APPENDIX 7

Flooding and Drainage Assessment

Austar Coal Mine Pty Ltd

Proposed Stage 2 Extension – Flood and Drainage Assessment for Longwall A5a

July 2010

Umwelt
Environmental Consultants

Proposed Stage 2 Extension – Flood and Drainage Assessment for Longwall A5a

Prepared by

Umwelt (Australia) Pty Limited

on behalf of

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1.0 Introduction

1.1 Background

Austar Coal Mine Pty Ltd (Austar) operates the Austar Coal Mine, an underground mine located approximately 10 kilometres south of Cessnock in the lower Hunter Valley of NSW. The mine is an aggregate of the former Ellalong, Pelton, Cessnock No. 1 and Bellbird South Collieries and is located in the South Maitland Coalfields. Austar has approval to carry out underground mining in three stages. Mining of Stage 1 is complete. A modification to Stage 2 was approved in June 2008 to allow Longwall Top Coal Caving (LTCC) mining methods to be adopted.

Austar proposes to extend its Stage 2 underground operations to include one additional longwall, known as Longwall A5a (refer to **Figure 1.1**).

The Stage 2 extension area is located within the Quorrobolong Creek and Cony Creek catchments, which form part of the Congewai Creek and Wollombi Brook drainage systems. The location of the Stage 2 extension area within the Quorrobolong Creek and Cony Creek catchments is shown on **Figure 1.2**.

1.2 Scope of Assessment

The primary aims of this flood and drainage assessment are to determine how the flooding and surface drainage regimes might change with the underground mining of Longwall A5a, in comparison to the previously estimated responses for underground mining of Stage 2 and Stage 3.

This report has been prepared to support a Statement of Environmental Effects (SEE) that assesses the potential environmental impacts of the proposed Stage 2 extension.

1.3 Modelling Approach

The two-dimensional (2D) hydrodynamic model previously developed to describe the flooding behaviour of the study area was used to assess the potential impacts of underground mining of Longwall A5a. The development of this model is detailed fully in previous reports, being *Flooding Assessment: Longwalls A3, A4 and A5* (Umwelt, 2007) and *Flood and Drainage Assessment: Stage 3* (Umwelt, 2008).

The previously developed flood model was modified to take into account the predicted changes to the landform due to mine subsidence and was used to assess the flood impacts associated with the addition of Longwall A5a in the Stage 2 mine plan (i.e. Stage 2a). The same flood model was used to assess the cumulative flood impacts associated with the mining of the subsequent Stage 3 operations.

The inflows, boundary conditions, roughness characteristics and mesh structure used for the previous studies (Umwelt, 2007 and Umwelt, 2008) for the 100 year Average Recurrence Interval (ARI) and 1 year ARI storm events were used in the flood modelling for this flood and drainage assessment.

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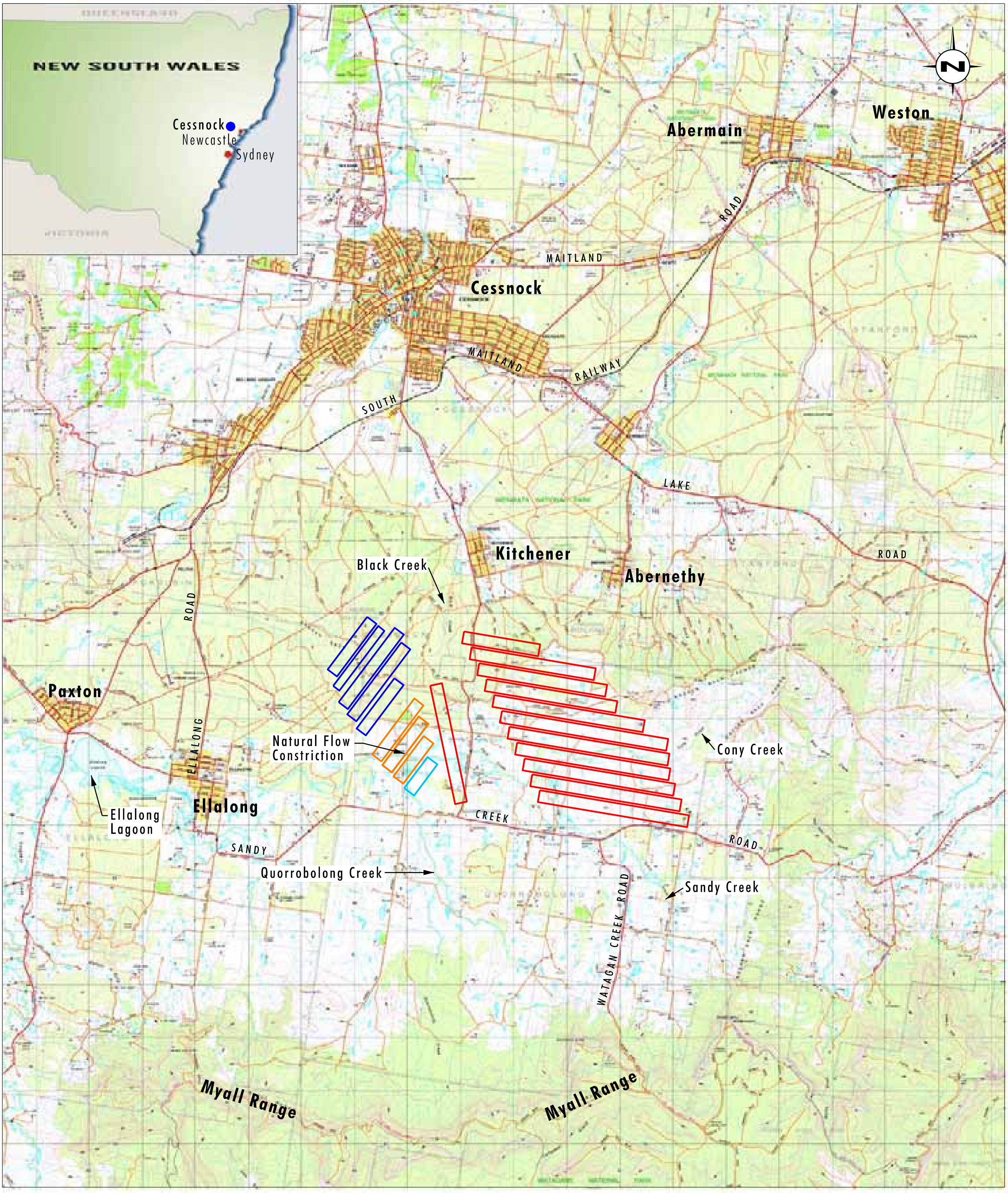


Source: Topo Maps: LPI NSW, Longwall Layout: Austar Coal Mine

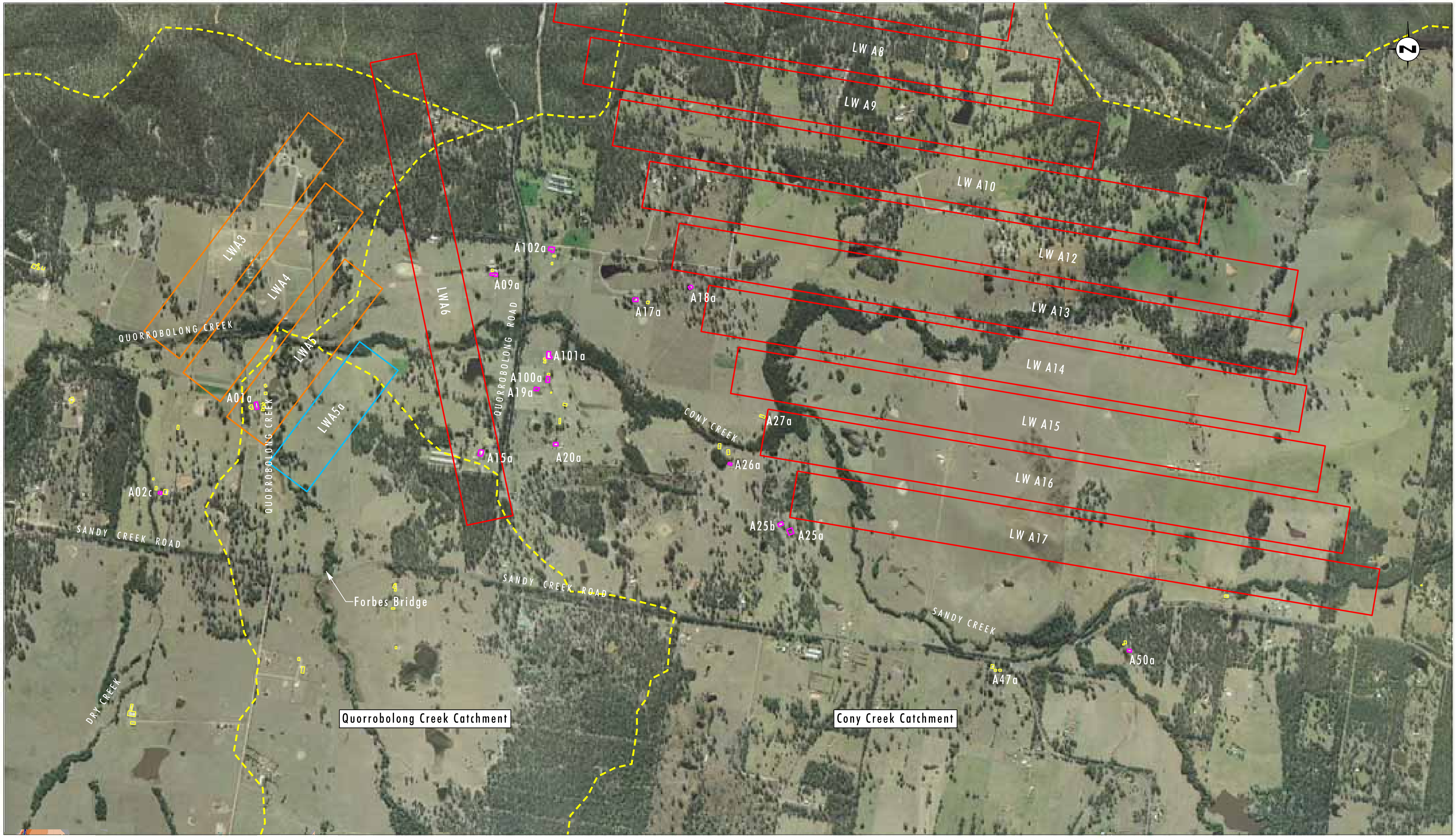
0 1.0 2.0 4km
1:100 000

Legend

- Layout for Stage 1 Longwall Panels
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels

FIGURE 1.1

Locality Plan



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

Legend

Layout for Stage 2 Longwall Panels
Layout for Stage 2 Extension Longwall Panel
Conceptual Layout for Stage 3 Longwall Panels
Building
Dwelling
A01a Dwelling Reference Number
Catchment Boundary

FIGURE 1.2

Catchment Context

Results from the previous assessment work (Umwelt, 2008) for the modelled maximum flood depths and velocities for the 100 year ARI storm event are shown on **Figures 1.3** to **1.8** for the:

- Pre-Stage 2 mining landform;
- Stage 2 mining landform with predicted subsidence (i.e. Longwalls A3 to A5); and
- Stage 3 mining landform with predicted subsidence (i.e. Longwalls A3 to A5 and A6 to A17).

A series of models were run to generate flood characteristics for the predicted subsidence scenarios for the 100 year and 1 year ARI storm events.

In this report the different mine stages are referred to as follows:

- Stage 2 (approved mine plan consisting of Longwalls A3 to A5);
- Stage 2a (approved mine plan consisting of Longwalls A3 to A5 and proposed Longwall A5a); and
- Stage 3 (approved mine plan consisting of Longwalls A6 to A17).

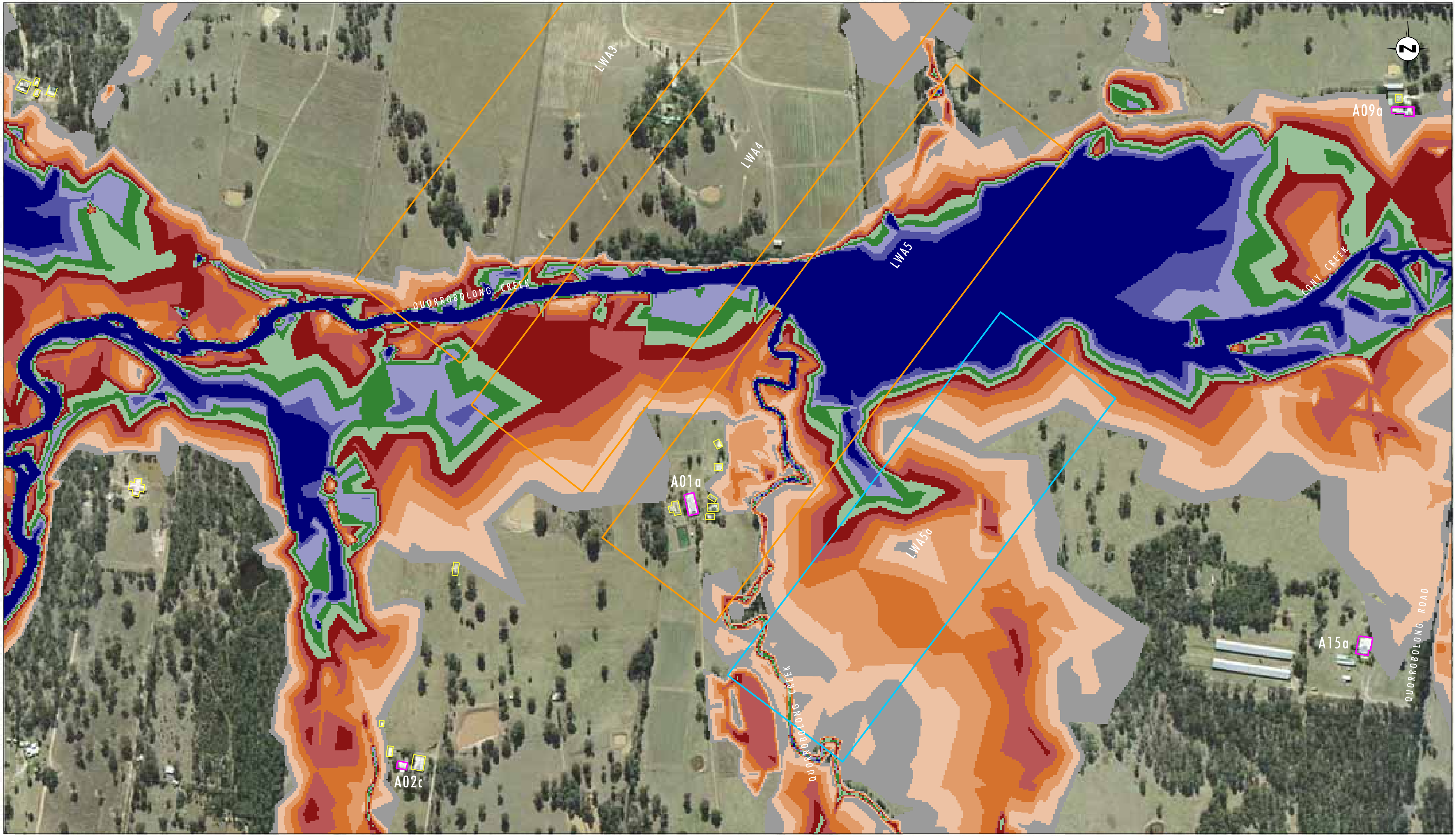
After running the flood models the output data from the models was loaded into a database. From this database the peak flood depths, elevations and velocities were extracted and flood hazard categories generated according to Appendix G of the *Floodplain Development Manual* (NSW Government, 2005).

Based on the modelling outcomes the following impacts of the proposed mining of Longwall A5a were assessed (refer to **Section 3.0**):

- changes to freeboard at dwellings;
- flood hazard categories for dwellings and private property access routes; and
- potential changes to flood regimes, including impacts on flood prone land, creek channels, flow paths and remnant ponding.

2.0 Subsidence Predictions

To assess the potential impact of mine subsidence on the flooding response, subsidence predictions prepared by MSEC (2009) for the proposed underground mining operations were used. The subsidence predictions included the predicted subsidence and the upper bound subsidence for the mining operations for Stage 2a and for the combination of Stage 2a and Stage 3 (i.e. including the predicted subsidence for Stage 2 as approved, Longwall A5a and Stage 3 as approved). The subsidence predictions provided by MSEC (2009) were used to modify the existing land surface model used within the 2D hydrodynamic flood model.



Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

0 100 200 300m
1:6000

Legend

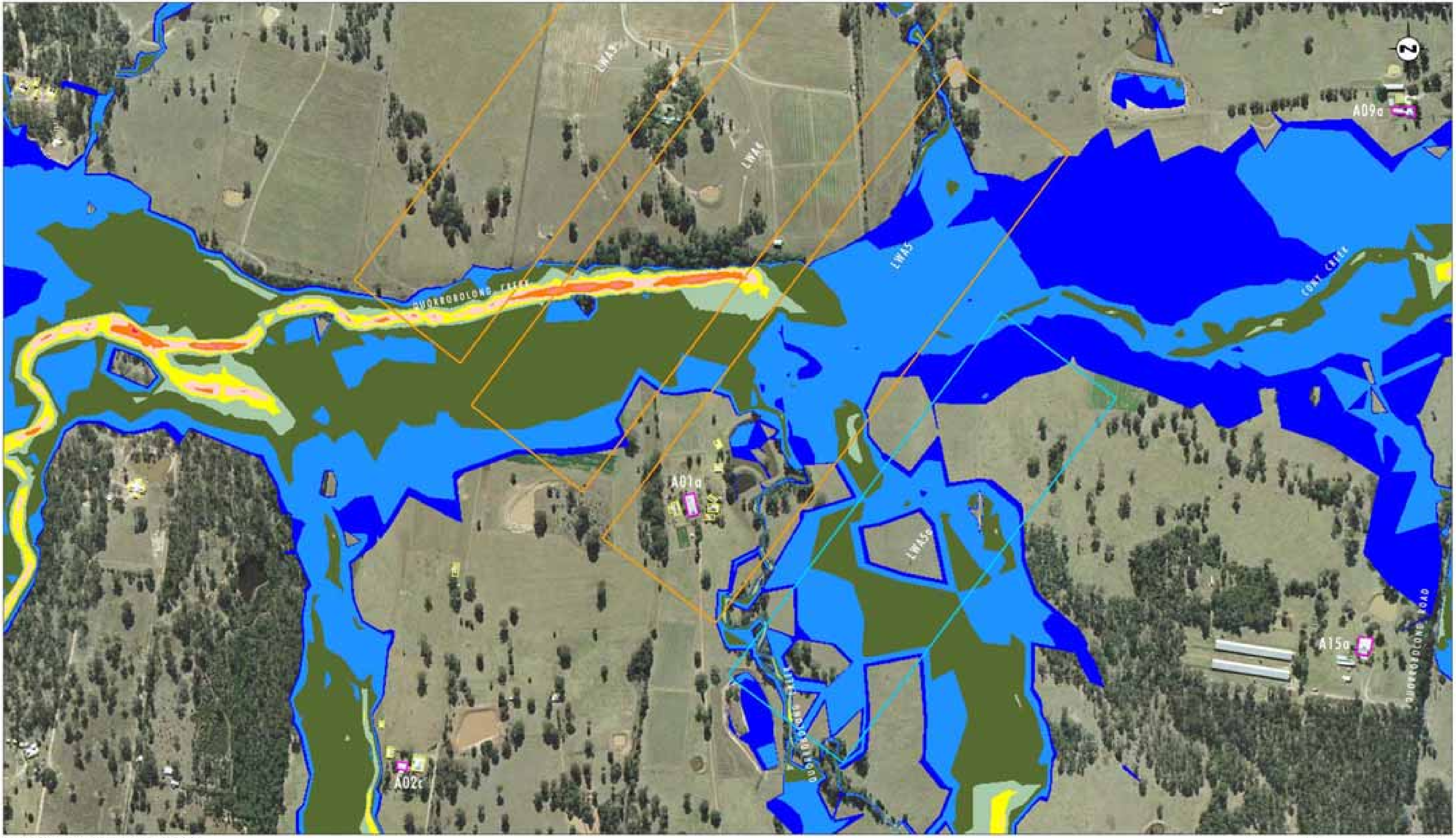
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

Water Depth (m)

- Range [0.001 : 0.100]
- Range [0.100 : 0.300]
- Range [0.300 : 0.500]
- Range [0.500 : 0.700]
- Range [0.700 : 0.900]
- Range [0.900 : 1.100]
- Range [1.100 : 1.300]
- Range [1.300 : 1.500]
- Range [1.500 : 1.700]
- Range [1.700 : 1.900]
- Range [>1.900]

FIGURE 1.3

100 year ARI Storm: Maximum Modelled Water Depths for Pre Stage 2 Mining



0 100 200 300m
1:6000

Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

Legend

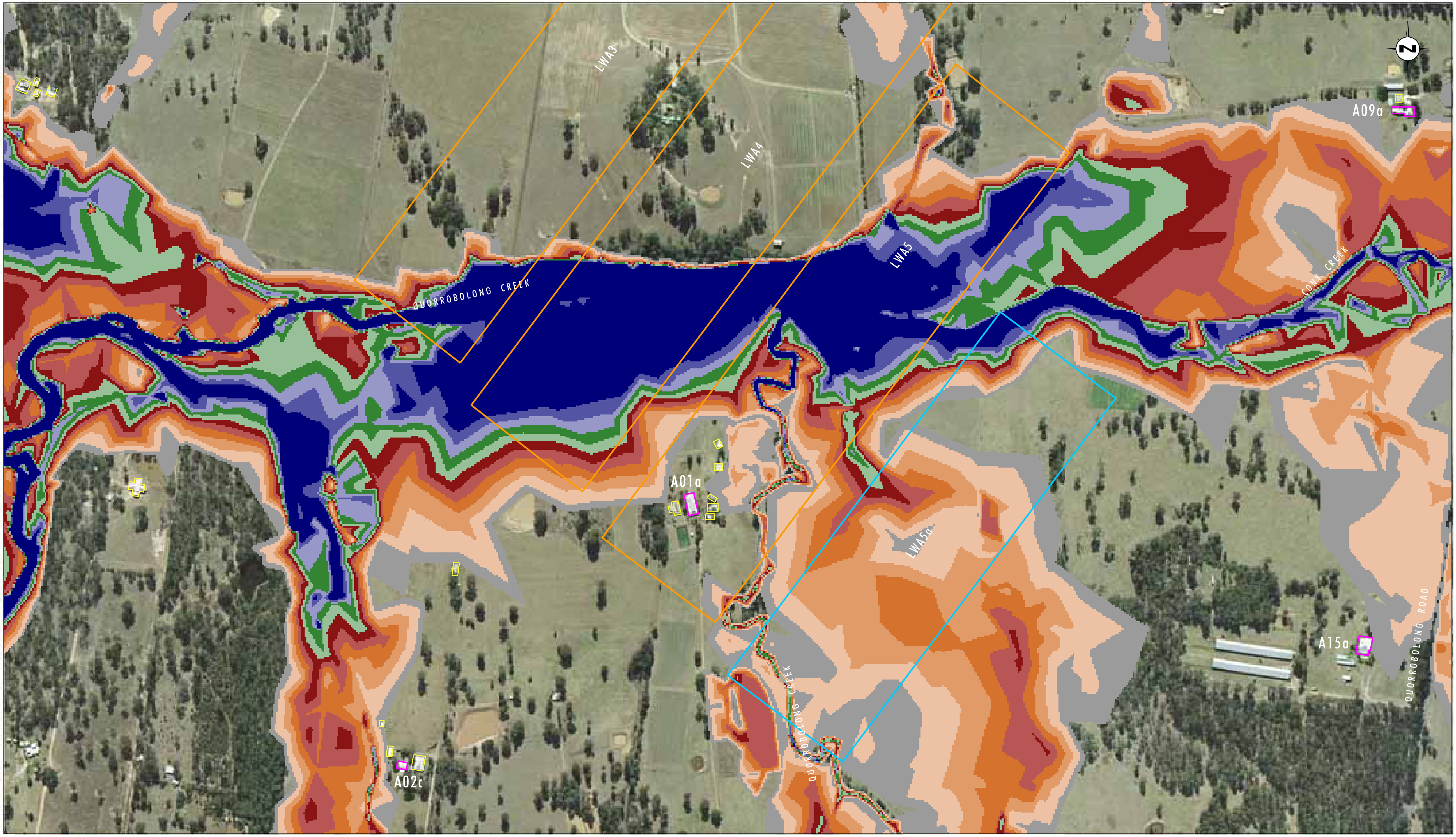
- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 1.4

100 year ARI Storm: Maximum Modelled Water Velocities for Pre Stage 2 Mining



Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

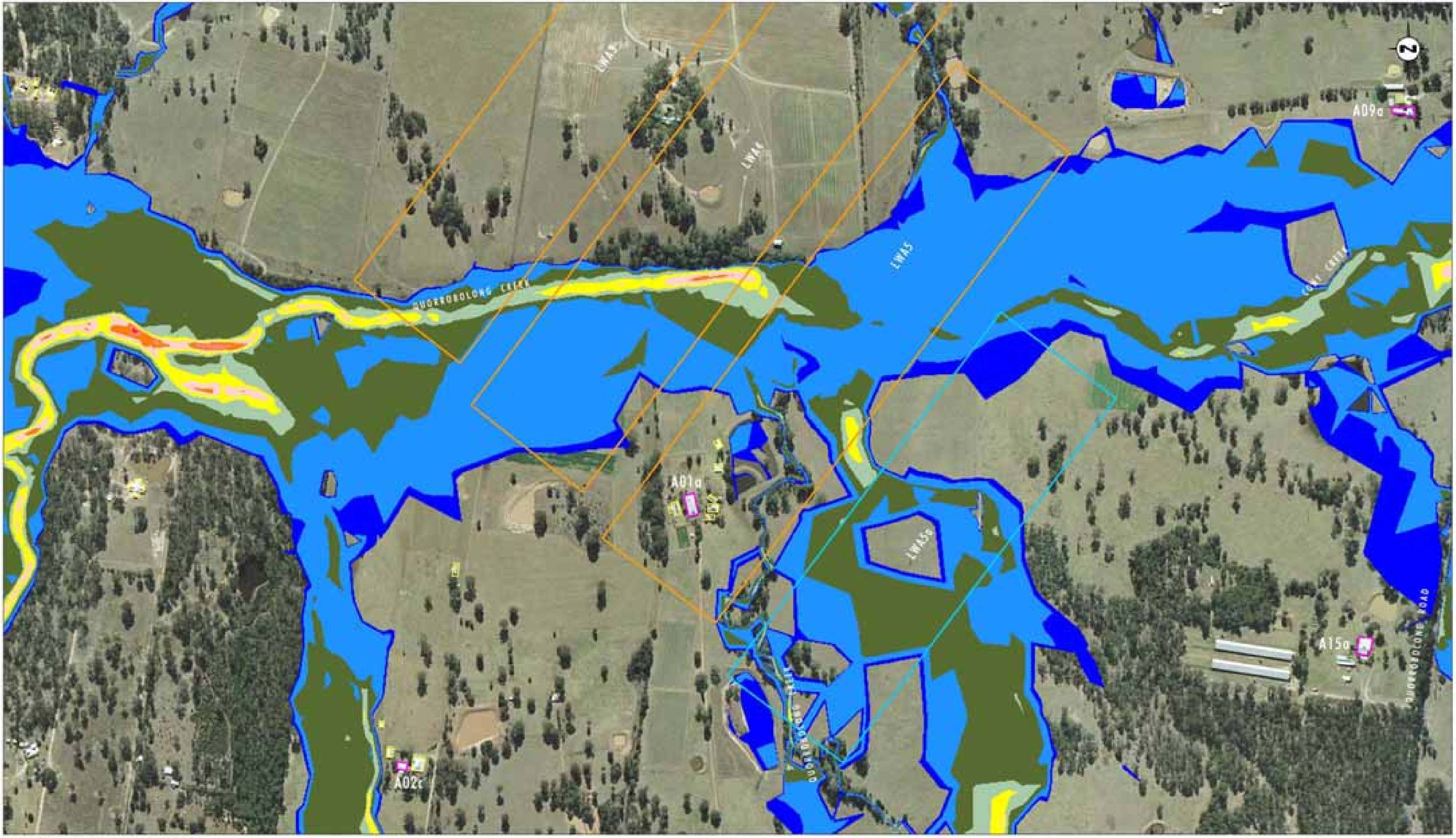
Water Depth (m)

- Range [0.001 : 0.100]
- Range [0.100 : 0.300]
- Range [0.300 : 0.500]
- Range [0.500 : 0.700]
- Range [0.700 : 0.900]
- Range [0.900 : 1.100]
- Range [1.100 : 1.300]
- Range [1.300 : 1.500]
- Range [1.500 : 1.700]
- Range [1.700 : 1.900]
- Range [>1.900]

FIGURE 1.5

100 year ARI Storm:
Maximum Modelled Water Depths for
Predicted Subsidence (Longwalls A3 to A5)

File Name (A3): R58_V1/2274_745.dgn



0 100 200 300m
1:6000

Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

Velocity (m/s)

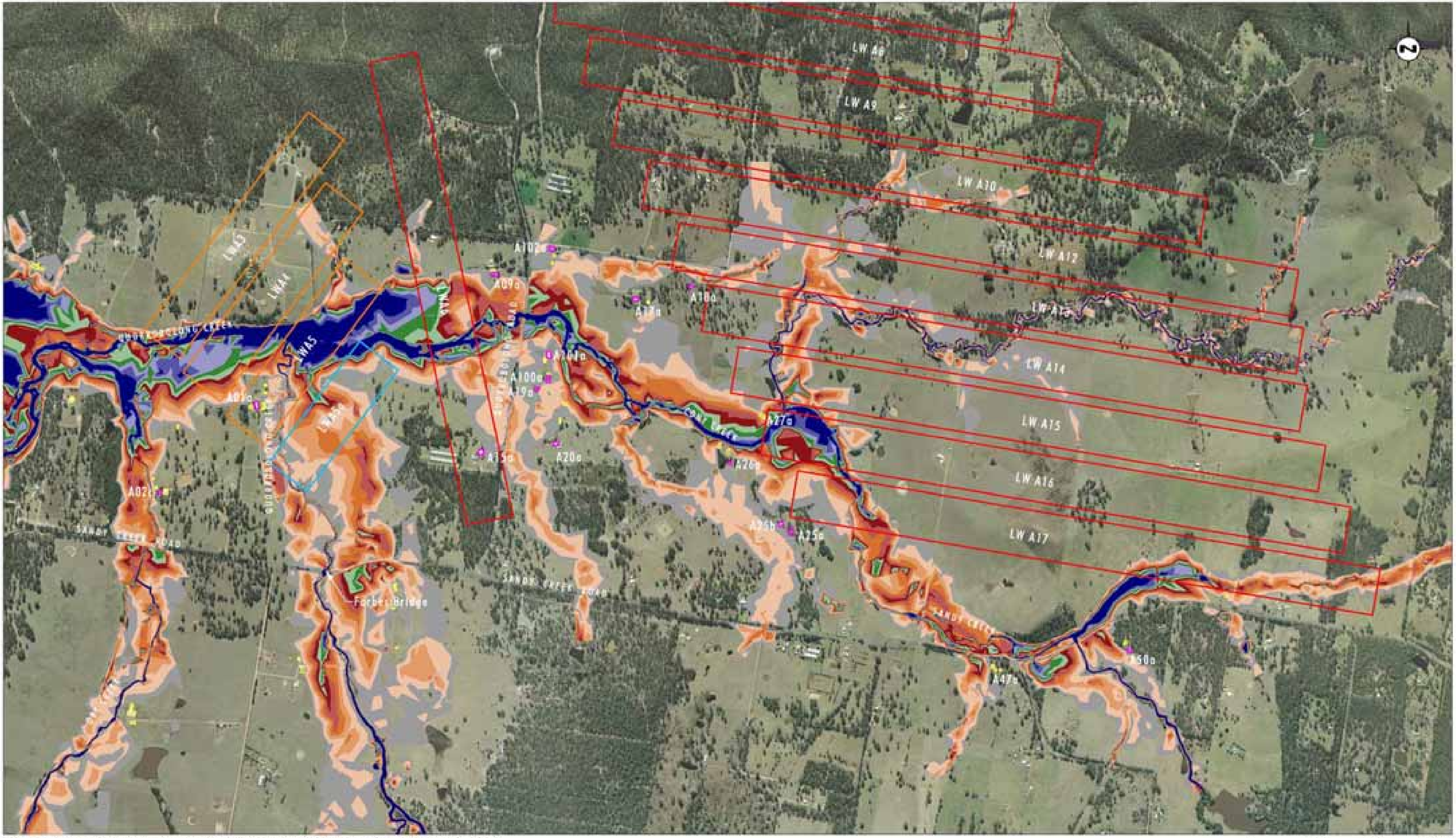
- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 1.6

100 year ARI Storm: Maximum Modelled Water Velocities for Predicted Subsidence (Longwalls A3 to A5)

File Name (A3): R58_V1/2274_753.dgn

Umwelt



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

0 300 600 900m
1:18 000

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

Water Depth (m)

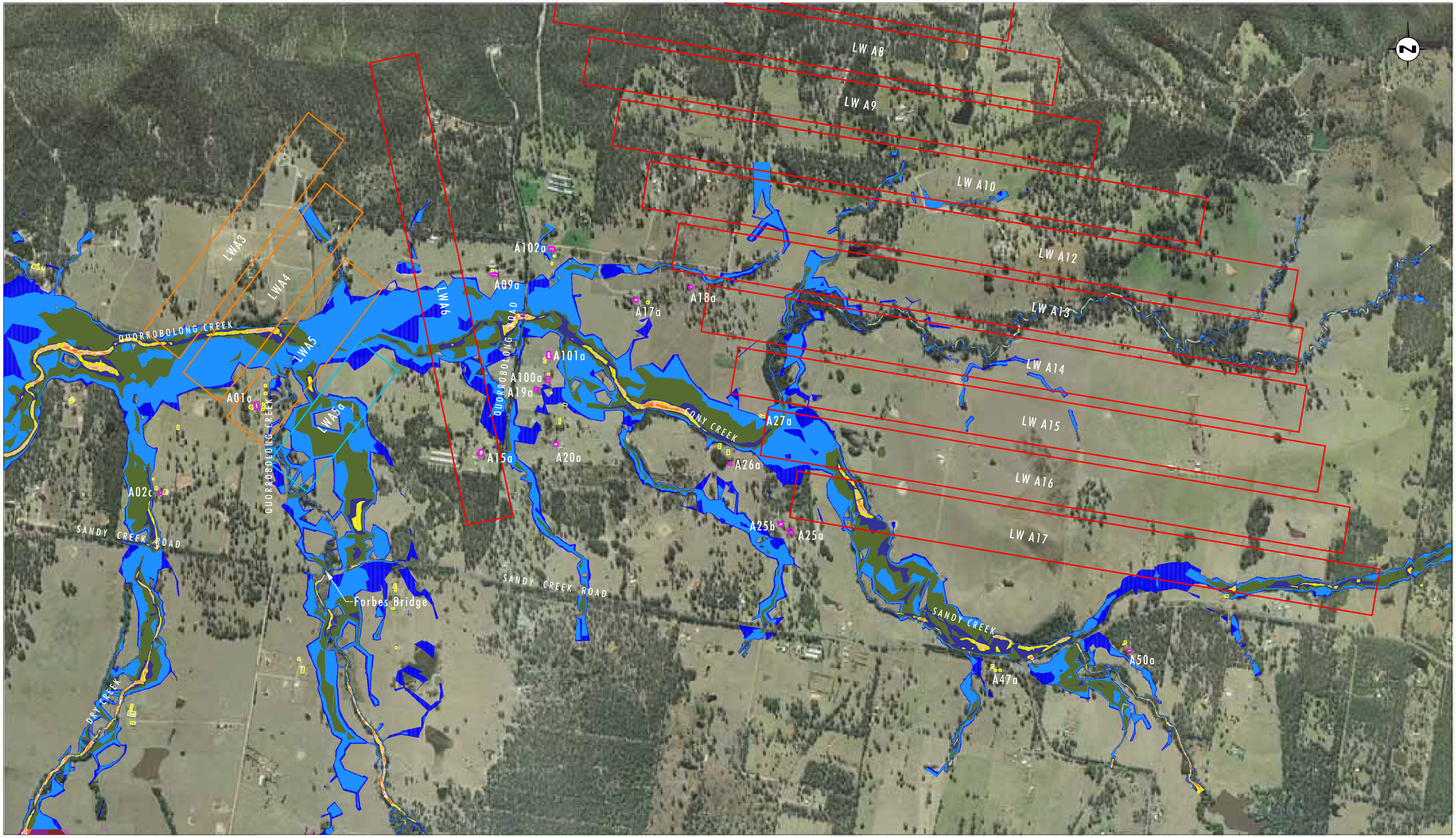
- Range [0.001 : 0.100]
- Range [0.100 : 0.300]
- Range [0.300 : 0.500]
- Range [0.500 : 0.700]
- Range [0.700 : 0.900]
- Range [0.900 : 1.100]
- Range [1.100 : 1.300]
- Range [1.300 : 1.500]
- Range [1.500 : 1.700]
- Range [1.700 : 1.900]
- Range [>1.900]

FIGURE 1.7

100 year ARI Storm: Maximum Modelled Water Depths for Predicted Subsidence (Longwalls A3 to A5 and A6 to A17)

File Name (A3): R58_V1/2274_750.dgn

Umwelt



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 1.8

100 year ARI Storm: Maximum Modelled Water Velocities for Predicted Subsidence (Longwalls A3 to A5 and A6 to A17)

File Name (A3): R58_V1/2274_755.dgn

3.0 Model Outcomes

3.1 Predicted Impacts with Stage 2a

The potential impacts of underground mining of Longwalls A3 to A5 and Longwall A5a (i.e. Stage 2a) were determined. The outcomes of the assessment are summarised in **Sections 3.1.1** and **3.1.2**.

Figures 3.1 and **3.2** describe the modelled maximum flood depths and velocities for the 100 year ARI storm event with the predicted subsidence for Stage 2a. **Figure 3.3** shows flow hydrographs derived for the 100 year flood event downstream of the Stage 2 mining area. **Figure 3.4** shows the potential changes to remnant ponding as a result of the proposed underground mining of Longwall A5a.

3.1.1 Flood Depths

A comparison of the modelled flood response for the predicted subsidence for Stage 2a (i.e. Longwalls A3 to A5a) with those previously modelled for the predicted subsidence for Stage 2 (i.e. Longwalls A3 to A5), indicated that the addition of Longwall A5a could potentially reduce flood levels downstream of the confluence of Cony Creek and Quorrobolong Creek (i.e. downstream of the natural flow constriction, refer to **Figure 1.1**). The maximum modelled decrease was in the order of 160 millimetres, indicating that the predicted subsidence from Longwall A5a could return maximum flood depths in Quorrobolong Creek downstream of the confluence to depths similar to pre-Stage 2 mining conditions.

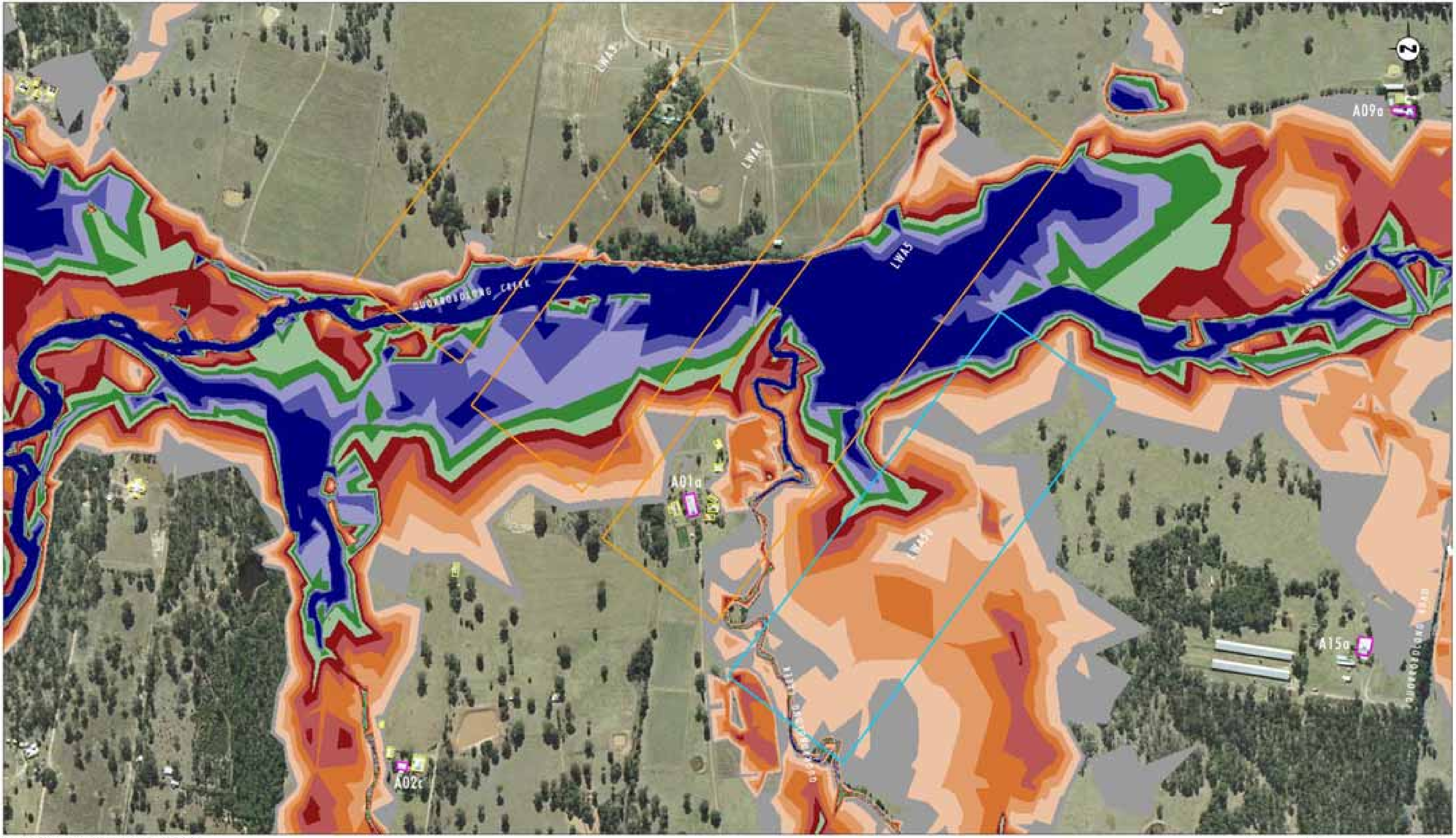
In the sections of Cony and Quorrobolong Creeks upstream of the natural flow constriction, modelling indicated an increase in the modelled maximum flood levels with Longwall A5a. These predicted increases in maximum flood depths typically occurred along Quorrobolong Creek upstream of the confluence with Cony Creek. The maximum modelled increase in flood depth was in the order of 500 millimetres, with an average increase for this area in the order of 100 millimetres.

The modelling indicates that the predicted subsidence associated with the proposed Stage 2 extension will not increase flood depths during the 100 year ARI storm event at dwellings within the Quorrobolong Valley.

3.1.2 Flow Velocities

Modelled flow velocities as a result of the predicted subsidence of Longwall A5a (i.e. Stage 2a) were found to slightly increase within the channel sections of Quorrobolong Creek, downstream of the natural flow constriction point, compared to the values obtained previously for Stage 2 (i.e. Longwalls A3 to A5).

In the sections of Quorrobolong Creek upstream of the confluence with Cony Creek in the vicinity of Longwall A5a, modelled peak flow velocities within the main channel of Quorrobolong Creek were found to increase at the upstream edge of Longwall A5a and downstream of the channel pillar between Longwalls A5 and A5a, with an average increase in the order of 0.1 m/s for this section of Quorrobolong Creek. These increases were largely confined to the channel section and immediate overbank areas where increased channel slopes occurred as a result of the additional subsidence. The localised increase in velocity is within the range of velocities naturally occurring within Quorrobolong Creek in large flood events and is not anticipated to significantly affect channel stability.



Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

0 100 200 300m
1:6000

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

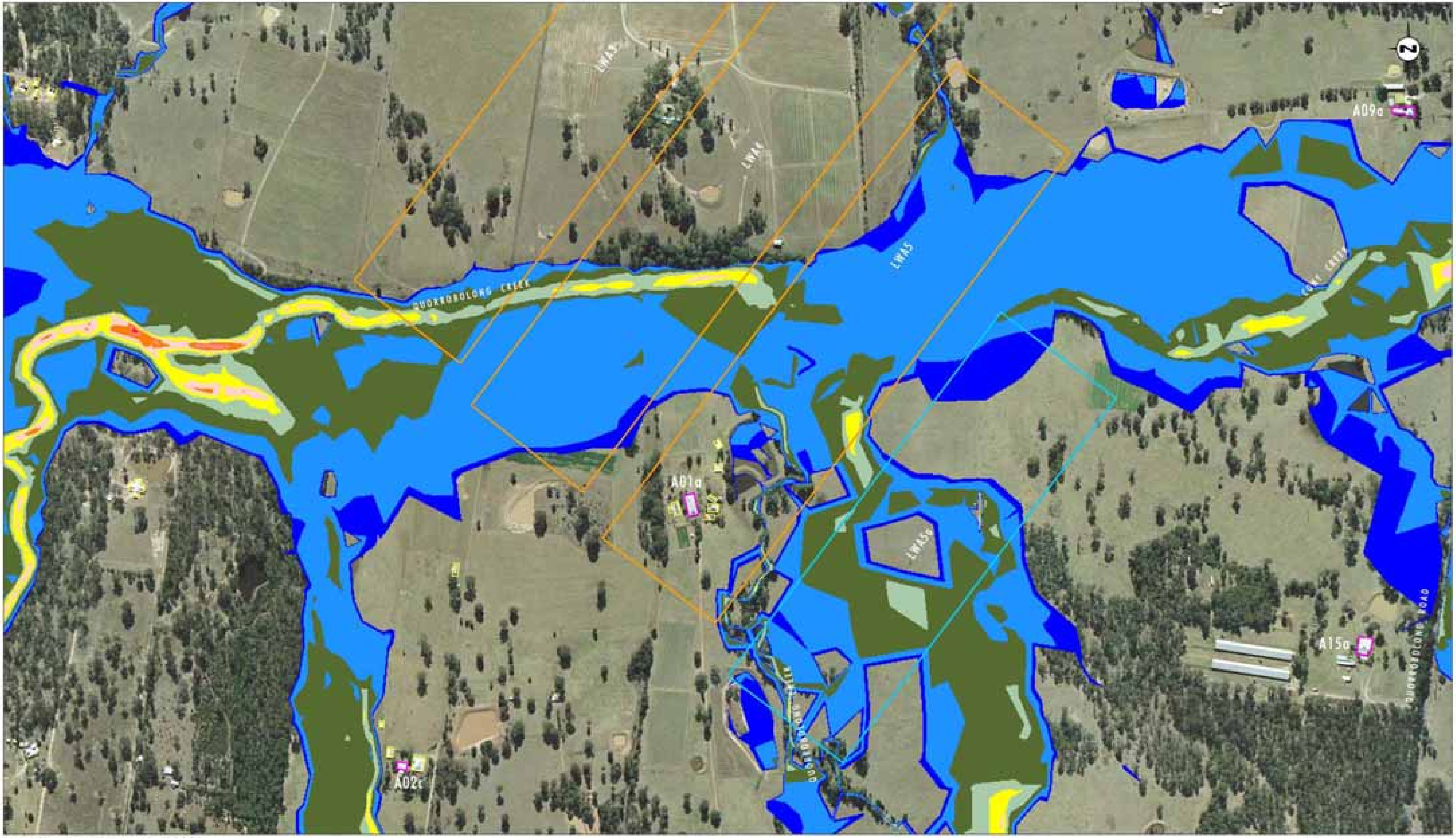
Water Depth (m)

- Range [0.001 : 0.100]
- Range [0.100 : 0.300]
- Range [0.300 : 0.500]
- Range [0.500 : 0.700]
- Range [0.700 : 0.900]
- Range [0.900 : 1.100]
- Range [1.100 : 1.300]
- Range [1.300 : 1.500]
- Range [1.500 : 1.700]
- Range [1.700 : 1.900]
- Range [>1.900]

FIGURE 3.1

100 year ARI Storm: Maximum Modelled Water Depths for Predicted Subsidence (Longwalls A3 to A5a)

File Name (A3): R58_V1/2274_746.dgn



Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

0 100 200 300m
1:6000

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number

Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 3.2

100 year ARI Storm: Maximum Modelled Water Velocities for Predicted Subsidence (Longwalls A3 to A5a)

File Name (A3): R58_V1/2274_754.dgn

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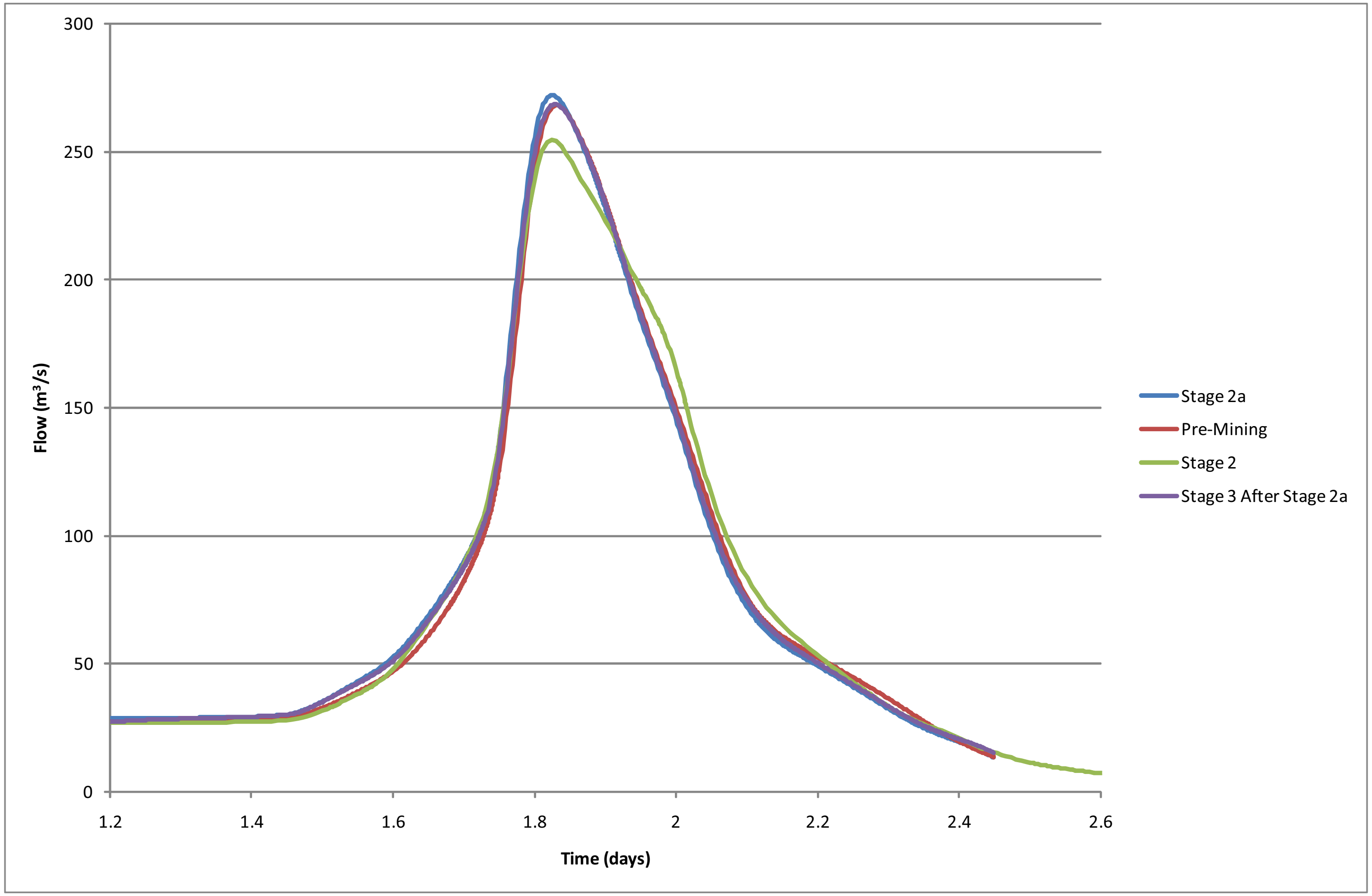
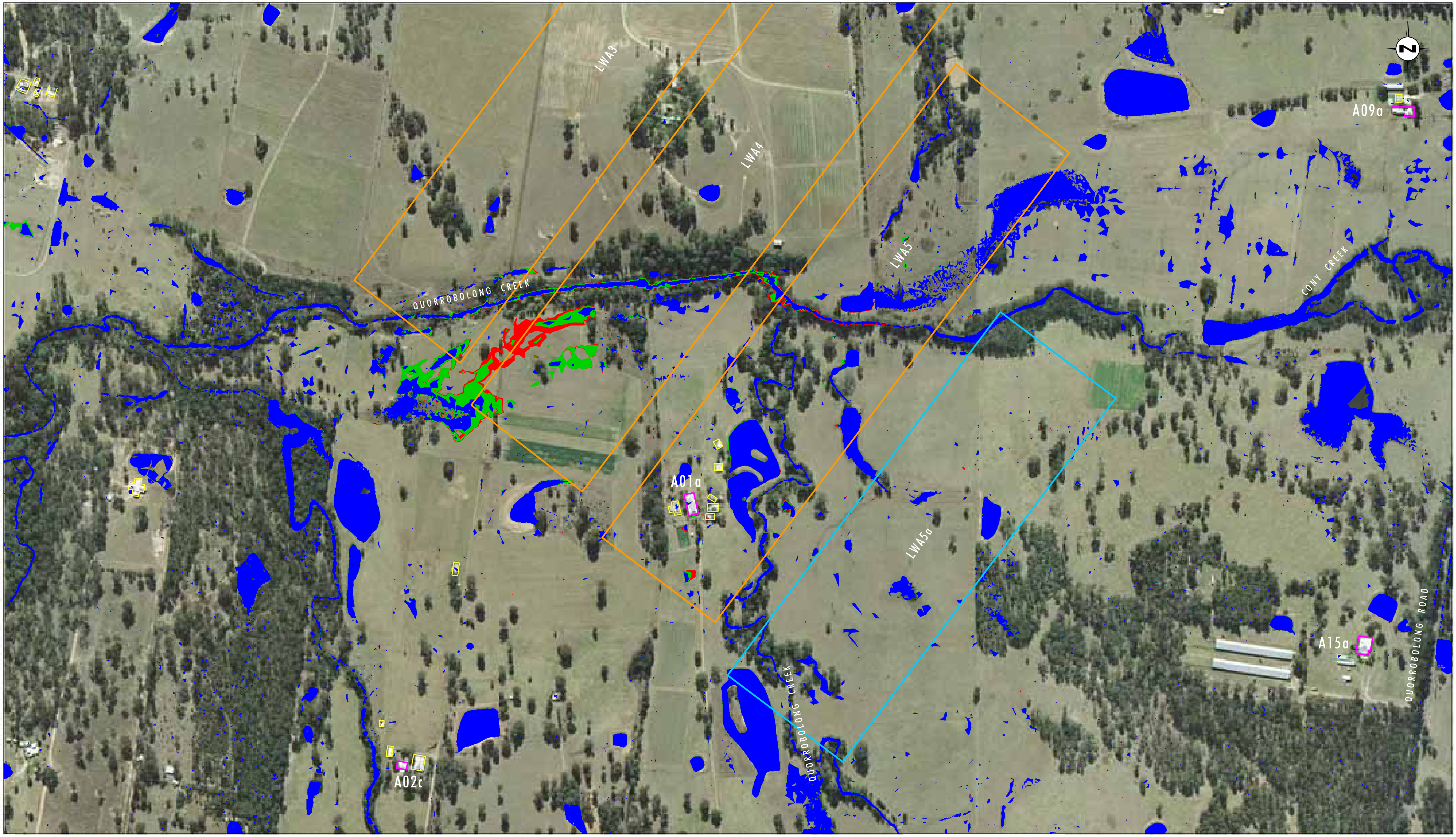


FIGURE 3.3

Modelled 100 year Flow Hydrographs
Downstream at Stage 2

Umwelt



Base Source: AAM Hatch, 2006
Source: Longwall Layout: Austar Coal Mine
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Building
- Dwelling
- A01a Dwelling Reference Number
- Pre-Mining
- Predicted Subsidence Longwalls A3 to A5
- Predicted Subsidence Longwalls A3 to A5a

FIGURE 3.4

Remnant Ponding

File Name (A3): R58_V1/2274_747.dgn

Analysis of the modelling results for Cony Creek and Quorrobolong Creek indicate that maximum velocities will remain within non-scouring levels for both the 100 year and 1 year ARI storm events following the Stage 2 Extension Project and as a result no significant changes due to velocity induced scouring or erosion are predicted.

3.1.3 Flood Hazard Categories

In order to assess the potential flood hazards associated with underground mining in the Stage 2 Extension Study Area, the flood hazard categories outlined in Appendix G of the *Floodplain Development Manual* (2005) were utilised. The four flood hazard categories, in order of increasing hazard, are:

- unclassified;
- vehicles unstable;
- wading unsafe (and vehicles unstable); and
- damage to light structures.

Modelling indicated that negligible changes to the maximum flood hazard categories along access routes to dwellings would occur with the predicted subsidence for Longwalls A3 to A5a (i.e. Stage 2a) compared to the predicted subsidence for Longwalls A3 to A5 (i.e. Stage 2).

Modelling also indicated that no changes to the maximum flood hazard categories at dwellings would occur with the predicted subsidence for Longwalls A4 to A5a (i.e. Stage 2a) compared to the predicted subsidence for Longwalls A3 to A5 (i.e. Stage 2).

3.1.4 Duration of Flooding and Remnant Ponding

Flood model hydrographs immediately downstream of the Stage 2 mine area (refer to **Figure 3.3**) are comparable to the flood hydrographs derived previously for the pre-mining and with predicted subsidence for Stage 2 (i.e. Longwalls A3 to A5) mining operations, indicating that the proposed underground mining of Longwall A5a will have negligible effect on flood downstream of the Stage 2 mining area during the 100 year ARI storm event.

The predicted subsidence as a result of the proposed underground mining of Longwall A5a resulted in minor changes to the remnant surface ponding in the area to be undermined (refer to **Figure 3.4**). As can be seen by the analysis, the potential impacts on remnant ponding were confined to existing flow paths, paddocks and dams, with no predicted impact on access routes to, or within, the properties south of Quorrobolong Creek. The area found to be most impacted by the predicted subsidence associated with the addition of Longwall A5a was along the southern bank of Quorrobolong Creek above Longwalls A3 and A4. Other pre-mining ponding areas were found to be reduced with the predicted subsidence associated with Longwall A5a as a result of increased land gradients.

3.1.5 Potential Impacts on Stream Flow and Channel Stability

The flood modelling analysis indicates that the Stage 2 Extension Project will not have a significant impact on the flow regime of the Cony Creek and Quorrobolong Creek systems with only minor changes predicted in runoff regimes and peak discharges.

Based on the subsidence predictions (refer to **Section 2.0**), the predicted subsidence associated with the extraction of Longwall A5a will result in maximum changes in grade of

0.5 per cent and 0.4 per cent respectively within Quorrobolong Creek and Cony Creek. This predicted maximum change in grade is similar to the change in grade predicted to occur after the extraction of Longwalls A3 to A5. The locations of the maximum changes in grade are expected to occur further upstream as a result of the extraction of Longwall A5a.

As the predicted changes in in-channel grade are small and are considered to lie within the natural variations in grade of the creek lines of the Quorrobolong Valley, it is considered that the Stage 2 Extension Project will not significantly alter the flow capacity or stream velocities within the existing channels. It is also considered that there is minimal potential for channel realignment to occur as a result of the Stage 2 Extension Project.

The potential to increase erosion on the landform is also expected to be minimal due to the relatively small predicted changes in landform grades combined with the high level of groundcover limited amount of exposed soils that exist in the area.

3.2 Cumulative Impacts of Stages 2a and 3

The potential cumulative impacts of underground mining of Stages 2a and 3 (i.e. Longwalls A3 to A5a and A6 to A17) were determined. The outcomes of the assessment are summarised below.

The cumulative impact of Stage 2 and Stage 3 predicted subsidence on maximum modelled flood depths is shown on **Figure 3.1**. **Figures 3.5** to **3.8** describe the modelled maximum flood depths and velocities for the 100 year ARI storm event with the predicted subsidence for Stages 2a and 3. **Figure 3.3** shows the flood hydrographs extracted from the flood model immediately downstream of the Stage 2 mine area.

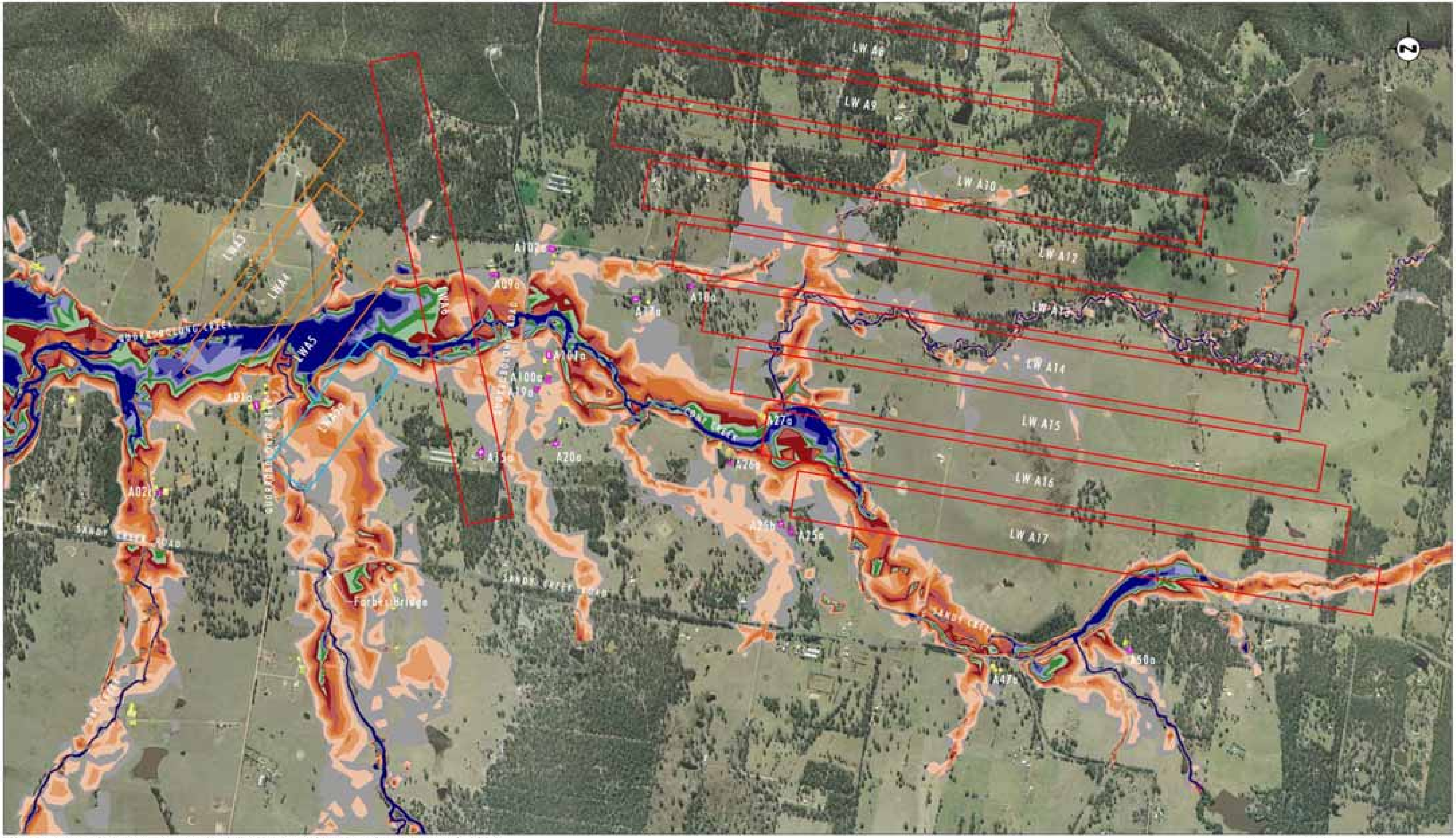
The addition of Longwall A5a had negligible influence on the previously modelled flood depths, flows, velocities and flood hazard categories estimated for the Stage 3 operations with predicted subsidence (refer to **Figures 3.5** and **3.6**).

The modelled flow hydrograph for immediately downstream of the Stage 2 mining area (refer to **Figure 3.3**) for mining of Stages 2a and 3 is similar to that derived for Stage 2a. It is therefore considered that Longwall A5a will have negligible influence on the previously predicted cumulative flood and drainage impacts of underground mining within Stage 3.

4.0 Summary and Conclusions

Analysis of the predicted subsidence associated with the mining of Longwall A5a indicates that the addition of Longwall A5a would have only minor impacts on the flood response downstream of the Stage 2 mining area. The main area of influence of the proposed additional longwall on the flood response was predicted to be within the immediate vicinity of Longwall A5a, with increases in both flood depth and velocity modelled for the sections of Quorrobolong Creek upstream of the confluence with Cony Creek, and decreases in flood depths in Cony Creek upstream and downstream of Longwall A5a relative to the previous modelled results for Stage 2 (i.e. Longwalls A3 to A5).

The modelling indicated that the natural flow constriction within Cony Creek downstream of the confluence of Cony and Quorrobolong Creeks would remain a point of flow control, with the predicted subsidence due to the underground mining of Longwall A5a modifying the flooding response upstream and downstream of this location in such a way as to more closely resemble the pre-Stage 2 mining flood response. Modelling also indicated that the



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

Water Depth (m)

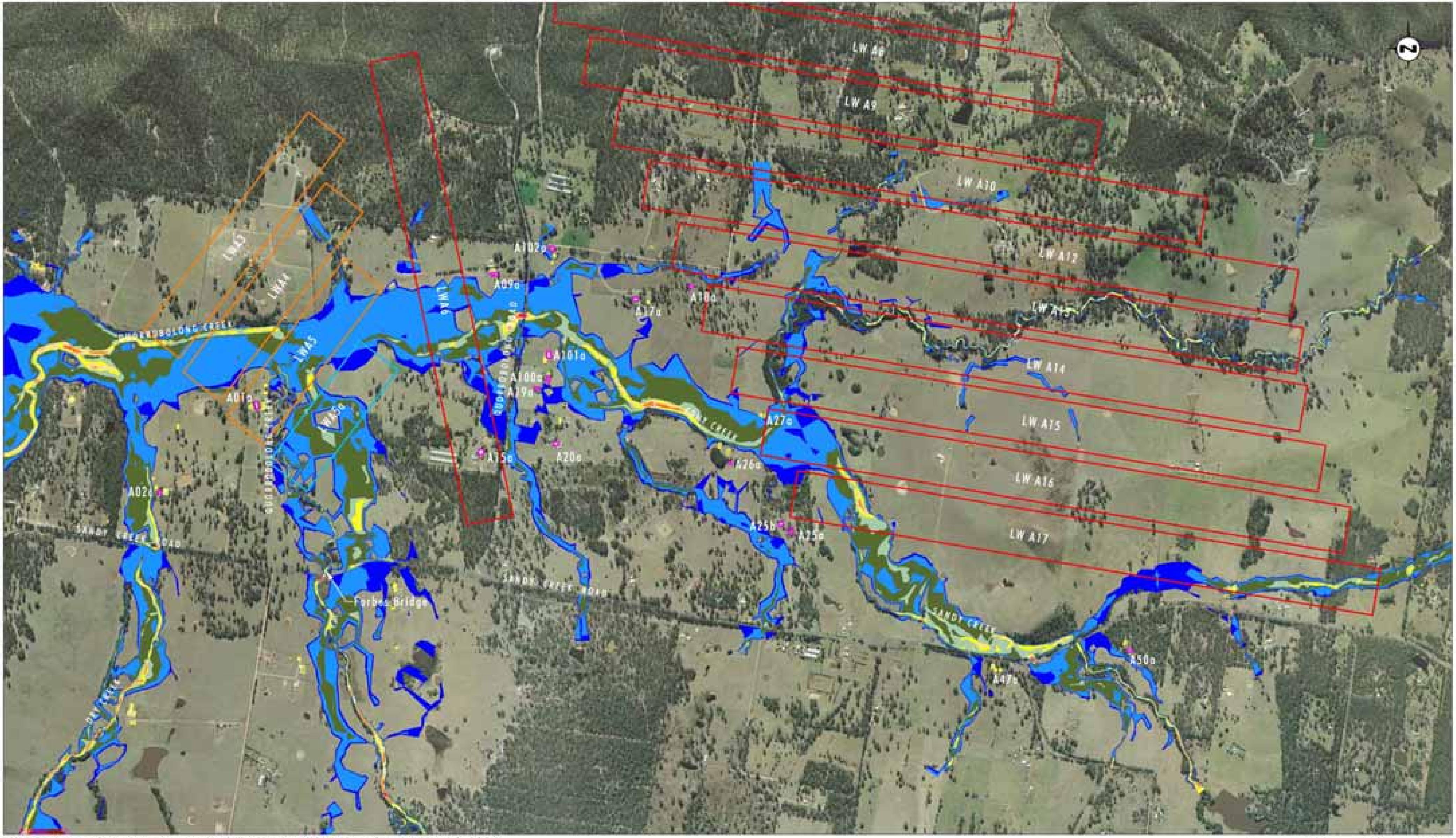
- Range [0.001 : 0.100]
- Range [0.100 : 0.300]
- Range [0.300 : 0.500]
- Range [0.500 : 0.700]
- Range [0.700 : 0.900]
- Range [0.900 : 1.100]
- Range [1.100 : 1.300]
- Range [1.300 : 1.500]
- Range [1.500 : 1.700]
- Range [1.700 : 1.900]
- Range [>1.900]

FIGURE 3.5

100 year ARI Storm: Maximum Modelled Water Depths for Predicted Subsidence (Longwalls A3 to A5a and A6 to A17)

File Name (A3): R58_V1/2274_749.dgn

Umwelt



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

0 300 600 900m
1:18 000

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

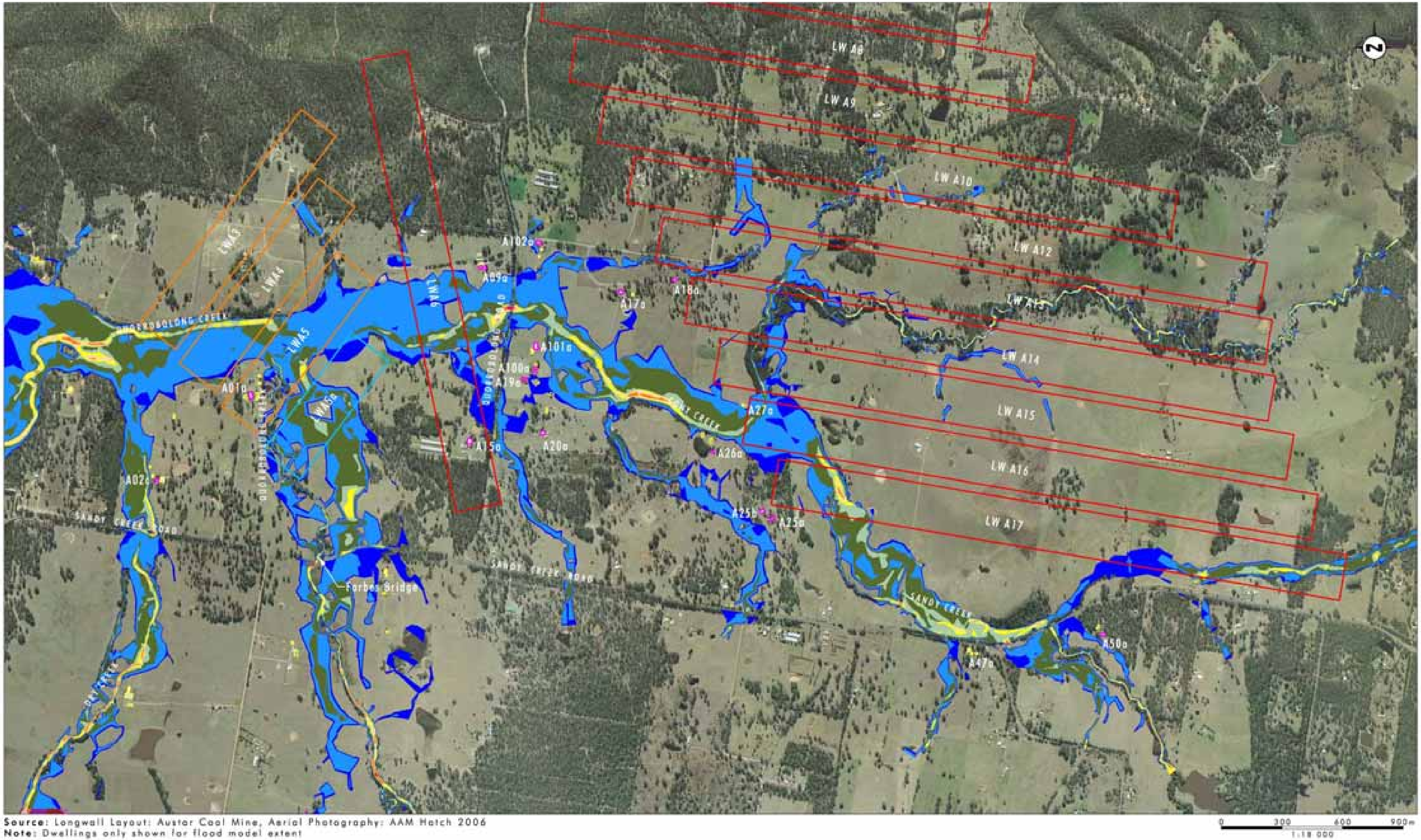
Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 3.6

**100 year ARI Storm:
Maximum Modelled Water Velocities for
Predicted Subsidence (Longwalls A3 to A5a and A6 to A17)**

File Name (A3): R58_V1/2274_759.dgn



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

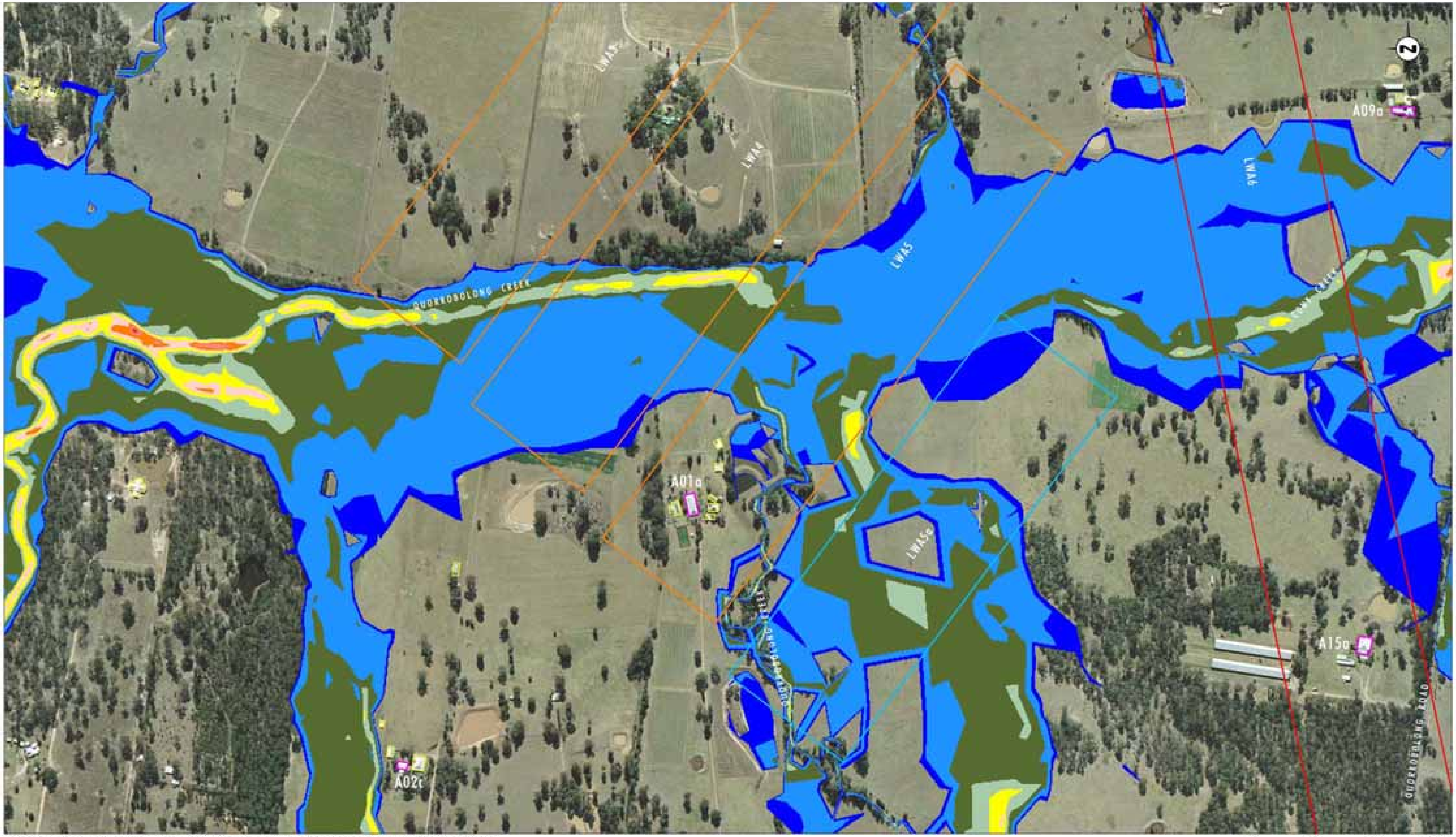
Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 3.7

100 year ARI Storm: Maximum Modelled Water Velocities for Predicted Subsidence (Longwalls A3 to A5a and A6 to A17)

Umwelt



Source: Longwall Layout: Austar Coal Mine, Aerial Photography: AAM Hatch 2006
Note: Dwellings only shown for flood model extent

0 100 200 300m
1:6000

Legend

- Layout for Stage 2 Longwall Panels
- Layout for Stage 2 Extension Longwall Panel
- Conceptual Layout for Stage 3 Longwall Panels
- Building
- Dwelling
- A01a Dwelling Reference Number

Velocity (m/s)

- Range [0.100 : 0.250]
- Range [0.250 : 0.500]
- Range [0.500 : 0.750]
- Range [0.750 : 1.000]
- Range [1.000 : 1.250]
- Range [1.250 : 1.500]
- Range [1.500 : 1.750]
- Range [1.750 : 2.000]
- Range [2.000 : 2.250]
- Range [2.250 : 3.500]

FIGURE 3.8

100 Year ARI Storm:
Maximum Modelled Water Velocities for Predicted Subsidence (Longwalls A3 to A5a and A6 to A17) over the Stage 2 Extension Study Area

File Name (A3): R58_V1/2274_797.dgn

cumulative influence of Longwall A5a on the flooding response previously assessed for the Stage 3 mining operations would be negligible.

The modelled changes to flood hazard categories and flood extents as a result of the proposed underground mining of Longwall A5a were negligible. No access routes to private properties were found to be affected by the predicted subsidence associated with the proposed underground mining of Longwall A5a.

The predicted subsidence associated with Longwall A5a was predicted to result in minor localised changes to the remnant ponding and overland flowpaths in the area to be undermined. Areas of additional remnant ponding were predicted to occur in sections of Quorrobolong Creek overlying Longwalls A3 and A4, with some additional ponding increases found adjacent to the confluence of Quorrobolong and Cony Creeks. The additional predicted remnant ponding was limited to existing flow paths, paddocks and dams.

5.0 References

MSEC, 2009, *The Prediction of Subsidence parameters and the Assessment of Mine Subsidence Impacts on the natural Features and Surface Infrastructure Resulting from the Extraction of the Proposed Longwall A5a in Stage 2 at the Austar Coal Mine*, prepared for Austar Coal Mine Pty Ltd.

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