

## 3.7 Water quality and hydrology

This Section provides a description of the existing water quality and hydrology in the vicinity of the Project. The information is based on a review of the *1:25,000 Topographic Map 9030-I-S for Riverstone* (Central Mapping Authority of New South Wales 1983), previous desktop studies completed for the Project (Maunsell 2006a, 2007a, 2007b), aerial photography, and a site visit undertaken on 9 April 2008. Water quality and hydrology impacts associated with the Project are discussed in Section 8.7.

### 3.7.1 Surface water

#### **Watercourses, water bodies and drainage**

Surface waterways in the vicinity of the existing rail corridor include Eastern Creek and its tributaries (refer Figure 3-21). Eastern Creek is located approximately 200 metres west of the rail corridor and generally runs parallel with the rail line the entire length of the Project. Tributaries to Eastern Creek are located on both sides of the rail corridor, with the following eight surface water crossings along the length of the rail corridor (as indicated on the *1:25,000 Topographic Map 9030-I-S for Riverstone*):

- 300 metres north of the Quakers Hill Parkway overbridge
- 100 metres north of Manorhouse Boulevard, Quakers Hill
- 400 metres north of Seldon Street, Quakers Hill
- Advance Street, Schofields
- 250 metres south of Riverstone Road, Riverstone
- Robinson Street, Riverstone
- Castlereagh Street, Riverstone
- Princes Street, Riverstone.

The surrounding waterways generally drain from east to west across the rail corridor via 19 culverts (including the above-mentioned stream crossings), eventually flowing to Eastern Creek.

Thirty-four perennial lakes/water storage dams have been identified within 500 metres of the rail corridor; these are shown in Figure 3-21, which also shows the location of Eastern Creek and its tributaries within the Project area.

Surface water quality in the vicinity of the rail corridor is influenced by runoff from rural properties, roads, urban areas and overflows from the Riverstone Sewage Treatment Plant (Blacktown City Council 2007).

Survey data and site observations indicate that the majority of the existing rail track from Quakers Hill to Vineyard may not have an underground longitudinal drainage system and consists mainly of informal, grassed, open drains/swales (Maunsell 2008). This type of arrangement provides natural water filtering, reducing the impacts of runoff pollutants, and minimising sediment delivery to the informal Council drainage systems and Eastern Creek. This type of system also includes capacity for some on-site detention to reduce downstream stormwater flow impacts.

## Flooding

Parts of the Blacktown LGA are susceptible to flooding, including parts of the study area. Blacktown City Council (undated) has mapped flood-prone areas within the LGA as low, medium or high risk. These categories are based on flood level, velocity and/or frequency of expected flood waters, and are indicated in Figure 3-21 and defined as follows:

- High flood risk — all land below the 100-year flood level that is subject to a high hydraulic hazard (i.e. high flood damages, potential risks to life and/or evacuation problems).
- Medium flood risk — all land below the 100-year flood level that is subject to a low hydraulic hazard (i.e. significant flood damage and risk to life).
- Low flood risk — all land above the 100-year flood level and up to the probable maximum flood level (i.e. the risk of flooding varies from 1 chance in 100, to 1 chance in approximately 10,000,000 depending on the location within the floodplain).

Eastern Creek has a backwater influence on upstream flood levels from Schofields to Victoria Street, Riverstone. The culvert flood assessment report prepared for the Project (Maunsell 2007c) indicated that the study area is prone to low-, medium- and high-risk flooding (refer Figure 3-21). Areas of high flood risk along the eastern side of the rail corridor include:

- residential areas just north and south of Schofields Station
- between Robinson Street and Hobart Street, Riverstone
- between Melbourne Road and Victoria Street, Riverstone.

Potential flooding across the rail corridor is governed by the headwater levels of the railway crossing culverts. Eleven of the existing culverts (19 in total) have less than 500 millimetres rail freeboard (a factor of safety expressed in millimetres above a flood level) for the 50-year and 100-year average recurrence interval (ARI) (refer Table 3-28). The ARI is the long-term average number of years between the occurrences of a flood as big as, or larger than, the selected event. For example, floods with a discharge as great as or greater than the 50-year ARI flood level will occur, on average, once every 50 years. Based on this information, the 100-year ARI flood level is likely to overtop the existing tracks at chainages 40.920 kilometres, 45.730 kilometres, 46.355 kilometres, 46.490 kilometres and 46.880 kilometres (refer Figure 3-21). The culvert flood assessment report indicated that 14 of the existing culverts may require replacement or extension under existing conditions to prevent 100-year ARI flood levels overtopping the track.

**Table 3-28 Existing culverts with less than 500 millimetres of rail freeboard for the 50-year and 100-year ARI flood**

Culvert no.	Location (Chainage)	Flood risk category	Existing rail level (m AHD <sup>2</sup> )	50 year ARI headwater level (m AHD <sup>2</sup> )	Freeboard (m AHD <sup>2</sup> )	100 year ARI headwater level (m AHD <sup>2</sup> )	Freeboard (m AHD <sup>2</sup> )
2	40.720	High	26.85	26.47	0.38	26.82	0.03
3,4 and 5	40.920	High	26.10	26.46	-0.36	26.81	-0.71
6	41.485	High	26.83	Freeboard okay	>0.5	26.63	0.20

Culvert no.	Location (Chainage)	Flood risk category	Existing rail level (m AHD <sup>2</sup> )	50 year ARI headwater level (m AHD <sup>2</sup> )	Freeboard (m AHD <sup>2</sup> )	100 year ARI headwater level (m AHD <sup>2</sup> )	Freeboard (m AHD <sup>2</sup> )
11	43.950	Medium	20.60	Freeboard okay	>0.5	20.46	0.14
13	45.275	Medium	18.20	Freeboard okay	>0.5	17.74	0.46
14	45.730	High	15.35	Information not available	n/a	>17.33 <sup>1</sup>	-1.98
15	46.355	High	14.80	Information not available	n/a	>17.33 <sup>1</sup>	-2.50
16	46.490	High	15.12	Information not available	n/a	>17.33 <sup>1</sup>	-2.21
17	46.880	High	17.24	Information not available	n/a	>17.33 <sup>1</sup>	-0.09

Source: Maunsell (2007c)

Notes: 1: Based on extracts from the *Blacktown Floodplain Management Study 1996 for Eastern Creek* (Blacktown City Council 1996).

2: m = metres; AHD = Australian Height Datum

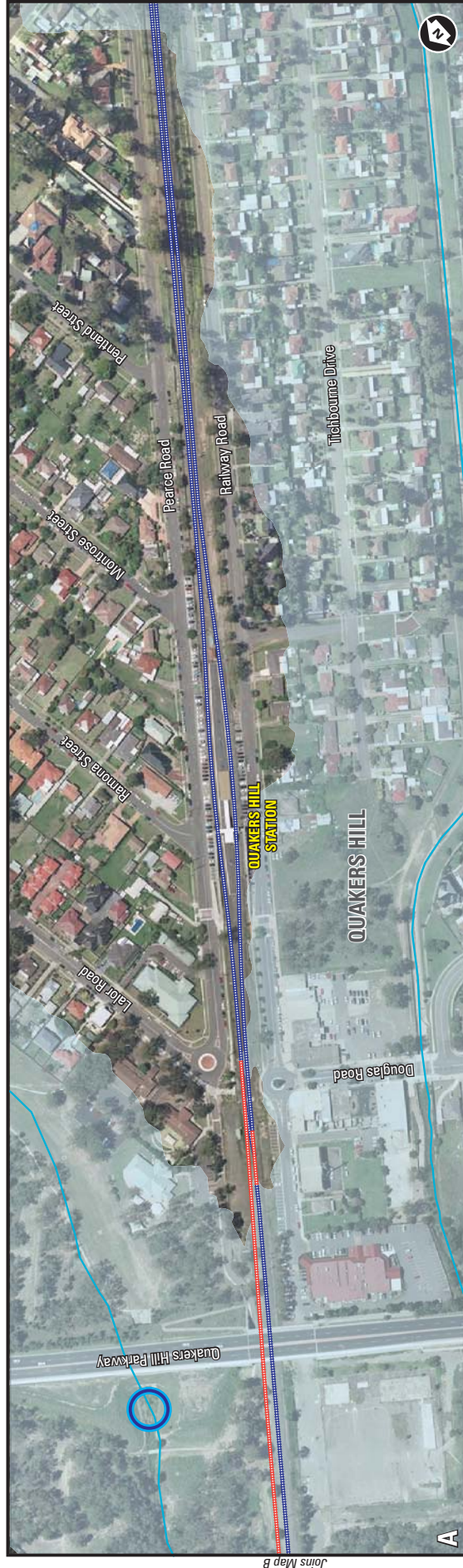
There are no observed flood risk areas north of Victoria Street, Riverstone that are relevant to the Project.

The probable maximum flood (PMF) event for the upper reaches of the Eastern Creek catchment was assessed for the GCC as part of the detailed technical studies undertaken for the Alex Avenue and Riverstone precincts, located between Quakers Hill and Vineyard (GHD 2008). This study assumed that the PMF is equivalent to a 1:10,000,000 ARI flood event (GHD 2008). This assessment reported that during the PMF, Eastern Creek is affected by backwater flooding from the Hawkesbury-Nepean River (which has a PMF flood level in the area of Eastern Creek of 26.4m AHD) and that due to the steep topography within the upper reaches of the Eastern Creek catchment, the PMF flood extents are only marginally different to the 100 year ARI flood extents (GHD 2008).

### 3.7.2 Groundwater

The geotechnical desktop study prepared for the Project indicated that the watertable in the study area is likely to be high, between approximately 300 and 900 metres north of Quakers Hill Station (Maunsell 2006). Groundwater flows from perched groundwater within cuttings were identified between Schofields and Vineyard (Maunsell 2007b).

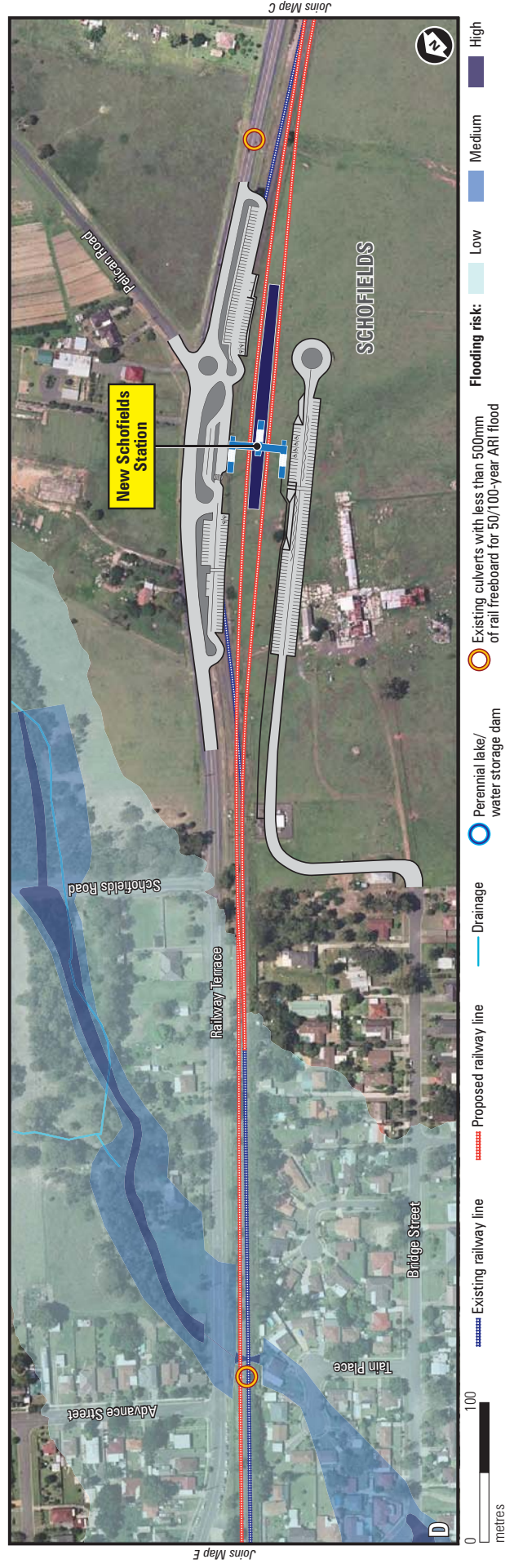
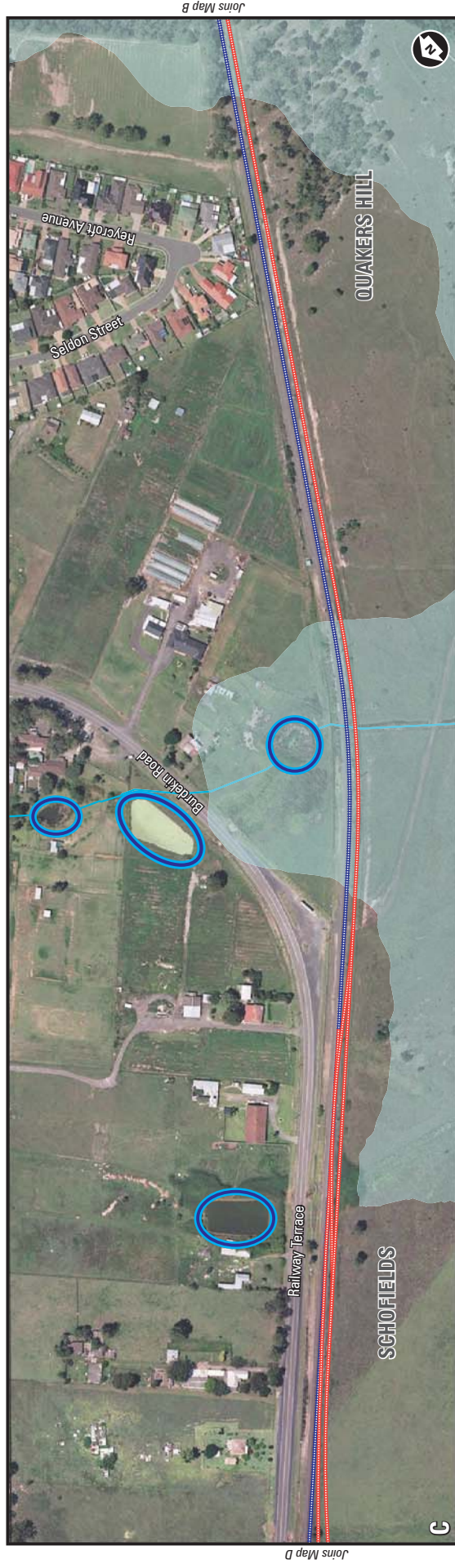
The area has been identified as having a moderate to high salinity potential and could, therefore, result in saline groundwater conditions. Further geotechnical investigation would be undertaken to obtain information on the site hydrogeology during the detailed design phase of the Project.



**Figure 3-21a** Flood mapping and waterways within the project area

Note: Project detail shown is indicative only, subject to detailed design.





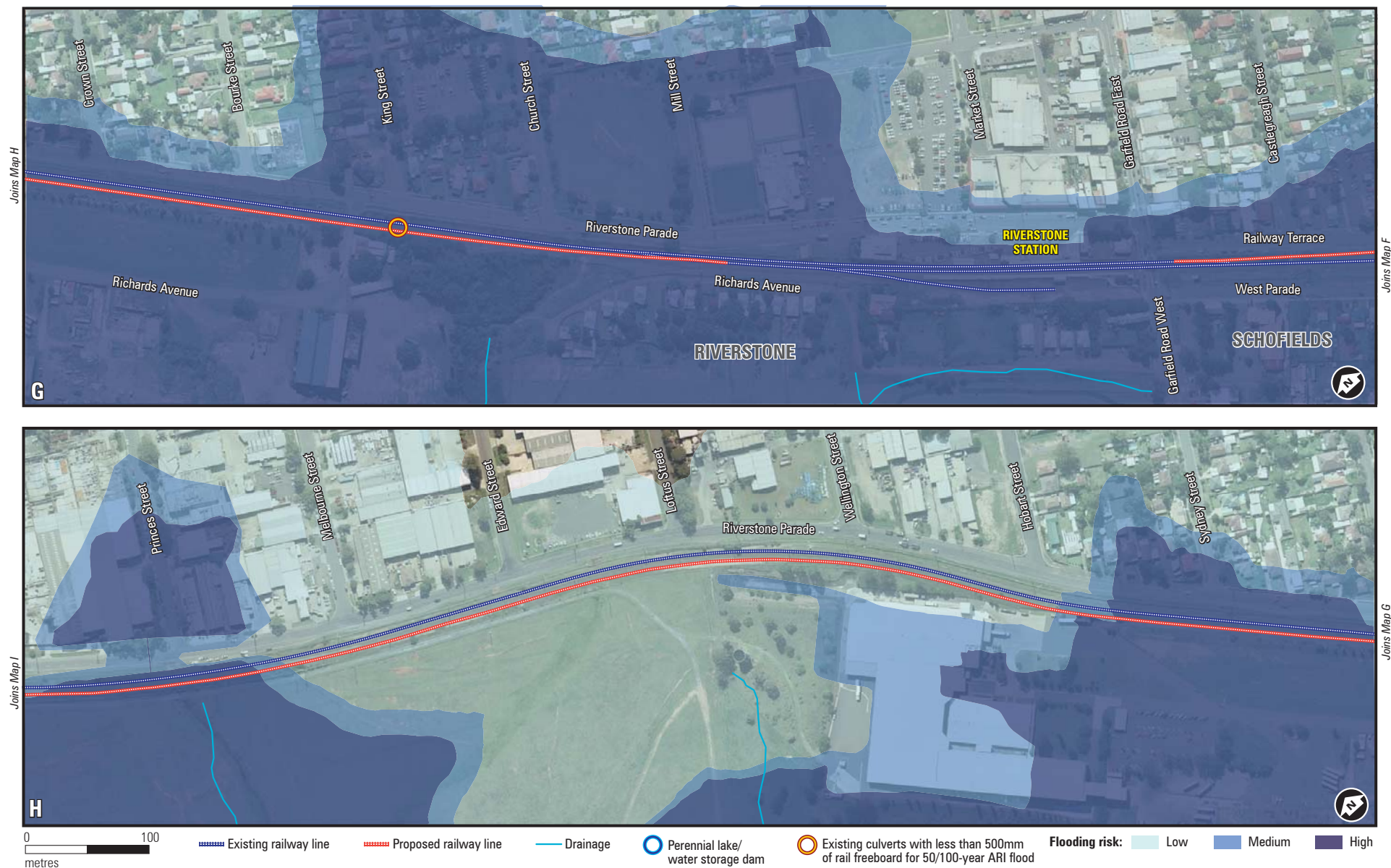
**Figure 3-21b** Flood mapping and waterways within the project area  
 Note: Project detail shown is indicative only, subject to detailed design.





**Figure 3-21c** Flood mapping and waterways within the project area  
 Note: Project detail shown is indicative only, subject to detailed design.

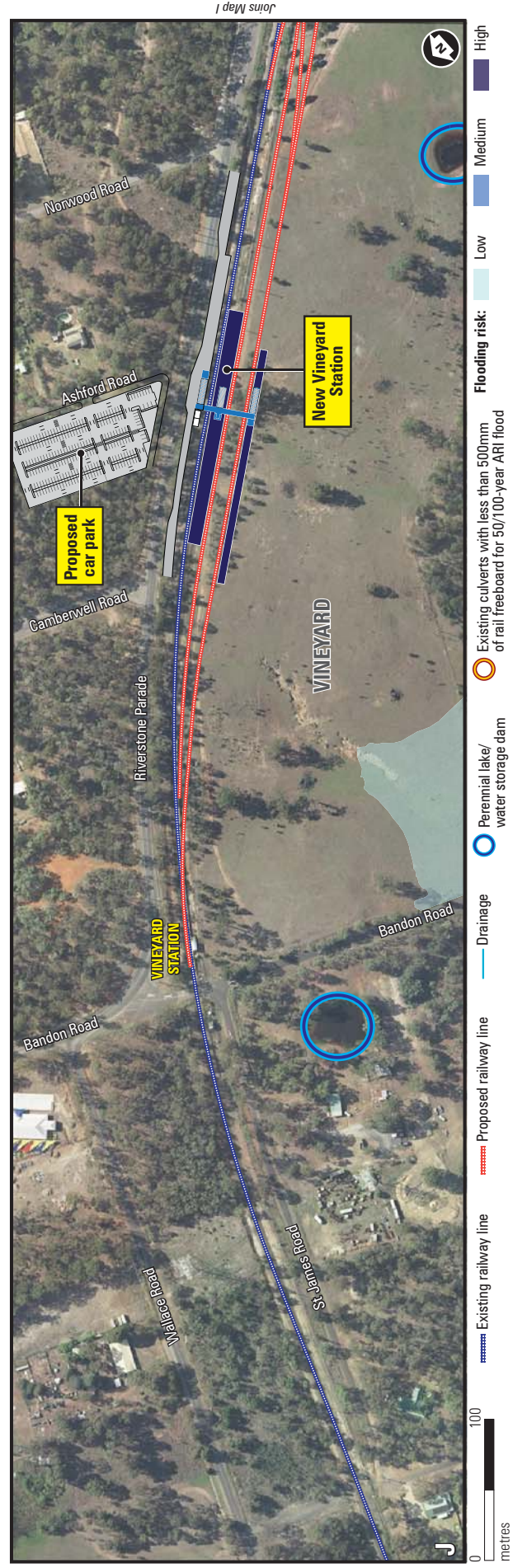




**Figure 3-21d** Flood mapping and waterways within the project area

Note: Project detail shown is indicative only, subject to detailed design.





**Figure 3-21e** Flood mapping and waterways with the project area  
 Note: Project detail shown is indicative only, subject to detailed design.