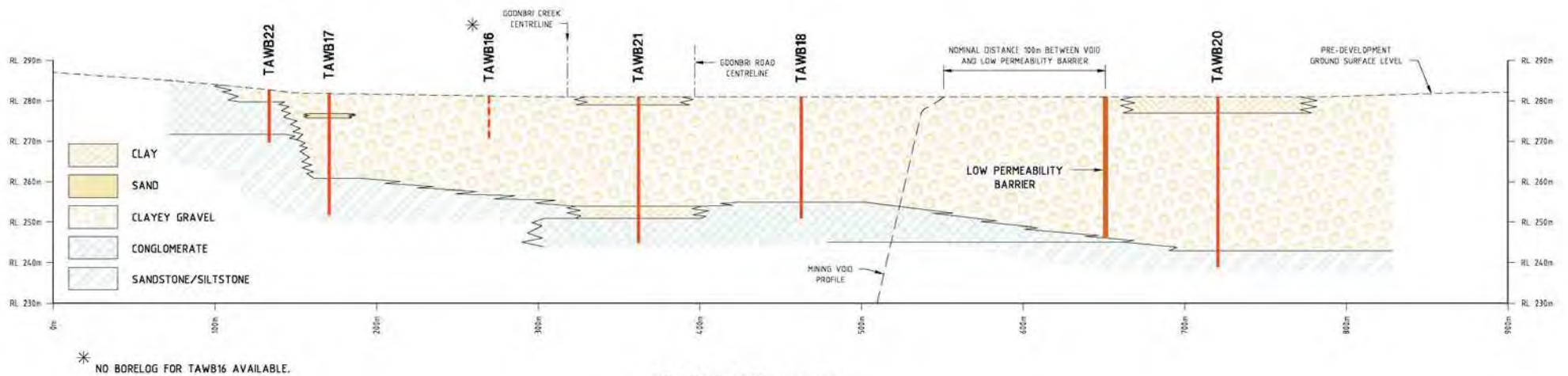


**PLAN SHOWING GEOLOGICAL SECTION LOCATION**

SCALE 1:2500



\* NO BORELOG FOR TAWB16 AVAILABLE.

**SECTION A** IDEALISED GEOLOGICAL SECTION  
SCALE HORIZ 1:2500 VERT 1:4000

Source: Allan Watson Associates (2011)

**TARRAWONGA COAL PROJECT**

**FIGURE A-15**  
Geological Section

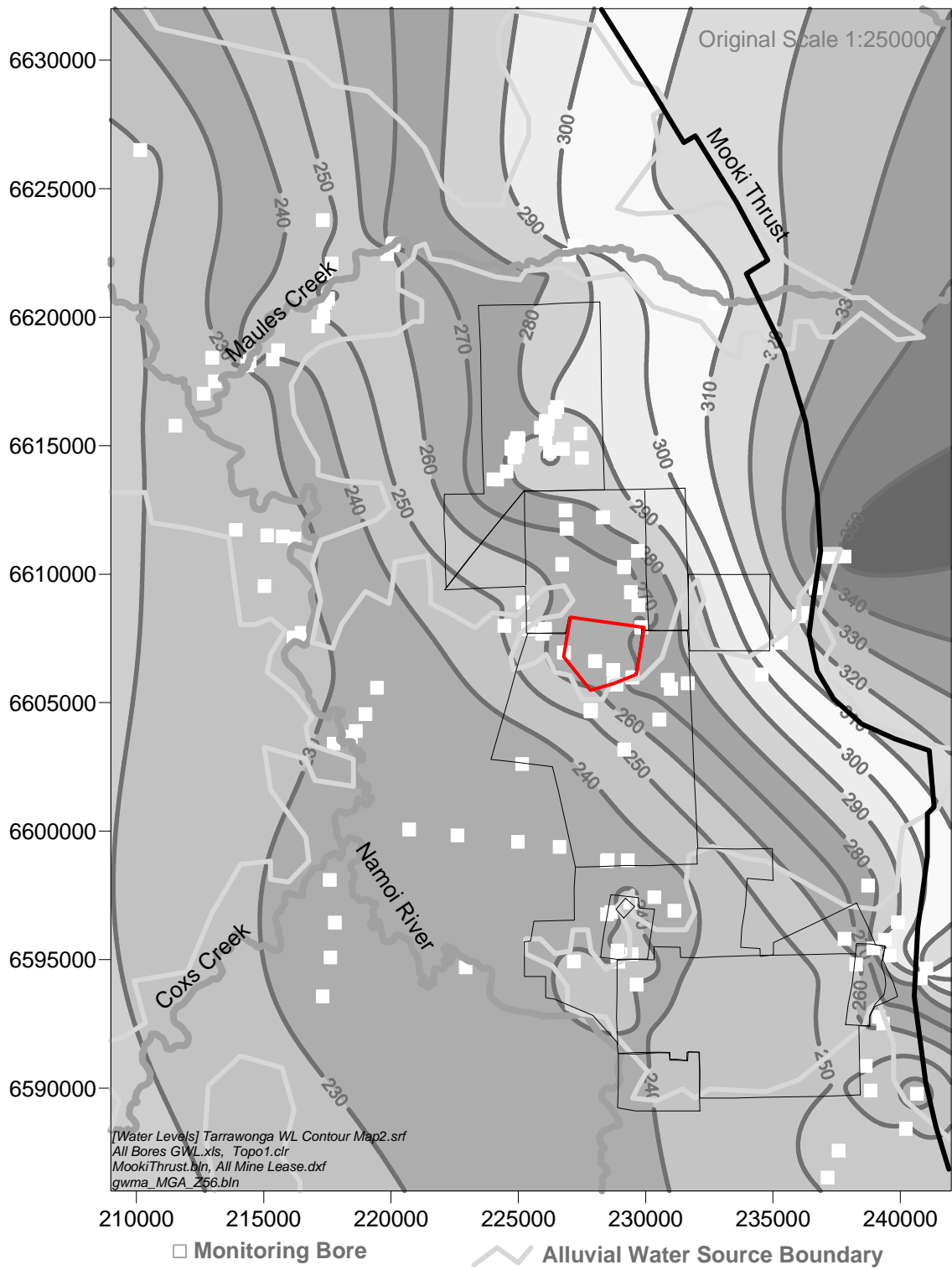


Figure A-16. Representative Watertable Contours [mAHd]

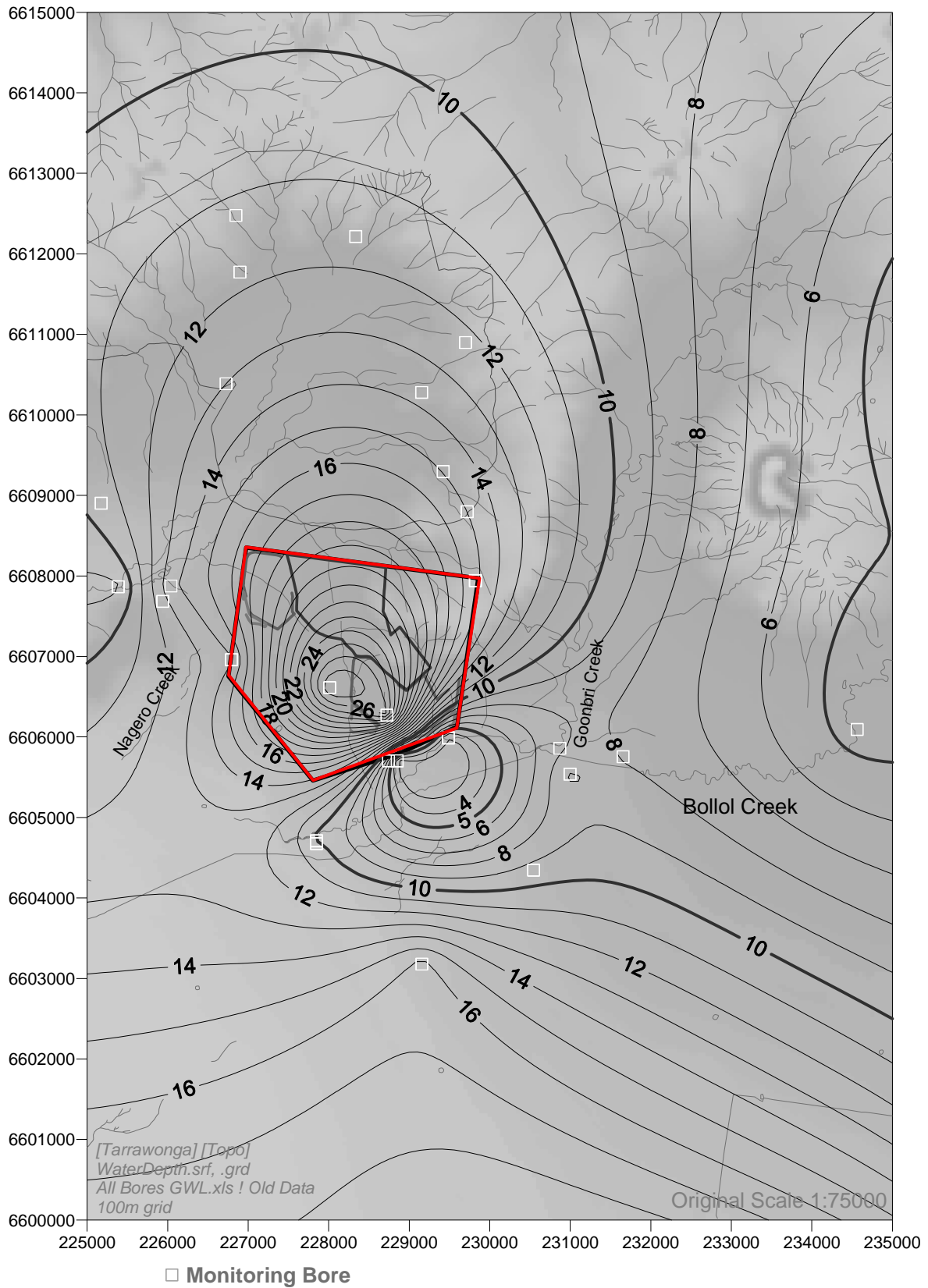


Figure A-17. Representative Depth to Water Contours [m] with Ground Topography Underlay

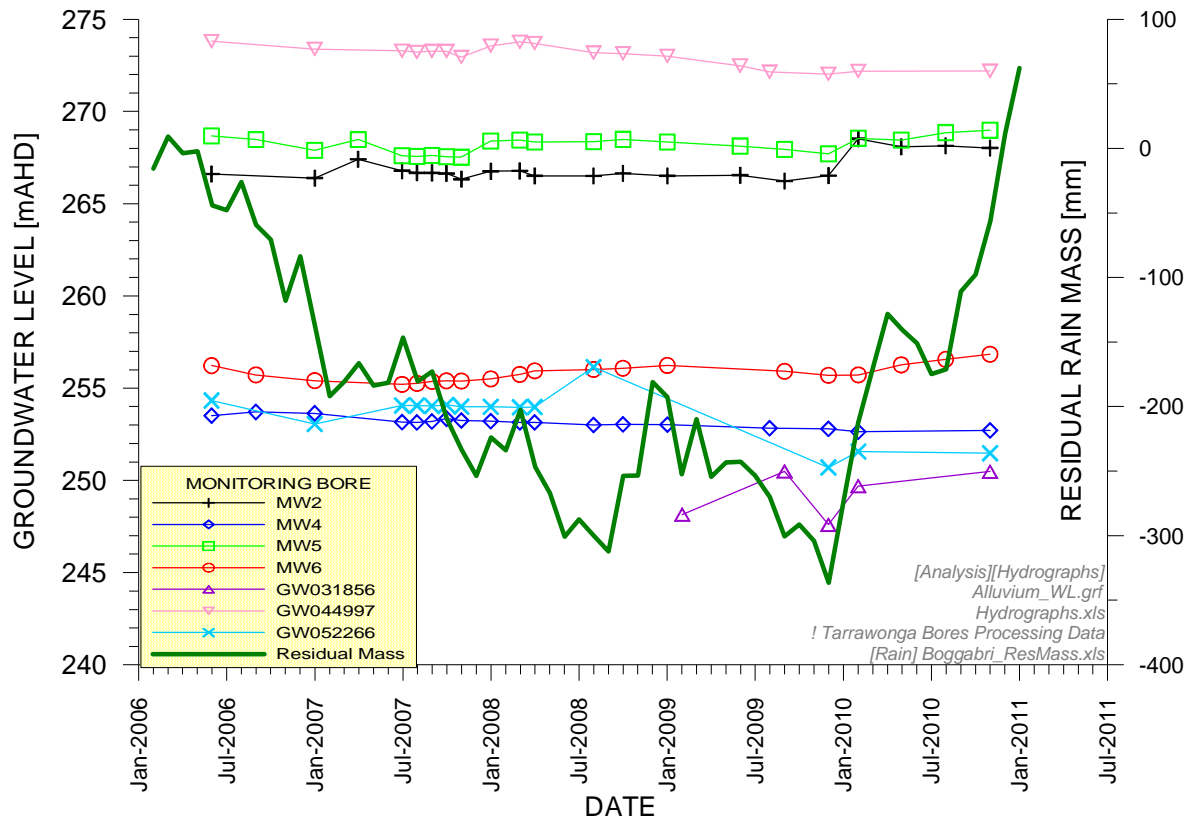


Figure A-18. Groundwater Hydrographs for Bores Screened in Alluvium

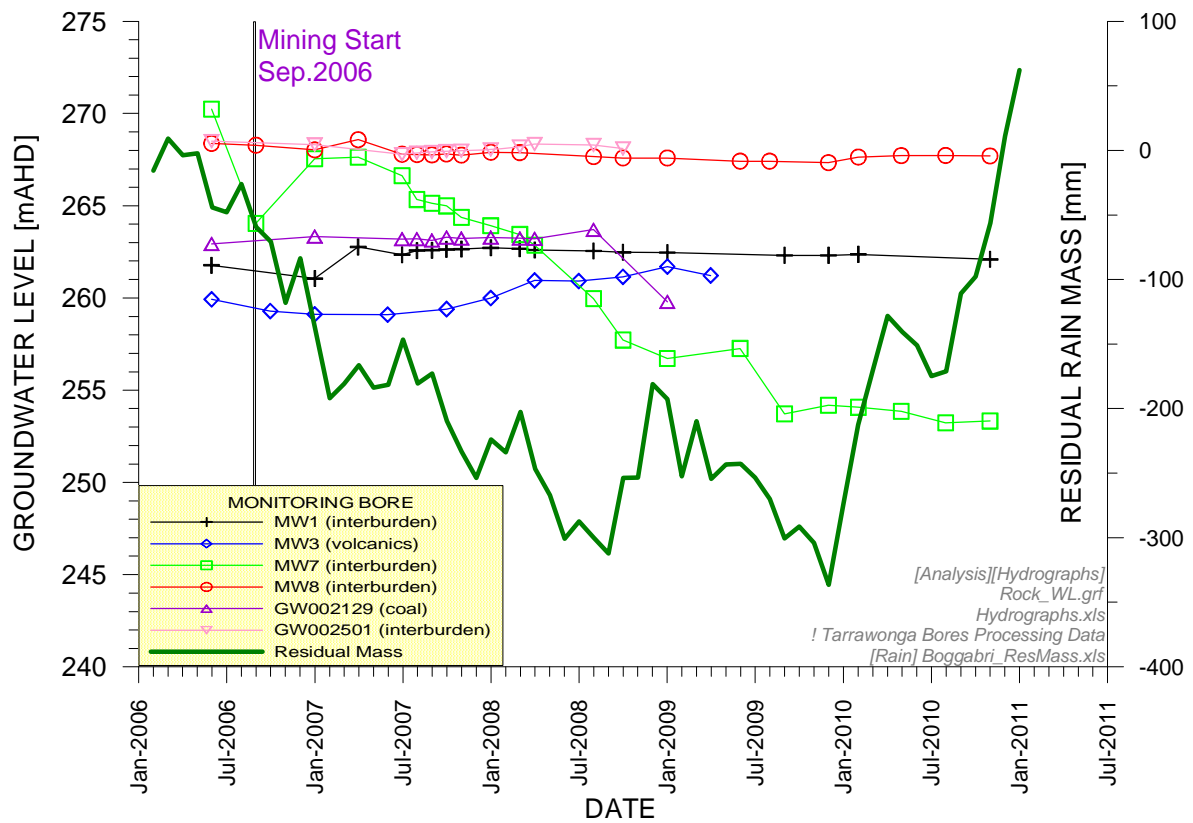


Figure A-19. Groundwater Hydrographs for Bores Screened in Coal, Interburden and Volcanics

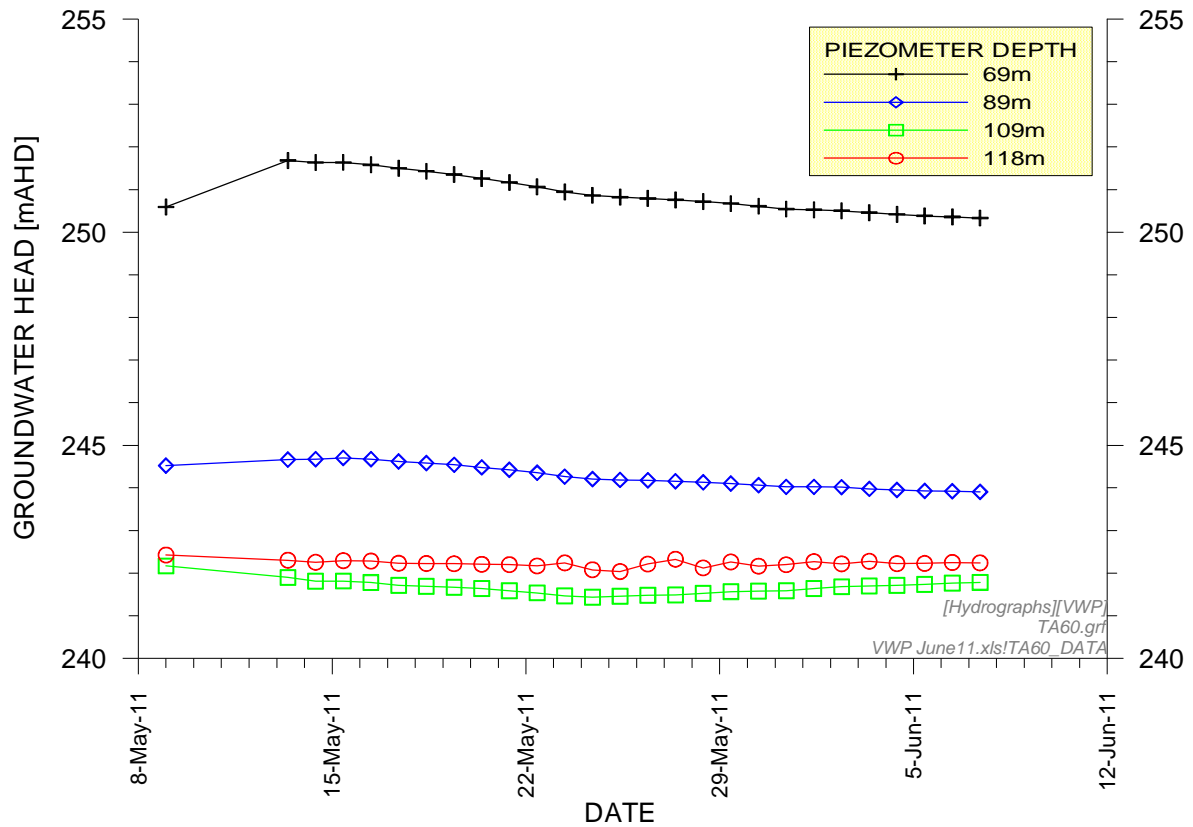


Figure A-20. Multi-level Groundwater Hydrographs for Bore TA60C

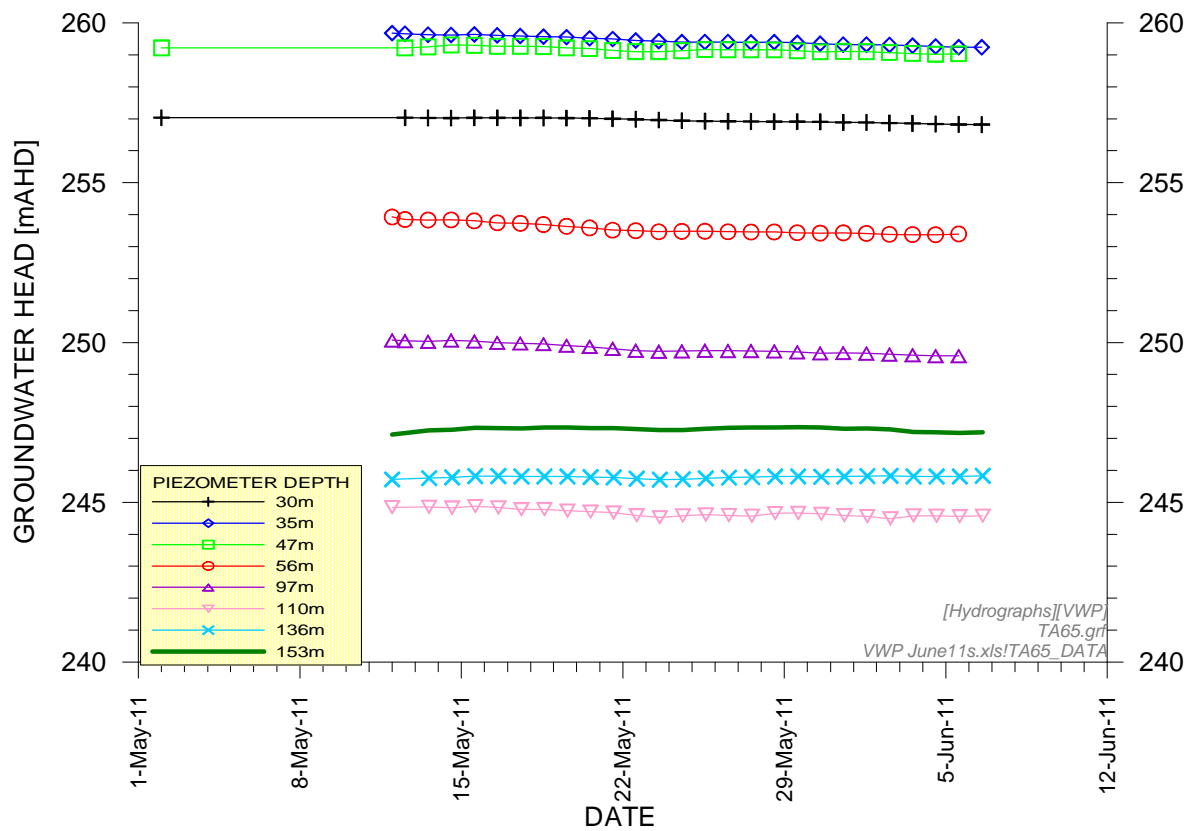


Figure A-21. Multi-level Groundwater Hydrographs for Bore TA65C

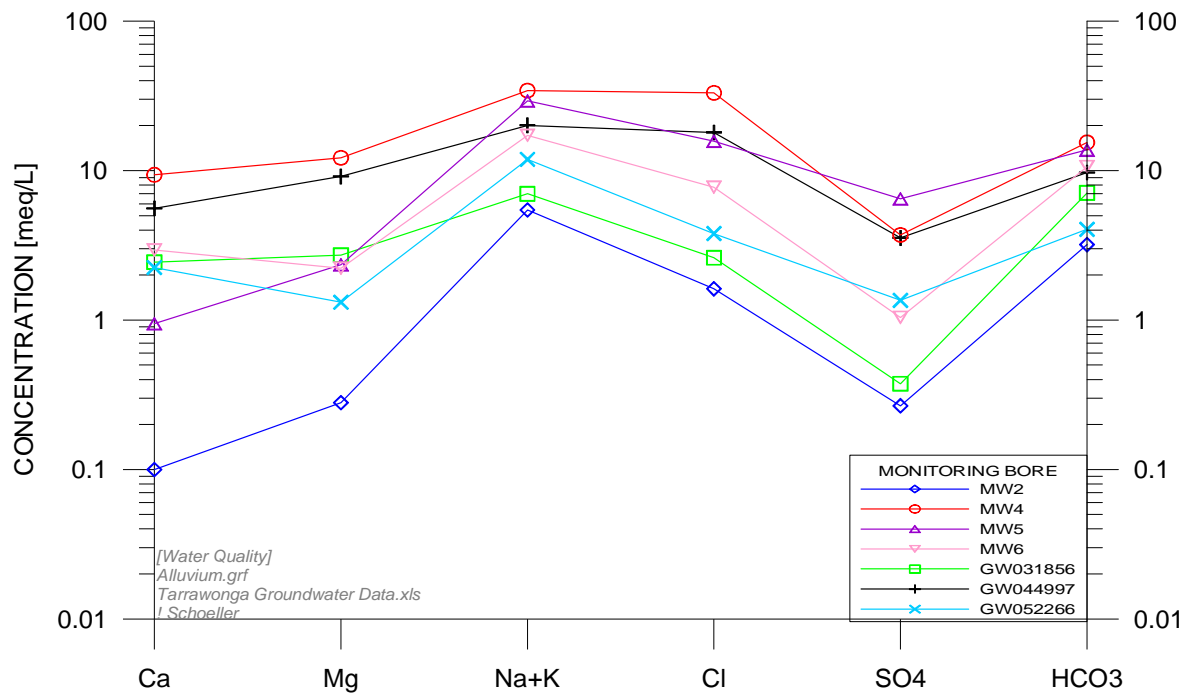


Figure A-22. Schoeller Diagram for Major Ions in Alluvial Groundwater

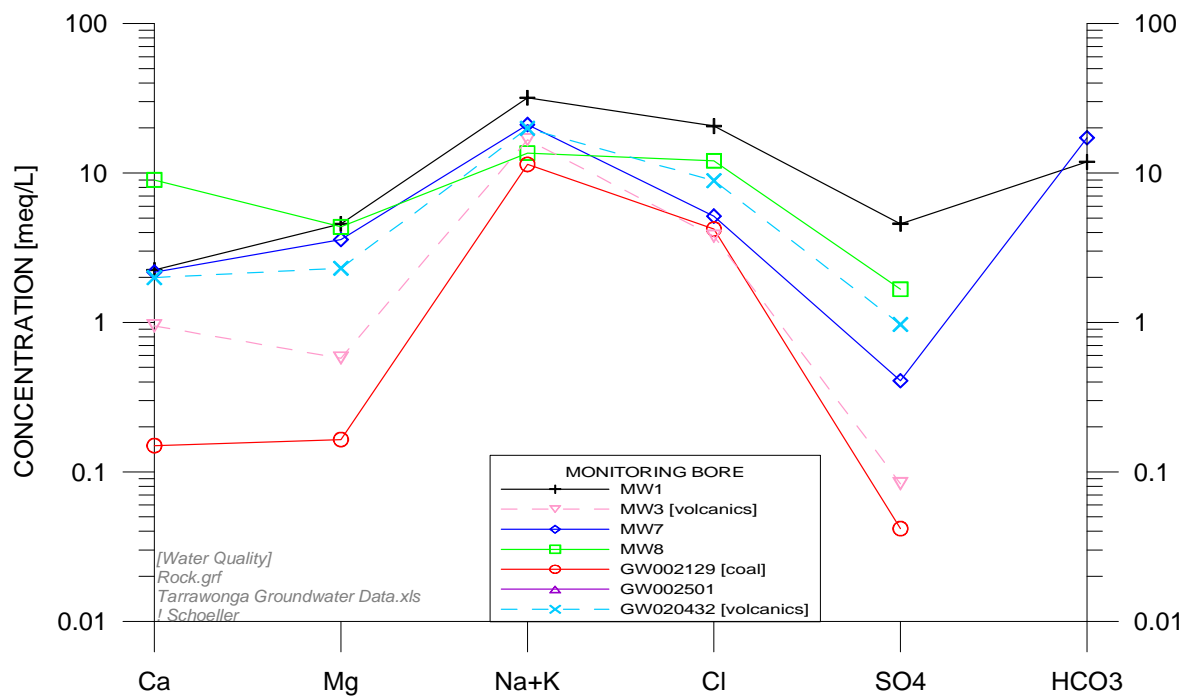


Figure A-23. Schoeller Diagram for Major Ions in Groundwater within Coal, Interburden and Volcanics

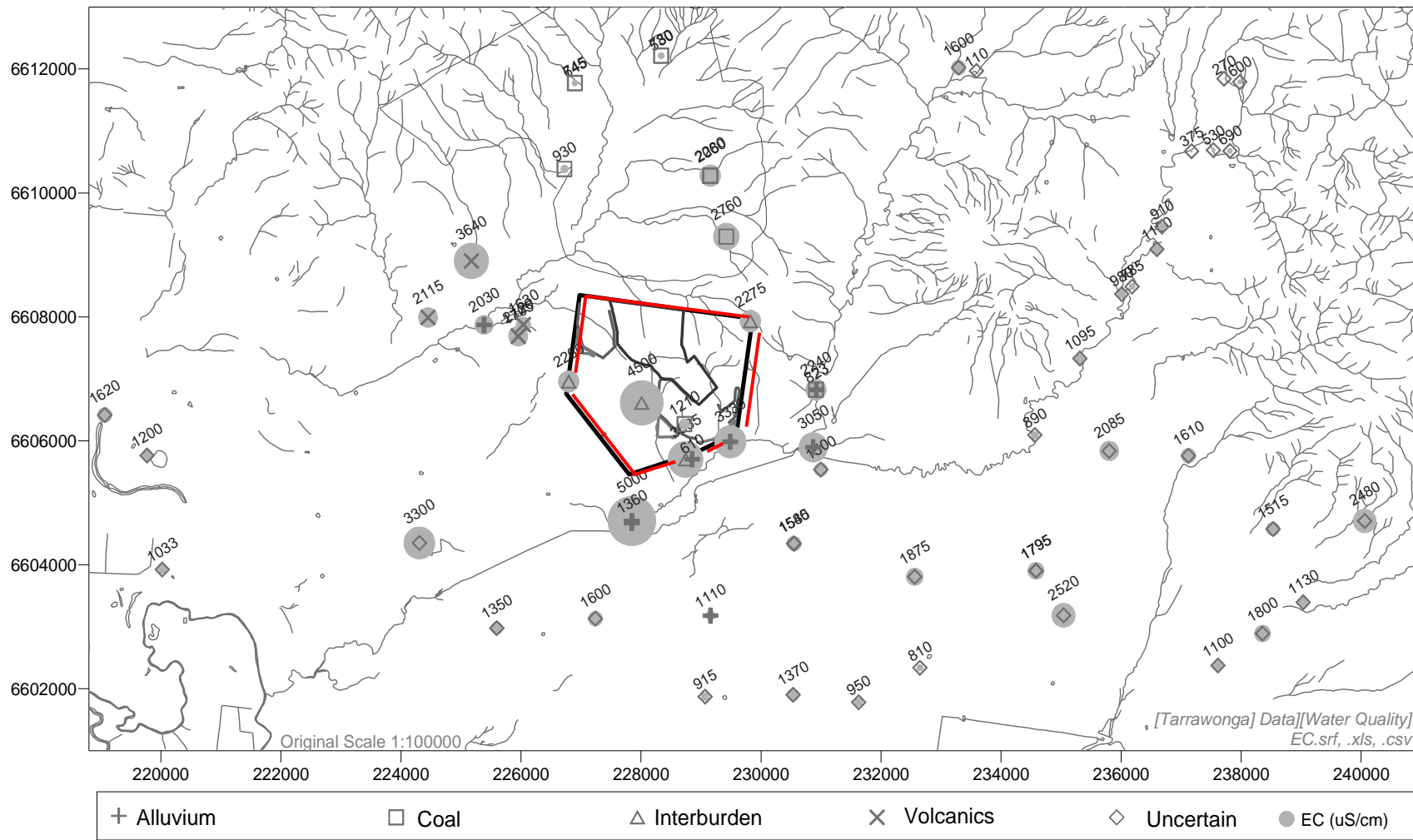


Figure A-24. Groundwater Electrical Conductivity (Median and Spot Values) [μS/cm]

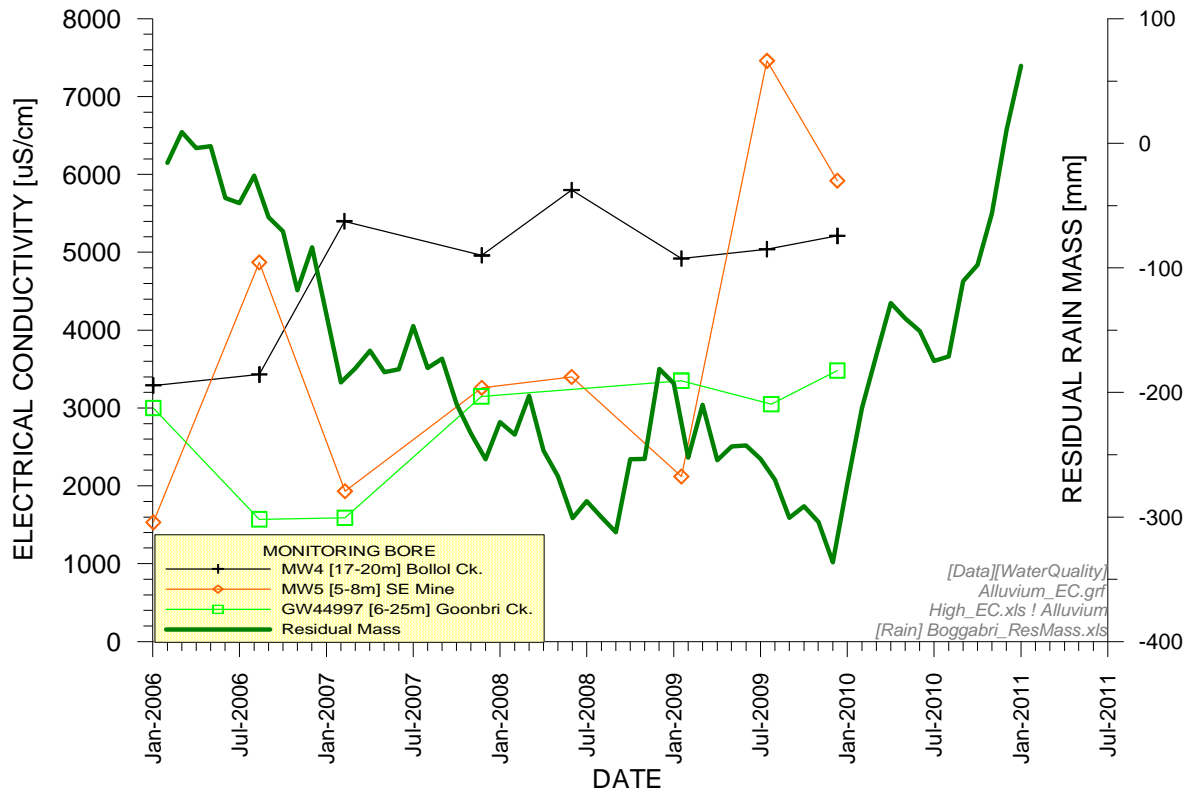


Figure A-25. Graphs of High Electrical Conductivity for Bores Screened in Alluvium

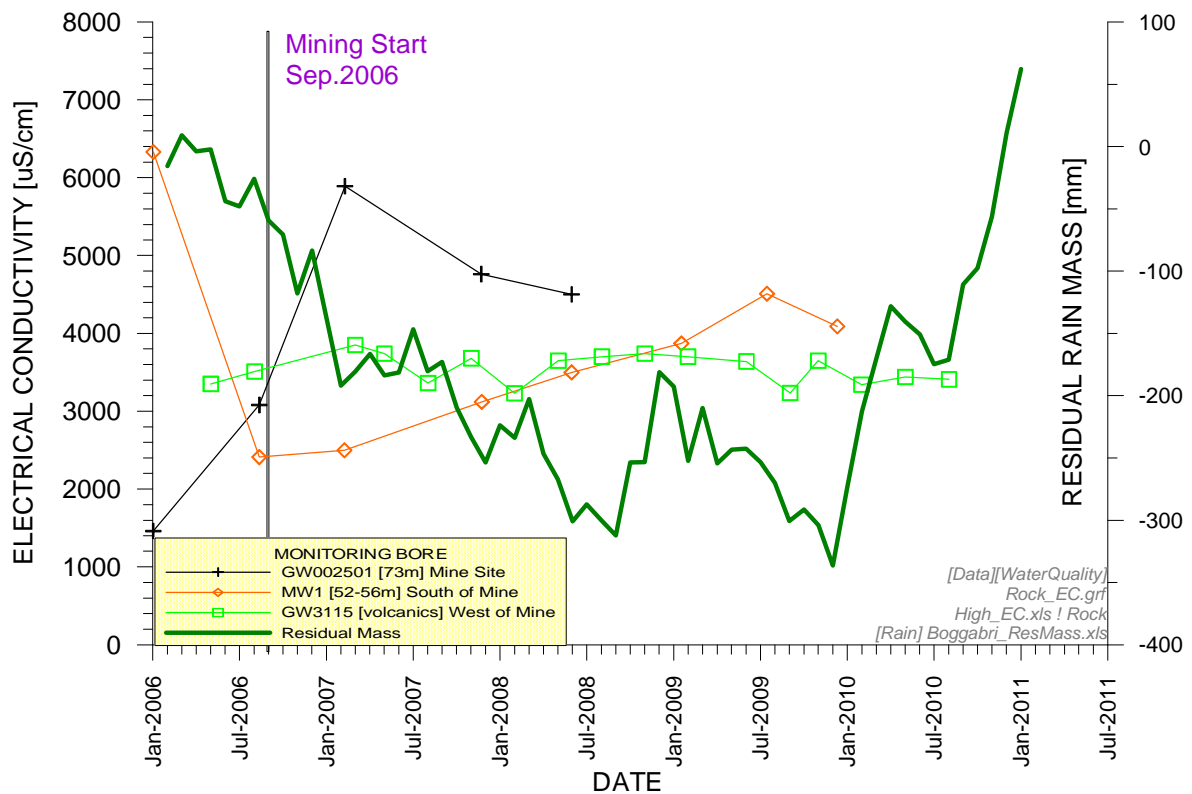
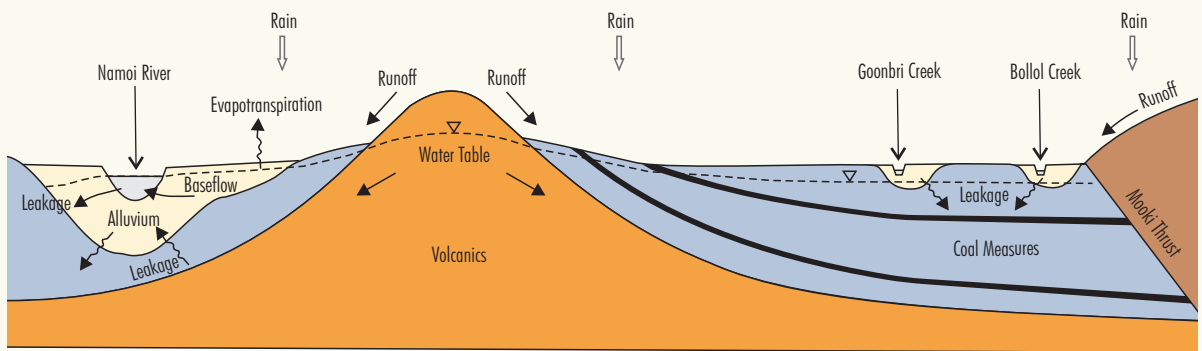
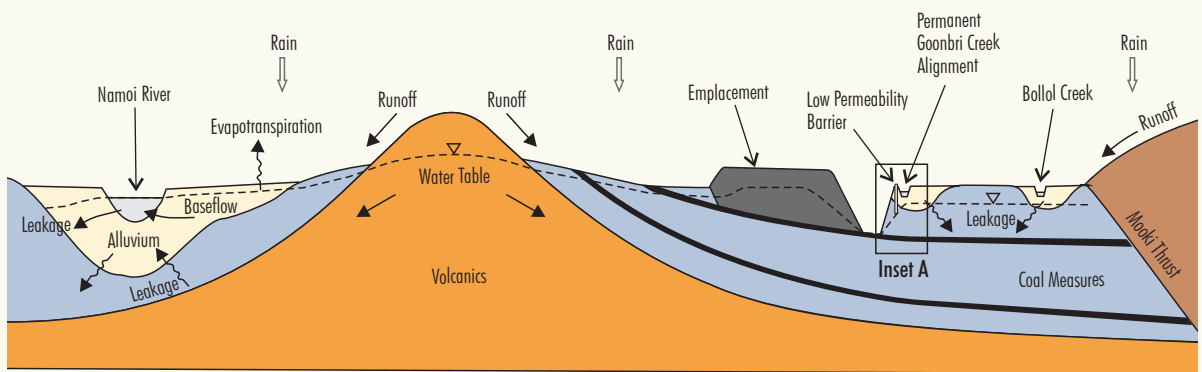


Figure A-26. Graphs of High Electrical Conductivity for Bores Screened in Interburden and Volcanics



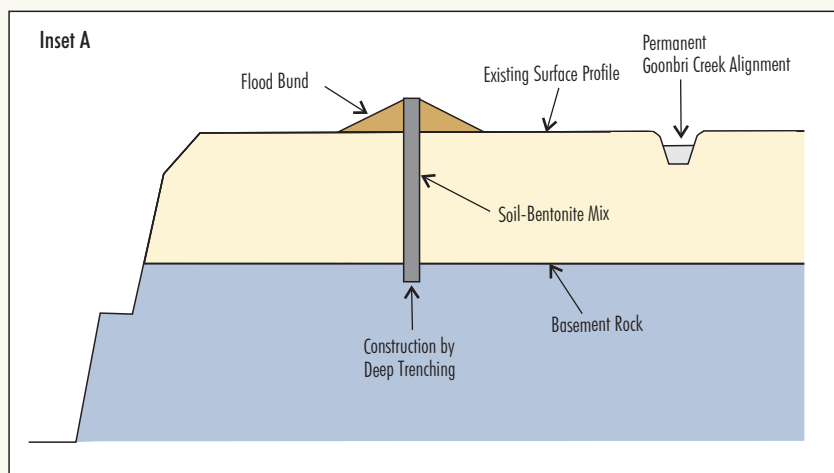


Conceptual Model Prior to Mining



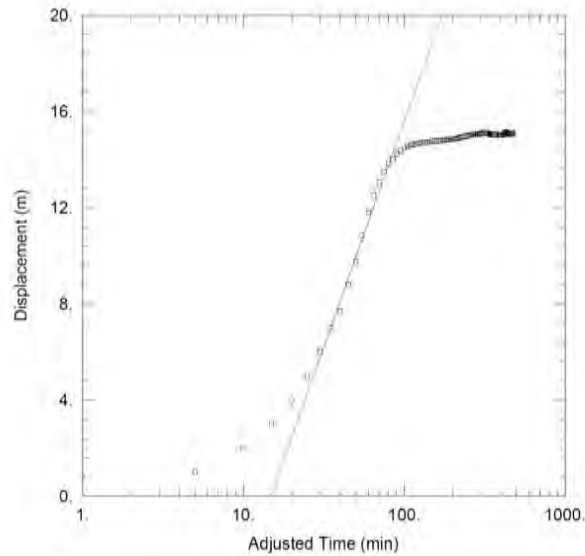
Conceptual Model Towards the End of Mining

- LEGEND
- Alluvium - Undifferentiated Sediments
  - Maules Creek Formation
  - Boggabri Volcanics
  - Rocky Creek Conglomerate

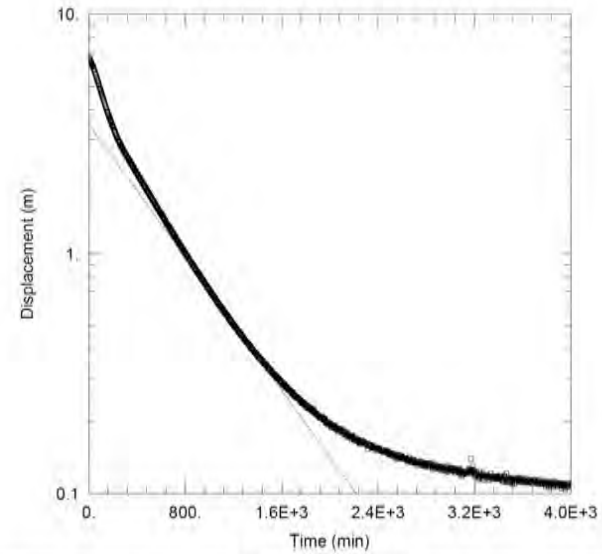


Low Permeability Barrier (Allan Watson Associates, 2011)



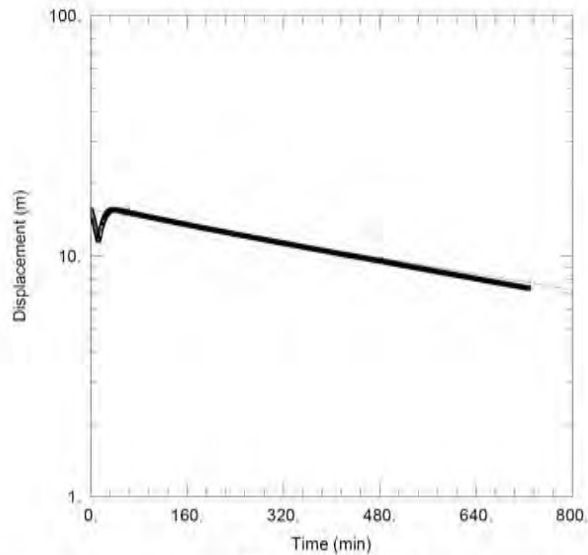


| WELL TEST ANALYSIS              |       |                |                               |       |       |
|---------------------------------|-------|----------------|-------------------------------|-------|-------|
| Data Set: J:\Tarra\TAWB14ok.aqt |       | Time: 14:39:29 |                               |       |       |
| Date: 08/30/11                  |       |                |                               |       |       |
| PROJECT INFORMATION             |       |                |                               |       |       |
| Company: TAWB14                 |       |                |                               |       |       |
| Client: Whitehaven              |       |                |                               |       |       |
| Project: S119                   |       |                |                               |       |       |
| Location: Tarawonga             |       |                |                               |       |       |
| Test Well: TAWB14DDd            |       |                |                               |       |       |
| AQUIFER DATA                    |       |                |                               |       |       |
| Saturated Thickness: 3. m       |       |                | Anisotropy Ratio (Kz/Kr): 1.  |       |       |
| WELL DATA                       |       |                |                               |       |       |
| Pumping Wells                   |       |                | Observation Wells             |       |       |
| Well Name                       | X (m) | Y (m)          | Well Name                     | X (m) | Y (m) |
| New Well                        | 0     | 0              | New Well                      | 0     | 0     |
| SOLUTION                        |       |                |                               |       |       |
| Aquifer Model: Confined         |       |                | Solution Method: Cooper-Jacob |       |       |
| T = 0.1351 m <sup>2</sup> /day  |       |                | S = 0.554                     |       |       |

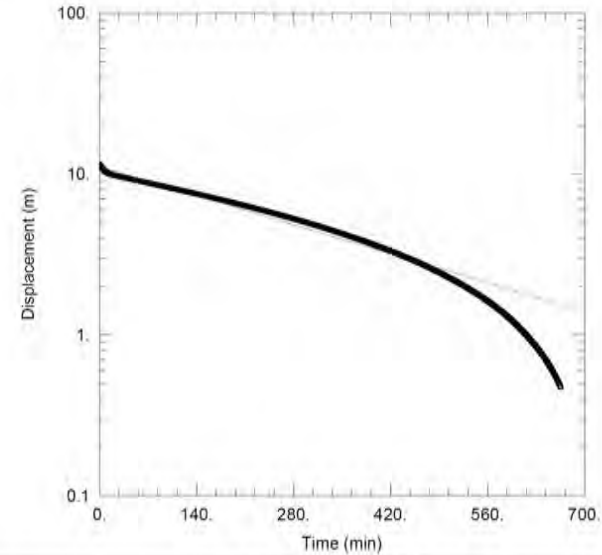


| WELL TEST ANALYSIS                  |                                   |
|-------------------------------------|-----------------------------------|
| Data Set: J:\Tarra\TAWB16.aqt       | Time: 14:36:28                    |
| Date: 08/30/11                      |                                   |
| PROJECT INFORMATION                 |                                   |
| Client: Whitehaven                  |                                   |
| Project: S119                       |                                   |
| Location: Tarawonga                 |                                   |
| Test Well: TAWB16                   |                                   |
| AQUIFER DATA                        |                                   |
| Saturated Thickness: 24. m          | Anisotropy Ratio (Kz/Kr): 0.5     |
| WELL DATA (New Well)                |                                   |
| Initial Displacement: 23. m         | Static Water Column Height: 24. m |
| Total Well Penetration Depth: 26. m | Screen Length: 18. m              |
| Casing Radius: 0.065 m              | Well Radius: 0.065 m              |
|                                     | Gravel Pack Porosity: 0.          |
| SOLUTION                            |                                   |
| Aquifer Model: Confined             | Solution Method: Hvorslev         |
| K = 0.001789 m/day                  | y0 = 3.488 m                      |

FIGURE A-28 Groundwater Investigation – Pumping Test [TAWB14] and Rising Head Test [TAWB16] Results (Source: RPS Aquaterra, 2011)



| WELL TEST ANALYSIS                        |                                   |
|---|-----------------------------------|
| Data Set: J:\Tarra\TA60(86.5 - 89.5m).aqt | Time: 14:42:02                    |
| Date: 08/30/11                            |                                   |
| PROJECT INFORMATION                       |                                   |
| Client: Whitehaven                        |                                   |
| Project: S119                             |                                   |
| Location: Tarrawonga                      |                                   |
| Test Well: TA60C 86.5 - 89.5              |                                   |
| AQUIFER DATA                              |                                   |
| Saturated Thickness: 20. m                | Anisotropy Ratio (Kz/Kr): 0.5     |
| WELL DATA (New Well)                      |                                   |
| Initial Displacement: 15.5 m              | Static Water Column Height: 20. m |
| Total Well Penetration Depth: 89.5 m      | Screen Length: 3. m               |
| Casing Radius: 0.065 m                    | Well Radius: 0.065 m              |
|   | Gravel Pack Porosity: 0.          |
| SOLUTION                                  |                                   |
| Aquifer Model: Confined                   | Solution Method: Bouwer-Rice      |
| K = 0.005043 m/day                        | y0 = 15.65 m                      |



| WELL TEST ANALYSIS                          |                                   |
|---|-----------------------------------|
| Data Set: J:\Tarra\TA60(116.5 - 119.5m).aqt | Time: 16:12:09                    |
| Date: 08/30/11                              |                                   |
| PROJECT INFORMATION                         |                                   |
| Client: Whitehaven                          |                                   |
| Project: S119                               |                                   |
| Location: Tarrawonga                        |                                   |
| Test Well: TA60C 116.5 - 119.5              |                                   |
| AQUIFER DATA                                |                                   |
| Saturated Thickness: 55. m                  | Anisotropy Ratio (Kz/Kr): 0.5     |
| WELL DATA (New Well)                        |                                   |
| Initial Displacement: 11.5 m                | Static Water Column Height: 55. m |
| Total Well Penetration Depth: 119.5 m       | Screen Length: 3. m               |
| Casing Radius: 0.025 m                      | Well Radius: 0.025 m              |
|   | Gravel Pack Porosity: 0.          |
| SOLUTION                                    |                                   |
| Aquifer Model: Confined                     | Solution Method: Hvorslev         |
| K = 0.002586 m/day                          | y0 = 11.08 m                      |

FIGURE A-29 Groundwater Investigation – Slug Test Results [TA60C] (Source: RPS Aquaterra, 2011)

| INDICATIVE THICKNESS (m) | LAYER |  |
|--------------------------|-------|--|
| 30                       | 1     |  |
| 70                       | 2     |  |
| 15                       | 3     |  |
| 20                       | 4     |  |
| 10                       | 5     |  |
| 15                       | 6     |  |
| 5                        | 7     |  |
| 2                        | 8     |  |
| 35                       | 9     |  |
| 90                       | 10    |  |
| 70                       | 11    |  |
| 50                       | 12    |  |

### LITHOLOGY

|                                 |
|---------------------------------|
| Alluvium or Regolith            |
| Alluvium or Overburden          |
| Overburden                      |
| Braymont Seam to Jeralong Seam  |
| Interburden                     |
| Merriown Seam to Velyama Seam   |
| Interburden                     |
| Nagero Upper Seam               |
| Interburden                     |
| Northam Seam to Templemore Seam |
| Underburden                     |
| Volcanics                       |

**Note:** In the model, seam layers are reduced in thickness to the aggregate thickness of contained coal seams. The surplus layer thickness is allocated to the overlying interburden.

 Targeted Coal Seams for the Project

Source: TCPL (2011); Whitehaven Coal Mining Pty Ltd (2011); Idemitsu Boggabri Coal Limited (2011); Aston Resources (2011) and NSW office of Water (2010)



TARRAWONGA COAL PROJECT

**FIGURE A-30**  
Numerical Model Layers





Figure A-31. Model Grid with Geological Boundaries and Layer 1 Monitoring Bore Locations [cell dimensions 50-500m]

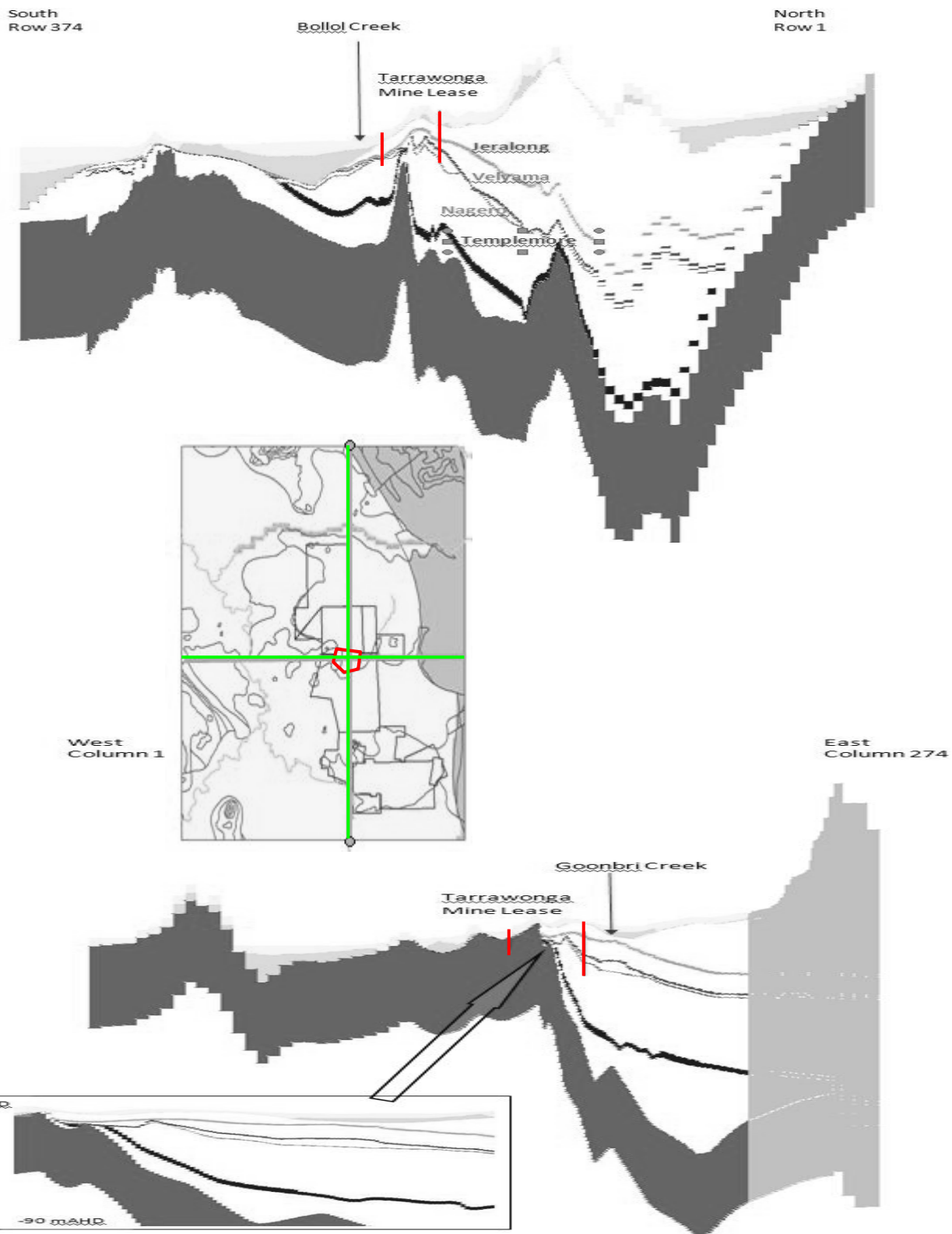


Figure A-32. Representative Model Cross-sections through Tarrawonga Coal Mine at Easting 228425 and Northing 6606725

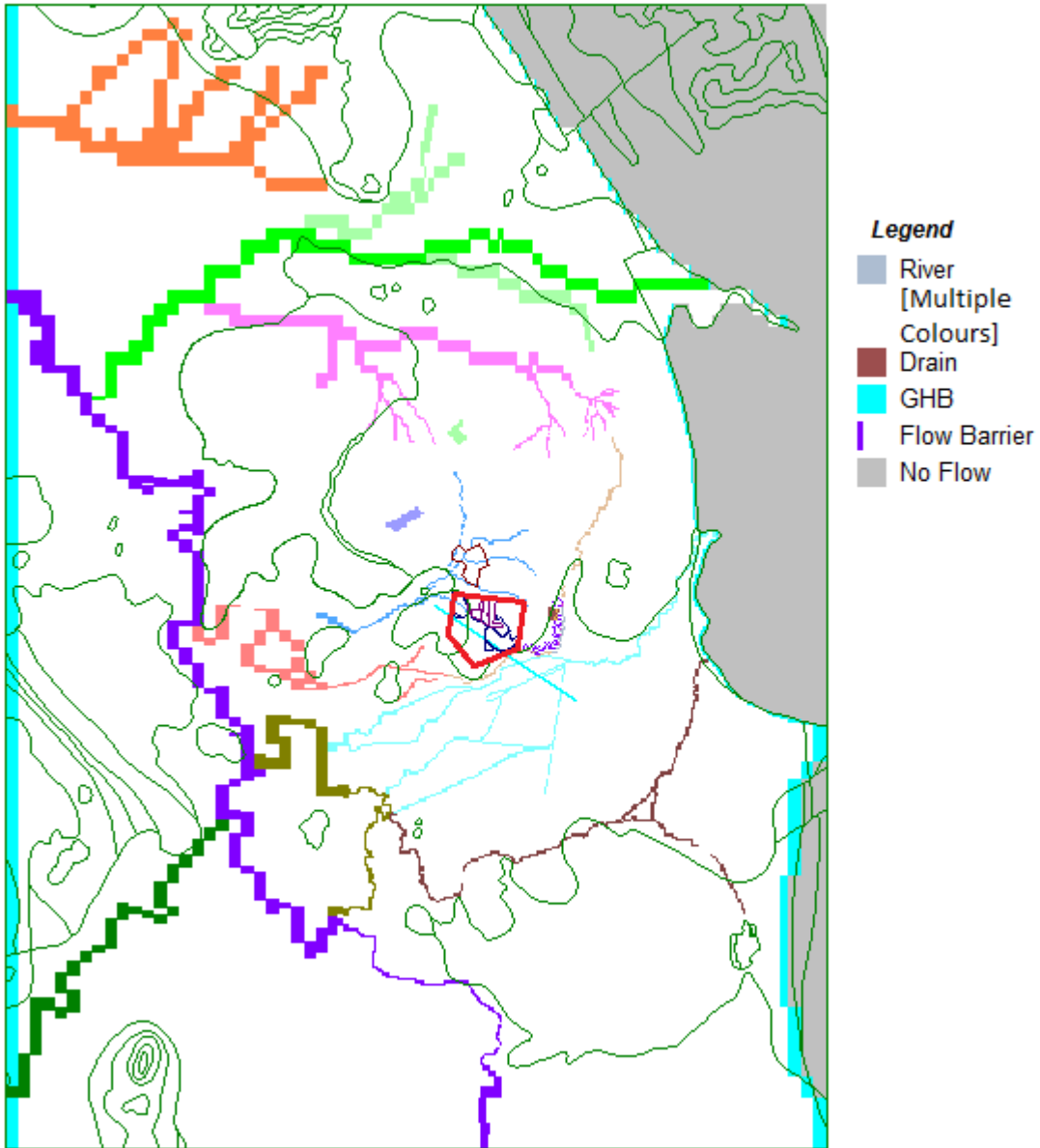


Figure A-33. Model Boundary Conditions

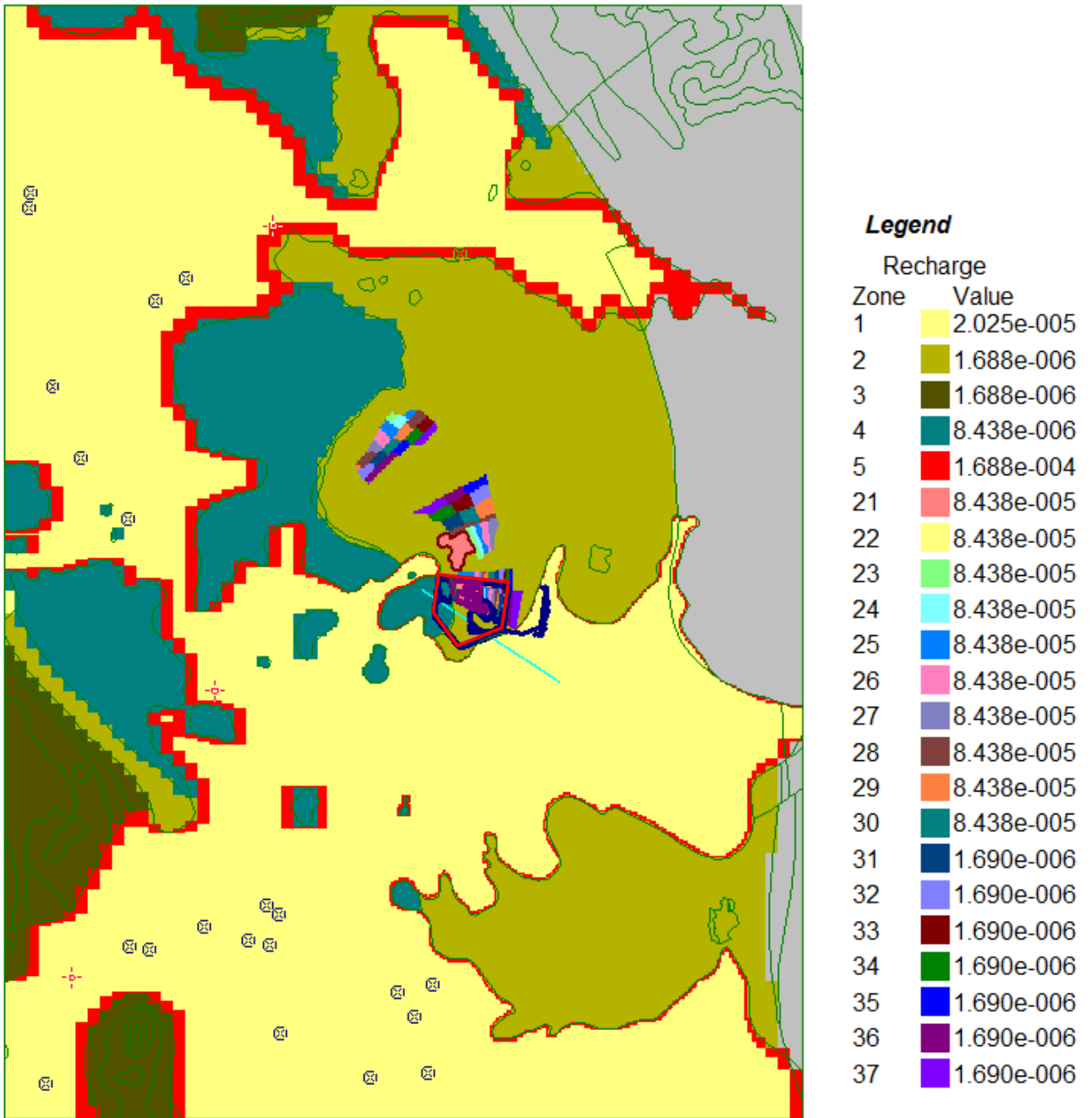


Figure A-34. Rainfall Infiltration Rates [m/day]





Figure A-35. Simulated Pit Inflow During 2006-2010 for Tarrawonga and Boggabri Coal Mines [ML/day]

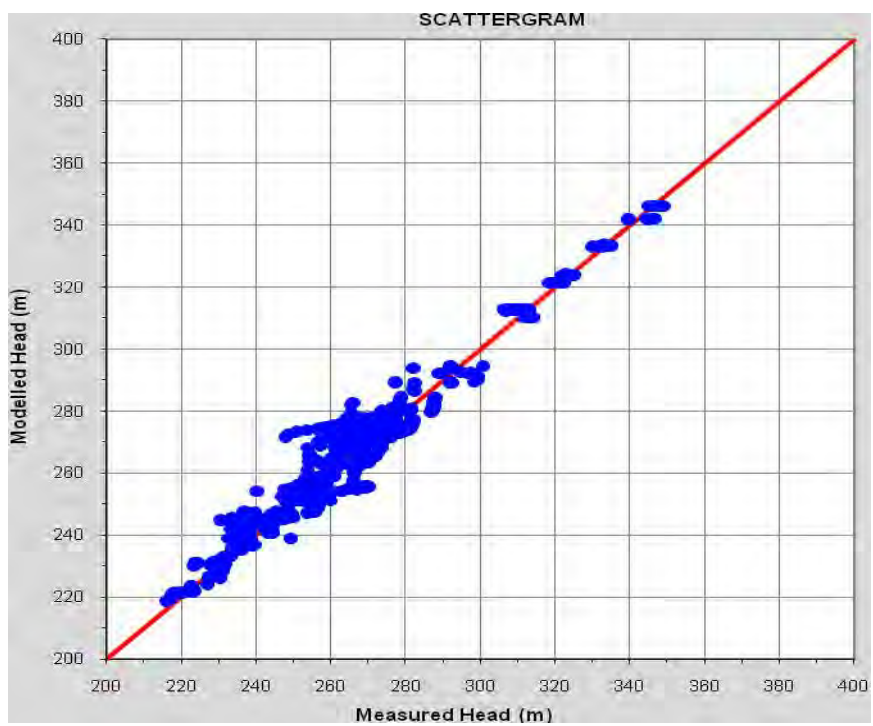


Figure A-36. Scattergram of Simulated and Measured Heads for Transient Calibration

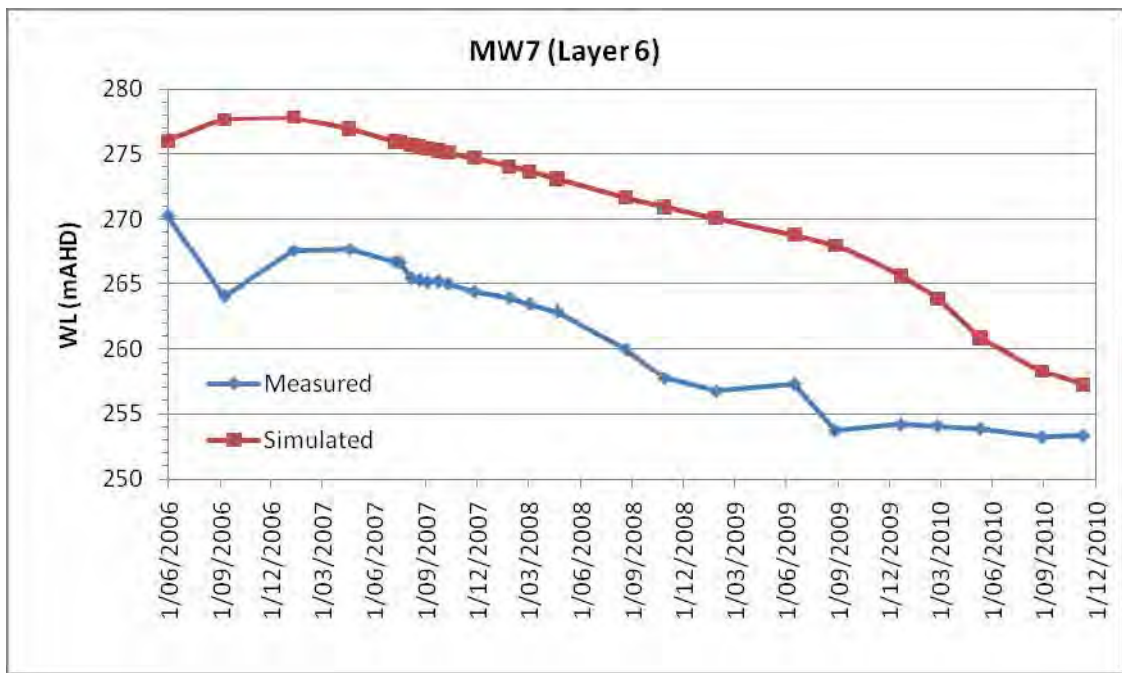
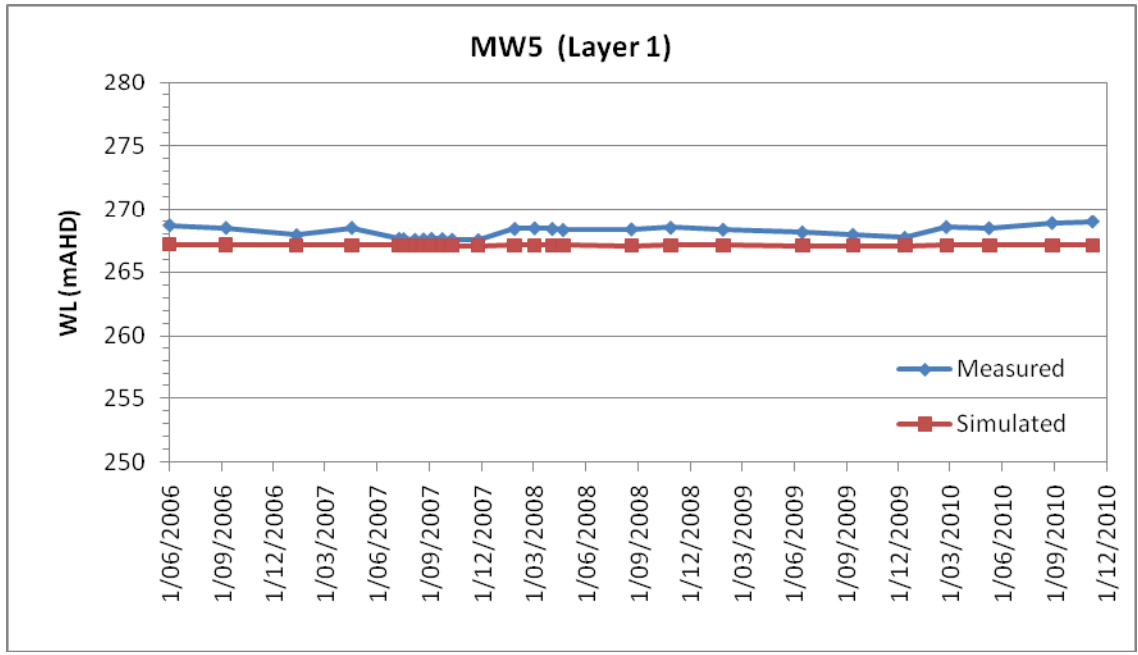


Figure A-37. Representative Simulated and Measured Hydrographs at Bores in the Tarrawonga Coal Mine Monitoring Network [MW5 and MW7]

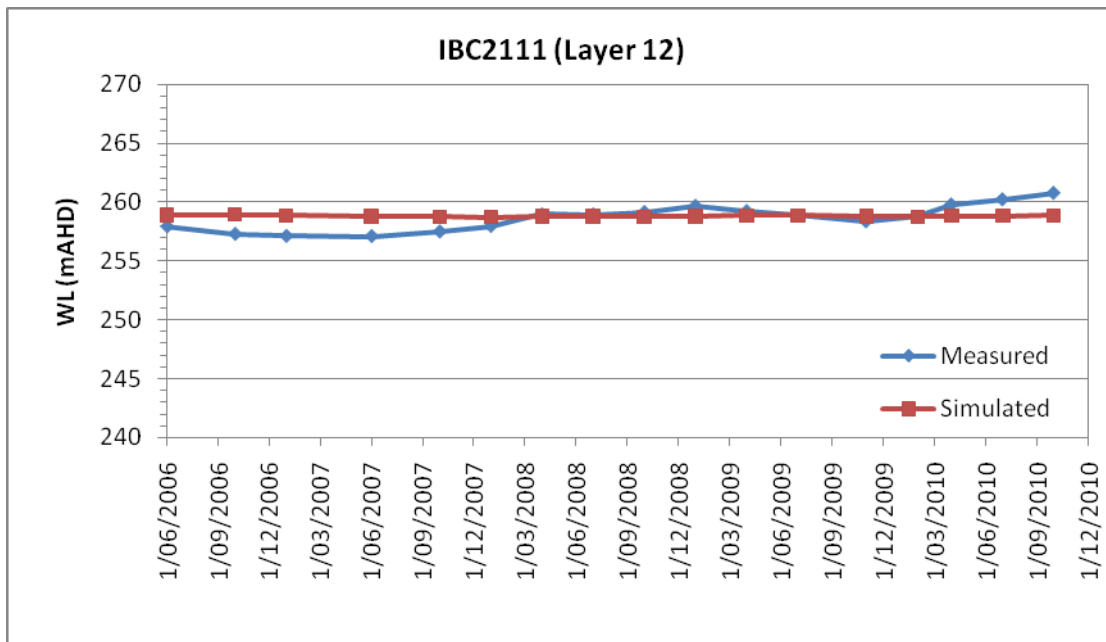
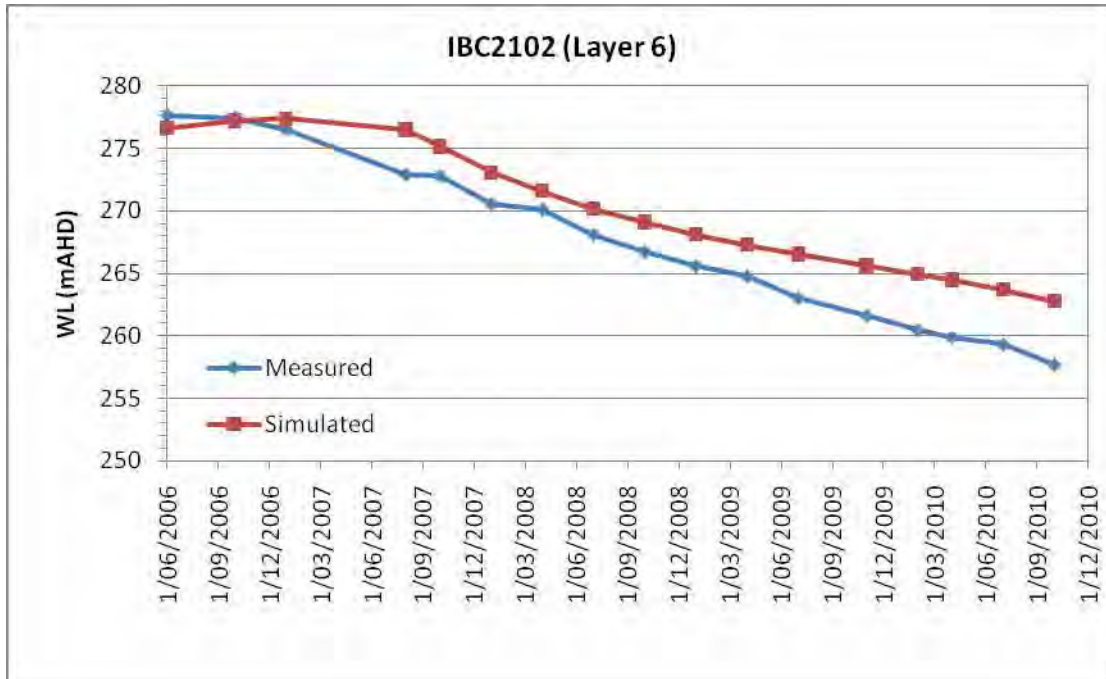


Figure A-38. Representative Simulated and Measured Hydrographs at Bores in the Boggabri Coal Mine Monitoring Network [IBC2102 and IBC2111]

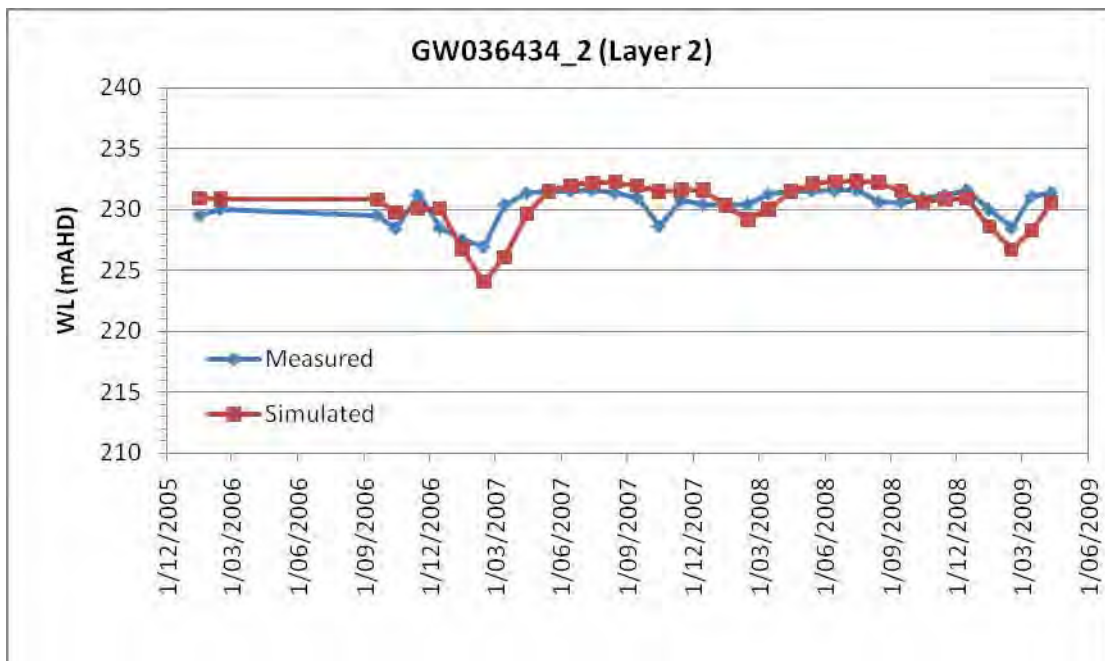
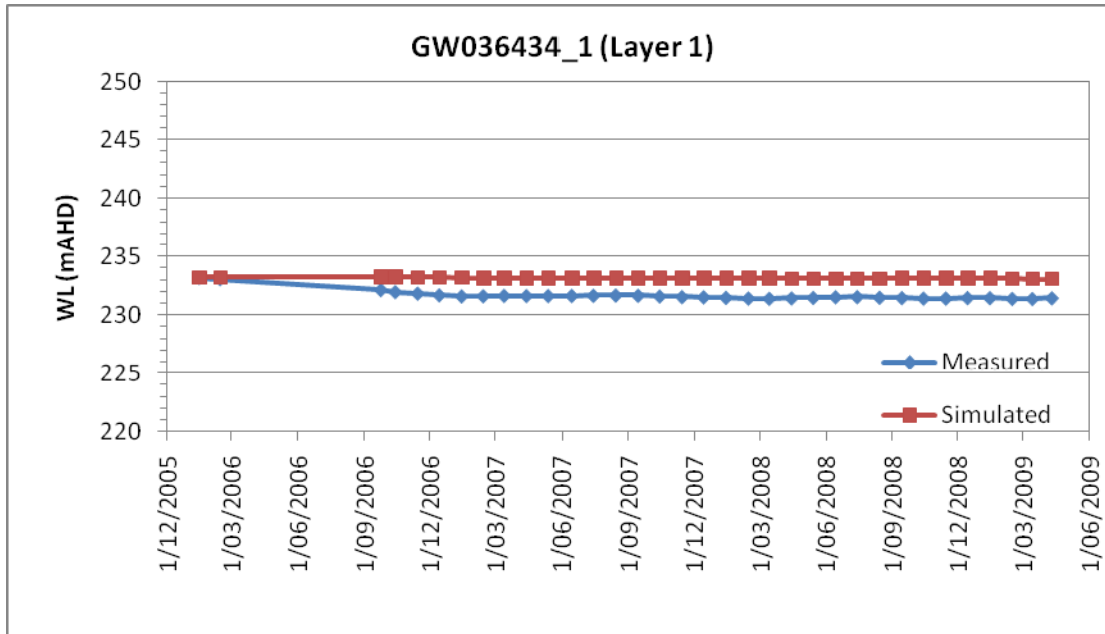


Figure A-39. Representative Simulated and Measured Hydrographs at Bores in the NSW Office of Water Monitoring Network [GW036434\_1 and GW036434\_2]

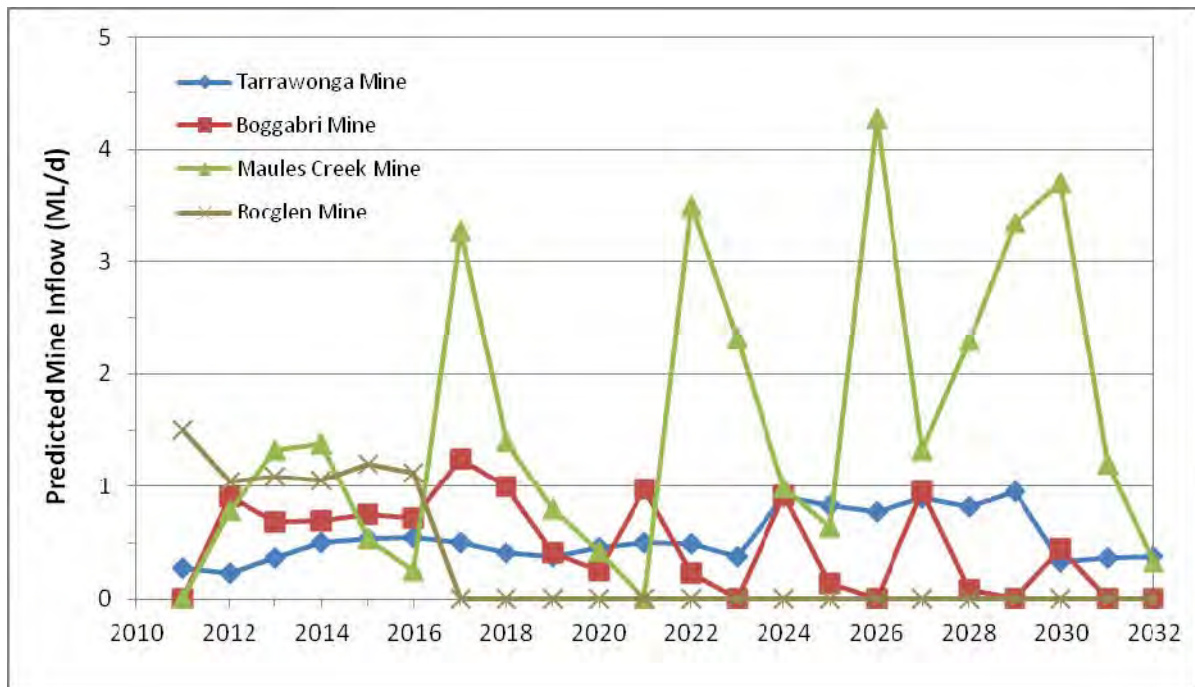


Figure A-40. Simulated Pit Inflow at All Mines from 2011 to 2032 [ML/day]

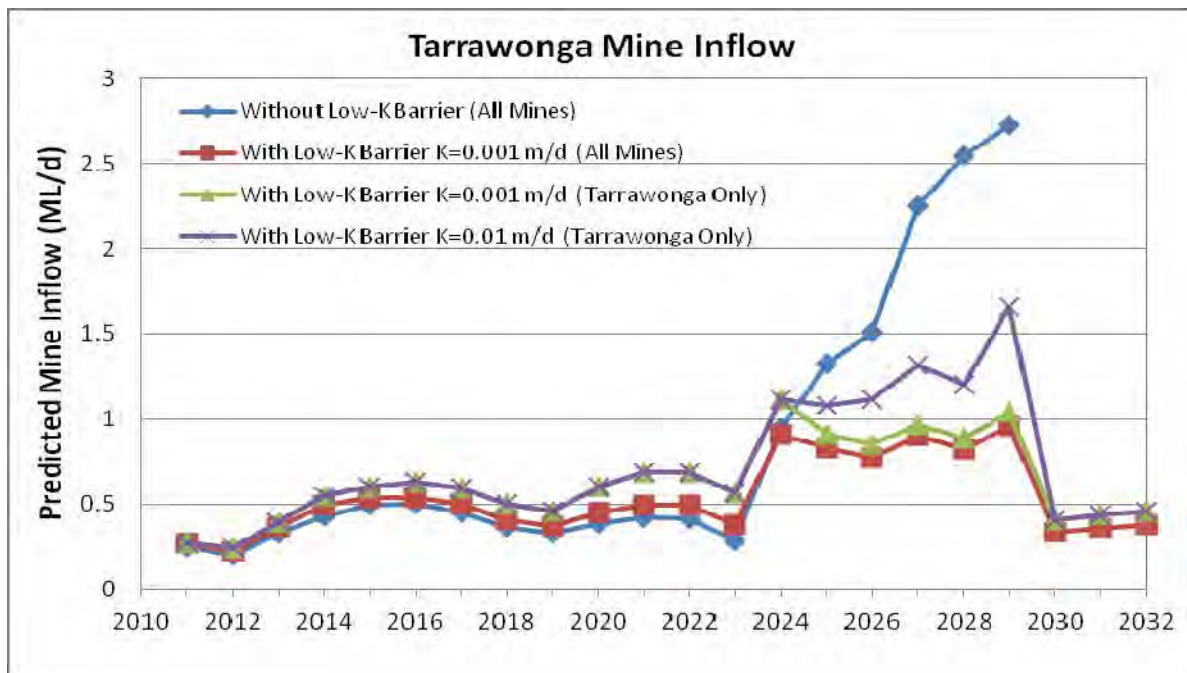


Figure A-41. Sensitivity Analysis for Simulated Pit Inflow from 2011 to 2032 [ML/day]

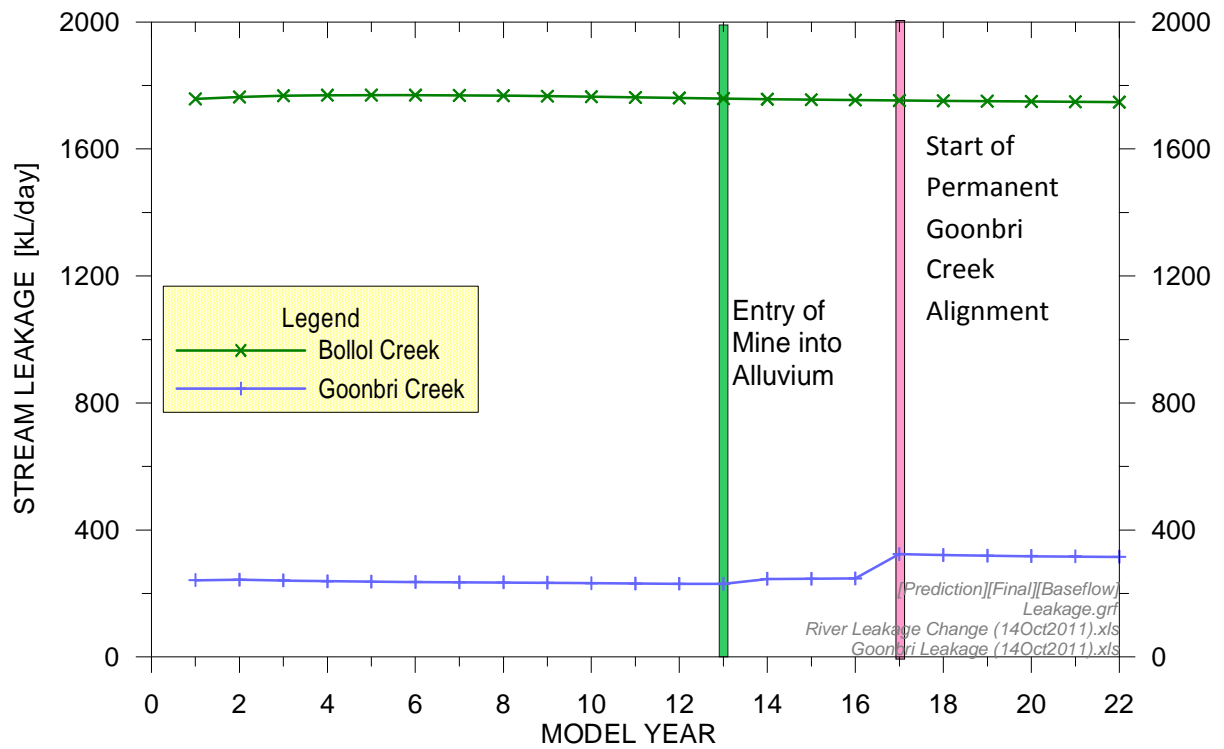


Figure A-42. Simulated Stream Leakage at Goonbri Creek and Bollol Creek [kL/day]

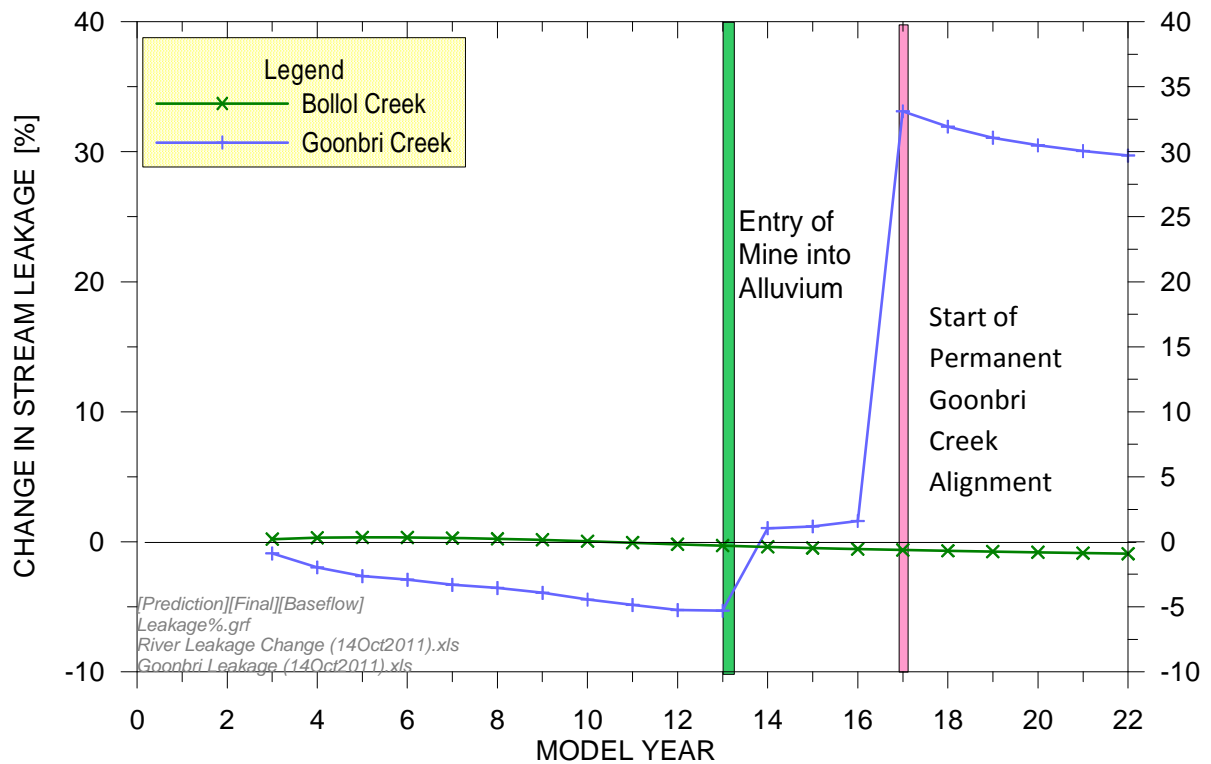
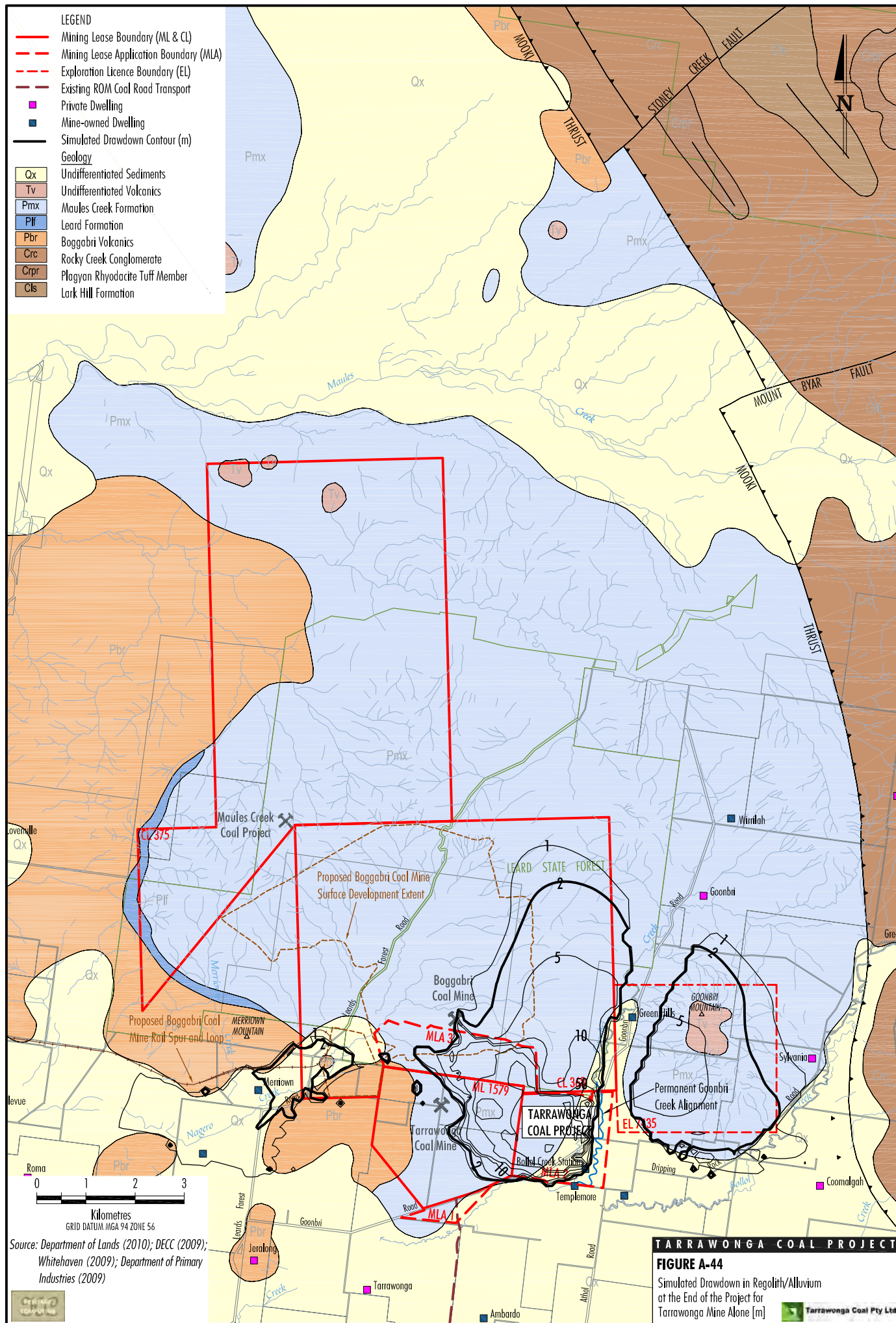
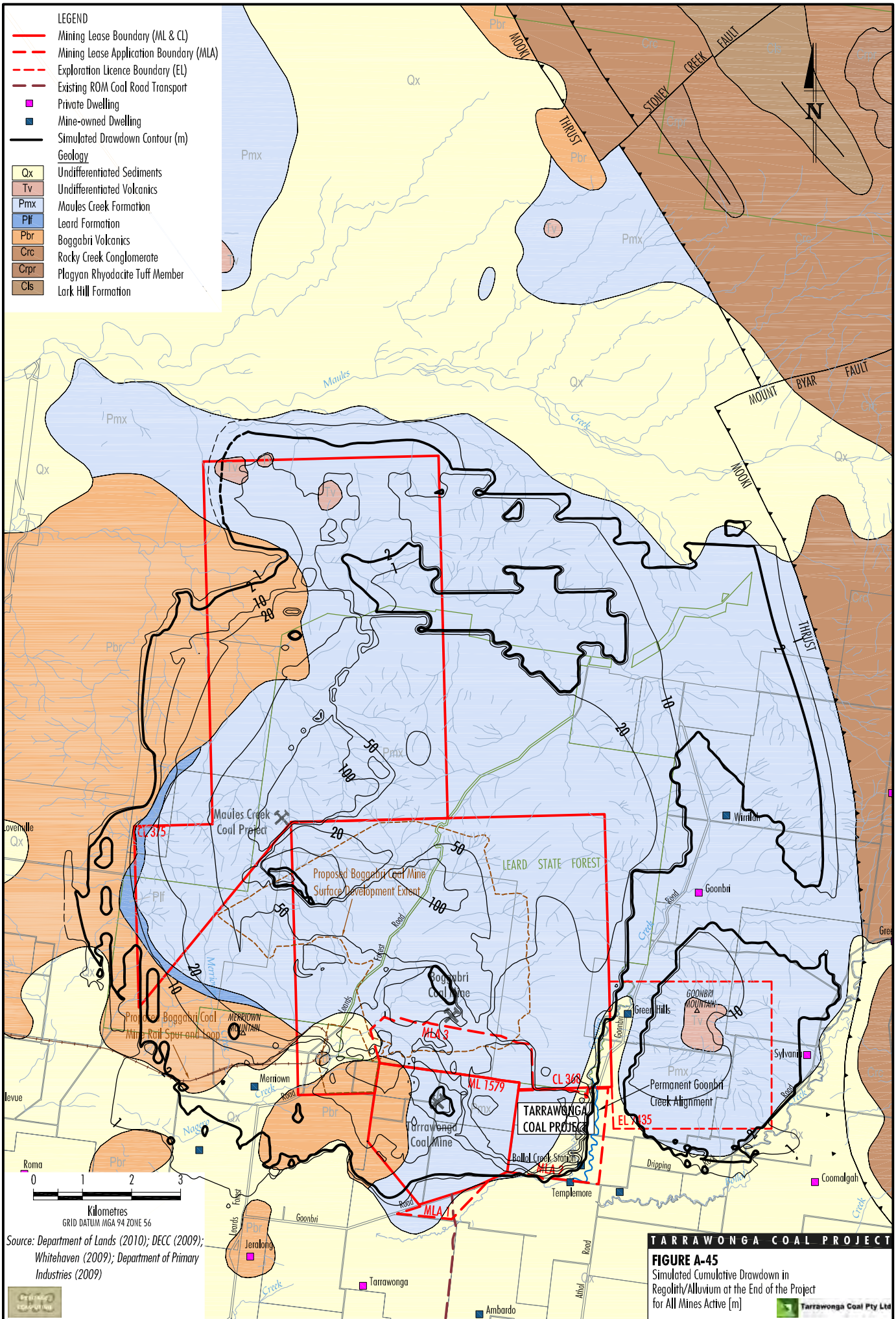


Figure A-43. Simulated Stream Leakage at Goonbri Creek and Bollol Creek [kL/day] from Commencement of the Project (in Model Year 3)



**TARRAWONGA COAL PROJECT**  
**FIGURE A-44**  
 Simulated Drawdown in Regolith/Alluvium at the End of the Project for Tarrawonga Mine Alone [m]

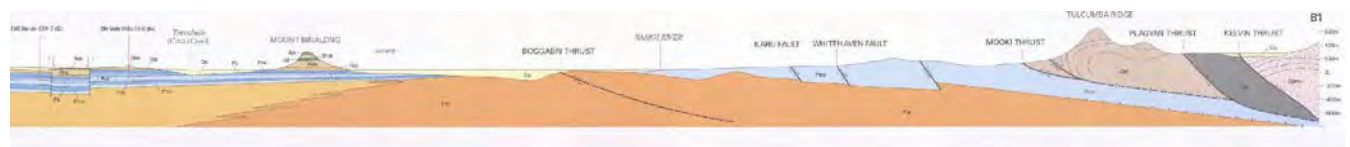
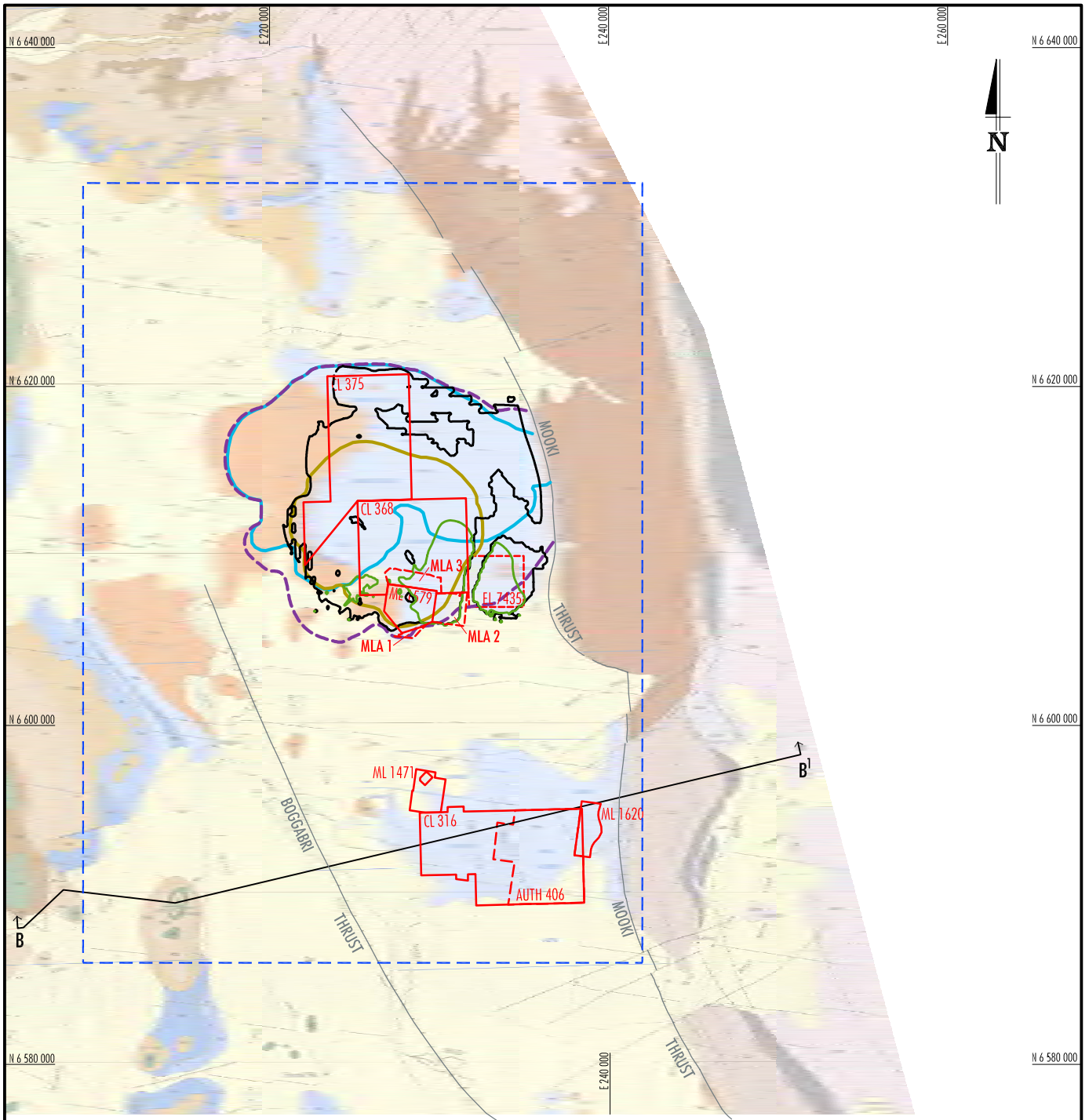
Source: Department of Lands (2010); DECC (2009); Whitehaven (2009); Department of Primary Industries (2009)



- LEGEND**
- Mining Lease Boundary (ML & CL)
  - Mining Lease Application Boundary (MLA)
  - Exploration Licence Boundary (EL)
  - Existing ROM Coal Road Transport
  - Private Dwelling
  - Mine-owned Dwelling
  - Simulated Drawdown Contour (m)
- Geology**
- Qx Undifferentiated Sediments
  - Tv Undifferentiated Volcanics
  - Pmx Maules Creek Formation
  - Pif Leard Formation
  - Pbr Boggabri Volcanics
  - Crc Rocky Creek Conglomerate
  - Cpr Plogyan Rhyodacite Tuff Member
  - Cls Lark Hill Formation

**TARRAWONGA COAL PROJECT**  
**FIGURE A-45**  
 Simulated Cumulative Drawdown in Regolith/Alluvium at the End of the Project for All Mines Active [m]  
 Tarrawonga Coal Pty Ltd





**SECTION B-B<sup>1</sup>**

- LEGEND**
- Mining and Exploration Tenements
  - Approximate Model Extent
- DRAWDOWN CONTOURS**
- Boggabri (alone) [1m] \*
  - Maules Creek (alone) [1m] #
  - Maules Creek (cumulative - including Boggabri and Tarrawonga [existing]) [1m] #
  - Tarrawonga (alone) [2m]
  - Tarrawonga (cumulative - including Boggabri and Maules Creek) [2m]

\* Source: AGE (2010) Drawing No. 17

# Source: AGE (2011) Drawing No. 20



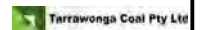
Kilometres  
GRID DATUM: MGA 94 ZONE 56

Source: NSW Department Primary Industries - Gunnedah Coalfield North 100k (2011)

**TARRAWONGA COAL PROJECT**

**FIGURE A-46**

Comparison of Predicted Cumulative Water Table Drawdown Contours [m]



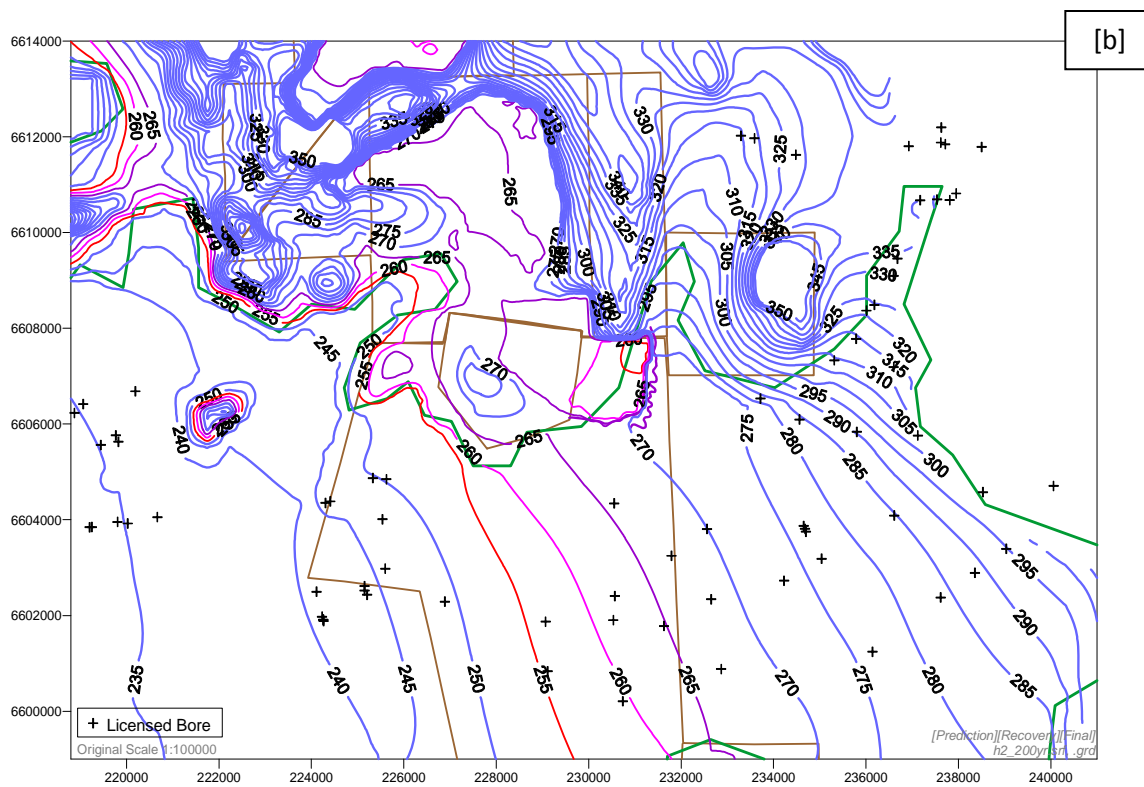
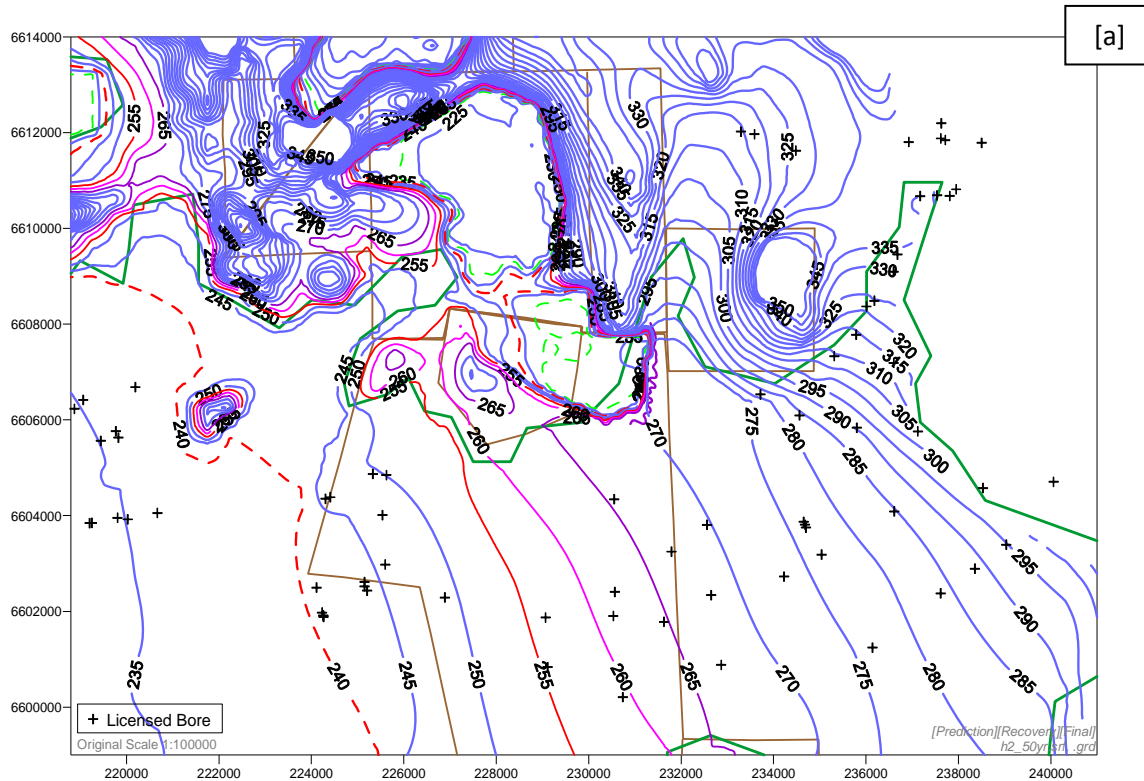


Figure A-47. Predicted Watertable Contours in Spoil, Regolith and Alluvium after Recovery for [a] 50 Years and [b] 200 Years [mAHD]

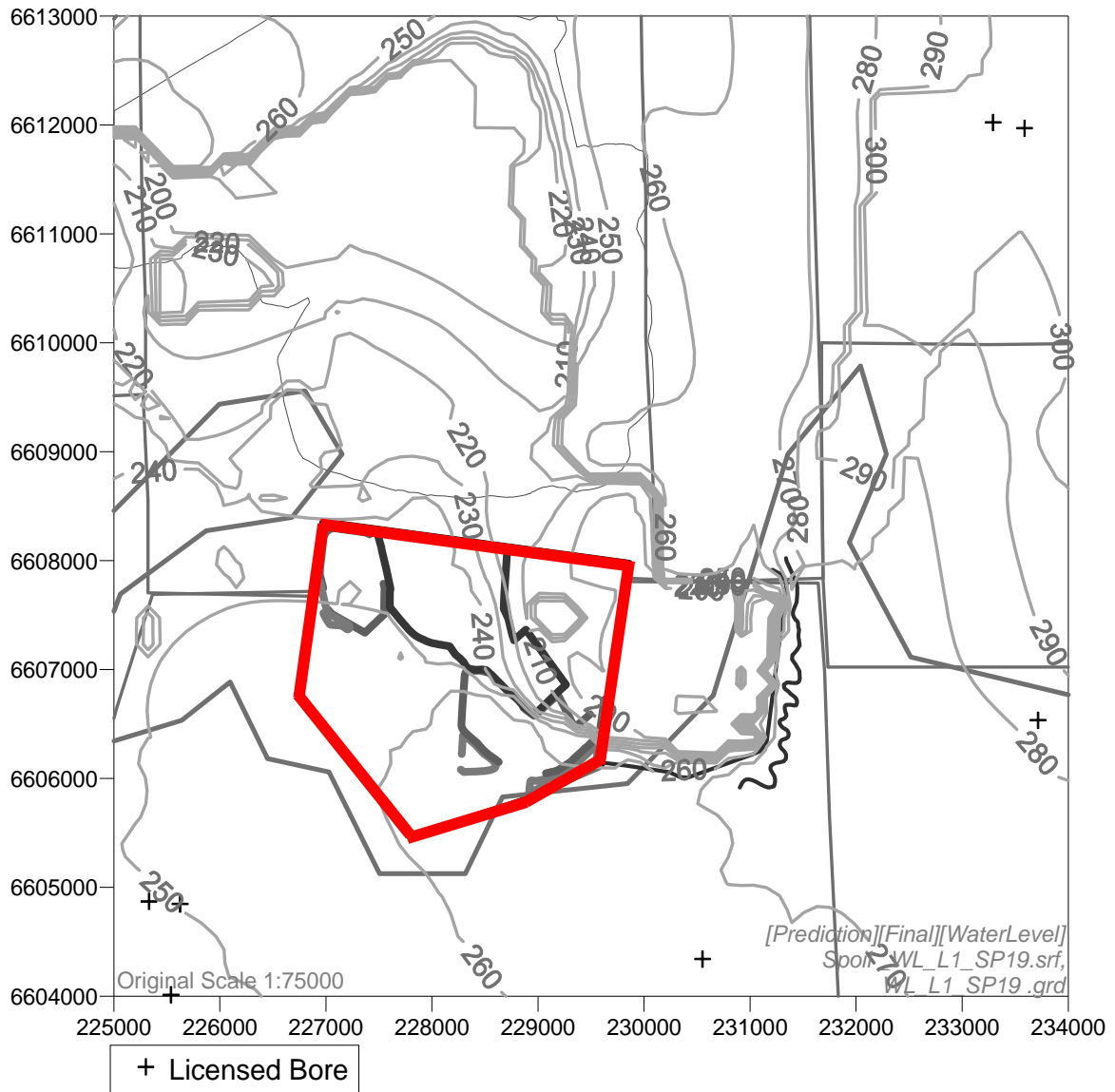
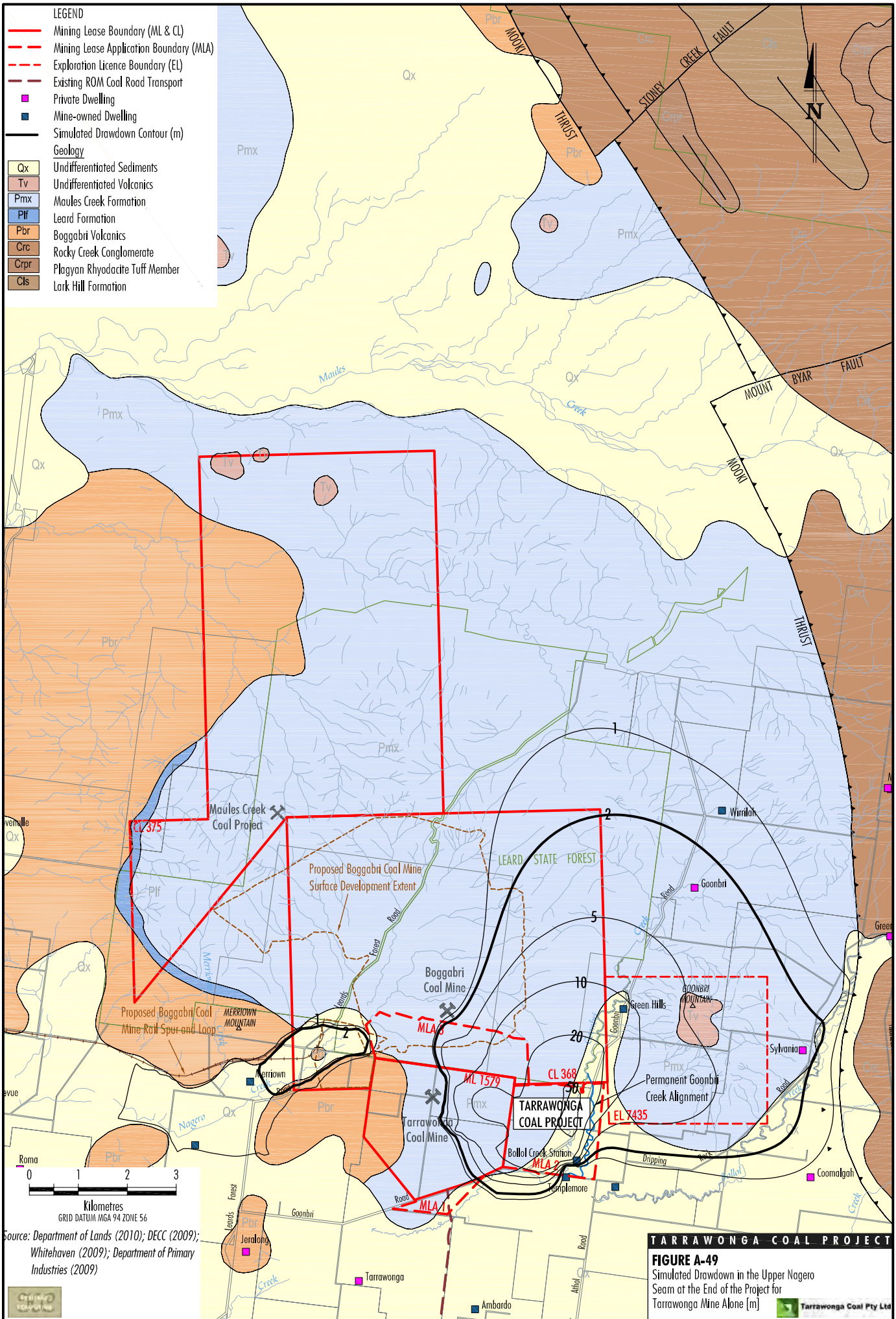
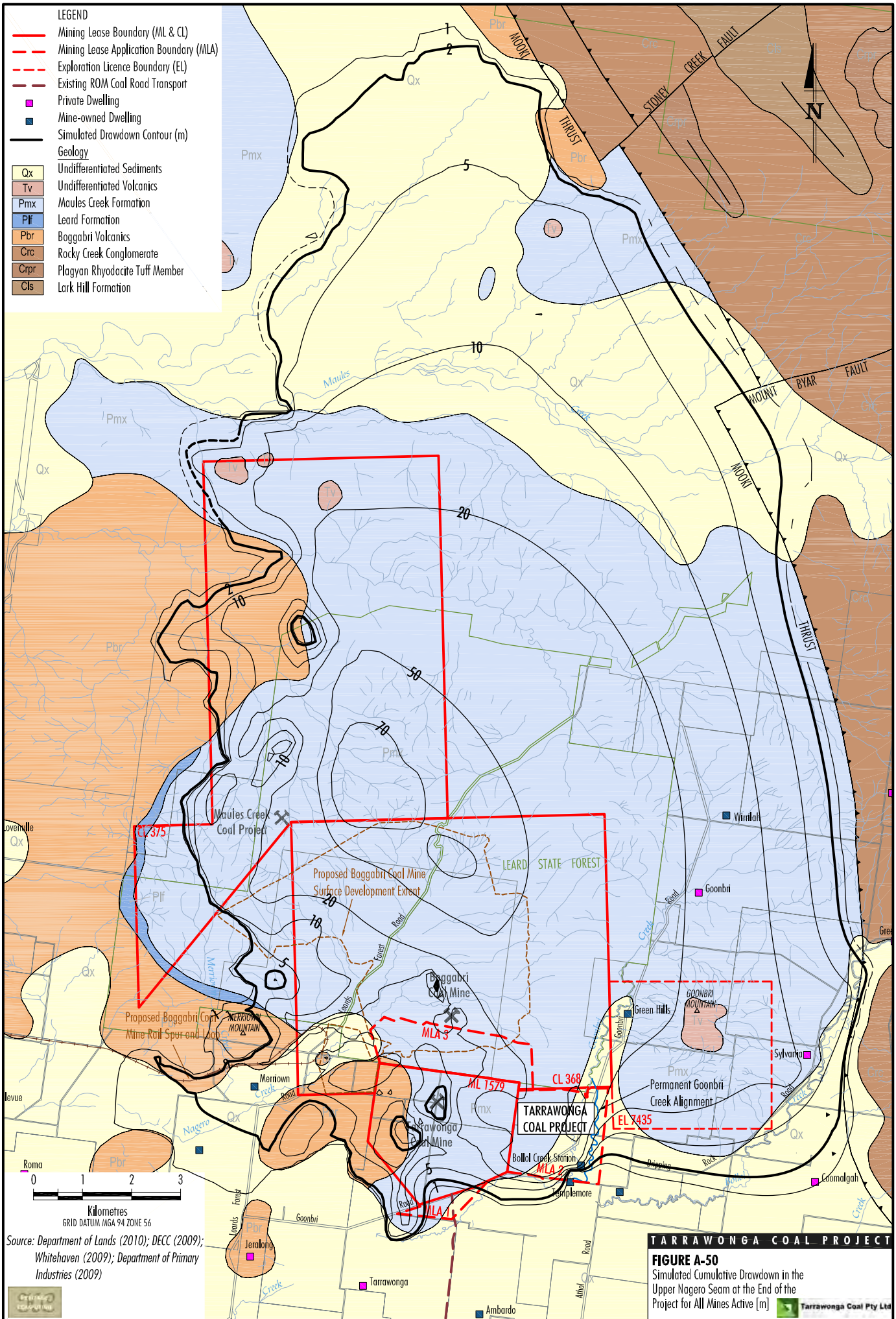


Figure A-48. Predicted Watertable Contours in Spoil, Regolith and Alluvium at the End of Project Mining (Model Year 19) [mAHD]



**TARRAWONGA COAL PROJECT**  
**FIGURE A-49**  
 Simulated Drawdown in the Upper Nagero Seam at the End of the Project for Tarrawonga Mine Alone [m]



**TARRAWONGA COAL PROJECT**  
**FIGURE A-50**  
 Simulated Cumulative Drawdown in the Upper Nagero Seam at the End of the Project for All Mines Active [m]

Source: Department of Lands (2010); DECC (2009); Whitehaven (2009); Department of Primary Industries (2009)

