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8.1 INTRODUCTION

This chapter identifies the existing environmental values of groundwater within the proposed rail corridor. The assessment surmises potential impacts resulting from the rail. Management measures to mitigate potential groundwater impacts are also discussed and highlighted throughout the chapter. A detailed assessment of groundwaters for the rail component is provided in Volume 5, Appendix 14.

8.2 LEGISLATIVE FRAMEWORK

Groundwater in Australia is managed through Groundwater Management Units (GMUs) or "Declared Areas" where groundwater is regulated. GMUs in Queensland are managed under a Water Resource Plan, which is implemented through a corresponding Resource Operations Plan. Areas where groundwater is not regulated are termed "Non-Declared Areas". The GMU indicates that the rail alignment lies within an area where the Queensland Government regulates the construction of bores and taking of water (The GMU extent is shown in Figure 1).

8.2.1 DECLARED GROUNDWATER AREAS FOR RAIL ALIGNMENT

The rail corridor crosses Bowen GMU at KP05, a large undeclared groundwater area from KP05 to KP230 and the Highlands GMU from KP230 to KP468. The position of the declared groundwater areas are shown in

Figure 1 while the DERM registered groundwater bores along the rail alignment are shown in Figure 2 and Figure 3.

Both the Bowen and Highlands GMUs do not specify Water Quality Objectives (WQOs) that need to be met for environmental and other public benefit outcomes. Within the Highlands GMU, an entitlement is required for all extraction purposes other than stock and domestic water use.

Water quality should therefore meet the Environmental Protection Policy (Water) 1997 (EPP Water) requirements. The requirements are based on DERMs QWQG, as these are given precedence over other recognised guidelines. The rail alignment falls within the Central Coast Queensland region of the guidelines. Existing water quality data should be compared with Central Queensland values for upland and lowland streams.

8.3 METHODS OF ASSESSMENT

8.3.1 DESKTOP REVIEW

The desktop component included a literature review and searches of relevant Commonwealth, State and Local databases. Specific information sourced and utilised included:

- historical groundwater bore records sourced from DERM;
- digital searches for GIS groundwater data sourced from DERM;
- review of relevant Commonwealth, Queensland, and Local Guidelines and Standards including the Council of Standards- Australian and New Zealand Standards, Water Quality – Sampling, Part 11: Guidance on Sampling of Groundwater (1997) and Queensland Water Quality Guidelines (DERM 2009); and
- published and grey literature including publications sourced from Great Artesian Basin Coordinating Committee (GABCC).

A summary of existing groundwater data within the rail corridor was prepared by SKM (2009). A review of additional field data collected by E3 and discussions with the DERM hydrogeologists were added to the background data review to produce a conceptual model of groundwater along the rail alignment.

Figure 1. Declared Groundwater Areas

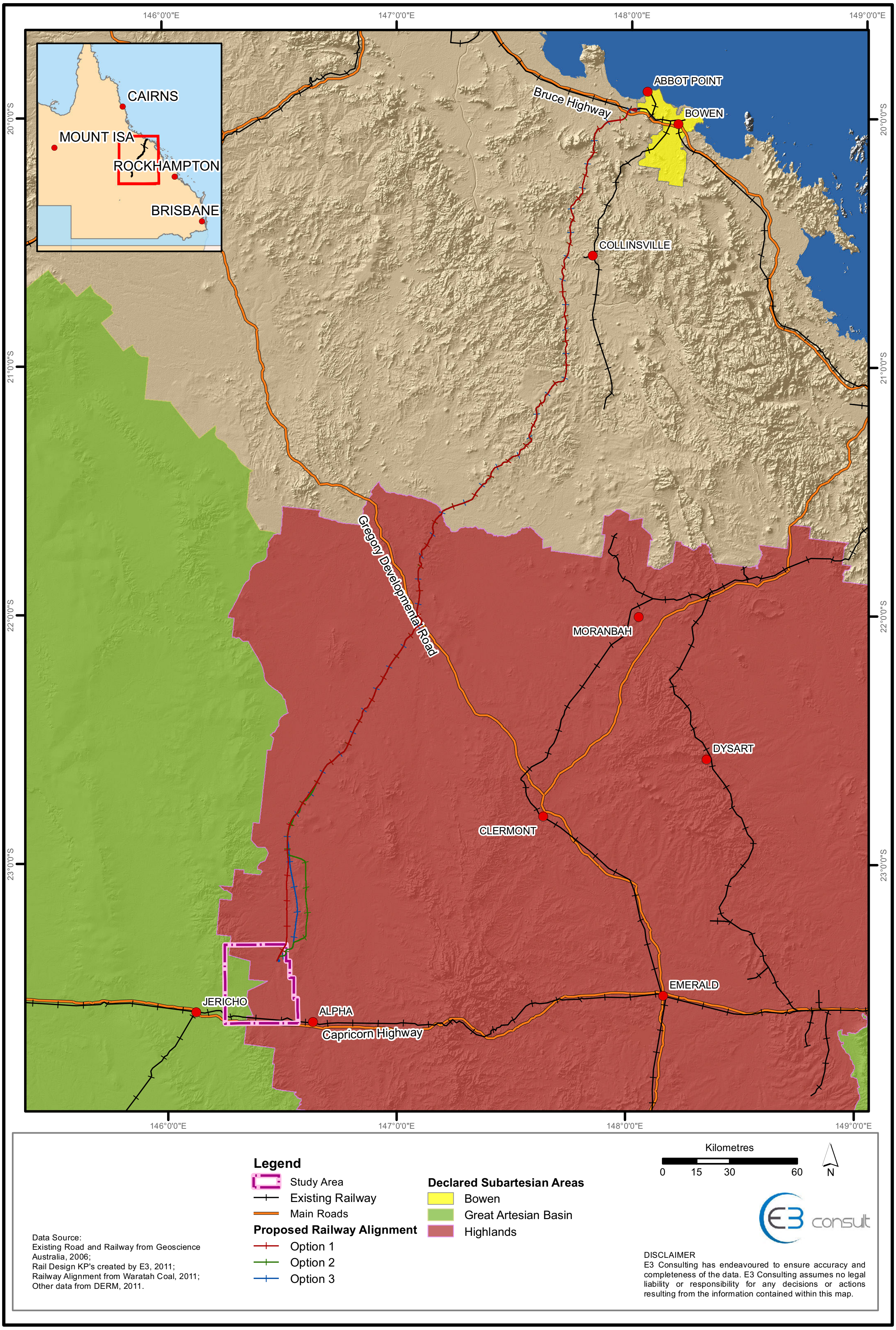
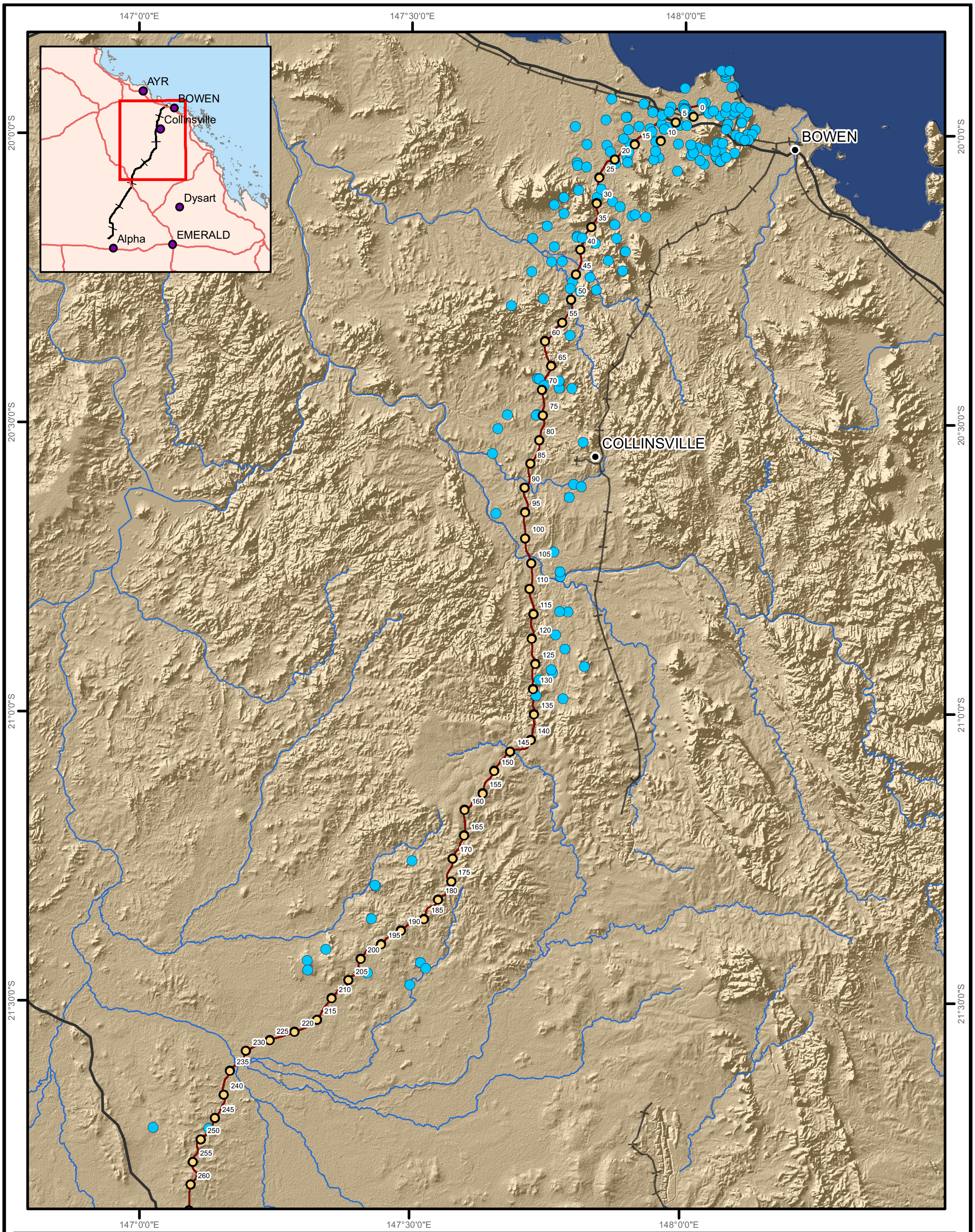


Figure 2. DERM Registered Groundwater Bores – KP05 to KP230 (Map 1 of 2)



Legend

- Proposed Rail Design KP's
- Groundwater Well Location
- Watercourse
- Existing Railway

Railway Alignment

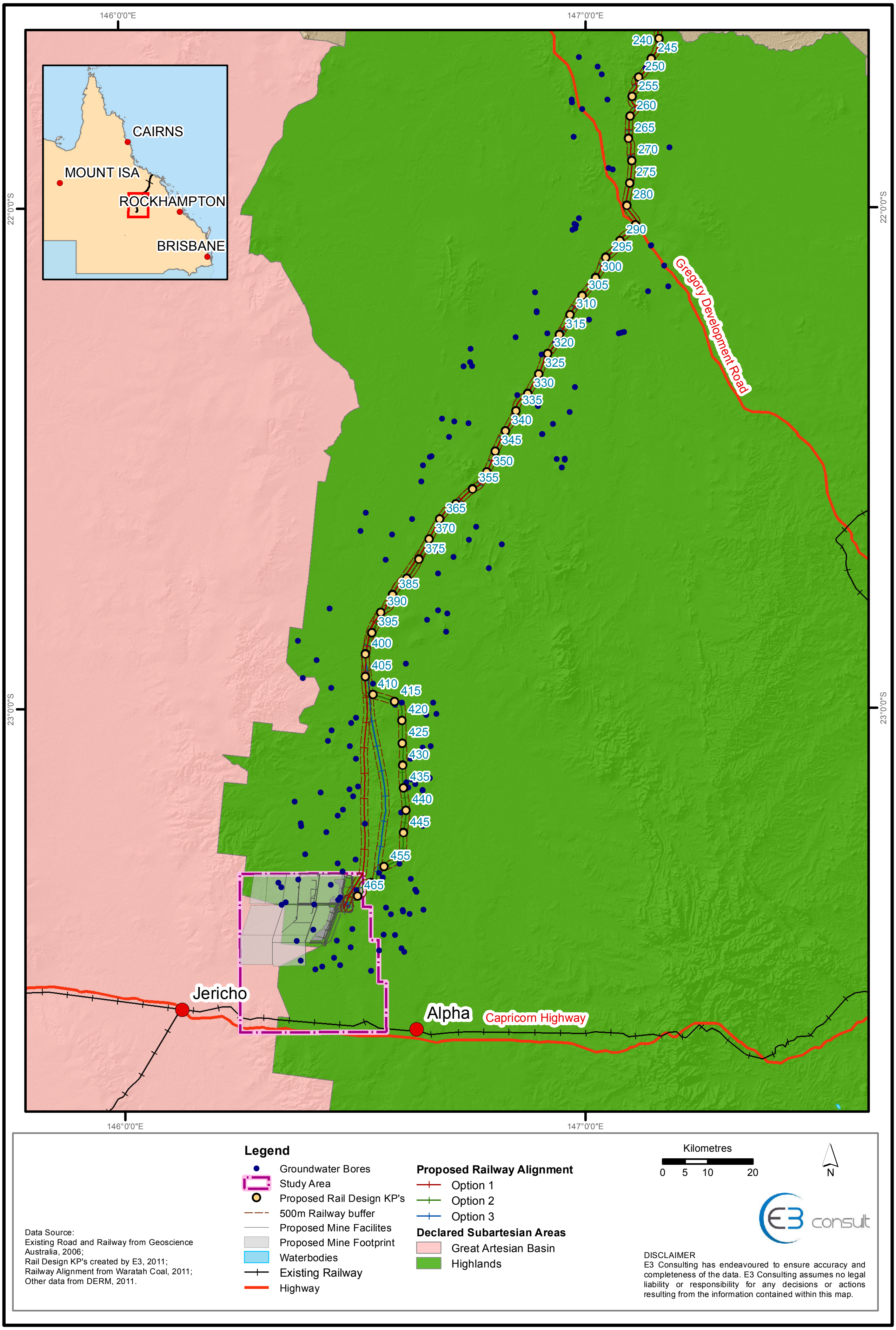
- Option 1
- Option 2
- Option 3

Data Source:
Existing Road and Railway from Geoscience Australia, 2006;
Rail Design KP's created by E3, 2011;
Railway Alignment from Waratah Coal, 2011;
Other data from DERM, 2010.

E3 consult

DISCLAIMER
E3 Consulting has endeavoured to ensure accuracy and completeness of the data. E3 Consulting assumes no legal liability or responsibility for any decisions or actions resulting from the information contained within this map.

Figure 3. DERM Registered Groundwater Bores – KP250 to KP468 (Map 2 of 2)



8.4 DESCRIPTION OF ENVIRONMENTAL VALUES

Previous studies of groundwater in the area of the rail alignment include DERM historical groundwater records, the desktop review undertaken for the study area by SKM (2009) and investigations for the Abbot Point Multi Cargo Facility (MCF) EIS (GHD, 2010). The following findings are information compiled from these sources.

8.4.1 KP05 – KP230 UNDECLARED GROUNDWATER AREA

8.4.1.1 Aquifers

A large undeclared groundwater area is intersected by the rail alignment between KP05 and KP230. A discussion of the geology of the area is provided in Volume 3, Chapter 3.

Aquifer systems predominantly occur in unconfined and confined weathered and fractured granite / igneous systems occur across much of the undeclared groundwater area between KP05 and KP230. Shallow unconfined and confined tertiary aquifers in shale, sandstone and clay strata are also likely to exist in the southern portion of the undeclared groundwater area between KP200 and KP230. DERM records indicate that groundwater in the Suttor Formation appears as an unconfined aquifer in the coarse sandstones with water levels between 10 m to 80 m below ground level (bgl). Shallow alluvial unconfined aquifers in alluvial leads may occur in river valleys; however specific data does not exist for these aquifers.

8.4.1.2 Yields and Water Quality

Yields of between 1 and 5.6 L/s and a range in salinity between 400 and 1,300 mg/L total dissolved solids (TDS) occurs in the granite aquifers (SKM, 2009). No yield or salinity data was available for the tertiary aquifers within the area. Limited static water level data exist for bores within the area. The data available indicates water levels from 5 m to 30 mbgl.

Yields and water quality in the alluvial leads was not present in the available DERM records.

8.4.1.3 Conceptual Hydrogeological Model

The conceptual hydrogeological model for the granitic aquifers comprises rainfall recharge onto areas of outcrop in the south and west of the undeclared groundwater area between KP130 and KP170 likely to be associated with the Mount Coolon range. Groundwater recharge from these zones would be expected to flow down a topographic gradient in a westerly direction via natural groundwater flow paths to the alluvial leads and to deeper weathered or fractured granite aquifers.

The hydrogeological model for the shallow unconfined tertiary aquifers comprises rainfall recharge across the entire area of the aquifers and also via infiltration from alluvial leads in river valleys. Direction of flow of these aquifers is likely to follow surface gradients. The alluvial leads are recharged via infiltration of rainfall and stream water in times of flow / flood. Flow direction in these leads will be towards the structural base of the alluvial lead and then in the downstream direction in river valleys. Where the rivers are effluent to the leads, some flows away from rivers may occur, whilst in areas where the alluvials are influential to the river flows, the flows will be towards the river.

8.4.2 KP230 – KP468 HIGHLANDS GROUNDWATER MANAGEMENT UNIT

8.4.2.1 Aquifers

The rail alignment crosses the Highlands GMU between KP230 and KP468. The aquifer systems in this area are comprised predominantly of tertiary shale, sandstone (including the Suttor Formation) and clay strata. The depth to the top of these aquifers ranges from 10 – 150 m bgl and static water levels range from 10 m to 80 m bgl. Semi-confined Permian aquifers are likely to exist at greater depth within the area.

8.4.2.2 Yields and Water Quality

Data from the tertiary aquifers indicate a range in yield of between 0.3 to 13 L/s and a range in salinity of 200 to >10,000 mg/L TDS. Some of these values exceed the ANZECC and ARMCANZ (2000) guidelines for livestock drinking water of 2,000 mg/L; however, guidelines for total dissolved solids are not specified for ecosystem protection.

8.4.2.3 Conceptual Hydrogeological Model

The conceptual hydrogeological model for the rail component comprises of rainfall recharge to tertiary aquifers in areas east of the boundary of the Great Artesian Basin and percolation from surface water bodies during periods of flow. The semi confined Permian aquifers are recharged via both surface rainfall in recharge zones and leakage from the shallow unconfined tertiary aquifers.

8.5 POTENTIAL IMPACTS

Primarily, future work involved in the construction of the rail alignment will be cut, fill and levelling as required. It is not anticipated that deep impact works will be involved except for the construction of pylons for bridge structures.

The main potential impacts with respect to groundwater are related to shallow near surface groundwater that could be impacted by railway construction activities.

Construction activities with the potential to impact on include:

- establishment of works depots and laydown areas;
- establishment of borrow pits, quarries and sand extraction pits;
- extracting groundwater for construction purposes;
- bulk earthworks; and
- culvert construction, blasting, rail and bridge construction.

Storage and handling of fuels / chemicals / raw materials has the potential to impact groundwater where leaks or spills from storage and handling areas occur. Where the groundwater that is impacted by contaminants is up gradient of an environmental receptor (i.e. a water body), a groundwater bore, or within the radius of influence of an active groundwater bore there is potential for impacts to a receptor.

Impacts to local groundwater regimes may also occur where groundwater is within the construction zone in the upper 1 m of the surface or where bridge construction entails deeper construction in areas of shallow groundwater that requires dewatering of construction areas.

In the event blasting is required for construction there is the potential for fractures to occur in aquifers causing increased permeability and changes to local groundwater regimes. This may alter the existing groundwater regime and / or disturbance of adjacent groundwater users' infrastructure. Where groundwater needs to be sourced for construction purposes there is also potential for interference with adjacent groundwater users.

Where groundwater levels are disturbed or large areas are sealed and either reduced rainfall infiltration and/or compaction of the underlying aquifer occurs there is potential for changes in shallow groundwater levels that may also affect adjacent groundwater users.

Where piling is required, there is potential for drill muds to be introduced into the underlying aquifer contaminating the groundwater.

8.6 MITIGATION AND MANAGEMENT

Proposed mitigation measures to be implemented, include:

- ensuring safe and effective fuel, oil and chemical storage and handling on site. This includes storing these materials within roofed, bunded areas with a storage capacity exceeding the capacity of the storage vessel by 10% and an impermeable floor;
- providing appropriate spill control materials including booms and absorbent materials on site and at refuelling facilities at all times in the event that a substance is spilled;
- in the event of groundwater contamination occurring, the impact will be assessed and remediated in accordance with the requirements of the EP Act;
- surface flows should be channelled with appropriate erosion and sediment controls to minimise potential for erosional scouring of soils or increased sediment loading of recharge water leading to changes in recharge of shallow aquifers. Sediment control structures will be regularly checked, repaired, replaced and/or cleaned out. The control shall be maintained so that they will always have 70% of their capacity available. An Erosion and Sediment Control Plan should be prepared to alleviate this impact; and
- where blasting is to be undertaken, conduct a census of bores within a 500 m area and monitor bores to assess potential impacts and requirements for mitigation measures.

8.7 CONCLUSION

The main potential impacts with respect to groundwater are related to shallow near surface groundwater that could be impacted by railway construction activities. The potential impacts include contamination from fuel / chemical / raw material storage; impacts to groundwater levels from quarries / sand extraction; impacts to neighbouring groundwater users from groundwater sourced water supplies; impacts to aquifers from blasting; and Impacts to shallow aquifers from bridge construction. If managed properly it is unlikely works will have any significant impact on groundwater resources along the rail alignment.

8.8 COMMITMENTS

Waratah Coal commit to:

- developing ESCPs prior to the commencement of construction to reduce impacts on groundwater;
- implementation of management plans and containment structures for potential contaminants;
- remediation of groundwater contamination should it be caused by the project;
- geotechnical assessment of the rail alignment to assess areas where construction requirements (i.e. excavation or blasting) have potential for impacts to groundwater;
- site specific investigation of the areas identified from geotechnical review; and
- entering into agreements with surrounding landowners regarding monitoring of impacts and make good provisions where impacts occur.