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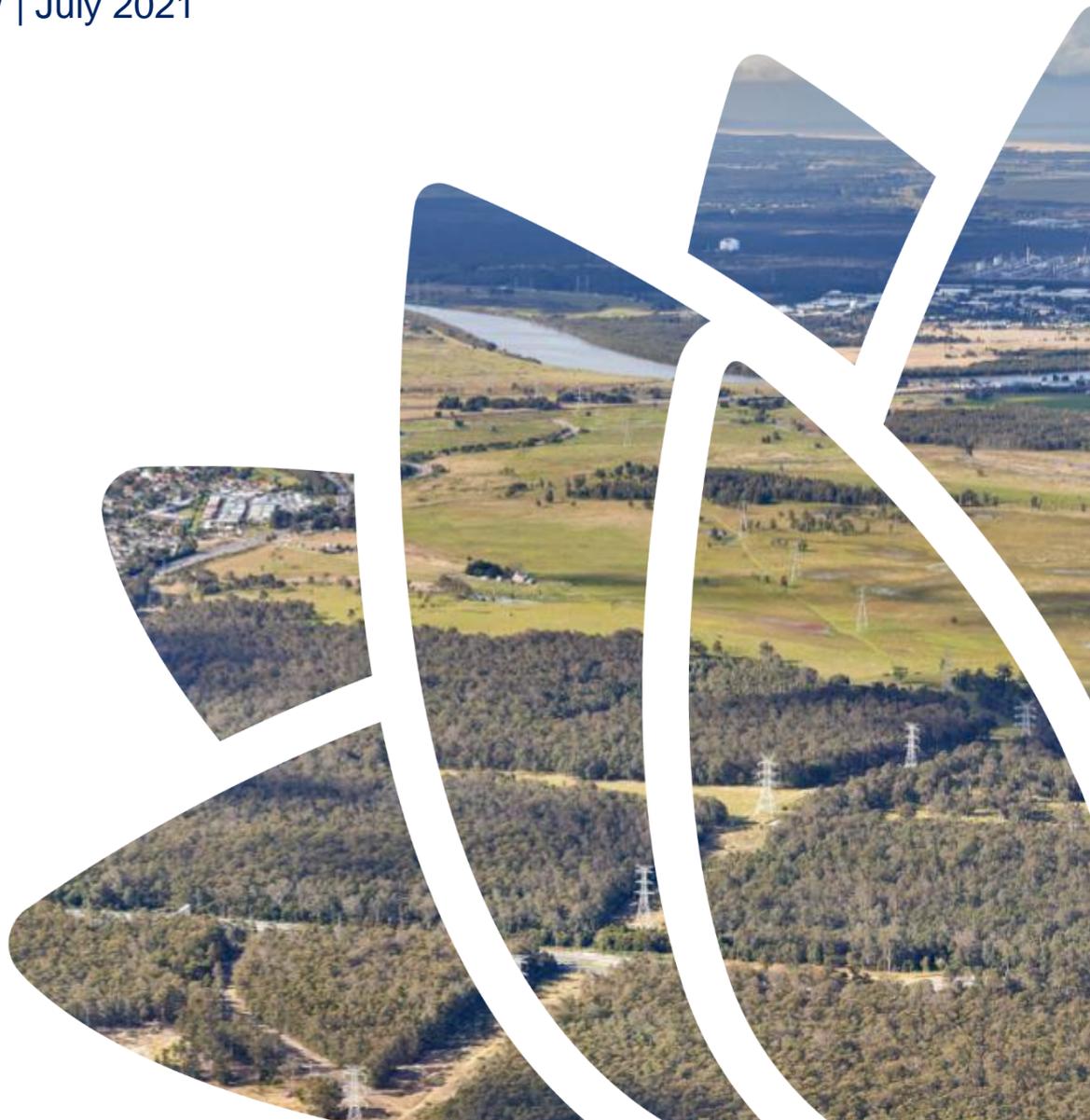
**BUILDING OUR FUTURE**



# M1 Pacific Motorway extension to Raymond Terrace

Environmental impact statement –  
Chapter 17: Non-Aboriginal heritage

Transport for NSW | July 2021



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# 17. Non-Aboriginal heritage

This chapter describes the potential non-Aboriginal heritage impacts that may be generated by the construction and operation of the project and presents the approach to the management of these impacts.

The desired performance outcomes for the project relating to non-Aboriginal heritage, as outlined in the SEARs, are to:

- Ensure the design, construction and operation of the project facilitates, to the greatest extent possible, the long term protection, conservation and management of the heritage significance of items of environmental heritage and Aboriginal objects and places
- Ensure the design, construction and operation of the project avoids or minimises impacts, to the greatest extent possible, on the heritage significance of environmental heritage and Aboriginal objects and places.

**Table 17-1** outlines the SEARs that relate to non-Aboriginal heritage and identifies where they are addressed in this EIS. The full assessment of non-Aboriginal heritage impacts is provided in the Non-Aboriginal Heritage Working Paper (**Appendix Q**).

Table 17-1 SEARs (non-Aboriginal heritage)

Secretary’s requirement	Where addressed
13. Heritage	
1. The Proponent must identify and assess any direct and/or indirect impacts (including cumulative impacts) to the heritage significance of:	
(c) environmental heritage, as defined under the <i>Heritage Act 1977</i> ; and	Direct and indirect impacts on environmental heritage are identified and assessed in <b>Section 17.4.2</b> . There are no Aboriginal places of heritage significance within the Aboriginal heritage study area (refer to <b>Section 12.4.3</b> ). Cumulative impacts are assessed in <b>Chapter 23</b> (cumulative impacts).
(d) items listed on the National and World Heritage lists.	There are no heritage items within the construction footprint that are listed on the National or World Heritage lists (refer to <b>Section 17.3.2</b> and <b>Section 12.4.3</b> ).
2. Where impacts to State or locally significant heritage items are identified, the assessment must:	
(a) include a significance assessment and statement of heritage impact for all heritage items (including any unlisted places that are assessed as having heritage value);	Significance assessments and statements of heritage impacts are summarised in <b>Section 17.3.4</b> and <b>Section 17.4.2</b> , respectively. The full assessments are detailed in the Non-Aboriginal Heritage Working Paper ( <b>Appendix Q</b> ).
(b) provide a discussion of alternative locations and design options that have been considered to reduce heritage impacts	Discussion on considered alternative location and design options is provided in <b>Section 17.4.1</b> .

Secretary's requirement	Where addressed
<p>(c) in areas identified as having potential archaeological significance, undertake a comprehensive archaeological assessment in line with Heritage Council guidelines which includes a methodology and research design to assess the impact of the works on the potential archaeological resource and to guide physical archaeological test excavations and include the results of these excavations;</p>	<p>Following discovery of historical artefact deposits during test excavation for Aboriginal heritage, one item (Glenrowan Homestead) was assessed as having potential archaeological significance (refer to <b>Section 17.3</b>).</p> <p>A detailed archaeological assessment was carried out for Hexham Shipyards and Tarro Historic Site however neither required test excavation as works are not impacting on the location of archaeology. A summary of the significance assessment for these sites is provided in <b>Section 17.3.4</b>.</p> <p>Further information on the detailed archaeological assessment, the test excavation results, archaeological assessment, methodology and research design for the salvage excavation at Glenrowan Homestead (Item 3) is provided in the Non-Aboriginal Heritage Working Paper (<b>Appendix Q</b>).</p>
<p>(d) consider impacts to the item of significance caused by, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, increased traffic, visual amenity, landscape and vistas, curtilage, subsidence and architectural noise treatment (as relevant);</p>	<p>Statements of heritage impact which consider direct and indirect impacts are summarised in <b>Section 17.4.2</b>.</p> <p>The full assessments are detailed in the Non-Aboriginal Heritage Working Paper (<b>Appendix Q</b>).</p>
<p>(e) outline measures to avoid and minimise those impacts in accordance with the current guidelines; and</p>	<p>Proposed environmental management measures are provided in <b>Section 17.5</b>.</p>
<p>(f) be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria).</p>	<p>Details of the qualified heritage consultants who carried out this assessment are provided in the Non-Aboriginal Heritage Working Paper (<b>Appendix Q</b>).</p>
<p>3. Noise and vibration – Structural</p>	
<p>1. The Proponent must assess construction and operation noise and vibration impacts in accordance with relevant NSW noise and vibration guidelines. The assessment must include consideration of impacts to the structural integrity and heritage significance of items (including Aboriginal places and items of environmental heritage).</p>	<p>Statements of heritage impact which consider noise and vibration impacts from the project during construction and operation are provided in <b>Section 17.4.2</b>.</p> <p>Surface and subsurface artefacts (Aboriginal heritage) are not subject to potential noise or vibration impacts (refer to <b>Section 12.5.1</b> and <b>Section 12.5.2</b>).</p> <p>Further discussion on vibration impacts on heritage structures are provided in <b>Chapter 8</b> (noise and vibration).</p>
<p>11. Visual amenity</p>	
<p>1. The Proponent must assess the visual impact of the project and any ancillary infrastructure (including noise barriers) on:</p> <p>(c) heritage items including Aboriginal places and environmental heritage</p>	<p>Statements of heritage impact which consider impacts, such as visual impacts of the project, are provided in <b>Section 17.4.2</b>.</p> <p>Visual impacts on Aboriginal places is discussed in <b>Section 12.5.1</b>.</p>

## 17.1 Policy and planning setting

The non-Aboriginal heritage assessment was prepared to assess the potential impacts of the project in accordance with the following relevant legislation, policy and guidelines:

- *Environmental Planning and Assessment Act 1979* (EP&A Act)
- *Heritage Act 1977* (Heritage Act)
  - NSW State Heritage Register (SHR)
  - Part 6 Division 9 of the Heritage Act – Archaeological relics
  - Section 170 Heritage and Conservation registers.
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
  - Commonwealth Heritage List (CHL)
  - National Heritage List (NHL)
  - Register of the National Estate (RNE).
- Australia ICOMOS Charter for Places of Cultural Significance (The Burra Charter) (Australia ICOMOS 2013)
- Assessing Significance for Historical Archaeological Sites and 'Relics' (NSW Heritage Branch 2009)
- NSW Heritage Manual (NSW Heritage Office 1996)
  - Assessing Heritage Significance (NSW Heritage Office 2001)
  - Investigating Heritage Significance (draft guideline) (NSW Heritage Office 2004)
  - Statements of Heritage Impact (OEH 1996).
- Roads and Maritime Services Cultural Heritage guidelines (Roads and Maritime Services 2015g).

Skeletal remains were not found during the only excavation for the project at Glenrowan and therefore the Skeletal Remains: Guidelines for Management of Human Skeletal Remains under the *Heritage Act 1977* (NSW Heritage Office 1998) were not relevant to preparing the assessment. However, the skeletal remains guidelines is referred to for consideration during the preparation of the Non-Aboriginal Heritage Management Plan (refer to **Section 17.5**).

The Criteria for the Assessment of Excavation Directors (Heritage Council of NSW 2011) would be applied during future test excavations at the Glenrowan Homestead and Tarro Historic Site (refer to **Section 17.5**).

Further detail on the above legislation, policies and guidelines, and how they apply to the project, is provided in the Non-Aboriginal Heritage Working Paper (**Appendix Q**).

## 17.2 Assessment methodology

### 17.2.1 Assessment approach

The overall approach to the non-Aboriginal heritage assessment comprised identifying heritage items<sup>1</sup> within and next to the construction footprint and assessing their significance in accordance with the Heritage Office (2001) guidelines and the Australia ICOMOS Charter for Places of Cultural Significance 2013 (The Burra Charter) (Australia ICOMOS 2013).

The methodology for the assessment of non-Aboriginal heritage included:

- Reviewing the relevant heritage legislation (as outlined in **Section 17.1**)
- Searching all available historical heritage registers for heritage places within or next to the construction footprint, including searches of the following heritage registers:
  - NSW State Heritage Inventory (SHI)
  - NSW SHR
  - Section 170 Heritage and Conservation Registers
  - National Trust of Australia Register (NTAR)
  - RNE
  - CHL
  - NHL
  - World Heritage List (WHL)
  - Newcastle Local Environmental Plan 2012 (NLEP)
  - Maitland Local Environmental Plan 2011 (MLEP)
  - Port Stephens Local Environmental Plan 2011 (PSLEP).
- Collating any known heritage curtilage (boundary) information as part of the heritage searches
- Carrying out a literature review, including previous archaeological reports, historical heritage studies, local heritage studies, and conservation management plans; as well as regional and local history documents and maps, where available
- Developing a predictive model for occurrence of historical site types in the landscape, including the use of aerial imagery, and applying this to the construction footprint to identify priority areas for field survey
- Carrying out field survey of the identified priority areas to inspect known historical heritage items, identify any previously unidentified historical heritage items, assess potential for historical archaeology, and identify heritage curtilages where necessary
- Developing a list of historical heritage items and features located within or next to the construction footprint
- Preparing a Statement of Heritage Impact (SOHI), including assessments of significance, for all historical heritage items potentially impacted by the project
- Developing management measures to mitigate impacts on non-Aboriginal heritage.
- Assessing cumulative non-Aboriginal heritage impacts that may arise from the interaction between project construction and operation activities and the activities of other approved or proposed projects in the area.

### 17.2.2 Study area

The study area for the project comprises the construction footprint with a one kilometre buffer, used to identify the types and nature of heritage items in the broader region and to inform an understanding of the potential for previously unidentified heritage items within the construction footprint. The impact assessment focusses on those heritage items within or next to the construction footprint.

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<sup>1</sup> The term 'heritage item' is used throughout this chapter to indicate any non-Aboriginal historical heritage place including buildings, structures, and archaeological remains. Each heritage item is individually numbered but may include either a single component or multiple components making up a broader complex with direct historical and cultural associations.

### 17.2.3 Site investigations

Prior to carrying out the field survey, priority areas for survey were identified using background information. This included aerial images, the predictive statement for historical site types, previous studies and field surveys, and historical heritage register listings.

Field surveys were carried out at identified priority areas by suitably-qualified archaeologists between December 2015 and June 2020, and typically involved:

- Inspection of listed historical heritage items within or next to the construction footprint
- Inspection of areas identified as having the potential for heritage items.

The findings of field surveys are provided in **Section 17.3**.

### 17.2.4 Assessment of significance and impact assessment

#### *Assessments of significance*

Where non-Aboriginal heritage items were identified within or next to the construction footprint, assessments were carried out to determine their relative importance ('assessments of significance'). Places which are likely to be significant are those which 'help an understanding of the past or enrich the present, and which would be of value to future generations' (Australia ICOMOS 2013). In Australia, the significance of a place is generally assessed according to aesthetic, historic, scientific and/or social value.

Assessments of significance were carried out in accordance with the Assessing Heritage Significance manual (NSW Heritage Office 2001). The NSW Heritage Council has adopted specific criteria for heritage assessment, which have been gazetted pursuant to the Heritage Act. The seven criteria upon which assessments of significance are based are outlined below:

- Criterion (a) an item is important in the course, or pattern, of NSW cultural or natural history
- Criterion (b) an item has strong or special association with the life or works of a person, or group or persons, of importance in NSW cultural or natural history
- Criterion (c) an item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW
- Criterion (d) an item has strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons
- Criterion (e) an item has potential to yield information that would contribute to an understanding of NSW cultural or natural history
- Criterion (f) an item possesses uncommon, rare or endangered aspects of NSW cultural or natural history
- Criterion (g) an item is important in demonstrating the principal characteristics of a class of NSW cultural or natural places or cultural or natural environments.

Assessments of significance were prepared for all heritage items located within or next to the construction footprint. The results are provided in **Section 17.3**.

#### *Level of impact*

The level of impact on the heritage significance of each heritage item in the construction footprint has been assessed based on the definitions and framework for assessing severity of impacts from the EPBC Act

Significant impact guidelines 1.2 (Department of Sustainability Environment Water Population and Communities 2013). The following characteristics were used to assess the level of impact:

- The scale of the project and its impacts
- The intensity of the project and its impacts
- The duration and frequency of the project and its impacts.

The levels of impact used in this assessment are defined in **Table 17-2**. For impacts to meet a certain level they generally need to have two or more of the characteristics noted above and in **Table 17-2**. The level of impact assigned to each heritage item is based on the level assessed following implementation of management measures.

Table 17-2 Definitions of levels of impact

Level of impact	Characteristics assessed		
	Scale	Intensity	Duration/Frequency
Major	Medium – large	Moderate – high	Permanent/irreversible
Moderate	Small – medium	Moderate	Medium – long term
Minor	Small/localised	Low	Short term/reversible
Negligible	Little or no physical impact; or little or no impact on heritage significance from physical impacts; or potential physical impacts are now able to be prevented through implementation of management measures (for example, vibration).		

### Statements of heritage impact

A SOHI is used to identify what impact the project would have on a heritage item identified in the assessment. A SOHI, together with supporting information, addresses:

- Why the item is of heritage significance
- What impact the proposed works would have on that significance
- What measures are proposed to mitigate negative impacts
- Why more sympathetic solutions are not viable (NSW Heritage Office 2002).

A SOHI for each heritage item with the potential to be impacted by the project has been prepared in accordance with the NSW Heritage Office (2002) Statements of Heritage Impact guidelines. A summary of each SOHI is provided in **Section 17.4.2**. Further details are provided in the Non-Aboriginal Heritage Working Paper (**Appendix Q**).

## 17.3 Existing environment

### 17.3.1 Historical context

During the early days of convict settlement at Sydney, the favoured means of transport was by boat up and down the coast and inland via the waterways. In 1797, coal was discovered at the mouth of the Hunter River by Lieutenant Shortland and in 1801, Lieutenant-Colonel Paterson took the survey boat 'Lady Nelson' to investigate and report on this coal outcrop as well as other natural resources. A second survey was carried out by Charles Grimes and Francis Barrallier six months later. Shortly after their return to Sydney, Governor King established the first European settlement at Newcastle, located to the south of the construction footprint.

In 1812, 1818 and 1821 Governor Macquarie took parties up the Hunter River. He named a location on the riverbank where they camped in 1818 as 'Raymond Terrace', located to the north of the construction footprint. They proceeded up the Hunter and Paterson Rivers, visiting some of the farms Governor Macquarie had permitted settlers to occupy. In the 1820s, grants for land east and west of the Hunter River were made available. The alluvial flats along the Hunter River began to be settled and by 1825 there were almost 300 settlers living in the region. The increase in population resulted in the construction of a carriage road between Wallis Plains and Newcastle, as well as the introduction of a regular boat service along the Hunter River, which dissects the construction footprint.

The Pacific Highway, a section of which is located within the construction footprint, was the first large construction project carried out by the Main Roads Board. The establishment of industries, such as the steelworks, in Newcastle, located to the east of the construction footprint, resulted in Newcastle becoming the second largest city in NSW, prior to 1925. As a result of this growth, it was necessary to form a road connection with Sydney and the rest of NSW, particularly as motor cars became more popular. Work on the road commenced in 1925. The North Coast Road between Hexham and Tweed Heads was proclaimed in 1928 and named the Pacific Highway in 1931.

Today, the surrounding area is largely rural in nature with the main population concentrated in the town of Raymond Terrace. Smaller towns, such as Tarro, are located throughout the remaining rural and semi-rural areas. Some parts of the surrounding suburbs have continued their industrial past with Heatherbrae and Tomago containing both rural and industrial characteristics.

Further information on the history of the individual towns in the vicinity of the construction footprint is outlined in the Non-Aboriginal Heritage Working Paper (**Appendix Q**).

## 17.3.2 Heritage context

### *Desktop assessment*

A review of previous heritage assessments and the heritage register searches indicated the following (refer to **Figure 17-1**):

- Three listed heritage items are located within the construction footprint; Hexham Shipbuilding Yards, Hannell Family Vault and Tarro Historic Site (original township of what was formerly known as Upper Hexham)
- Three listed heritage items are located next to the construction footprint (Residence, Tarro Substation and Pumping Station).

Two LEP-listed heritage items, the Newcastle Crematorium (I34) and Our Lady of Lourdes Church (I547), are not situated within or next to the construction footprint but have been identified as being eligible for consideration of at-property architectural noise treatment in the Noise and Vibration Working Paper (**Appendix H**) and hence have been included in this assessment.

One heritage item, Hunter Estuary Wetland was identified on the Register of National Estate (RNE), however this register was closed in 2007 and is no longer a statutory list.

A further 13 heritage items are situated within the study area (within one kilometre of the construction footprint). None of these items are considered further in this assessment due to their distance from the construction footprint, or the distance of key historical heritage elements of the item from the construction footprint.

Based on the desktop assessment, there is also the potential for previously unidentified historical heritage items to be situated within the construction footprint, particularly in the more rural sections, including:

- Houses, homesteads and other buildings associated with the settlement of the region
- Past rural uses related to pastoral industry and farming, including stockyards, fences, sheds and outbuildings, and creek fords.

Searches did not identify any heritage items listed on the SHR, SHI, NTAR, CHL, NHL, MLEP, PSLEP or WHL within or next to the construction footprint.

### **Review of aerial imagery**

Aerial imagery from 2015 was reviewed to identify areas of heritage potential prior to the field survey. Several properties were identified where the nature of features or buildings indicated that they may have some heritage potential. Of these properties, six areas were identified for field survey, as identified in **Table 17-3**.

Table 17-3 Areas with potential for heritage items within the construction footprint

<b>Description of area of potential</b>	<b>Location</b>
Glenrowan Homestead	51 New England Highway, Black Hill
An industrial site at the former mineral sands processing site	1877 Pacific Highway, Tomago
Building remains and footings	15 Pacific Highway, Tomago
A racetrack (possible Motto Farm)	2171 Pacific Highway, Tomago
Possible building footings located next to the Hunter River and possible man-made canals	Lot 131 DP 1092779
A creek crossing	1 Anderson Drive, Tarro

### **17.3.3 Field survey results**

Field surveys were carried out for listed historical heritage items and for priority areas within and next to the construction footprint which were identified as having the potential for heritage items.

Following the field survey and subsequent assessment, eight listed heritage items, one former listing (Item 5) and one potential heritage item (Item 3) were considered to occur within or next to the construction footprint, or would be subject to project-related work, including:

- Item 1: Hannell Family Vault (NLEP I179)
- Item 2: Hexham Shipbuilding Yards (NLEP I180)
- Item 3: Glenrowan Homestead
- Item 4: Residence, 29 Eastern Avenue, Tarro (NLEP I548)
- Item 5: Hunter Estuary Wetland
- Item 6: Tarro Historic Site (original township of what was formerly known as Upper Hexham) (NLEP A18)
- Item 7: Tarro Substation (NLEP I546)
- Item 8: Pumping Station (listed on NLEP I550, Hunter Water Corporation Section 170 register)
- Item 9: Newcastle Crematorium (NLEP I34)
- Item 10: Our Lady of Lourdes Church (NLEP I547).

The location of these items is shown on **Figure 17-1** (with the exception of Item 5, refer to discussion below). A description of these heritage items and photographs from field surveys are provided in **Table 17-4**.

As described in **Section 17.3.2**, Item 5, Hunter Estuary Wetland, listed on the non-statutory RNE, was removed from further assessment as former listings have been superseded by stronger ongoing heritage protection provisions under national environment law. There is no current listing affecting this item within the construction footprint of the project.

Field surveys did not involve survey of the Newcastle Crematorium (Item 9) or Our Lady of Lourdes Church (Item 10) as the historical heritage elements of this listing are located over 250 metres and 500 metres from the construction footprint, respectively. These two items have been included in this assessment due to eligibility for at-property treatment for noise mitigation (discussed further in **Chapter 8** (noise and vibration)).



- Construction footprint
- The project
- Main North Rail Line
- Waterways

**Non-Aboriginal registered and potential heritage items**

- 1. Hanel Family Vault
- 2. Hexham Shipbuilding Yards
- 3. Glenrowan Homestead
- 4. Residence

- 6. Tarro Historic Site (Original township of what was formerly known as Upper Hexham)
- 7. Tarro Substation
- 8. Pumping Station

- 9. Newcastle Crematorium
- 10. Our Lady of Lourdes Church

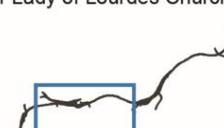


Figure 17-1 Listed and potential heritage items within or next to the construction footprint, or subject to project-related work

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Table 17-4 Description and photographs of listed and potential heritage items identified during field surveys

Item name and register no.	Description and results of survey	Photographs from field surveys	
Listed heritage items			
<p>Hannell Family Vault (Item 1) NLEP I179</p>	<p>This heritage item is located within the construction footprint. This heritage item comprises a stone vault structure, located about 20m from the banks of the Hunter River, and standing about three metres above the flat Hexham Plain. The vault is surrounded by overgrown vegetation including shrubs, weeds and grass. Due to its proximity to the Hunter River, over the years it has been flooded several times and, during major floods, has been completely covered by water.</p> <p>The heritage curtilage of the vault includes the entire lot which overlaps with about 10m of the construction footprint at the western end of the lot. This section of the construction footprint comprises mostly an existing gravel vehicle track, with a small band of grass on either side. The physical building comprising the vault is located about 120m east and 20m north of the construction footprint.</p>		
<p>Hexham Shipbuilding Yards (Item 2) NLEP I180</p>	<p>This heritage item is located within the construction footprint. The Hexham Shipbuilding Yards comprises a mangrove swamp containing straight cuts commensurate with 19th century boat building. The listing also includes a location description 'public open space', although the curtilage is located on privately owned land.</p> <p>The construction footprint passes through the heritage curtilage of the Hexham Shipbuilding Yards. The construction footprint at this location comprises an existing informal gravel vehicle track, built up by around one metre above the Hunter River floodplain. The area to either side of the existing vehicle track is grassed. Several shallow depressions in the ground were noted next to the construction footprint on the north side of the vehicle track. Several pieces of timber were located at the end of one of the depressions.</p>		
		<p>Photo 17-3 The Hexham Shipbuilding Yards, facing east</p>	<p>Photo 17-4 Depressions in foreground and construction footprint in background, facing south</p>

Item name and register no.	Description and results of survey	Photographs from field surveys	
<p>Residence, 29 Eastern Avenue, Tarro (Item 4) NLEP I548</p>	<p>This heritage item is located next to the construction footprint.</p> <p>The site comprises a single storey facebrick work building with dichromatic brick work emphasising building edges around window openings and doorways, and corners of building. The main roof is hipped with corrugated metal sheets. It has a secondary bull nose corrugated metal roof over L-shaped verandah. The residence also has a number of brick squat chimneys to main building. The residence is situated on top of a rise which slopes steeply down to level ground next to the construction footprint.</p> <p>The building of significance is located about 60m from the construction footprint. No other heritage elements are in proximity to the construction footprint.</p>	 <p>Photo 17-5 Residence located on top of a rise, facing north.</p>	 <p>Photo 17-6 Level ground at base of rise and rubbish pile, facing east.</p>
<p>Tarro Historic Site (Item 6) NLEP A18</p>	<p>This heritage item is located within the construction footprint.</p> <p>This heritage item is listed as the actual site of the church of St Stephen and burial ground, and it represents the settlement of the area Upper Hexham, now called the suburb of Tarro.</p> <p>This heritage item is located within road reserve on the corner of Anderson Drive and the Tarro interchange. At least three quarters of the heritage curtilage contain thick vegetation in the form of small shrubs and trees. The northern portion has short grass allowing visibility of several features. There is an undated stone plaque located on a concrete slab (<b>Photo 17-7</b>) in the centre of the grassed area marking the site as St Stephen's Church of England. To the east of the undated stone plaque is a second stone plaque on a concrete slab (<b>Photo 17-8</b>) which commemorates the</p>	 <p>Photo 17-7 Undated stone plaque marking the site as St Stephen's Church of England, facing south</p>	 <p>Photo 17-8 Second stone plaque marking the opening of the Tarro Interchange, facing south</p>

Item name and register no.	Description and results of survey	Photographs from field surveys	
	<p>opening of the Tarro Interchange in 1996. Northeast of the second stone plaque, and next to the road, there is a concrete slab containing a raised stone feature (<b>Photo 17-9</b>). A view from Tarro Historic Site, facing north, is shown in <b>Photo 17-10</b>.</p> <p>No other historical heritage features were observed during the site inspection.</p>	 <p data-bbox="1088 639 1592 707">Photo 17-9 Concrete and stone feature, facing south.</p>	 <p data-bbox="1621 639 2132 707">Photo 17-10 The Tarro Historic Site next to road, facing north</p>
<p>Tarro Substation (Item 7) NLEP I546</p>	<p>This heritage item is located next to the construction footprint.</p> <p>The Tarro Substation is a stretcher bond brick single storey building on concrete footings, with decorative render and stone features. It has a stop hipped Marseille tiled roof with timber ventilation and exposed eaves, a sheeted double door in a rusticated stone opening, and a multi-pane timber window within a rusticated stone framed opening. The building has moulded rendered concrete detailing. The building was built at the same time as the Tarro Pumping Station (Item 8).</p> <p>The physical structure of the building is located next to the construction footprint.</p>	 <p data-bbox="1088 1201 1592 1278">Photo 17-11 Tarro substation, facing southwest.</p>	 <p data-bbox="1621 1114 2132 1181">Photo 17-12 Tarro substation, facing southwest</p>

Item name and register no.	Description and results of survey	Photographs from field surveys	
Pumping Station (Item 8) NLEP I550	<p>This heritage item is located next to the construction footprint. The survey confirmed that the description from the NLEP is accurate, as follows.</p> <p>The main building of the Tarro Pumping Station is a large, purpose-built water pumping station in the Federation style. The building is brick built in Flemish bond with black tuck pointing, which is now faded. The building has painted render and concrete details with a parapeted and hipped Marseille tiled roof. There are two timber louver vent stacks and extended eaves supported on steel brackets, as well as ornate dormer with cast detail. The building has a Colorbond downpipe and guttering. The entrance door is a panelled timber door with glazed overlight. There are mostly replacement timber windows, some glazed and some broken, as well as some original windows. Internally virtually all equipment has been removed and the space is largely used for storage.</p>	 <p>Photo 17-13 Pumping Station, facing northeast.</p>	 <p>Photo 17-14 Pumping Station, facing northeast</p>
Potential heritage items identified during field surveys			
Glenrowan Homestead (Item 3)	<p>This potential heritage item is located within the construction footprint.</p> <p>Glenrowan Homestead is located on a large somewhat flat rise overlooking floodplain and swamp landforms. The Glenrowan Homestead is a farm complex comprising two clusters of buildings/structures, one located about 300m (Site 1) and one about 100m (Site 2) south of the New England Highway, Tarro. The houses at both of the sites were occupied at the time of the survey. The house at Site 1 has been modified over time and additional buildings have been constructed near the house at Site 2, reflecting the residential use of the houses. An artefact scatter and area of archaeological potential are located about 130m south of the New England Highway (Site 3).</p> <p>Site 1 at Glenrowan Homestead contains a single storey farmhouse, sheds, remnant gardens and a driveway. Site 2 at Glenrowan Homestead contains a weatherboard house.</p>	 <p>Photo 17-15 South-eastern section of brick house (Site 1), facing north</p>	 <p>Photo 17-18 Weatherboard and cement sheeting shed (Site 1), facing west</p>

Item name and register no.	Description and results of survey	Photographs from field surveys
	<p>Site 3 contains subsurface historical archaeological artefacts.</p> <p>Previous archaeological excavations carried out at Site 3 uncovered 73 historical artefacts across the site, which are catalogued in full in the Non-Aboriginal Heritage Working Paper (Appendix Q). Findings across Site 3 comprised of mostly domestic artefacts likely deposited in the late 19th century, including materials made of ceramic, shell, bone, metal, glass, metal and cement. Given its close proximity, it was determined most likely that these artefacts are part of a rubbish dump associated with the Glenrowan Homestead. Alternatively, they may have been dumped by residents of the nearby township of Tarro in a dump of a more communal nature.</p>	 <p>Photo 17-16 Weatherboard house (Site 2), facing east</p>  <p>Photo 17-19 Rubbish pile (Site 2), facing north</p>  <p>Photo 17-17 Start of the test excavation at Site 3 facing south-east, looking downhill</p>  <p>Photo 17-20 Complete boot polish bottle found during excavations at Site 3</p>

### 17.3.4 Assessments of significance

As outlined in **Section 17.2**, assessments of significance were carried out for the historic heritage items identified within or next to the construction footprint. Significance assessments are summarised in **Table 17-5**.

Table 17-5 Summary of significance of heritage items within or next to the construction footprint

Item name and register no.	Level of significance	Summary of heritage significance
Registered heritage items		
Hannell Family Vault NLEP I179 (Item 1)	Local	Associated with the locally prominent Hannell Family, and in particular, John Hannell, who was a well-known publican who also founded several sporting associations in the broader region. The vault is an unusual monument in an uncommon location.
Hexham Shipbuilding Yards NLEP I180 (Item 2)	Local	The Hexham Shipbuilding Yards are locally significant as they are associated with the development of this area and the rise of shipbuilding along the Hunter River in the 19th century. The archaeological remains could contribute to a greater understanding of this industry.
Residence, 29 Eastern Avenue, Tarro NLEP I548 (Item 4)	Local	The house demonstrates the development of social class and economic growth of the region. The interiors are of significance.
Tarro Historic Site NLEP A18 (Item 6)	Local	The Tarro Historic site is the site of the original township of Tarro, and the original site of St Stephens Church and burial ground from 1840. The site has local historical significance as a place of first settlement of the area and is associated with Edward Sparkes, the original grantee. The site has a strong association with Bishop Broughton (the first Bishop of Australia). The site has local associative significance with the development of a settlement on high land to the west of the Hunter River and may contain relics of the period.
Tarro Substation NLEP I546 (Item 7)	Local	The Tarro Substation is a small decoratively built masonry valve house across the street from the former Tarro Pumping Station. The building is still in service and complements the Pumping Station, with both designed in a style which demonstrates the high degree of civic pride which the Hunter District Water Board took in its early infrastructure.  The building is representative of form and style of architecture used for this particular function and a rare example of this architectural style in this region.
Pumping Station NLEP I550 (Item 8)	Local	The Tarro Pumping Station is an exceptionally finely detailed early 20th century water pumping station, which superseded the pumping station at the Walka Water Works near Maitland. The Pumping Station is constructed in the Federation Free Style and is the most finely constructed building remaining within the Hunter Water Corporation network. It includes a matching boundary fence and valve house. As a purpose-built industrial building it is a rare example of public architecture, built at a time when the ornamentation of infrastructure was part of the civic pride in its development. Now decommissioned, the building lacks most internal elements or machinery.

Item name and register no.	Level of significance	Summary of heritage significance
Newcastle Crematorium, Beresfield NLEP I34 (Item 9)	Local	The Newcastle Crematorium has a high level of historical and aesthetic significance for Newcastle and the wider Hunter Region. Its construction was associated with the introduction of the modern practice of cremation to the region, as this form of funerary rite became more widely accepted across the State in the 1930s. As part of a small group of NSW crematoria of that decade, the Newcastle Crematorium thus helps to demonstrate the changing understandings of and responses to death associated with the practice. The Newcastle Crematorium represents a high level of architectural and landscaping achievement within Newcastle and the wider Hunter region, as a fine example of the Art Deco style, set in a formally landscaped garden. Along with the other crematoria designed by Robertson, and the C. Bruce Dellitt's Anzac Memorial (Sydney), it forms part of a small group of commemorative buildings in NSW that employ the Art Deco style to create a dignified and solemn atmosphere. Along with other architectural landmarks in Newcastle, the Crematorium is a marker of the status of Newcastle as NSW's second city as the city matured in the first half of the twentieth century.
Our Lady of Lourdes Church, Tarro NLEP I547 (Item 10)	Local	Important local landmark representative of an important step in the development of church facilities in the suburb of Tarro. The interiors are of significance.
Potential heritage items identified during field surveys		
Glenrowan Homestead (Item 3)	Local	A farm house is usually intimately connected with farming and a typical settlement pattern is one of a farm house and associated sheds, stables and yards being located as a single complex within the landscape. The Glenrowan Homestead, comprising these features, is significant at a local level for demonstrating early to mid-20th century dairying/grazing activities in the region and the particular way of life for residents during this period of time, who engaged in early farming. The artefact scatter identified at Site 3 of the Glenrowan Homestead item potentially extends further along the edge of the slope to the north-east and south-west. The artefacts recovered have the potential to yield information about domestic life on a late 19th century to mid-20th century dairy farm and within a rural settlement. The artefacts also have the potential to indicate the importance of the homestead in the region through the types of artefacts present at the site.

## 17.4 Impact assessment

### 17.4.1 Alternatives and design options considered

As described in **Chapter 4**, route options were evaluated within a value management process between November 2005 and February 2006. Following selection of a preferred route and consideration of the community and stakeholder feedback, the preferred route design for the project was progressed into a concept design which was placed on public display in July and August 2008. After responding to submissions, a corridor was reserved and gazetted, and the concept design became the 2010 Preferred Route.

Alternate alignment options to the 2010 Preferred Route were identified to address the issues raised in the project review and to better meet the project objectives. This included providing improved accessibility, addressing design constraints in crossing the Hunter River and floodplain and minimising environmental impact. Accordingly, the area between Black Hill and Heatherbrae was reviewed. Alignment 1 and Alignment 2 were progressed for further investigation. A number of interchange arrangements were also investigated at Black Hill, Tarro, Tomago, Heatherbrae and Raymond Terrace. All of these options met the project objectives.

The preferred alignment selected from the options was Alignment 2. Alignment 0 (the 2010 Preferred Route) was closer to the LEP-listed Oak Factory (NLEP I178) and Hexham Bridge (NLEP I187) than Alignment 2. Alignment 0 would also have destroyed Site 1 at the Glenrowan Homestead (Item 3 of this assessment) and had a greater likelihood of causing heritage impacts. Alignment 1 was closer to the Hexham Shipbuilding Yards (NLEP I180) and the Hannell Family Vault (NLEP I179) with the potential to cause greater heritage impacts than Alignment 2. Alignment 2 was selected as the preferred option as it would avoid the high value biodiversity areas located either side of the Hunter River compared to Alignment 0 and Alignment 1, while best balancing the functional, social and economic and natural environment and culture considerations.

The concept design was revised in 2016 following community and stakeholder feedback. Further non-Aboriginal heritage assessment was carried out on these design refinements but there was no substantive difference to impacts on heritage from these changes.

Ultimately, the project alignment has reduced the potential for heritage impacts as compared to earlier options and alignments considered.

In locations where impacts to heritage items were unable to be avoided, a number of management measures have been provided to avoid further impacts as a result of the project, provided in **Section 17.5**.

### 17.4.2 Assessment of potential impacts

A summary of the potential project impacts that relate to each heritage item and the potential direct and indirect impacts on heritage items is provided in **Table 17-6**. The complete SOHIs for above heritage items are provided in the Non-Aboriginal Heritage Working Paper (**Appendix Q**).

Table 17-6 Summary of potential impacts on heritage items

Heritage item and significance	Project activities	Impacts	Summary of heritage impact
Major impact			
<p>Glenrowan Homestead (Item 3)</p> <p>Local significance</p>	<p>Construction of the motorway requiring demolition of Site 2 and destruction of Site 3</p>	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>Demolition of weatherboard house and non-heritage buildings at Site 2 due to construction of motorway.</li> <li>Destruction at Site 3 (artefact scatter) due to ground disturbance associated with construction of motorway. Although Site 3 is about twelve metres south of the main alignment, it is within the construction footprint and would be subject to impacts related to construction in the area.</li> <li>The main house at Site 1 has been identified as being eligible for consideration of at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</li> </ul> <p>No indirect impacts to this heritage item are anticipated.</p>	<p><b>Major impact</b></p> <p>The proposed work within heritage curtilage of the Glenrowan Homestead would impact on two of the three sites within the heritage complex's curtilage; Site 2 would be demolished and Site 3 would be destroyed. The project would not have a direct impact on the main house, buildings and gateway at Site 1.</p> <p>The overall impact would be of medium-large scale and moderate-high intensity, with the changes being permanent and irreversible.</p> <p>The project would result in the disturbance of archaeological deposits at Site 3. Archaeological salvage excavation, as outlined in the Non-Aboriginal Heritage Working Paper (<b>Appendix Q</b>) would occur at Site 3 prior to work proceeding.</p> <p>The visual amenity of Glenrowan Homestead would be altered, as it is currently within a rural setting. Upon completion of the project the surrounding area to the north of the homestead would be a motorway. However, the impact would be limited given that there is already a highway in this location. Further, rural vistas to the south of the homestead would remain.</p> <p>The project would remove the existing access arrangements at the site and increase traffic near the heritage item, however these outcomes would not impact on the significance of the heritage item.</p> <p>The main house at Glenrowan Homestead has also been identified as being eligible for consideration of at-property noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</p> <p>Site 1 is beyond the safe working distances for cosmetic damage from vibration, however the safe working distances assumes that the heritage buildings are structurally sound. As this may not be the case for the buildings at Site 1, management measures for potential vibration impacts have been included for this item.</p>

Heritage item and significance	Project activities	Impacts	Summary of heritage impact
Minor impact			
Hexham Shipbuilding Yards NLEP I180 (Item 2)  Local significance	Upgrade of existing vehicle track involving building up and widening existing track	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>The construction of an upgraded access track would directly impact the heritage curtilage of the item. There is low potential for archaeological remains to be disturbed or destroyed by the works as the area with the highest potential for archaeological remains specifically related to the shipyards is outside the construction footprint.</li> </ul> <p>No indirect impacts to this heritage item are anticipated.</p>	<p><b>Minor impact</b></p> <p>The project is unlikely to have a direct impact on the Hexham Shipbuilding Yards as the area most likely to contain the shipyard remains is outside the construction footprint, and the proposed access track would be built up over the existing ground surface and existing access track rather than heavily disturbing sub-surface remains.</p> <p>There would be increased traffic on the access track both during construction and operation of the project, however as discussed this would not impact on the likely areas of archaeological remains.</p>
Negligible impact			
Hannell Family Vault NLEP I179 (Item 1)  Local significance	<ul style="list-style-type: none"> <li>Upgrade of existing vehicle track involving excavation of the ground surface</li> <li>Adjacent ancillary facility (AS8)</li> </ul>	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>Direct impact to the heritage curtilage of the heritage item from upgrade of an access track located about 120m southwest of the vault; however, the vault itself would not be directly physically impacted and there would be no change to the curtilage.</li> </ul> <p><b>Possible direct impact</b></p> <ul style="list-style-type: none"> <li>Possible unplanned impacts by accidental damage from machinery from the ancillary construction area (AS8) located about 20m south of the physical structure of the vault.</li> </ul> <p><b>Possible indirect impact</b></p> <ul style="list-style-type: none"> <li>Possible indirect impacts from vibration during construction activities.</li> </ul>	<p><b>Negligible impact</b></p> <p>No adverse impacts on the physical vault structure of the Hannell Family Vault have been identified. However, as a proposed ancillary facility (AS8) is located 20m south of the physical structure of the vault, there may be indirect impacts to the vault due to vibration if vibration-generating machinery is operating within the ancillary facility and within the safe working distances for heritage items. The vault may also be incidentally impacted by accidental damage from machinery or vehicles operating in the vicinity.</p>

Heritage item and significance	Project activities	Impacts	Summary of heritage impact
<p>Residence, 29 Eastern Avenue, Tarro NLEP I548 (Item 4)</p> <p>Local significance</p>	<p>Construction of motorway adjacent to LEP heritage curtilage</p>	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>The heritage item has been identified as being eligible for consideration of at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</li> </ul> <p><b>Possible indirect impact</b></p> <ul style="list-style-type: none"> <li>Possible indirect impacts from vibration during construction activities.</li> </ul>	<p><b>Negligible impact</b></p> <p>No construction impacts to the heritage item are expected as construction would be limited to the construction footprint, next to the heritage item curtilage. The physical heritage building is located about 40m from the construction footprint and about 65m from the project.</p> <p>The physical building is beyond the safe working distances for cosmetic damage from vibration, however the safe working distances assumes that the heritage buildings are structurally sound. As this may not be the case for the building, management measures for potential vibration impacts have been included for this item.</p> <p>The installation of a noise barrier (NB.03) and associated vegetation removal would change the character of the landscape setting for the heritage listed residence by altering the spatial character and outlook. However, the distance between the proposed noise barrier and the residence is sufficient that there would be little or no impact on the heritage significance of the heritage item.</p> <p>The residence has been identified as being eligible for consideration of at-property noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</p>
<p>Tarro Historic Site NLEP A18 (Item 6)</p> <p>Local significance</p>	<p>Potential work on the existing road pavement, kerbs/gutters and subsurface drainage on Anderson Drive, Tarro</p>	<p><b>Possible direct impact</b></p> <ul style="list-style-type: none"> <li>The proposed works would be confined to existing road pavement, kerb/gutter and subsurface drainage outside the heritage item curtilage</li> <li>Possible unplanned impacts by accidental damage from machinery given the proximity of works to the site</li> <li>If construction works are to take place within the curtilage of this heritage item the project would directly impact the site through destruction of potential archaeological deposits relating to the former church and burial ground.</li> </ul> <p>No indirect impacts to this heritage item are anticipated.</p>	<p><b>Negligible impact</b></p> <p>Works in the location would be confined to the existing road pavement, kerbs/gutters and subsurface drainage on Anderson Drive and would not overlap with the heritage curtilage. As such, the heritage item would be avoided.</p> <p>If work was to take place within the curtilage of this heritage item, the project would have a direct impact on potential subsurface archaeological deposits at the Tarro Historic Site. In this event, the level of impact on the heritage item would be major during construction and operation.</p>

Heritage item and significance	Project activities	Impacts	Summary of heritage impact
<p>Tarro Substation NLEP I546 (Item 7)</p> <p>Local significance</p>	<p>Potential work on the existing road pavement, kerbs/gutters and subsurface drainage on Anderson Drive, Tarro</p>	<p><b>Possible direct impact</b></p> <ul style="list-style-type: none"> <li>The proposed works would be confined to existing road pavement, kerb/gutter and subsurface drainage, about three metres from the building.</li> <li>Possible unplanned impacts by accidental damage from machinery given the proximity of works to the site.</li> </ul> <p><b>Possible indirect impact</b></p> <ul style="list-style-type: none"> <li>Possible indirect impacts from vibration as the distance is less than the safe working distances (less than 25m) for cosmetic damage from vibration as presented in the Table 2 of the Construction Noise and Vibration Guideline (Roads and Maritime Services 2016b).</li> </ul>	<p><b>Negligible impact</b></p> <p>No adverse impacts on the Tarro Substation are expected from the project. However, as the project would be located next to the Tarro Substation there may be unplanned impacts to the Tarro Substation building façade due to vibration or accidental damage from machinery or vehicles. Depending on the location of vibration inducing works carried out within Anderson Drive there is potential to comply with the safe working distances for heritage items.</p> <p>The effect of the project would be major new visual elements in the mid distance of the view from the heritage item, and the loss of long-distance views across the floodplain. There would be no change to the foreground of the view. While the distant views would change, this would not impact on the heritage significance of the heritage item.</p>
<p>Pumping Station NLEP I550 (Item 8)</p> <p>Local significance</p>	<p>Potential work on the existing road pavement, kerbs/gutters and subsurface drainage on Anderson Drive, Tarro</p>	<p><b>Possible direct impact</b></p> <ul style="list-style-type: none"> <li>The proposed works would be confined to existing road pavement, kerb/gutter and subsurface drainage, about four metres from the brick fence of the heritage item.</li> <li>Possible unplanned impacts by accidental damage from machinery given the proximity of works to the site.</li> </ul> <p><b>Possible indirect impact</b></p> <ul style="list-style-type: none"> <li>Possible indirect impacts from vibration as the distance is less than the safe working distances (less than 25m) for cosmetic damage from vibration as presented in the Table 2 of the Construction Noise and Vibration Guideline (Roads and Maritime Services 2016b).</li> </ul>	<p><b>Negligible impact</b></p> <p>No adverse impacts on the Pumping Station are expected as a result of the project construction and operation. However, as the project would be located next to the Pumping Station and its associated brick fence, there may be indirect impacts to the heritage item due to vibration or unplanned direct impacts by accidental damage from machinery or construction vehicles. Depending on the location of vibration inducing works carried out within Anderson Drive there is potential to comply with the safe working distances for heritage items.</p> <p>The effect of the project would be major new visual elements in the mid distance of the view from the heritage item, and the loss of long-distance views across the floodplain. There would be no change to the foreground of the view. While the distant views would change, this would not impact on the heritage significance of the heritage item.</p>

Heritage item and significance	Project activities	Impacts	Summary of heritage impact
<p>Newcastle Crematorium NLEPI34 (Item 9)</p> <p>Local significance</p>	<p>At-property architectural noise treatment</p>	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>The heritage item has been identified as being eligible for consideration of at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</li> </ul> <p>No indirect impacts to this heritage item are anticipated.</p>	<p><b>Negligible impact</b></p> <p>No adverse impacts on the Newcastle Crematorium are expected as a result of project construction as the main crematorium building is more than 500m from the construction footprint. The only proposed works at or near this heritage item would be at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar) in response to operational impacts.</p>
<p>Our Lady of Lourdes Church, Tarro NLEPI547 (Item 10)</p> <p>Local significance</p>	<p>At-property architectural noise treatment</p>	<p><b>Direct impact</b></p> <ul style="list-style-type: none"> <li>The heritage item has been identified as being eligible for consideration of at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar).</li> </ul> <p>No indirect impacts to this heritage item are anticipated.</p>	<p><b>Negligible impact</b></p> <p>No adverse impacts on the church are expected as the heritage item is more than 250m from the construction footprint. The only proposed works at or near this heritage item would be at-property architectural noise treatment such as double glazing of external windows and/or provision of ventilation systems (or similar) in response to operational impacts.</p>

Following the implementation of management measures (**Section 17.5**), the project would have the following impacts:

- **Major impact:** Item 3: Glenrowan Homestead
- **Minor impact:** Item 2: Hexham Shipbuilding Yards.

The project was assessed as having a **negligible** impact on the remaining items, these are:

- Item 1: Hannell Family Vault
- Item 4: Residence, 29 Eastern Avenue, Tarro
- Item 6: Tarro Historic Site (original township of what was formerly known as Upper Hexham)
- Item 7: Tarro Substation
- Item 8: Pumping Station
- Item 9: Newcastle Crematorium
- Item 10: Our Lady of Lourdes Church.

## 17.5 Environmental management measures

The environmental management measures that will be implemented to minimise the non-Aboriginal heritage impacts of the project, along with the responsibility and timing for those measures, are presented in **Table 17-7**.

Table 17-7 Environmental management measures (non-Aboriginal heritage)

Impact	Reference	Management measure	Responsibility	Timing
Non-Aboriginal heritage impacts	NA01	<p>A Non-Aboriginal Heritage Management Plan (NAHMP) would be prepared prior to construction in consultation with Heritage NSW. As a minimum, the NAHMP would include the following:</p> <ul style="list-style-type: none"> <li>• A list, plan and maps with GIS layers showing the location of identified heritage items both within, and near, the construction footprint</li> <li>• Procedures to be implemented during construction to avoid or minimise impacts on items of heritage significance including protective fencing</li> <li>• The Unexpected Heritage Items Procedure (Transport for NSW 2019b) which will be followed in the event that unexpected heritage finds are uncovered during construction</li> <li>• A procedure for the unexpected discovery of human skeletal remains as per the Skeletal remains: guidelines for the management of human skeletal remains (NSW Heritage Office 1998).</li> </ul>	Transport/ Contractor	Prior to construction
Hannell Family Vault	NA02	<ul style="list-style-type: none"> <li>• A dilapidation survey will be carried out.</li> <li>• Barrier fencing will be erected between the construction project activities and vault structure.</li> </ul>	Contractor	Prior to construction/ construction
Glenrowan Homestead	NA03	<ul style="list-style-type: none"> <li>• Archival photographic recording of Site 2 will be carried out prior to demolition.</li> <li>• Archaeological salvage excavation at Site 3 under the supervision of an Excavation Director, who meets the NSW Heritage Council criteria will be carried out prior to works proceeding.</li> <li>• A dilapidation survey will be carried out.</li> <li>• Architectural noise treatment at the main house at Site 1 would be sympathetic to the heritage values of the item.</li> </ul>	Contractor	Prior to construction
Residence, 29 Eastern Avenue, Tarro	NA04	<ul style="list-style-type: none"> <li>• A dilapidation survey will be carried out.</li> <li>• Architectural noise treatment at the heritage residence would be sympathetic to the heritage values of the item.</li> </ul>	Contractor	Prior to construction

Impact	Reference	Management measure	Responsibility	Timing
Tarro Historic Site	NA05	<p>If construction works are to take place within the site curtilage further archaeological investigation under the supervision of an Excavation Director, who meets the NSW Heritage Council criteria, would be carried out as follows:</p> <ul style="list-style-type: none"> <li>• Non-invasive survey using ground penetrating radar or other appropriate geophysical inspection technique will be carried out across the curtilage of the heritage item to assist in identifying the presence of burials or other archaeological features.</li> <li>• Following the non-invasive survey, archaeological test excavation of the heritage item within the construction footprint will be carried out to confirm presence and nature of archaeological relics in accordance with a research design and methodology to be developed.</li> </ul>	Contractor	Detailed design/ prior to construction/ construction
Tarro Substation and Pumping Station	NA06	<ul style="list-style-type: none"> <li>• A dilapidation survey will be carried out.</li> </ul>	Contractor	Detailed design/ prior to construction/ construction
Newcastle Crematorium and Our Lady of Lourdes Church	NA07	Architectural noise treatment at the heritage buildings would be sympathetic to the heritage values of the item.	Contractor	Detailed design/ prior to construction/ construction
Other relevant management measures				
Impacts on known Aboriginal sites	AH01	<p>An Aboriginal Cultural Heritage Management Plan (ACHMP) will be prepared in accordance with the Procedure for Aboriginal cultural heritage consultation and investigation (Roads and Maritime Services 2011b) and Standard Management Procedure – Unexpected Heritage Items (Roads and Maritime Services 2015f). The ACHMP will be prepared in consultation with all relevant Aboriginal groups.</p> <p>The ACHMP will include:</p> <ul style="list-style-type: none"> <li>• Details of investigations completed or planned to be carried out and any associated approvals required</li> <li>• Mapping of areas of Aboriginal heritage value and identification of protection measures to be applied during construction</li> <li>• Procedures to be implemented if previously unidentified Aboriginal objects, including skeletal remains, are discovered during construction</li> <li>• An induction program for construction personnel on the management of Aboriginal heritage values</li> <li>• Opportunities for on-going Aboriginal community engagement in the project.</li> </ul>	Transport / Contractor	Prior to construction

Impact	Reference	Management measure	Responsibility	Timing
	AH02	Archaeological salvage excavation, surface collection and exclusion fencing as detailed in Table 9-1 of the Aboriginal Cultural Heritage Assessment Report must be carried out in accordance with the methodology specified in the Chapter 9 of the Aboriginal Cultural Heritage Assessment Report ( <b>Appendix L</b> ).	Contractor / Transport	Prior to construction/ construction
Vibration impacts to residential and commercial structures	NV03	Where vibration generating activities will be carried out within minimum working distances for cosmetic damage, vibration monitoring will be carried out. Where monitoring indicates cosmetic damage criteria are exceeded, alternative low vibration work practices will be investigated and implemented.	Contractor	Construction
Vibration impacts to heritage structures	NV05	Heritage items within 100m of vibration intensive work are to be considered on a case by case basis and further investigation would be carried out during detailed design to confirm the structural integrity (i.e. structurally sound or unsound) of all potentially affected structures.  Where items are considered sensitive to vibration, appropriate vibration criteria would be determined after detailed inspections have been completed.	Contractor	Prior to construction/ construction
Operational road traffic noise impacts	NV07	Operational noise and vibration mitigation measures would be identified in an Operational Noise and Vibration Review (ONVR).  Requirements for mitigation measures, including quieter noise pavements, noise barriers, and at-property treatments, would be reviewed as part of the ONVR and as the detailed design progresses. Detailed information on floorplans and facade construction for school classrooms, places of worship and childcare centres determined to exceed the applicable Noise Criteria Guideline (NCG) (Roads and Maritime Services 2015c) internal noise criteria will be obtained during design development.  The implementation of treatments would be carried out in accordance with the Noise Mitigation Guideline (NMG) (Roads and Maritime Services 2015d).	Transport / Contractor	Detailed design/ construction/ prior to operation
Landscape character and visual impacts including during construction	UD01	An Urban Design and Landscape Plan (UDLP) will be prepared to support the project. The plan will present an integrated urban design for the project, providing practical detail on the application of design principles and objectives identified in the EIS. The plan will include: <ul style="list-style-type: none"> <li>• Location and identification of existing vegetation and proposed landscaped areas, including species to be used</li> <li>• Built elements including retaining walls, bridges and noise barriers</li> <li>• Walking and cyclist elements including footpath locations, paving types and pedestrian crossings</li> <li>• Fixtures such as lighting, fencing and signs</li> <li>• Details on the staging of landscape work including related environmental controls such as erosion and sedimentation controls and drainage</li> </ul>	Contractor	Prior to construction

Impact	Reference	Management measure	Responsibility	Timing
		<ul style="list-style-type: none"> <li>• Procedures for monitoring and maintaining landscaped or rehabilitated areas</li> <li>• The project will consider CPTED principles during detailed design to minimise safety and security risks to all users and communities in the study area. The project will carry out CPTED reviews at each milestone by a qualified professional. Additional recommendations as a result of reviews will be implemented where reasonable and feasible</li> <li>• Water sensitive urban design solutions.</li> </ul> <p>The plan will be prepared in accordance with Transport urban design policy guidelines including:</p> <ul style="list-style-type: none"> <li>• Beyond the Pavement – Urban design approach and procedures for road and maritime infrastructure planning, design and construction (Transport for NSW 2020a)</li> <li>• Landscape design guideline: Design guideline to improve the quality safety and cost effectiveness of green infrastructure in road corridors (Roads and Maritime Services 2018a)</li> <li>• Bridge Aesthetics: Design Guidelines to improve appearance of bridges in NSW (Transport for NSW 2019a)</li> <li>• Noise wall design guideline: Design guideline to improve the appearance of noise walls in NSW (Transport for NSW 2016a)</li> <li>• Shotcrete Design Guideline: Design guidelines to avoid, minimise and improve the appearance of shotcrete in NSW (Transport for NSW 2016b)</li> <li>• Water sensitive urban design guideline, Applying water sensitive urban design principles to NSW transport projects (Transport for NSW 2017b).</li> </ul>		