CHAPTER 20

Soils and contamination

ALBURY TO ILLABO ENVIRONMENTAL IMPACT STATEMENT

ARTC | INLAND RAIL
An Australian Government Initiative

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20.1 Summary

Construction would temporarily expose the natural ground surface and sub-surface through the removal of vegetation, overlying structures (such as existing roads) and excavation. Some sites contain dispersive soils or soils prone to high erosion hazard, including Table Top Yard clearances, Billy Hughes bridge, Culcairn pedestrian bridge and Culcairn Yard clearances, The Rock Yard clearances, Pearson Street bridge, Wagga Wagga Station and surrounds, and enhancement sites within the Junee precinct. The potential for erosion impacts would be minimised by implementing standard best-practice soil erosion control measures during construction.

The proposal site is in an area described as having low probability of acid sulfate soil, with the exception of the Murray River Bridge enhancement site where there are sediments below the water table that have a 'high probability' of acid sulfate soil occurring. The proposal would not disturb sediments in the river. Salinity is known to occur in the proposal site and excavations at four locations along the proposal site could lead to increased salinity risk; further investigations would be carried out during detailed design to inform any required responses to this risk.

A soil and water sub-plan would be developed to manage potential soil and water quality impacts during construction, including potential impacts associated with stockpile management, salinity and acid sulfate soil. Further assessment would be completed at enhancement sites where excavation is required and the presence of acid sulfate soil or saline soils is known or suspected.

The proposal is located within an existing rail corridor, which has a general level of risk associated with contamination from historical development and activities associated with its operation. Based on the intensity of historical activities observed within the rail corridor, including the presence of operational facilities, and development in the surrounding area, enhancement sites within and surrounding Albury Station and Wagga Wagga Station have a higher likelihood of contamination being present. Equally, enhancement sites with more extensive excavation proposed (both area and depth), including Riverina Highway bridge, Billy Hughes bridge, Pearson Street bridge and Kemp Street bridge enhancement sites, may also have a higher likelihood for contamination to be encountered through the proposal.

For these enhancement sites, further investigation would be carried out to inform detailed design, and the subsequent management and classification of the excavated material during construction in the contamination and hazardous materials sub-plan. Where the risk of asbestos and/or lead-paint has been identified, further assessment would be required prior to construction and, potentially, additional management or remediation. Hazardous materials would be handled and disposed of in accordance with relevant standards.

Operation is not likely to result in any significant impacts on soils, topography or geology. The risk of soil erosion during operation would be minimal, as all areas impacted during construction would be sealed or rehabilitated, and landscaped to prevent soil erosion. All maintenance activities would continue to be undertaken in accordance with ARTC's standard operating procedures.

20.2 Approach

This chapter provides an assessment of soils and contamination for the Albury to Illabo (A2I) section of the Inland Rail—program (the proposal). The full contamination assessment is provided in Technical Paper 13: Contamination. The contamination assessment is a Preliminary Site Investigation (PSI), as defined in the National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended) (the NEPM) (National Environment Protection Council (NEPC, 2013)

20.2.1 Secretary's Environmental Assessment Requirements

The Secretary's Environmental Assessment Requirements (SEARs) relevant to soils and contamination, and where in the environmental impact statement (EIS) these have been addressed, are provided in Appendix A: Secretary's Environmental Assessment Requirements.

20.2.2 Relevant legislation, policies and guidelines

The assessments were undertaken in accordance with the SEARs and with reference to the requirements of relevant legislation, policies and/or assessment guidelines, including:

- The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act), *Contaminated Land Management Act 1997* (NSW) (CLM Act) and State Environmental Planning Policy (Resilience and Hazards) 2021
- NEPM (NEPC, 2013)
- *Protection of the Environment Operations Act 1997* (NSW) (POEO Act)

- *Acid Sulfate Soils Assessment Guidelines* (Acid Sulfate Soils Management Advisory Committee (ASSMAC), 1998a)
- *Acid Sulfate Soils Manual* (ASSMAC, 1998b)
- *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997* (NSW Environment Protection Authority (EPA), 2015)
- *Guidelines for the Assessment, Remediation and Management of Asbestos – Contaminated Sites in Western Australia* (WA Department of Health, 2009)
- *Guidelines for the NSW Site Auditor Scheme (3rd edition)* (EPA, 2017)
- EPA Guidelines developed under the CLM Act, including *NSW EPA 2020 Contaminated Land Guidelines: Consultants Reporting on Contaminated Land* (EPA, 2020b)
- EPA Guidelines developed under the POEO Act, including NSW EPA, *2014 Waste Classification Guidelines*
- *Local Government Salinity Initiative – Introduction to Urban Salinity* (Department of Infrastructure, Planning and Natural Resources (DIPNR), 2006) and *Site investigations for urban salinity* (Department of Land and Water Conservation (DLWC), 2002b)
- *PFAS National Environmental Management Plan version 2.0* (Head of EPAs Australia and New Zealand (HEPA), January 2020)
- *Managing Urban Stormwater: Soils and construction Volume 1* (Landcom, 2004) and *Volume 2* (A. Installation of Services; B. Waste Landfills; C. Unsealed Roads; D. Main Roads; E. Mines and Quarries) (Department of Environment and Climate Change (DECC), 2008c).
- *Managing Land Contamination, Planning Guidelines SEPP 55 – Remediation of Land* (Department of Urban Affairs and Planning (DUAP) and EPA, 1998)
- *Urban and regional salinity* – guidance given in the *Local Government Salinity Initiative* booklets, including *Site Investigations for Urban Salinity* (Department of Land and Water Conservation (DLWC), 2002b).

20.2.3 Methodology

Study area

The study area for the soil and contamination assessment focused on the proposal site and the immediate surrounds.

Key tasks

The key assessment tasks are:

- reviewing the following databases to identify areas of known and potential contamination:
  - Department of Defence database for unexploded ordnance
  - NSW EPA register of contaminated sites and list of notified sites, under sections 58 and 60 of the *Contaminated Land Management Act 1997* (NSW) (CLM Act), for sites located within 2 kilometres (km) of the proposal study area
  - NSW EPA's environment protection license (EPL) records under section 308 of the POEO Act
  - NSW Government database of former gasworks sites
- reviewing publicly available data and web-based information searches, and background information relevant to the study area, survey data and topography, including:
  - Bureau of Meteorology (BoM), Australian Groundwater Explorer
  - historical aerial photographs from the NSW Government Land and Property Information website
  - geology of the proposal study area using the NSW Planning and Environment (DPE) Digital Imaging Geological System (DiGS) database
  - NSW Soil and Land Information System including use of the eSPADE mapping portal on soil profile and soil map information
  - NSW Government acid sulfate soils (ASS) risk mapping (**asris.csiro.au/**)
  - NSW Government's Heads of Asbestos Coordination Authorities naturally occurring asbestos risk mapping

- maps published by the Geological Survey of NSW, former Department of Conservation and Land Management, and Australian Soils Resource Information System (ASRIS)
- mapping published by the former DPIE (now DPE) showing salinity risk and electrical conductivity of those soils

- reviewing relevant contaminated land records and reports:
  - available previous reports relevant to contamination for the proposal sites
  - ARTC contaminated land records
  - all available relevant contamination reports
- site walkover to ground truth the findings of the desktop assessment
- conducting a risk assessment through a preliminary contamination conceptual site model (CSM) to provide a summary of how and where potential contaminants across the proposal site are expected to move and what impacts such movement may have (see below)
- identifying potential areas of ASS and soil salinity that may be disturbed by the proposal
- assessing the impacts arising from the disturbance and excavation of land and disposal of soil
- identifying feasible and reasonable mitigation measures.

Refer to section 3.3 of Technical Paper 13: Contamination for the full details on methodology for the contamination assessment.

20.2.4 Contamination risk assessment matrix

The risk matrix (Table 20.1) was used to consider the significance of the risks associated with source pathway receptor scenarios identified through development of the CSM. The risk matrix allows for simple identification of the direct receptors of the contaminating activities and whether or not they will result in unacceptable risk to human health or the environment based on activities associated with construction or operation of the proposal.

TABLE 20.1 RISK ASSESSMENT MATRIX

	Likelihood		
Consequence	**Unlikely**	**Possible**	**Likely**
Minor	Low	Low	Medium
Moderate	Low	Medium	High
Significant	Medium	High	High

Risks are defined as follows:

- Low risk—based on review of the source, pathway receptor linkages, the areas of environmental concern (AEC) is not anticipated to pose unacceptable risk to human health or the environment.
- Medium risk—based on review of the source, pathway receptor linkages, the AEC has the potential to pose unacceptable risk to human health or the environment.
- High risk—based on review of the source, pathway receptor linkages, the AEC is considered likely to pose unacceptable risk to human health or the environment.

20.2.5 Key risks

An environmental risk assessment was undertaken for the proposal (refer Appendix E: Environmental risk assessment). Matters relating to soils and potential contamination with an assessed level of medium or above are:

- erosion as a result of the disturbance of soils during construction, particularly in soil landscapes characterised by dispersive soils
- potential to disturb contaminated soils during construction
- contamination of soils/groundwater due to spills and leaks during construction
- exposure of ASS or saline soils and subsequent erosion
- potential to disturb hazardous materials during the demolition of buildings and structures
- erosion of soils during operation and maintenance works.

The soils and contamination assessment considered the potential risks identified by the environmental risk assessment, in addition to potential risks and impacts identified by the scoping report, the SEARs and relevant guidelines and policies (as appropriate).

20.3 Existing environment

20.3.1 Topography

Albury

The elevation of the enhancement sites in the Albury precinct range from about 150 m Australian Height Datum (mAHD) at the Murray River to 230 mAHD. The land generally slopes to the south towards the Murray River.

Greater Hume–Lockhart

The enhancement sites in Greater Hume–Lockhart precinct are located at about 210 to 220 mAHD. The topography generally slopes to the north, west to the Murrumbidgee River; however, there are localised high points along the Olympic Highway that drain to various tributaries of the Murrumbidgee River.

Wagga Wagga

The enhancement sites in the Wagga Wagga precinct within Uranquinty and Wagga Wagga are located at an elevation of about 190 to 200 mAHD at the south of the Murrumbidgee River. The topography generally slopes to the north to the Murrumbidgee River; however, there are localised high points along the Olympic Highway that drain to various tributaries of the Murrumbidgee River.

The Bomen Yard clearances enhancement site is located at about 230 mAHD elevation and generally slopes south to the Murrumbidgee River.

Junee

The topography generally slopes from the Harefield Yard clearances enhancement site, located at an elevation of about 250 mAHD, up towards Junee with the Kemp Street bridge, Junee yard clearances and Olympic Highway underbridge enhancement sites at elevations of about 300 to 320 mAHD. For the Junee to Illabo clearances enhancement site, the elevation varied from 250 mAHD in the east to 360 mAHD in the west.

Kemp Street bridge and Junee Yard clearances enhancement sites are located in a topographic depression that extends towards the north–northwest, with neighbouring hills to the south, east and west peaking at approximately 360 mAHD.

20.3.2 Soil types

A review of eSPADE was conducted and soil types along the proposal site are summarised in Table 20-2.

TABLE 20-2 SOIL LANDSCAPE

Location	Landscape	Soil	Characteristics
Albury precinct			
Murray River bridge	▸ Wakool River landscape	▸ Grey and black Vertosols (deep cracking clays) ▸ Brown and red chromosols (soils with a clay subsoil overlain by a lighter topsoil).	▸ Prone to water logging.
Albury Station pedestrian bridge, Albury Yard clearances and Riverina Highway bridge	▸ Wait A While landscape ▸ Livingston landscape	▸ Red Kurosols, (soils with a clay subsoil that are acidic) in the south of the site ▸ Red Chromosols in the north of the site.	▸ Localised wind erosion, waterlogging and flooding, and salinity.
Table Top yard clearances	▸ Ettamogah landscape	▸ Typically deep to moderately deep red-to-yellow Chromosols and Kurosols ▸ sodosols (podzolic profile (soil formed by weathering and leaching) with elevated sodium in the clay) in low-lying areas.	▸ High erosion hazard ▸ Localised gully erosion has been observed along with widespread wind and sheet erosion.

Location	Landscape	Soil	Characteristics
Billy Hughes bridge	▸ Ettamogah landscape	▸ Typically deep to moderately deep red to yellow Chromosols and Kurosols ▸ Sodosols in low-lying areas.	▸ High erosion hazard ▸ Localised gully erosion has been observed along with widespread wind and sheet erosion.
Greater Hume–Lockhart precinct			
Culcairn pedestrian bridge and Culcairn Yard clearances	▸ Culcairn soil landscape	▸ Comprises very deep (>1.5 m), moderately well-drained red and brown Chromosols and Kurosols ▸ Yellow and grey Sodosols on the higher, older terraces ▸ Deep (1.0–1.5 m), moderately well-drained grey and brown dermosols (clay-dominated soils with a gradational profile) occurring on lower, younger terraces.	▸ Prone to localised high gully erosion hazard, acidity, waterlogging, poor drainage, sodicity and foundation hazard where sodic.
Henty Yard clearances	▸ Henty soil landscape	▸ Comprise very deep (>1.5 m), moderately well-drained brown and yellow Sodosols on the higher terraces ▸ Older terraces with deep (1.0–1.5 m), moderately well-drained brown Dermosols and yellow Chromosols occurring on lower, younger terraces.	▸ Prone to moderate wind and gully erosion hazard ▸ Prone to localised acidity, waterlogging, poor drainage, sodicity, foundation hazard where sodic, burial by wind-blown sand and complex terrain.
Yerong Creek Yard clearances	▸ Mangoplah soil landscape ▸ O'briens Creek soil landscape in the far south (in the vicinity of Sandy Creek)	▸ Comprise moderately deep (80–150 centimetre (cm)) red Sodosols ▸ Far south comprises of moderately deep red and brown Sodosols.	▸ Prone to streambank erosion, acidity and localised water logging.
The Rock Yard clearances	▸ Vincent Road soil landscape ▸ Mangoplah soil landscape	▸ Moderately deep (80–150 cm) sodosols ▸ In the west, formed from colluvium (loose soil, deposited by erosion) from the local sandstones, while in the east the soils are of alluvial (loose soil, deposited by water) origin.	▸ Local soils are also prone to high erosion hazard, localised foundation hazard and strong acidity ▸ Low-lying areas are also prone to localised waterlogging.
Wagga Wagga precinct			
Uranquinty Yard clearances	▸ Pearson soil landscape in the south ▸ O'briens Creek soil landscape ▸ Belfrayden soil landscape in the north east	▸ Moderately deep red sodosols in the west ▸ Moderately deep red and brown sodosols in the centre ▸ Red Chromosols and red Dermosols in the north east.	▸ Strong acidity, local water logging and stream bank erosion ▸ Erosion hazard is higher on the sodosols.
Pearson Street bridge	▸ Becks Lane soil landscape	▸ Moderately deep red and brown Chromosols and Dermosols.	▸ High erosion hazard, acidity and localised foundation hazards.
Cassidy Parade pedestrian bridge, Edmondson Street bridge, Wagga Wagga Station pedestrian bridge and Wagga Wagga Yard clearances	▸ Becks Lane soil landscape ▸ Lloyd soil landscape to the eastern end of the site	▸ Moderately deep red and brown Chromosols and Dermosols ▸ Eastern end of the site likely comprises red Chromosols and brown Sodosols.	▸ High erosion hazard, steep slopes, localised foundation hazards and mass movement, stoney and strongly acid soils on ridges and upper slopes.

Location	Landscape	Soil	Characteristics
Bomen Yard clearances	▸ Bomen soil landscape to the eastern end of the site ▸ Currawarna soil landscape to the western end of the of the site	▸ South-eastern side with shallow to moderately deep red and brown Dermosols (clay dominated soils with a gradational textural profile). South-western end of the site with moderately deep Tenosols (relatively young or poorly developed soils) formed from Aeolian (wind-blown) material.	▸ Moderate erosion hazard and acidity ▸ Locally shallow soil and localised foundation hazard.
Junee precinct			
Harefield Yard clearances	▸ Currajong soil landscape in the south west ▸ Houlaghans Creek soil landscape in the north east	▸ Deep (>100 cm) mottled red and brown Chromosols on upper, mid and lower slopes ▸ Moderately deep to deep (>50 cm), brown and red Dermosols on mid-to-lower slopes ▸ Deep (>100 cm), imperfect to moderately well-drained mottled red, brown and yellow Chromosols on lower slopes ▸ Deep (>100 cm), imperfectly drained brown and red Sodosols on some lower slopes, in drainage depressions and along creek flats.	▸ Localised seasonal waterlogging, flood hazard, sheet and gully erosion hazard, poor drainage, strong acidity of topsoils, sodicity/dispersibility and low wet bearing strength of subsoil, and salinity.
Kemp Street bridge, Junee Station pedestrian bridge and Junee Yard clearances, and Olympic Highway underbridge	▸ Currajong soil landscape	▸ Deep (>100 cm) mottled red and brown Chromosols on upper, mid and lower slopes ▸ Moderately deep to deep (>50 cm), brown and red Dermosols on mid-to-lower slopes ▸ Deep (>100 cm), imperfect to moderately well-drained mottled red, brown and yellow Chromosols on lower slopes ▸ Deep (>100 cm), imperfectly drained brown and red Sodosols on some lower slopes, in drainage depressions and along creek flats.	▸ Localised salinity, poor drainage, high run-on, sheet and gully erosion hazard, high erodibility of subsoils, acidity of topsoils, and sodicity/dispersibility of subsoil.
Junee to Illabo clearances	▸ Currajong soil landscape in the south ▸ Malebo soil landscape in the south ▸ Mimosa soil landscape centrally between Junee and Illabo ▸ Eurongilly soil landscape in the north and beneath Illabo	▸ Red and brown Chromosols and occasionally red Kurosols on upper, mid and lower slopes ▸ Brown and red Dermosols on mid-to-lower slopes ▸ Mottled red, brown and yellow Chromosols on lower slopes. Imperfectly drained brown and red Sodosols are often present in lower slopes, in drainage depressions and along creek flats.	▸ Localised salinity, poor drainage, high run-on, sheet, wind and gully erosion hazard, high erodibility of subsoils, acidity of topsoils, and sodicity/dispersibility of subsoil, engineering hazard, low bearing strength and mass movement.

20.3.3 Saline soils

Desktop review using eSPADE across the proposal sites indicates that several local soil types have potential salinity hazards associated with them. These appear most prevalent in the northern half of the proposal site, particularly from Wagga Wagga north, but localised salinity hazards cannot be discounted from soils in the south. A detailed summary of salinity at each enhancement site is provided in Appendix B of Technical Paper 13: Contamination.

The contamination assessment identified one area with very high potential salinity hazard at Culcairn Pedestrian bridge and Culcairn Yard clearances. Moderate salinity was mapped at several enhancement sites.

20.3.4 Acidity

Acid sulfate soils

A review of the ASRIS Acid Sulfate Risk map identified that the proposal site is located within areas described as low probability of ASS, with the exception of the Murray River bridge, where sediments have a 'high probability' of occurrence of inland ASS. It is possible that some other areas of localised inland ASS may be present in dams or other inundated areas where sulfides may be laid down in sediments over time. A detailed summary of ASS at each enhancement site is provided in Appendix B of Technical Paper 13: Contamination.

Naturally acidic soils

Naturally acidic soils may be acidic as a result of natural acidity inherent in the parent rock, due to organic acids being present in the soil or through agricultural practices (e.g. long-term fertiliser use).

A review of pH ranges from soils presented in eSPADE indicates that the upper 0.3 m of soils relevant to the proposal site generally has a pH of between 5 and 6, which is considered strongly to moderately acidic in the context of soil chemistry. This is particularly so in the valleys. Where the proposal site is located within, or near, more elevated terrain such as near Billy Hughes bridge enhancement site, Table Top Yard clearances enhancement site, The Rock Yard clearances enhancement site, north of Uranquinty Yard clearances enhancement site and the Junee to Illabo clearances enhancement site, the acidity of this upper 0.3-m ranges from pH 4.5 to pH 5.5 and is considered very strongly acidic to strongly acidic.

For subsoil (0.3 m to 1 m), eSPADE indicates that the soil is generally less acidic, with a pH range between 5.5 to 6.5 (moderately acidic to slightly acidic) except where the proposal is located in more elevated terrain, as identified within this section. In these instances, the pH of the subsoil is between 4.5 to 6.0 (very strongly acidic to moderately acidic).

See section 20.4.1 for site-specific assessment of naturally acidic soils.

20.3.5 Naturally occurring asbestos

Naturally occurring asbestos refers to a group of fibrous minerals associated with altered ultramafic rock. 'Ultramafic' describes igneous rocks that were originally formed deep in the earth; however, by the time they are exposed at the earth's surface by erosion, the rocks have been successively metamorphosed into serpentinite rock containing minerals such as lizardite, chrysotile and antigorite. These rocks are known to outcrop in parts of NSW and may include chrysotile asbestos or tremolite/actinolite asbestos, or sometimes no asbestos at all.

A search of the NSW Resources and Geosciences naturally occurring asbestos database indicated that no geological units with asbestos potential were located in the vicinity of the proposal; therefore, no naturally occurring asbestos was mapped within the proposal site. The potential for naturally occurring asbestos to be encountered has not been considered further.

20.3.6 Contamination

This section provides a summary of the desktop assessment and observations made during the site inspection. Further discussion of each of the existing contamination risks present in the study area are discussed in Technical Paper 13: Contamination.

Environmental setting

Albury precinct

Within the Albury precinct, land surrounding the rail corridor has predominately been comprised of agricultural land, with low-density residential development in the city of Albury since 1961. Commercial and industrial land uses were introduced along the rail corridor over time.

Desktop searches found that within the proposal site, or within 2 km of the proposal site, there were:

- no sites with an EPL other than ARTC's EPL and the following two sites:
  - a waste management facility that is located 1.3 km north east of the Riverina Highway bridge enhancement site. This site is registered for the non-thermal treatment of hazardous and other waste, as well as waste storage for hazardous, restricted soli, liquid, clinical and related waste, and asbestos waste
  - a paper/pulp manufacturing facility that is located 300 m from the Billy Hughes bridge enhancement site. This site is registered for dangerous goods production and paper or pulp production
- three properties with past or current notices on the NSW EPA's contaminated sites registers:
  - former gas works and its surrounding commercial land, located 870 m to the west of the Albury Station pedestrian bridge and Albury Station Yard clearances enhancement sites. The site has three current and four former notices. Current notices include the declaration as a remediation site (2005), an Amendment or

Repeal of Order or Notice in 2015 (current) and an Approved Voluntary Management Proposal in 2018 (current)

  - a service station, located 60 m to the west of the Riverina Highway bridge enhancement site. The site was declared to be a remediation site in 2008. In 2015 a Notice of Completion or Withdrawal of Approved Voluntary Management Proposal was issued
  - former Thales Australia site, located 1.5 km north of the Riverina Highway bridge enhancement site. The site was declared significantly contaminated in 2013 and a Notice to End Investigation Declaration was issued in 2019.
- two sites with reported unexploded ordinance (UXO) information:
  - a site located 1.5 km south west of the Billy Hughes bridge enhancement site has a UXO category of substantial potential. The site was part of an ammunition depot from WWII to 1982
  - a site located 580 m to the east of the Table Top clearances enhancement site. This site has a UXO category of slight potential. The site was used as an artillery range during WWII.

During the site inspection stockpiles (including ballast, demolition rubble), drums, a rusted abandoned tanker carriage and disused buildings was observed in the rail corridor.

Greater Hume—Lockhart precinct

Low-density residential development and agricultural land characterised the land uses adjacent to the enhancement sites since 1959. In addition to residential development, Bicentennial Park and silos were present at the Henty Yard clearances and further silos and warehouse buildings at Yerong Creek Yard clearances and The Rock Yard clearances.

Desktop searches found that within the proposal site, or within 2 km of the proposal site, there were:

- no sites with an EPL other than ARTC's EPL and three sewage treatment works at:
  - Culcairn, located 1.4 km to the east of the enhancement site
  - Henty, located 500 m to the west of the enhancement site
  - The Rock, located 1.4 km to the north west of the enhancement site.
- no sites with notices on NSW EPA's contaminated land registers.
- no sites with reported UXO information.

During the site inspection, stockpiles within the corridor (ballast, rails and sleepers, broken glass and other waste materials) was observed as well as an RV grey and black water disposal dump point adjacent to Culcairn Station. A suspected asbestos containing material (ACM) was observed in The Rock Yard clearances enhancement site.

Wagga Wagga precinct

Outside of Wagga Wagga, land uses are predominately low-density residential development and agricultural land within the site and surrounding area remained largely unchanged over time. In Wagga Wagga, commercial and low-density residential development is the predominant land use and the land uses have remained largely unchanged. Since the 1990s, land around the Bomen Yard clearances have been developed into a commercial and industrial precinct.

Desktop searches found that within the proposal site, or within 2 km of the proposal site, there were:

- several sites with an EPL within 2 km of the proposal site in addition to ARTC's EPL:
  - a recycling facility located around 800 m north-east of Pearson Street bridge enhancement site
  - a water filtration plant located around 1 km east of the Wagga Wagga Yard clearances enhancement site
  - a dairy processing plant located 370 m to the east of the Wagga Wagga Yard clearances enhancement site
  - a livestock processing facility located 700 m west of Bomen Yard clearances enhancement site
  - a livestock processing facility located 150 m west of Bomen Yard clearances enhancement site
  - a chemical production, chemical storage and waste storage facility located 60 m from Bomen Yard clearances enhancement site
  - a sewage treatment facility located 1.2 km to the west of Bomen Yard clearances enhancement site.
- three properties with past or current notices on the NSW EPA's contaminated land registers:
  - former gasworks, located 140 m north of the Pearson Street bridge enhancement site. This site has two former notices and one current notice (Notice for Maintaining Remediation) in 2008.

    - former dry-cleaning facility, located 1.8 km north of the Edmondson Street bridge enhancement site. The site was declared significantly contaminated in 2018 (current) and Knights Meats were issued with a Management Order in 2019
    - former gasworks, located 1.3 km north east or north of Edmondson Street bridge, Wagga Wagga Station pedestrian bridge and Wagga Wagga Yard clearances enhancement sites. The site has one former notice and two current notices (declaration as a Remediation Site in 2007, and an Approved Voluntary Management Proposal in 2013)
- a site located 1.6 km north east of the Bomen Yard clearances enhancement site is currently under assessment by the NSW EPA under section 60 of the CLM Act (recycling facility).
- no sites with reported UXO information.

During the site inspection, a RV grey and black water disposal dump point adjacent to Uranquinty Yard clearances, dumped material including rusted metal drums and large stockpiles was observed as well as potential ACM at the Pearson Street bridge and enhancement sites at Wagga Wagga Station.

Junee precinct

The enhancement sites and surrounding land has remained largely unchanged since 1961, with low-density residential development and agricultural land uses.

Desktop searches found that within the proposal site, or within 2 km of the proposal site, there were:

- no sites with an EPL (other than ARTC's EPL)
- no sites on the NSW EPA's contaminated sites registers. The Former Roundhouse Rail Depot facility located 980-m south of the Kemp Street bridge and Junee Yard clearances enhancement sites (which is under assessment by the EPA under section 60 of the CLM Act)
- no sites with reported UXO information.

During the site inspection, significant dumped material (such as drums, rails, sleepers and scrap metal) and several stockpiles of ballast and wooden beams, was observed. At the Harefield Yard clearances enhancement site, potential ACM fragments with glass, ceramic, ballast and plastic was observed in the west of the site. Railway cottages in poor condition, with significant ACM fragments, were observed at the Kemp Street bridge enhancement site.

General contamination risk

The proposal is located within an existing rail corridor, which is considered to contain a general level of risk associated with contamination from historical development and activities associated with its operation. A range of sites adjacent to the rail corridor that would be considered to have associated contaminated risk were identified, including agricultural land.

The sources for these general contamination risks include:

- fill used in construction of the existing rail line, which may be contaminated
- weed-suppression activities
- buildings potentially containing hazardous materials
- rail line ballast potentially containing heavy metals and other contaminants
- contamination from maintenance activities undertaken at sidings and near silos or other areas
- use of chemicals on agricultural land
- machinery storage and maintenance, refuelling and spray rig filling, agricultural sheds and silos.

Specific contamination risk

In addition to these general contamination risks, there are a number of potential areas of environmental concern (AECs) that are identified as having the potential for localised contamination to be encountered. A summary of the AECs is provided in Table 20-3. The AECs in each precinct are shown separately: Albury precinct (Figure 20-1), Greater Hume–Lockhart precinct (Figure 20-2), Wagga Wagga precinct (Figure 20-3), Junee precinct (Figure 20-4).

Potential sources of contamination and associated potential contaminations of concern identified at certain enhancement sites for each precinct are also provided in Table 20-3. For further discussion refer to Technical Paper 13: Contamination.

TABLE 20-3 AREAS OF ENVIRONMENTAL CONCERN AND POTENTIAL CONTAMINANTS IDENTIFIED WITHIN THE PROPOSAL SITE

Enhancement site(s)	AEC number	Description of AEC	Potential contaminations of concern
Albury precinct			
Murray River bridge	AEC 1	Structure with ACM sheeting. Murray River bridge also known to contain lead paint	Lead and other heavy metals
	AEC 2	Dumped rubbish	Heavy metals, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene, xylene (BTEX), polycyclic aromatic hydrocarbons (PAH), asbestos, lead containing dust and/or paint
	AEC 3	High probability of occurrence of inland ASS in Murray River sediment	ASS
Albury Station pedestrian bridge Albury Station Yard clearances Riverina Highway bridge	AEC 4	Service station, 616–624 Young Street, Albury	TRH, BTEX, PAHs and/or lead
	AEC 5	Drum storage	Point sources of heavy metals, TRH, BTEX, solvents, organochlorine pesticides (OCP) and organophosphorus pesticides (OPP), and asbestos fragments
	AEC 6	Old tanker carriage	Point sources of heavy metals, TRH, BTEX, solvents, OCPs and OPPs, and asbestos fragments
	AEC 7	Stockpiles of ballast along the track and one stockpile comprising demolition waste	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 8	Former Mobil depot	TRH, BTEX, PAHs and/or lead
	AEC 9	Properties 1 to 6. Former properties with asbestos building materials, unknown storage, historical pesticide use	TRH, BTEX, PAHs, pesticides and/or lead
	AEC 10	514–526 Young Street/Site 5 and Site 4. Former fuel depot	Phase separated hydrocarbons (PSH), TRH and BTEX
Billy Hughes bridge	AEC 11	Ballast stockpiles	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
Greater Hume–Lockhart precinct			
Culcairn Yard clearances	AEC 12	'Very High' salinity mapped as occurring in this area	High salinity soils
	AEC 13	Dumping of materials including buildings waste, metals drums and spray cans	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 14	Ballast stockpiles	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 15	Former Gang Shed (SES Headquarters), now Culcairn men's shed	TRH, BTEX, PAHs, heavy metals and asbestos. The Rural Fire Service (RFS) have advised that the Former Gang Shed has not been identified as a location where there has been historical use of use of per- and polyfluoroalkyl substances (PFAS). Therefore, this contaminant was not considered further.
Henty Yard clearances	AEC 16	Soil stockpiles, chemical (Penetrol) storage and sleepers	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 17	Stockpiles of soil and ballast	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 18	Dumped metal drums	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint

Enhancement site(s)	AEC number	Description of AEC	Potential contaminations of concern
	AEC 19	Henty RFS—potential historical storage of fire suppressants potentially used	TRH, BTEX, and PAHs The RFS have advised that this site has not been identified as a location where there has been historical use of PFAS. Therefore, this contaminant was not considered further.
	AEC 20	Shell service station	TRH, BTEX, PAH, PFAS, and/or lead.
Yerong Creek Yard clearances	AEC 21	Metals drums, tires and other debris stored (outside of site areas)	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 22	Storage of old electronic equipment including signal boxes, metal, pipes and ladders	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 23	Stockpiles of ballast and old rails	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 24	Yerong Creek fire station—historical storage of fire suppressants potentially used	TRH, BTEX, PAHs The RFS have advised that this site has not been identified as a location where there has been historical use of PFAS. Therefore, this contaminant was not considered further.
The Rock Yard clearances	AEC 25	The Rock RFS—historical storage of fire suppressants potentially used	TRH, BTEX, PAHs The RFS have advised that this site has not been identified as a location where there has been historical use of PFAS. Therefore, this contaminant was not considered further.
	AEC 26	Rusted metal drums, wooden sleepers, concrete blocks, tired and old rail	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 27	Potential ACM, glass and metal on the site surface	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 28	Potential ACM structure	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
Wagga Wagga precinct			
Uranquinty Yard clearances	AEC 29	Dumped metal drums	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 30	Uranquinty RFS	TRH, BTEX, PAHs The RFS have advised that this site has not been identified as a location where there has been historical use of PFAS. Therefore, this contaminant was not considered further.
	AEC 31	Service station—historical chemical storage at the Uranquinty RFS building	TRH, BTEX, PAHs and/or lead
Pearson Street bridge	AEC 32	Wagga Wagga Showground campground; storage of unknown minor chemicals	Heavy metals, OCPs and OPPs
	AEC 33	Potential ACM on the ground surface and fill containing anthropogenic material	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 34	Former council depot, storage of unknown chemicals or fuel, machinery maintenance	TRH, BTEX, PAHs, heavy metals and/or asbestos
	AEC 35	Potential ACM on the ground surface	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint

Enhancement site(s)	AEC number	Description of AEC	Potential contaminations of concern
Cassidy Parade pedestrian bridge Edmondson Street bridge Wagga Wagga Station pedestrian bridge	AEC 36	Potential USTs, formerly storage of firefighting storage tanks and former fuel store (not part of the site)—Former District Engineers Office, workshop and branch depot	TRH, BTEX, PAHs, PFAS and asbestos
Wagga Wagga Yard clearances	AEC 37	Former gang shed—historical storage of gas cylinders, grease and drums, transformers, rail components and battery acid containers, and potential asbestos in buildings	TRH, BTEX, PAHs, and asbestos
Bomen Yard clearances	AEC 38	Herbicide spraying around the station building and ballast stockpiles	Diffuse presence or isolated hotspots of OCPs or OPPs
	AEC 39	Abandoned drums and rail equipment	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
Junee precinct			
Harefield Yard clearances	AEC 40	Herbicide spraying around the station	N/A
	AEC 41	Potential ACM and glass, ceramic, ballast and plastic on the site surface	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
Kemp Street bridge and Junee Yard clearances	AEC 42	Potential ACM around and within building	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 43	Dumped metals drums, sleepers and scrap metal	TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
	AEC 44	Ballast stockpiles	Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint
Junee Station pedestrian bridge	AEC 45	Mobil service station	TRH, BTEX, PAHs and/or lead
Olympic Highway underbridge	AEC 46	Shell service station with drums labelled as cooking oil stored close to the tracks	N/A
Junee to Illabo clearances	AEC 47	Illabo RFS—potential historical chemical storage at the Illabo RFS building	TRH, BTEX, and PAHs The RFS have advised that this site has not been identified as a location where there has been historical use of PFAS. Therefore, this contaminant was not considered further.
	AEC 48	Ballast stockpiles	N/A

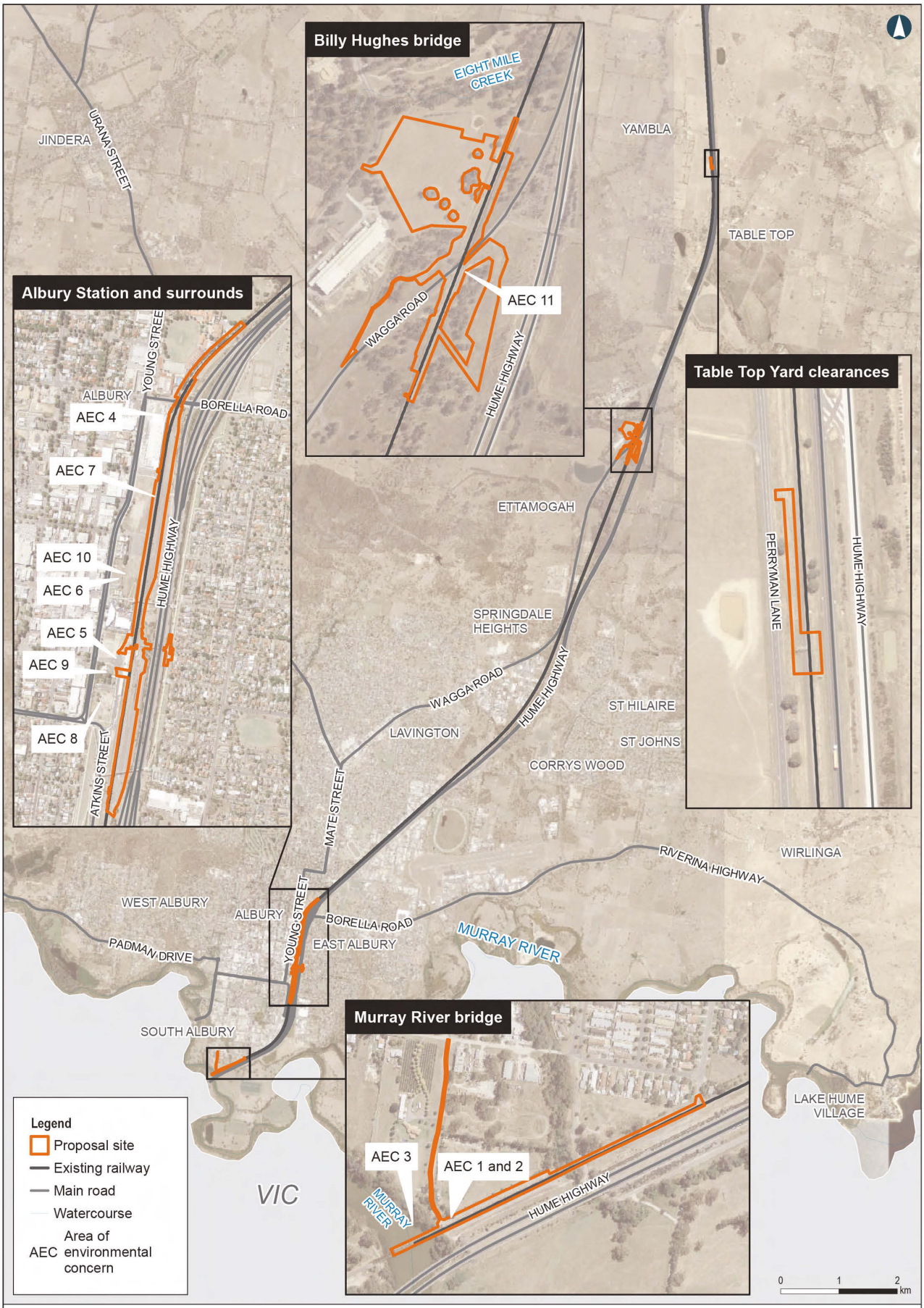

Figure 20-1 Areas of environmental concern for Albury precinct enhancement sites

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:85,000
Paper size: A4
Date: 14/12/2021

Data Sources: ARTC, NSWSS

210_EAP_F2001_EnvironmentalConcern_Albury_r1v4.mxd

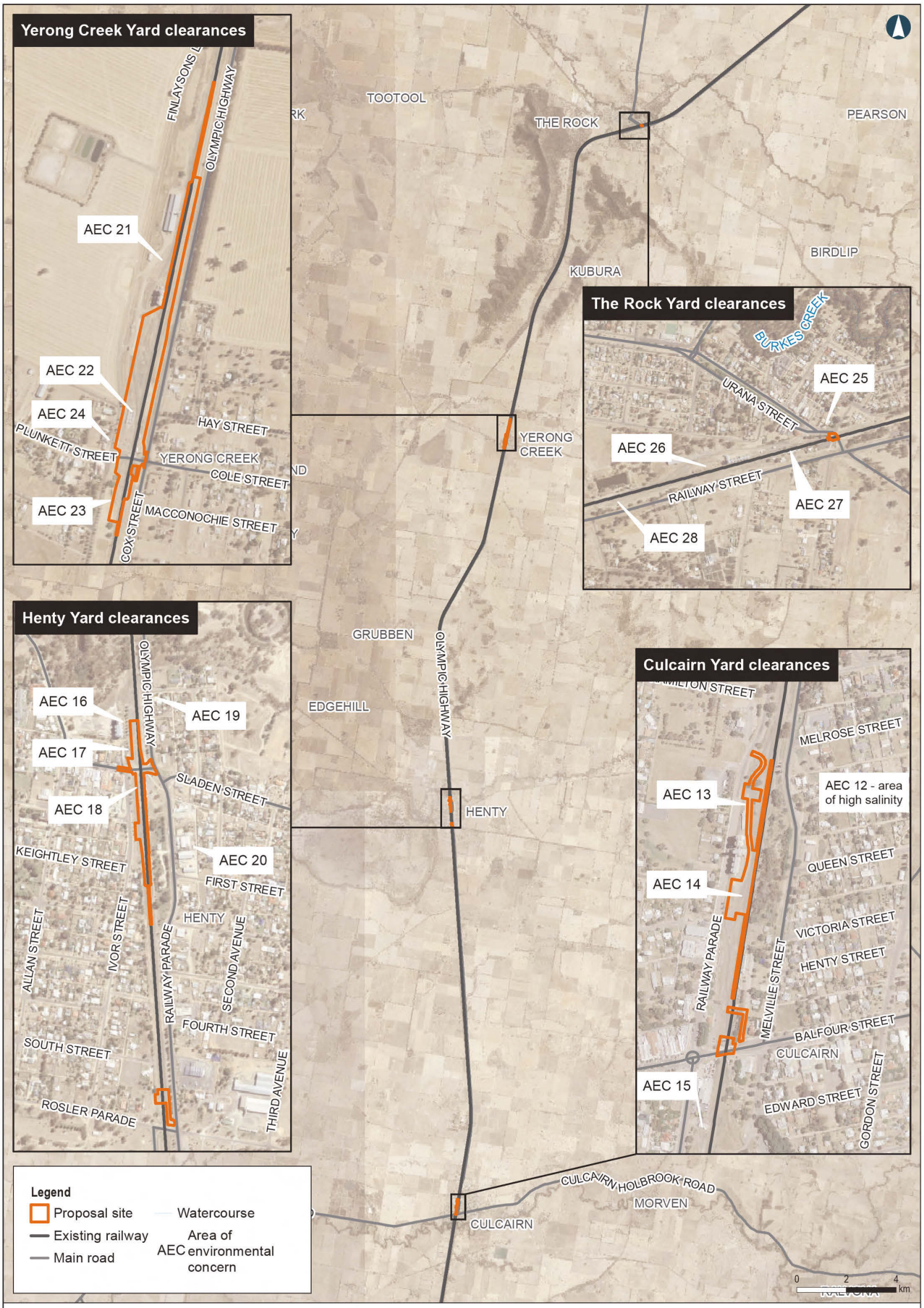

Figure 20-2 Areas of environmental concern for Greater Hume-Lockhart precinct enhancement sites

Data Sources: ARTC, NSWSS

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:200,000
Paper size: A4
Date: 4/11/2021

210_EAP_F2002_EnvironmentalConcern_LGH_r1v3.mxd

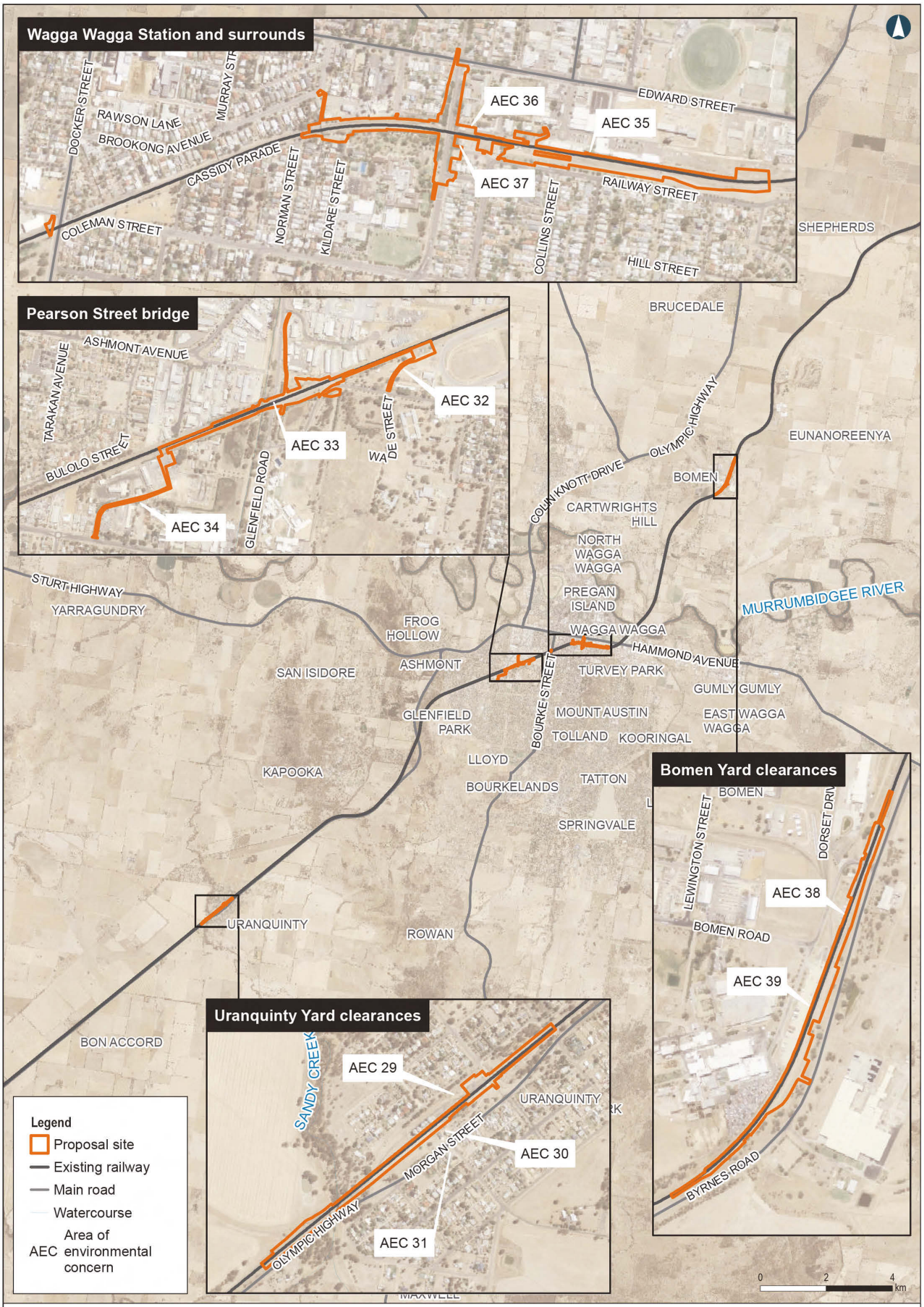

Figure 20-3 Areas of environmental concern for Wagga Wagga precinct enhancement sites

Data Sources: ARTC, NSWSS

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:150,000
Paper size: A4
Date: 14/12/2021

210_EAP_F2003_EnvironmentalConcern_Wagga_r1v4.mxd

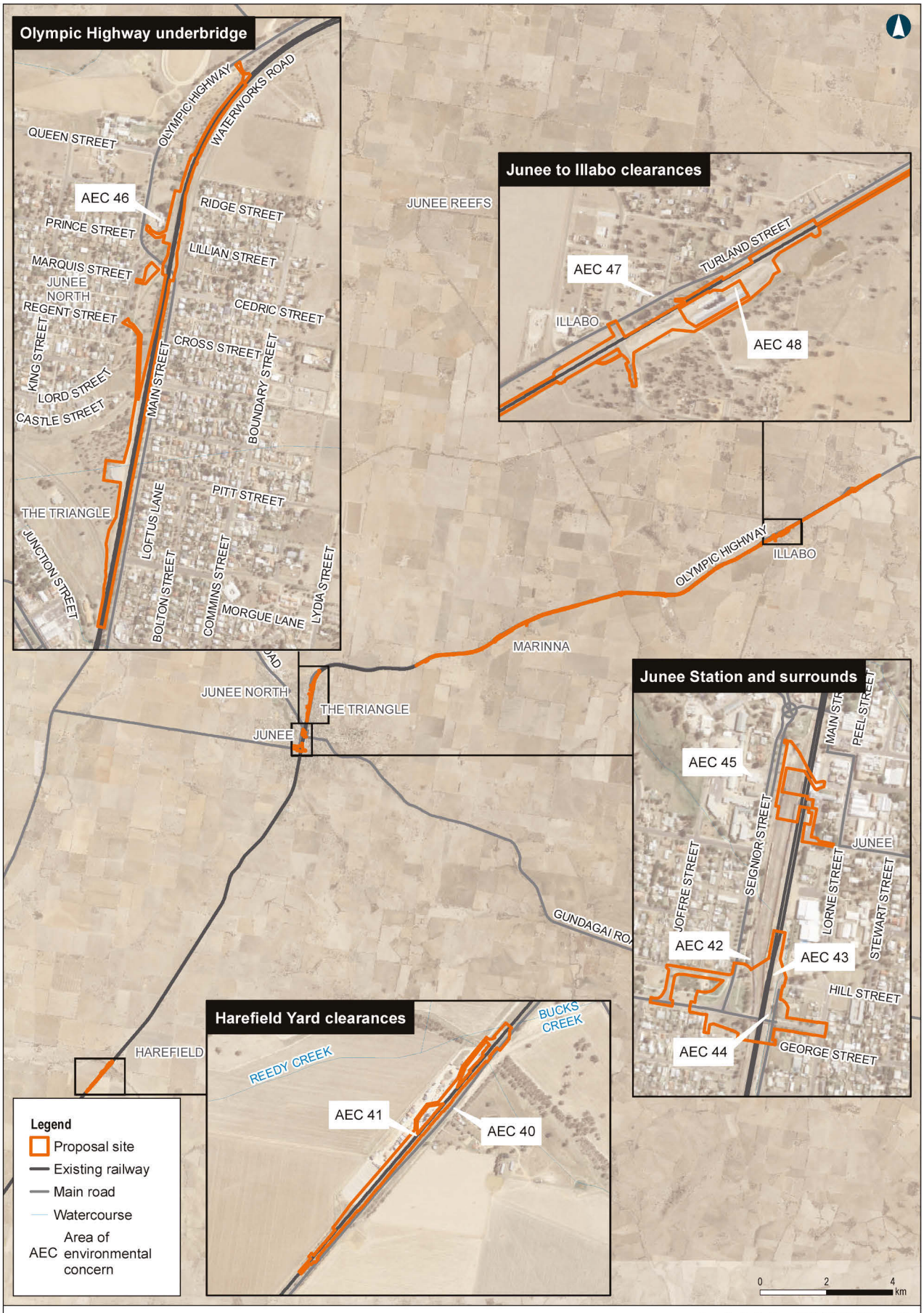

Figure 20-4 Areas of environmental concern for Junee precinct enhancement sites

Data Sources: ARTC, NSWSS

Coordinate System: GDA 1994 MGA Zone 55
Scale: 1:150,000
Paper size: A4
Date: 26/05/2022

210_EAP_F2004_EnvironmentalConcern_Junee_r1v6.mxd

20.4 Impact assessment—construction

Excavation and ground disturbance activities would expose and disturb soils. If not adequately managed, this could result in:

- erosion of exposed soil and stockpiled materials
- dust generation
- an increase in sediment loads entering the stormwater system and/or local runoff, and, therefore, nearby receiving waterways
- increase in salinity levels in soil
- ASS conditions
- mobilisation of contaminated sediments, with resultant potential for environmental and human health impacts.

Potential impacts as they relate to soils and contamination are considered in this section. This assessment has considered potential impacts to sensitive receiving environments, as well as the people that work or live in or near the proposal site. Sensitive receivers and their proximity to identified AECs in relation to the relevant construction activities of each enhancement site are identified in section 20.4.2. Further discussion of potential construction impacts on land uses and property, biodiversity (including aquatic ecology) and water resources are provided in Chapter 12: Land use and property; Chapter 16: Biodiversity; Chapter 18: Hydrology, flooding and water quality; and Chapter 19: Groundwater.

Potential water-quality impacts, including impacts caused by increased sediment loads, are considered in Chapter 18: Hydrology, flooding and water quality. As identified in Table 20-2, some enhancement sites contain dispersive soils or with soils prone to high erosion hazard. Air quality (dust) impacts are considered in Chapter 21: Air quality. Any excess spoils requiring removal from the proposal site will need to be classified in accordance with the *Waste Classification Guidelines* (NSW EPA, 2014b) for waste disposal purposes, or otherwise be assessed for its suitability for beneficial reuse, in accordance with existing resource recovery orders and exemptions prepared by the NSW EPA. Construction waste impacts are considered further in Chapter 23: Waste and resource management.

20.4.1 Soils

Soil erosion

Construction would temporarily expose the natural ground surface and sub-surface through the removal of vegetation, overlying structures (such as existing roads) and excavation. The exposure of soil to runoff and wind can increase soil erosion potential; particularly, where construction activities are undertaken in soil landscapes characterised by dispersive soils, given their susceptibility to erosion. As stated in Table 20-2 in section 20.3.2, some sites contain dispersive soils or soils prone to high erosion hazard. The potential for erosion impacts would be minimised by implementing standard best-practice soil erosion management measures during construction (see section 20.6) and risks associated with dust are discussed further in Chapter 22: Air quality.

Saline soils

Excavation of salt-affected soil from deeper horizons are likely to lead to an increase in salinity presence at the surface. Excavation of these areas are likely to disrupt the existing aboveground and sub-surface drainage patterns, allowing salts to be brought to the surface in seeps or to accumulate in zones of evaporation. Soil disruption associated with excavations or cuttings into the landscape for the proposal, footings, construction compounds, bridges or levelling purposes are potential activities that could lead to increased salinity risk. The following enhancement sites are most likely to have the highest salinity risk due to a more significant excavation on areas with moderate-to-high potential for salinity:

- Riverina Highway bridge (track lowering)
- Billy Hughes bridge (track lowering)
- Pearson Street bridge (track lowering)

The potential for impacts due to the presence of saline soils would be managed by site-specific salinity assessments (refer to section 20.6.2).

Acidity

Acid sulfate soils

The exposure of ASS to oxygen during disturbance can lead to the generation of sulfuric acid. The subsequent acidic leachate can then lead to mobilisation of heavy metals such as aluminium and iron into water bodies. Drainage from ASS may affect water quality and can impact aquatic organisms. The proposal site is located within

areas described as having a low probability of ASS, with the exception of Murray River bridge enhancement site. At this enhancement site, there are sediments that have a 'high probability' of occurrence of ASS.

The potential impacts associated with ASS at the Murray River bridge enhancement site would be minimal, as the proposed works comprise mainly structural bridge work and grading of an access track with very limited excavation. In addition to this, the proposed works are not located in areas where ASS is likely to be present and, therefore, the risk of encountering ASS is considered to be low.

Naturally acidic soil

Soil conditions are considered very strongly acidic to strongly acidic within, or near, more elevated terrain, such as near Ettamogah and Table Top, The Rock, Kapooka and northeast of Junee. The following five enhancement sites could be impacted by naturally acidic soils:

- Billy Hughes bridge
- Table Top Yard clearances
- The Rock Yard clearances
- Uranquinty Yard clearances
- Junee to Illabo clearances.

At these enhancement sites, the selection of construction materials and subsurface construction would consider the aggressivity of the soil (refer to section 20.6).

20.4.2 Contamination

There is a general contamination risk present across all enhancement sites, based on their general setting within an existing rail corridor and land uses that occur in and adjacent to these areas. Where even limited ground penetration is to take place, there is some potential for source, pathway and receptor linkages to be present from contamination. A review of available information did not identify widespread significant contamination within the proposal site; however, the AECs identified in Table 20-3 present potential contamination risk. This risk would not warrant detailed site investigations (DSI) to inform the EIS, as it can be effectively managed through construction management measures, including an unexpected finds protocol (UFP). Spoil or material being reused onsite would need to be tested to inform waste classification and/or beneficial reuse of spoil, and further investigation would be completed to inform waste management (including management of contamination) during construction (refer to Chapter 23: Waste and resource management).

Based on the desktop assessment and site inspection, the risk of contamination across the proposal site is considered to be low within the context of the continuing railway land use; however, some discrete areas of medium risk have been identified, such as areas of waste within the rail corridor, fill used in the construction of the existing rail line and structures containing hazardous materials (such as lead paint and asbestos).

Based on the intensity of historical activities observed within the rail corridor, including the presence of operational facilities, and development in the surrounding area, enhancement sites within and surrounding Albury Station and Wagga Wagga Station are considered to have a higher likelihood of contamination being present. Equally, enhancement sites with more extensive (including area and depth) excavation proposed, including Riverina Highway bridge, Billy Hughes bridge, Pearson Street bridge and Kemp Street bridge enhancement sites, may also be considered to have a higher likelihood for the proposal to encounter contamination. The mitigation measures outlined in section 20.6.2 include further investigation of these enhancement sites, which would confirm the requirement for further management actions. A Sampling, Analysis, and Quality Plan (SAQP) would be prepared to inform the scope of site investigations.

For enhancement sites where there is a risk of encountering contaminated soil, and more significant excavation is required as part of the proposal, further investigation would be carried out by the contractor to inform the detailed design and the subsequent management and classification of the excavated material during construction. Testing would be undertaken by a suitably qualified and experienced consultant, as defined in Schedule B9 of the NEPM (2013) and assessed against the criteria contained in NEMP (2013) to assess reuse and against the waste classification criteria in NSW EPA (2014b).

Contamination likely to be encountered during construction is likely to be isolated contamination hotspots across the enhancement sites and would include heavy metals, TRH, BTEX, PAHs, asbestos, lead dust and/or paint, OCPs and OPPs. Where the risk of asbestos and lead dust and/or paint has been identified, further assessment would be required prior to construction and suitable remediation or management completed.

As identified in Table 20-3, The Rock RFS, Henty RFS, the former Gang Shed (SES Headquarters), Yerong Creek RFS, Uranquinty RFS and Illabo RFS are within proximity of the proposal site; however, the RFS has advised that, to the best of their knowledge, no firefighting foams that contained PFAS were used at these sites.

Construction has the potential to result in the contamination of soil and groundwater due to spills and leaks of fuel, oils and other hazardous materials. In addition, there is the potential to introduce contamination to the proposal site through the acceptance of imported fill that has not been properly verified. These potential impacts would be minimal with the implementation of standard mitigation measures (refer to section 20.6). Table 20-4 outlines the potential contaminant source from construction activities and the pathways and receptors associated with the general contamination risks, as per Technical Paper 13: Contamination.

TABLE 20-4 GENERAL CONTAMINATION RISK FROM CONSTRUCTION—PATHWAY AND RECEPTORS

Construction activity	Relevant enhancement sites/AECs	Potential contaminants of concern	Pathway	Receptors	Assessed risk
Disturbance of areas of dumped rubbish in the rail corridor by general construction activities, including potential ACM	▸ Murray River bridge (AEC 2) ▸ Culcairn Yard clearances (AEC 13) ▸ Henty Yard clearances (AEC 18) ▸ Yerong Creek Yard clearances (AEC 21, AEC 22) ▸ The Rock Yard clearances (AEC 26, AEC 27) ▸ Uranquinty Yard clearances (AEC 29) ▸ Pearson Street bridge (AEC 33, AEC 35) ▸ Bomen Yard clearances (AEC 39) ▸ Harefield Yard clearances (AEC 41) ▸ Kemp Street bridge and Junee Yard clearances (AEC 42, AEC 43) ▸ Potential remains at all enhancement sites.	▸ Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint	▸ Direct contact[1] ▸ Inhalation[2].	▸ Workers onsite.	**Medium**—significant unsolicited waste disposal along the proposal site is unlikely. Additional soil investigations may be required where triggered by the UFP. Soils, waste and hazardous materials are to be managed in line with mitigation measures outlined in Table 20-9, including implementation of an Asbestos Management Plan (AMP) and UFP.
Excavation of fill used in construction of the existing rail line, which may be contaminated	▸ All enhancement sites where these activities occur in adjacent areas.	▸ Diffuse presence or isolated hotspots of heavy metals, TRH, BTEX, PAHs, asbestos along the existing rail	▸ Direct contact[1] ▸ Inhalation[2].	▸ Workers onsite.	**Medium**—significant unsolicited waste disposal along the proposal site is unlikely. Additional soil investigations may be required where triggered by the UFP. Soils, waste and hazardous materials are to be managed in line with mitigation measures outlined in Table 20-9, including implementation of an AMP and UFP.
Disturbance of soils that have been subject to weed-suppression activities along the proposal site by general construction activities	▸ All enhancement sites where these activities occur in adjacent areas.	▸ Diffuse presence or isolated hotspots of OCPs or OPPs along the existing rail.	▸ Direct contact[1] ▸ Inhalation[2] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Terrestrial and aquatic ecology (flora and fauna) within/adjacent to creeks or waterways.	**Low**—significant impact from weed suppression is unlikely and not likely to present a risk to human health receptors if correct construction practices are used. Unlikely to be sensitive ecological receptors onsite; there is the potential for more sensitive ecological receptors offsite.

Construction activity	Relevant enhancement sites/AECs	Potential contaminants of concern	Pathway	Receptors	Assessed risk
Demolition of buildings, bridges and other structures containing hazardous materials (including lead paint) but potentially located in the vicinity of all enhancement sites	▸ Murray River bridge (AEC 1, AEC 3) ▸ The Rock Yard clearances (AEC 28) ▸ Wagga Wagga Yard clearances (AEC 37) ▸ Kemp Street bridge and Junee Yard clearances (AEC 42) ▸ Potential remains at all enhancement sites.	▸ Asbestos and lead dust and/or paint	▸ Inhalation[2] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Terrestrial and aquatic ecology (flora and fauna) within/adjacent to creeks or waterways.	**Medium**—may present a risk to workers if not removed from the proposal site or made safe. Unlikely to be sensitive ecological receptors onsite; there is the potential for more sensitive ecological receptors offsite. A hazardous materials survey would be completed on buildings or other structures identified that may be impacted by the proposal. Hazardous materials will be managed as per the mitigation measures outlined in Table 20-9, including implementation of an AMP and UFP.

Disturbance of rail line ballast or stockpiles of soils during general construction that may be contaminated from maintenance activities undertaken at sidings and near silos or other areas	▸ All enhancements sites where these features occur. This includes the following enhancement sites:
	  ▸ Albury Yard clearances and Riverina Highway bridge enhancement sites (AEC 7)
	  ▸ Billy Hughes bridge enhancement site (AEC 11)
	  ▸ Culcairn Yard clearances (AEC 14)
	  ▸ Yerong Creek clearances (AEC 16, AEC 17, AEC 23)
	  ▸ Bomen Yard clearances (AEC 38)
	  ▸ Kemp Street bridge and Junee Yard clearances (AEC 44)
	  ▸ Junee to Illabo clearances (AEC 48).
		▸ Heavy metals, TRH, BTEX, PAHs, asbestos, lead containing dust and/or paint	▸ Direct contact[1]
			▸ Inhalation[2].
				▸ Workers onsite.	**Low**—potentially contain isolated spills or metals dust from trains. Ballast is typically an inert metamorphosed basalt or granite and not considered a contaminant source in and of itself.
					Ballast would be inspected for indications of contamination during construction.
					Mitigation and management measures are outlined in section 20.6.1 and section 20.6.2.

Construction activity	Relevant enhancement sites/AECs	Potential contaminants of concern	Pathway	Receptors	Assessed risk
Disturbance of soils during general construction that may be contaminated by use of agricultural chemicals on farmland	▸ All enhancements sites where these features occur in adjacent areas.	▸ Heavy metals, OCPs and OPPs.	▸ Direct contact[1] ▸ Inhalation[2] ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Groundwater ▸ Terrestrial and aquatic ecology (flora and fauna) within/adjacent to creeks or waterways.	**Low**—unlikely to be present in significant quantities in soil within the proposal site. Unlikely to be sensitive ecological receptors onsite; there is the potential for more sensitive ecological receptors offsite. These areas are generally located offsite and not in proposed work area.
Disturbance of soils during general construction that may be contaminated from machinery storage and maintenance, refuelling and spray rig filling, agricultural sheds and silos	▸ Albury Station pedestrian bridge, Albury Yard clearances, Riverina Highway bridge (AEC 5, AEC 6) ▸ Potential remains at all enhancement bridge, Albury enhancement sites.	▸ Point sources of heavy metals, TRH, BTEX, solvents, OCPs and OPPs, and asbestos fragments	▸ Direct contact[1] ▸ Inhalation[2] ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Groundwater ▸ Terrestrial and aquatic ecology (flora and fauna) within/adjacent to creeks or waterways.	**Low**—long-term machinery storage or maintenance may be a continued source of impact to soils and groundwater if permeated through soil profile but these areas are generally located offsite and not in proposed work area.

1. Direct contact through inadvertent ingestion, or dermal absorption of soils
2. Inhalation of impacted soils/dust/vapour spray

Precinct-specific contamination risk

In addition to potential impacts from general contamination risk, impacts from specific contamination risks have been identified at certain enhancement sites and outlined in the following sections.

Albury precinct

The potential enhancement site-specific impacts from AEC in the Albury precinct are outlined in Table 20-5. Refer to Table 20-3 for potential contaminants of concern at each AEC.

TABLE 20-5 SPECIFIC CONTAMINATION RISKS FOR ALBURY PRECINCT

Enhancement site and construction activity	Relevant AEC / Potential contaminants	Pathway	Receptors	Assessed risk
Riverina Highway bridge: ▸ Excavation associated with lowering of track ▸ Drainage of surface water overflow during track lowering	AEC 4 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Unnamed drain/culvert located 20 m to the east ▸ Groundwater of Upper Murray (alluvium) groundwater system ▸ Offsite residential, nearest being 19 m to the north, north-west.	**Low**—the service station is not in the immediate vicinity of the enhancement site and contaminants unlikely to be present in significant quantities in soil or groundwater within the enhancement site.
Adjacent to Albury Station and surrounds enhancement sites	AEC 8 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Unnamed drain/culvert located 20 m to the east ▸ Groundwater of Upper Murray (alluvium) groundwater system ▸ Offsite residential, nearest being 110 m to the south, south-west.	**Low**—the former depot has been assessed as unlikely to present a risk to receptors and no excavation is planned in this area.
	AEC 9 TRH, BTEX, PAHs, pesticides and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Unnamed drain/culvert located 20 m to the east ▸ Groundwater of Upper Murray (alluvium) groundwater system ▸ Offsite residential, nearest being 175 m to the south-west.	**Low**—adjacent to the enhancement site. Groundwater migration unlikely to impact Riverina Highway underbridge.

1. Direct contact through inadvertent ingestion or dermal absorption of soils

Greater Hume–Lockhart Precinct

The potential enhancement site-specific impacts from AEC in the Greater Hume–Lockhart precinct is outlined in Table 20-6. Refer to Table 20-3 for potential contaminants of concern at each AEC.

TABLE 20-6 SPECIFIC CONTAMINATION RISKS FOR GREATER HUME–LOCKHART PRECINCT

Construction activity	Relevant AEC/ Potential contaminants	Pathway	Receptors	Assessed risk
Culcairn Yard clearances: Excavation associated with track realignment and other ancillary works	AEC 15 TRH, BTEX, PAHs, heavy metals and asbestos	▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Billabong Creek, 220 m to the south ▸ Groundwater of the Billabong Creek groundwater system ▸ Offsite residential, nearest being 50 m to the west.	**Low**—AEC 15 is not located in the vicinity of the enhancement site, so migration to the enhancement site is not likely.
Henty Yard clearances: Excavation associated with track realignment and other ancillary works	AEC 19 TRH, BTEX and PAHs	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Buckaringah Creek, 160 m to the north ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being immediately to the south.	**Low**—The RFS shed is located approximately 50 m north of the enhancement site.
	AEC 20 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Buckaringah Creek, 470 m east ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 20 m to the east.	**Low**—the service station is not in the immediate vicinity of the enhancement site and contaminants unlikely to be present in significant quantities in soil or groundwater within the enhancement site.
Yerong Creek Yard clearances: Excavation associated with track realignment and other ancillary works	AEC 24 TRH, BTEX and PAHs	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Sandy Creek, 435 m to the south ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 55 m north.	**Low**—AEC 24 is located approximately 25 m west of the enhancement site.
The Rock Yard clearances: Gantry modifications	AEC 25 TRH, BTEX and PAHs	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Burkes Creek, 280 m to the north ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 30 m to the west.	**Low**—RFS have confirmed that PFAS was not historically used at the RFS building. AEC 25 is located approximately 50 m north of the enhancement site. No significant excavation.

1. Direct contact through inadvertent ingestion, or dermal absorption of soils

Wagga Wagga precinct

The potential enhancement site-specific impacts from AEC in the Wagga Wagga precinct are outlined in Table 20-7. Refer to Table 20-3 for potential contaminants of concern at each AEC.

TABLE 20-7 SPECIFIC CONTAMINATION RISKS FOR WAGGA WAGGA PRECINCT

Construction activity	Relevant AEC/ Potential contaminants	Pathway	Receptors	Assessed risk
Uranquinty Yard clearances: Excavation associated with track realignment and other ancillary works and bridge modifications	AEC 30 TRH, BTEX and PAHs	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Sandy Creek, 380 m to the south-west ▸ Endangered ecological community, 500 m to the north-east ▸ Groundwater of the Lachlan fractured rock ground water system ▸ Offsite residential, nearest being 105 m to the south-east.	**Low**—AEC 30 is located approximately 50 m north of the enhancement site.
	AEC 31 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Sandy Creek, 380 m to the south west ▸ Endangered ecological community, 500 m to the north-east ▸ Groundwater of the Lachlan fractured rock ground water system ▸ Offsite residential, nearest being immediately adjacent to the south.	**Low**—the service station is not in the immediate vicinity of the enhancement site and contaminants unlikely to be present in significant quantities in soil or groundwater within the enhancement site.
Pearson Street bridge: Excavation associated with lowering of track.	AEC 32; AEC 34 TRH, BTEX, PAHs, heavy metals and/or asbestos.	▸ Direct contact[1] ▸ Inhalation[2].	▸ Workers onsite ▸ Endangered ecological community, located in the Wagga Wagga LGA ▸ Unnamed artificial drainage line, immediately adjacent to AEC 32 and 615 m to the north-west of AEC 34 ▸ Groundwater of Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 30 m to the south of AEC 32 and 85 m to the south of AEC 34	**Low**—possible maintenance or storage areas may present an isolated source of impact to soils.
Edmondson Street bridge: Limited excavation for new bridge, stairs, ramps and utilities. Excavation associated with new drainage.	AEC 36; AEC 37 TRH, BTEX, PAHs, PFAS and asbestos	▸ Direct contact[1] ▸ Inhalation[2] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Groundwater of Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 65 m to the north-west of AEC 36 and 45 m to the south of AEC 37.	**Low**—primarily due to the small scale of proposed works. Chemicals may represent health or environmental concerns if present and not managed. Chemicals may also affect reuse opportunities.

1. Direct contact through inadvertent ingestion or dermal absorption of soils
2. Inhalation of impacted soils, dust, vapour, fibres

Junee precinct

The potential enhancement site-specific impacts from AEC in the Junee precinct are outlined in Table 20-8. Refer to Table 20-3 for potential contaminants of concern at each AEC.

TABLE 20-8 SPECIFIC CONTAMINATION RISKS FOR JUNEE PRECINCT

Construction activity	Relevant AEC / Potential contaminants	Pathway	Receptors	Assessed risk
Junee Station pedestrian bridge: Minor excavation associated bridge removal and signal adjustment.	AEC 45 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Unnamed tributary of Houlaghans Creek, 70 m to the south west ▸ Groundwater of Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 250 m to the south east.	**Low**—the service station is not in the immediate vicinity of the enhancement site and contaminants unlikely to be present in significant quantities in soil or groundwater within the enhancement site.
Olympic Highway underbridge: Excavation associated with track realignment.	AEC 46 TRH, BTEX, PAHs and/or lead	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ North arm of Jeralgambeth Creek, 800 m to the south ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 50 m to the south west.	**Low**—the service station is not in the immediate vicinity of the enhancement site and contaminants unlikely to be present in significant quantities in soil or groundwater within the enhancement site.
Junee to Illabo clearances: Excavation associated with level crossing works in Illabo	AEC 47 TRH, BTEX and PAHs	▸ Direct contact[1] ▸ Migration from overland flow into surface water bodies ▸ Migration through leaching into groundwater.	▸ Workers onsite ▸ Jeralgambeth Creek, 800 m to the east ▸ Groundwater of the Lachlan fractured rock groundwater system ▸ Offsite residential, nearest being 80 m to the south west	**Low**—AEC 47 is located approximately 50 m north-west of the ARTC leased area.

1. Direct contact through inadvertent ingestion or dermal absorption of soils

20.5 Impact assessment—operation

20.5.1 Soil

Soil erosion

There is potential for recently disturbed soils to be susceptible to erosion, particularly during initial periods of landscaping and re-establishment of vegetation. This may occur in areas where planting is proposed, including adjacent to disturbed areas, along embankments and in the reinstatement of temporary ancillary facilities where topsoil is settling and vegetation is establishing. Temporary soil stabilisation may be required immediately following construction, to prevent potential erosion, topsoil loss or soil migration; this is particularly likely to be required following severe storms. A rehabilitation strategy would be prepared to guide the approach to rehabilitation of disturbed areas and would include requirements for ongoing monitoring following the establishment of these areas, as described in section 20.6.

Operation is not likely to result in any significant impacts on soils, topography or geology. The risk of soil erosion during operation would be minimal, as all areas impacted during construction would be sealed or rehabilitated, and landscaped to prevent soil erosion. The maintenance activities and schedule would not change as a result of the proposal and would be undertaken in accordance with ARTC's standard operating procedures.

During operation, erosion of dispersive soils from activities not associated with the proposal could result in silting of drainage infrastructure, including culverts. To manage this potential operational impact, dispersive soils would be treated where exposed in cut batters, culvert crossings and drainage lines. Additional impacts from unsuitable soils would be minimised by taking soil types into consideration during design and construction.

Acidity

Operation would not impact on ASS—the maintenance activities and schedule would not change as a result of the proposal. Such activities would be unlikely to involve ground disturbance activities of sufficient depth to encounter ASS.

Saline soil

Operation is not expected to impact the salinity levels of the proposal site. The maintenance activities and schedule would not change as a result of the proposal. Such activities are unlikely to involve ground disturbance activities of sufficient magnitude to increase water infiltration resulting in erosion and offsite transport of saline sediments; particularly, with the implementation of standard best-practice erosion and sediment control measures.

Salinity and potential effects on the durability of infrastructure would be considered further during detailed design, with a focus on the potential high-salinity locations identified in section 20.3.3.

20.5.2 Contamination

Operation has the potential to contaminate soil and groundwater from spillage of petroleum, chemicals or other hazardous materials from maintenance activities; however, the maintenance activities and schedule would not change as a result of the proposal and the risk of this potential impact would remain low. Accidental spillage as a result of leakage or rail accidents would also be minimised by implementing existing ARTC procedures to manage the potential leaks and spills. This is considered further in Chapter 24: Hazards, of the EIS.

Notwithstanding, as noted in section 20.4.2, based on the intensity of historical activities observed within the rail corridor, including the presence of operational facilities, and development in the surrounding area, enhancement sites within Albury Station and surrounds, and Wagga Wagga Station and surrounds, the likelihood of contamination being present would be higher. Equally, enhancement sites with more extensive (including area and depth) excavation proposed, including Riverina Highway bridge, Billy Hughes bridge, Pearson Street bridge and Kemp Street bridge, may also be considered to have a higher likelihood for the proposal to encounter contamination. The mitigation measures outlined in section 20.6.2 includes further investigation of these enhancement sites.

20.6 Mitigation and management

20.6.1 Approach to mitigation and management

Approach to managing the key potential impacts identified

Environmental management for the proposal would be carried out in accordance with the environmental management approach, as detailed in Chapter 27: Approach to mitigation and management and Appendix H: Construction environmental management plan outline of the EIS.

The CEMP would include a:

- soil and water sub-plan. This sub-plan would include measures to manage potential soil and water quality impacts during construction, including potential impacts associated with stockpile management, salinity and ASS. Further detail is provided in Chapter 18: Hydrology, flooding and water quality
- contamination and hazardous materials sub-plan. This sub-plan would include measures, processes and responsibilities to minimise the potential for contamination impacts, spill procedures, asbestos management, and procedures for managing unexpected contamination finds.

Management of potentially contaminated spoil and other waste would be completed in accordance with the mitigation and management measures outlined in Chapter 23: Waste and resource management.

20.6.2 Mitigation measures

Measures that will be implemented to address potential soils and contamination impacts are listed in Table 20-9.

TABLE 20-9 SOIL AND CONTAMINATION MITIGATION MEASURES

Stage	Ref	Impact/issue	Mitigation measure
Detailed design/ pre-construction	SC1	Acid soils and rock	In the event of any ground disturbance below the water table in areas mapped as containing potential ASS at the Murray River bridge enhancement site, testing will be carried out to confirm the presence of actual and/or potential ASS and liming rates required to mitigate the risk. If ASS are encountered, they will be managed in accordance with the *Acid Sulfate Soils Manual* (ASSMAC, 1998b) and the *Waste Classification Guidelines – Part 4: Acid Sulfate Soils* (NSW EPA, 2014b).
Detailed design/ pre-construction	SC2	Acid soils and rock	The aggressivity of the soil pH to construction materials will be assessed to confirm impacts from acidity.
Detailed design/ pre-construction	SC3	Acid soils and rock	Where excavation into sulfidic rock is confirmed during detailed design, a suitably qualified geologist or geotechnical engineer will advise on the risk and mitigation required to ensure the suitability of construction materials. If sulfidic rock is identified, environmental advice will be sought for waste management and environmental protection.
Detailed design/ pre-construction	SC4	Saline soils	Further assessment of salinity will be completed at enhancement sites where excavation is required, including: ▸ Riverina Highway bridge enhancement site ▸ Billy Hughes bridge enhancement site ▸ Pearson Street bridge enhancement site ▸ Kemp Street bridge enhancement site The assessment of salinity will include drilling of representative boreholes to test the depth profile of salts and consideration of how the works will affect surface and subsurface water flows. Where identified, salinity will be managed in accordance with the salinity management plan. Relevant aggressivity will be considered in the design of subsurface structures.
Detailed design/ pre-construction	SC5	Contamination	Site investigations at more developed railway precincts (Albury and Wagga Wagga) and enhancement sites with more significant excavation (Riverina Highway bridge, Billy Hughes bridge, Pearson Street bridge and Kemp Street bridge) will be undertaken by a suitably qualified and experienced consultant, as defined in Schedule B9 of the NEPM (2013), to inform the detailed design and the subsequent management and classification of waste soil. The scope of site investigations will be informed by a Sampling, Analysis, and Quality Plan (SAQP). Any excavated material would be suitably managed in accordance with the Soil and Water Management sub-plan and the spoil management strategy (mitigation measure WM2).
Detailed design/ pre-construction	SC6	Contamination	In the event that unidentified contaminated material is discovered during construction, an unexpected contaminated finds protocol will be implemented. The protocol will detail requirements for ceasing work and isolating the potential contaminated material, requirements for site investigations and procedures for reporting and response. Site investigations, where required, will be undertaken by a suitably qualified and experienced consultant, as defined in Schedule B9 of the NEPM (2013) to assess exposure risks to site workers and other receptors. The results of the site investigations will be assessed against the criteria contained within the *National Environment Protection (Assessment of Site Contamination) Measure 1999* to determine the need for any remediation.

Stage	Ref	Impact/issue	Mitigation measure
Detailed design/ pre-construction	SC7	Hazardous materials	An occupational hygienist will be engaged to complete survey of areas known, or suspected to contain, asbestos or lead-based paint potentially impacted by the proposal. This work will be carried out in accordance with asbestos and lead-based paint management controls contained in the contamination and hazardous materials sub-plan of the CEMP. This would include (but is not limited to) areas with known or suspected asbestos or lead-based paint, including Murray River bridge (AEC 1), The Rock Yard clearances (AEC 27), buildings at Wagga Wagga Yard clearances (AEC 35), Harefield Yard clearances (AEC 41) and buildings at Junee Yard clearances (AEC 42). Lead paint is known to be present at Murray River bridge (AEC 1).
Construction	SC8	Hazardous materials	An appropriately licensed asbestos removal contractor will be engaged to remove all asbestos identified to be present. Removal will be undertaken in accordance with *How to Safely Remove Asbestos Code of Practice* (Safe Work Australia, 2020) and relevant regulatory requirements. This work will be carried out in accordance with asbestos management controls contained in the contamination and hazardous materials sub-plan of the CEMP.
Construction	SC9	Hazardous materials	Lead-based paint on structures will be appropriately removed and/or managed, including the Murray River bridge, in accordance with the lead risk work outlined in *Work Health and Safety Regulation* (2017).
Construction	SC10	Hazardous materials	Lead-based paint removal will be performed in accordance with the procedure outlined in *AS/NZS 4361.2:2017 Guide to hazardous paint management, Part 1: Lead and other hazardous metallic pigments in industrial applications* (Standards Australia, 2017)

20.6.3 Expected effectiveness of mitigation measures

Erosion and sediment control measures would be implemented in accordance with the requirements of the Blue Book. The measures contained in the Blue Book are based on field experience and have been previously demonstrated to be effective. In general, implementing measures in accordance with the Blue Book would reduce the potential for the impact to be realised (by using controls such as hay bales, covers on stockpiles, etc.) or enable the impact to be avoided completely (e.g. by not undertaking works during wet weather). As a result, the proposed mitigation measures are expected to be effective.

In relation to potential impacts associated with contamination, implementing the proposal measures (including the unexpected finds protocol and spill procedures) would reduce the potential for impacts.

20.6.4 Interaction between measures

Mitigation measures in other chapters that are relevant to the management of soil and contamination include:

- Chapter 18: Hydrology, flooding and water quality and Chapter 22: Air quality, specifically detail measures that minimise potential water quality and air quality impacts, and would also serve to mitigate and manage soil-related impacted. All measures for the proposal would be consolidated and described in the CEMP.
- Chapter 23: Waste and resource management, specifically details measures to manage asbestos-contaminated waste material and spoil management (including potentially contaminated spoil).

Together, these measures would minimise the potential impacts of the proposal. Common impacts and common mitigation measures would be consolidated to ensure consistency and implementation.

20.6.5 Residual risk

Residual impacts are impacts of the proposal that may remain after implementation of the management and mitigation measures detailed in sections 20.6.1 and 20.6.2. These are summarised in Table 20-10. The proposal would result in some unavoidable residual impacts, which would reduce the biodiversity values within the study area.

Further information on the approach to the environmental risk assessment, including descriptions of criteria and risk ratings, is provided in Appendix E: Environmental risk assessment.

TABLE 20-10 RESIDUAL RISK MANAGEMENT—SOIL AND CONTAMINATION

Stage	Potential impact	Pre-mitigated rating	Mitigation measures[1]	Residual risk rating	Residual risk management[2]
Construction	Disturbance of contaminated soils, and subsequent mobilisation resulting impacts at adjacent receptors	Medium	HFSQ5, CEMP,	Low	N/A
Construction	Disturbance of hazardous materials during construction work, including demolition of buildings and structures, resulting in exposure to workers and other receptors.	Medium	SC5, SC6, SC7, SC8	Low	N/A
Construction	Contamination of soils due to spills and leaks	Low	Soil and water management sub-plan	Low	N/A
Construction	Exposure of acid sulfate soils (ASS) and subsequent mobilisation of acidic discharges	Low	SC1	Low	N/A
Construction	Exposure of saline soils resulting in increased soil salinity	High	SC2, SC3 and SC4	Low	N/A
Construction	Erosion as a result of the disturbance of soils, particularly in soil landscapes characterised by dispersive soils.	Medium	HFWQ4	Low	N/A
Operation	Contamination of soils due to spills and leaks from maintenance activities	Low	Managed in accordance with ARTC procedures	Low	N/A
Operation	Increased risk of erosion during maintenance work	Low	Managed in accordance with ARTC procedures	Low	N/A
Operation	Increased risk of contamination of land due to leaks and spills from train operations	Low	Managed in accordance with ARTC procedures	Low	N/A

1. As described in Table 20-9.
2. For residual impacts with a risk rating of medium or above.