decommissioned or considered unsafe to people or livestock	Undertake additional works as required to remove remaining structures and rehabilitate. Repair post-subsidence cracking or identified impacts as required	Technical Services Manager
Piezometers	*Monitored as per Water Management Plan*	*Refer to Water Management Plan*	Piezometers located over LW goaf expected to be damaged.	Replace piezometer to original specifications (or as otherwise determined by hydrogeologist / or agreed in consultation with agencies	Environmental Officer
PED Cable			No longer operational	Inspect to locate site of damage and replace or repair as required	Technical Services Manager

Appendix C
Road Inspections and Response

Roads Inspections

As nominated in Table 6, inspection of roads and access tracks will be undertaken twice daily. As a minimum, inspections will commence as the longwall approaches within 100m and continue until the longwall is at least 100m past each road and until all final remediation works have been completed. Inspections will be the responsibility of the Earthworks Supervisor and will be recorded using the checklist attached. Any required actions (as outlined below) implemented accordingly and reported to the Technical Services Manager.

Impacts to Roads – Response

The following table has been developed to assist in implementing appropriate levels or response for a range of potential subsidence impacts to the unsealed access roads within the Mining Lease.

Table 13 Road Impact Table

Impact	Full Road Width	Half Road Width	Road Edge
Cracking > 100mm wide	HIGH	HIGH	MODERATE
Cracking 20 – 100mm wide	MODERATE	MODERATE	LOW
Cracking < 20mm wide	MODERATE	LOW	LOW
Water ponding	HIGH	MODERATE	LOW
Compression humps	HIGH	MODERATE	LOW
Other	MODERATE	LOW	LOW

Where impacts are noted to roads, the following guidelines will be implemented, noting that individual circumstances may require deviation from the following action. The order of priority for any contingency response under this plan will be:

1) Ensure the safety of all road users – public or mine personnel;
2) Minimise the duration of inconvenience or disruption to access of private properties; and
3) Repair in accordance with the level of impact (high, medium, or low) as identified in the table below.

Table 14 Road Response Table

Level of Impact	Response
HIGH	Barricade affected area and notify landowner, affected occupants/road users. Provide alternative access around hazard until remediation works are complete. Proceed with remediation works within 24 hours and document all actions.
MODERATE	Erect warning signs on both sides of hazard. Notify landowner, occupants/road users. Proceed with remediation works as soon as practicable and document all actions.
LOW	Proceed with remediation works in accordance with normal maintenance procedures under this plan and document all actions.

Method of Remediation and Available Resources

NCOPL maintains an Earthworks Contractor on-site to maintain and repair all internal mine access roads. Where repairs are required under this BFMP, the Earthworks Supervisor will direct the Contractor to undertake the works. The following resources will be available on-site to undertake repairs:

- Machinery: Earthworks contractor will maintain a standard fleet on site, including a grader, roller, excavator, front-end loader and haul trucks; and
- Materials: Earthworks contractor will maintain a small stockpile of road gravel or similar onsite for incidental repairs.

Inspection Checklist Template

Subsidence Inspection Checklist – Roads			
Date:		Longwall No.	
Time:		Face Position (chainage):	
Inspected by:		Area inspected	*Minimum + / - 100m from face position*
Road(s) Inspected			

Inspection Items	Present?	Comments	Impact Level (see table)
Warning signage	*Y / N*	*In place / visible / undamaged?*	
Surface Cracking	*Y / N*	*Present? Widths? Extent? Location?*	*High / Medium /Low*
Compression humps	*Y / N*	*Present? Widths? Extent? Location?*	*High / Medium /Low*
Damage to roadside drainage or ponding over pavement	*Y / N*	*Present? Widths? Extent? Location?*	*High / Medium /Low*
Safety issues / Other impacts?	*Y / N*	*Details?*	*Risk?*

Remediation Required	Earthworks Contractor Notified?	Reported to Technical Services Manager?
Summary details and timeframes for repair – see response table	*(Time/Date)*	*(Date)*

Signed:	