

5. Significance assessment

5.1 Basis for assessment

The concept of cultural heritage significance helps in estimating the value of places. 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 2000:12). In Australia, the significance of a place is generally assessed according to the following values:

- Aesthetic value
- Historic value
- Scientific value
- Social value.

The NSW Heritage Council has adopted specific criteria for heritage assessment, which have been gazetted pursuant to the *Heritage Act 1977*. The seven criteria upon which the following assessment of significance is 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 will 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.

Components of the NSW Heritage Manual, published by the NSW Heritage Office and NSW Department of Urban Affairs and Planning (NSW Heritage Office 2001) (now the Heritage Division of the Office of Environment and Heritage (OEH)), sets out a detailed process for conducting assessments of heritage significance. These guidelines have also been used in undertaking this significance assessment.

For places on Commonwealth land, or owned or managed by the Commonwealth Government the Australian Heritage Council assesses whether a Commonwealth place has significant heritage values against the nine Commonwealth Heritage List criteria, as follows:

- Criterion (a) the place has significant heritage value because of the place's importance in the course, or pattern, of Australia's natural or cultural history
- Criterion (b) the place has significant heritage value because of the place's possession of uncommon, rare or endangered aspects of Australia's natural or cultural history
- Criterion (c) the place has significant heritage value because of the place's potential to yield information that will contribute to an understanding of Australia's natural or cultural history
- Criterion (d) the place has significant heritage value because of the place's importance in demonstrating the principal characteristics of:
 - a class of Australia's natural or cultural places; or
 - a class of Australia's natural or cultural environments

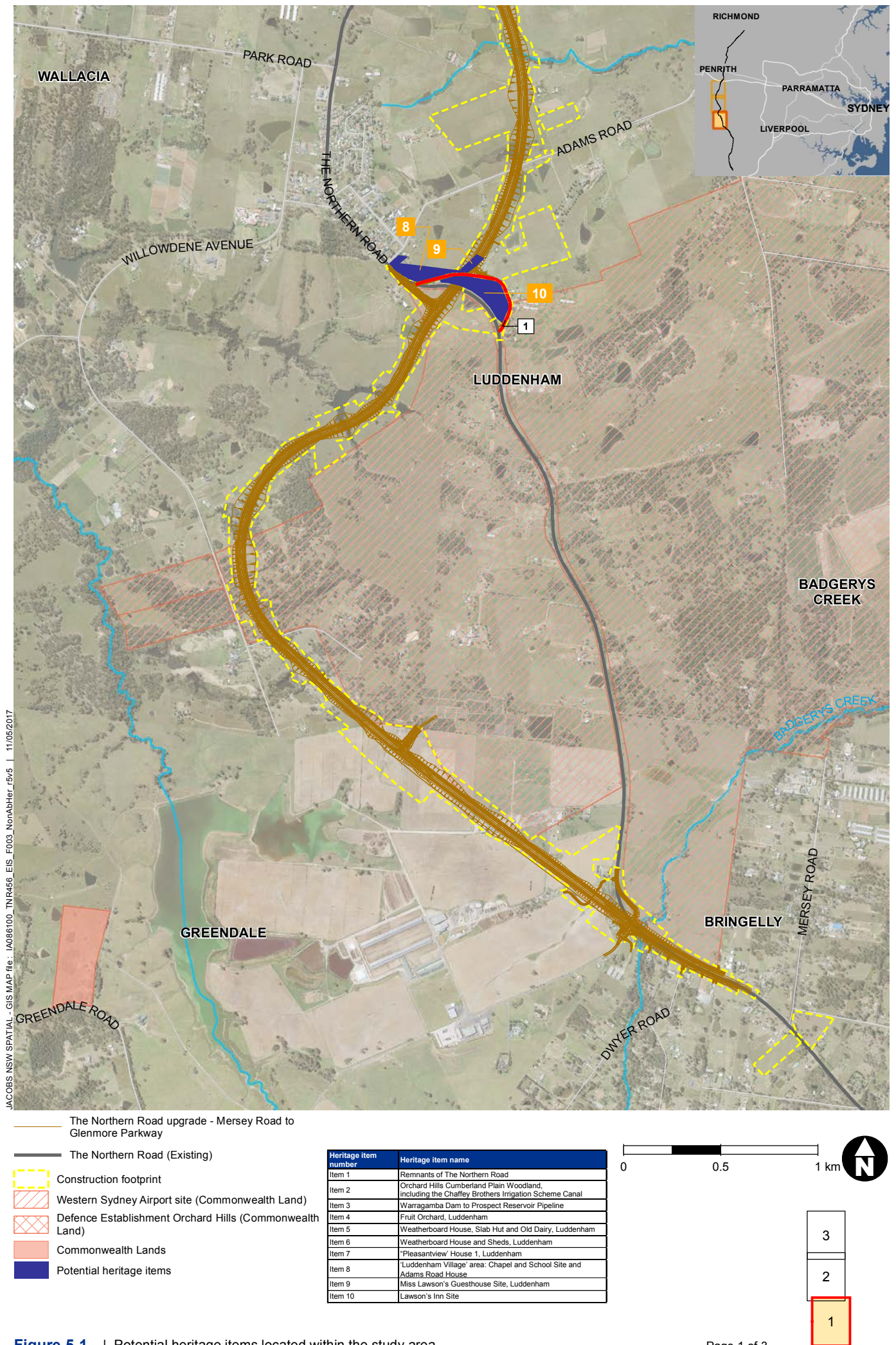
- Criterion (e) the place has significant heritage value because of the place's importance in exhibiting particular aesthetic characteristics valued by a community or cultural group
- Criterion (f) the place has significant heritage value because of the place's importance in demonstrating a high degree of creative or technical achievement at a particular period
- Criterion (g) the place has significant heritage value because of the place's strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Criterion (h) the place has significant heritage value because of the place's special association with the life or works of a person, or group of persons, of importance in Australia's natural or cultural history
- Criterion (i) the place has significant heritage value because of the place's importance as part of Indigenous tradition.

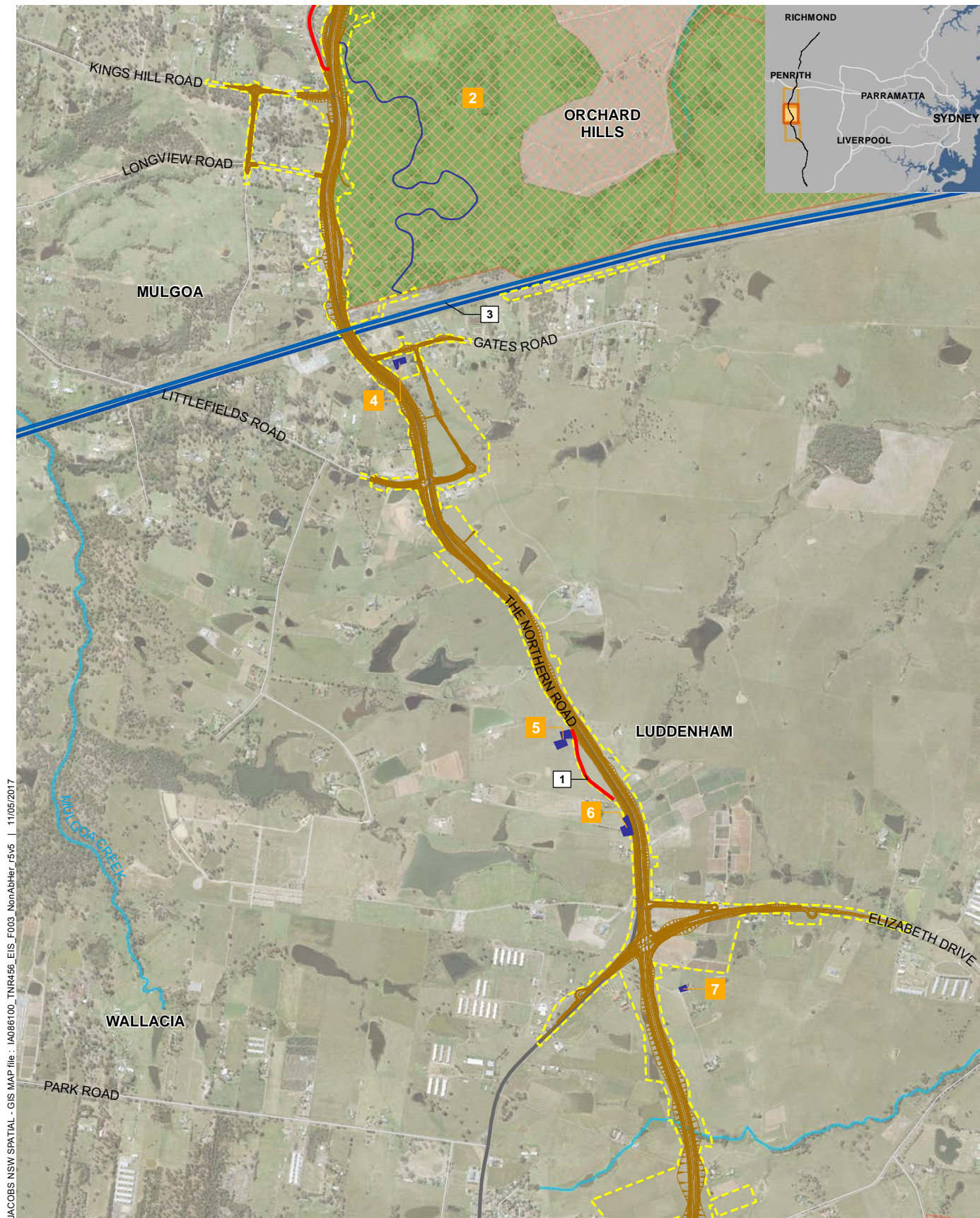
As well as assessing a place against criteria for its heritage value, the Australian Heritage Council applies a 'significance threshold' test. To reach the threshold for the National Heritage List, a place must have 'outstanding' heritage value to the nation. To be entered on the Commonwealth List, a place must have 'significant' heritage value.

Places on Commonwealth land have been assessed against these criteria.

Natural heritage values have also been assessed in relation to the Orchard Hills Cumberland Plain Woodland CHP. These are components of the natural environment that have aesthetic, historic, scientific or social significance, or other special value, for current and future generations. These values lend to a sense of identity and place (ERM 2011).

The potential heritage items considered for this significance assessment are mapped in **Figure 5-1**.





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Heritage item number	Heritage item name
Item 1	Remnants of The Northern Road
Item 2	Orchard Hills Cumberland Plain Woodland, including the Chaffey Brothers Irrigation Scheme Canal
Item 3	Warragamba Dam to Prospect Reservoir Pipeline
Item 4	Fruit Orchard, Luddenham
Item 5	Weatherboard House, Slab Hut and Old Dairy, Luddenham
Item 6	Weatherboard House and Sheds, Luddenham
Item 7	"Pleasantview" House 1, Luddenham
Item 8	"Luddenham Village" area: Chapel and School Site and Adams Road House
Item 9	Miss Lawson's Guesthouse Site, Luddenham
Item 10	Lawson's Inn Site

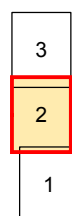
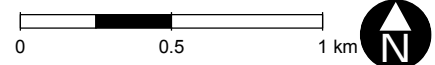
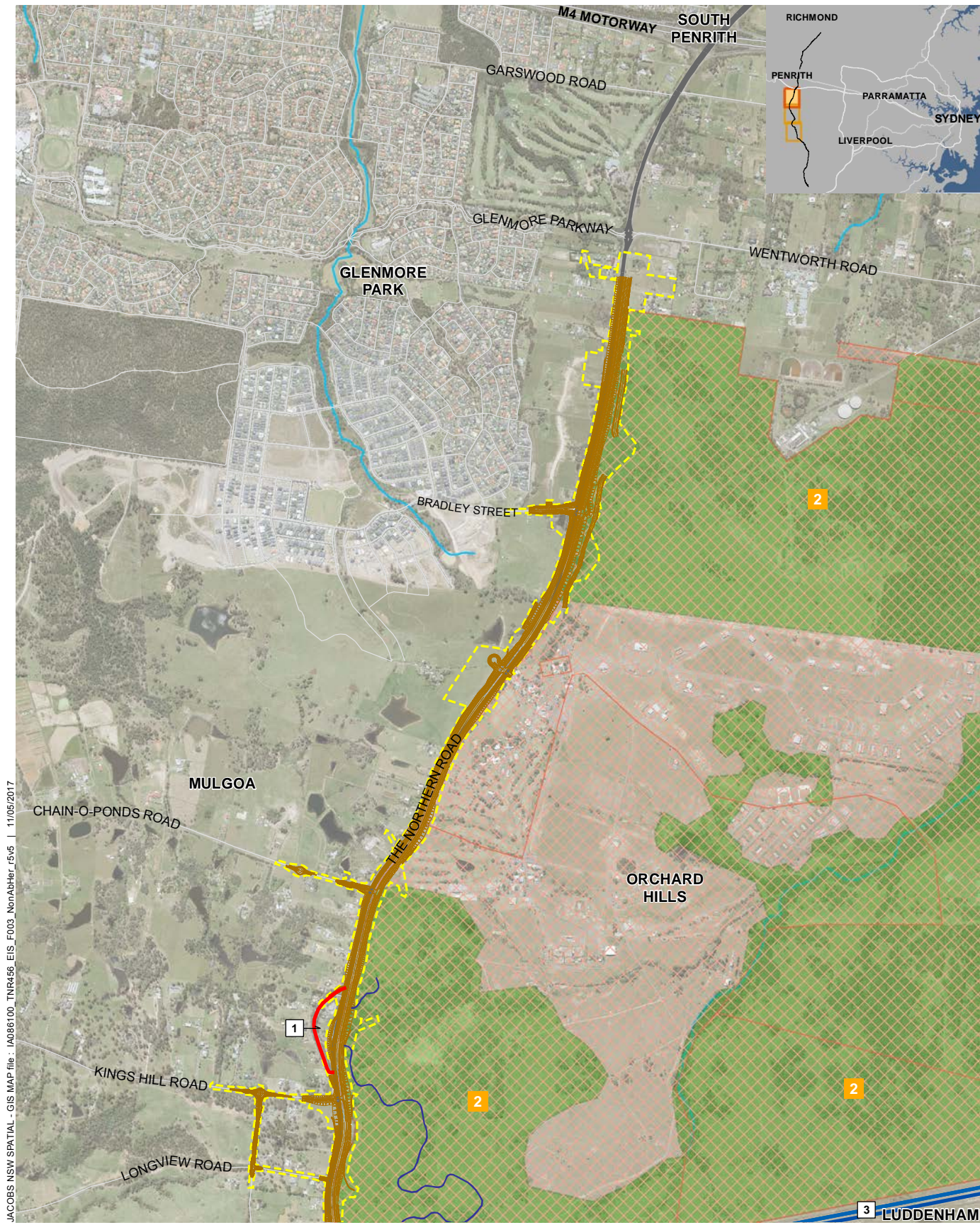


Figure 5-1 | Potential heritage items located within the study area



JACOBS NSW SPATIAL - GIS MAP file : JAO86100_TNR456_EIS_F003_NonAbHer_r5v6 | 11/05/2017

- The Northern Road upgrade - Mersey Road to Glenmore Parkway
- The Northern Road (Existing)
- WaterNSW supply pipelines
- Construction footprint
- Western Sydney Airport site (Commonwealth Land)
- Defence Establishment Orchard Hills (Commonwealth Land)
- Commonwealth Lands
- Potential heritage items
- Orchard Hills Cumberland Plain Woodland, including the Chaffey Brothers Irrigation Scheme Canal

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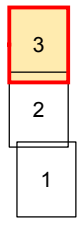
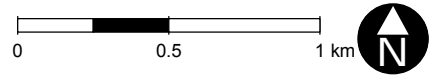


Figure 5-1 | Potential heritage items located within the study area

5.2 Item 1: Remnants of The Northern Road

5.2.1 Description and history

The following three old alignments of The Northern Road were identified from previous heritage assessments, discussions with property owners, and parish maps and were surveyed for this current assessment:

- Grover Crescent, Mulgoa (**Figure 5-2**) (Survey area no. 3S-3)
- Driveway of 2785-2787 The Northern Road and to the east of 2789A The Northern Road, Luddenham (**Figure 5-3**) (Survey area no. 4-2)
- Eaton Road, Luddenham (**Figure 5-4**) (Survey area no. 4-15).

Grover Crescent in Mulgoa is currently a bitumen road with housing and paddocks on either side (**Figure 5-5, Figure 5-6**). The section of road out the front of 2785-2787 The Northern Road and to the east of 2789A The Northern Road, Luddenham is currently an unsurfaced driveway (**Figure 5-7**). Eaton Road in Luddenham is currently a bitumen road largely rural in nature (**Figure 5-8**).

An assessment (RPS Manidis Roberts 2015: 143) of The Northern Road was undertaken to the south of the project. The report concluded that The Northern Road alignment to the south of the project *is considered to be significant as one of the earliest roads in the area, predating the subdivision of early land grants in the area*. In addition, a previous archaeological assessment (Artefact Heritage 2015: 44) found that there was potential for early road remnants such as surface treatments, culverts, retaining walls to be located at Eaton Road; however, no areas of archaeological potential or evidence of any of these features were identified during the 2016 field survey by Jacobs. However, no surface treatments, culverts or retaining walls were observed during the field survey in this area.

A previous heritage assessment (Paul Davies Pty Ltd 2007) reviewed the earlier nomination of The Northern Road as a potential heritage item. The item was not included on the Penrith LEP in 1991:

The Northern Road was nominated for its historic interest as an early colonial road. While alignment of the road in following a narrow ridgeline continues to be of historic interest the road has been upgraded and roadside margin cleared of trees. The elevation of the road provides impressive views of the Blue Mountains to the west. It is not recommended for listing (Paul Davies Pty Ltd 2007:205).

An article in the Nepean Times (NT) (23 June 1900) describes The Northern Road, or Bringelly Road, as it was called then: 'It is 66ft wide and 2ft. 6in. deep in mud or dust, according to the seasons'. It was originally a public road, but was then owned by Fred Andrews and Co (fuel merchants). The road may have been wider than usual with the article commenting: 'It is a pity this wretched road is so wide – it holds so much slush.' The article states that ideally the road should only be wide enough for [bullock] teams to pass. It appears to have been periodically maintained by trustees but there was a general lack of dedicated maintenance. Money allocated for repairs appears to have been used unwisely: 'Every ratepayer fancies he could do things better than an alderman could, and, whilst we know that the £1200 lately spent on this road was spent injudiciously, we must give the alderman credit for doing their best.' In 1900 there was no ballast in the construction of the road, while other roads 'around Botany' were ballasted at this time.

By 1901 however, the road appears to have improved. For four miles from the corner of the Main Western Road and Bringelly Road in Kingswood the road was in good condition: 'with the exception of the top dressing of gravel and metal, he saw a fairly constructed road, properly crowned and sloped to table-drains, and what appeared to be ample provision for footpaths on either side of the road' (NT 21 September 1901).

By 1906 the road had returned to a bad state of repair as 'the Government has refused point blank to have any more to do with this famous thoroughfare...' (NT, 27 January 1906). There appears to be a period between 1900 and 1906 where the road was maintained as '...it loomed up from a model mud pie to the best road in the district'. The bad state was due to 'wood teams', presumably transporting timber along the roads.

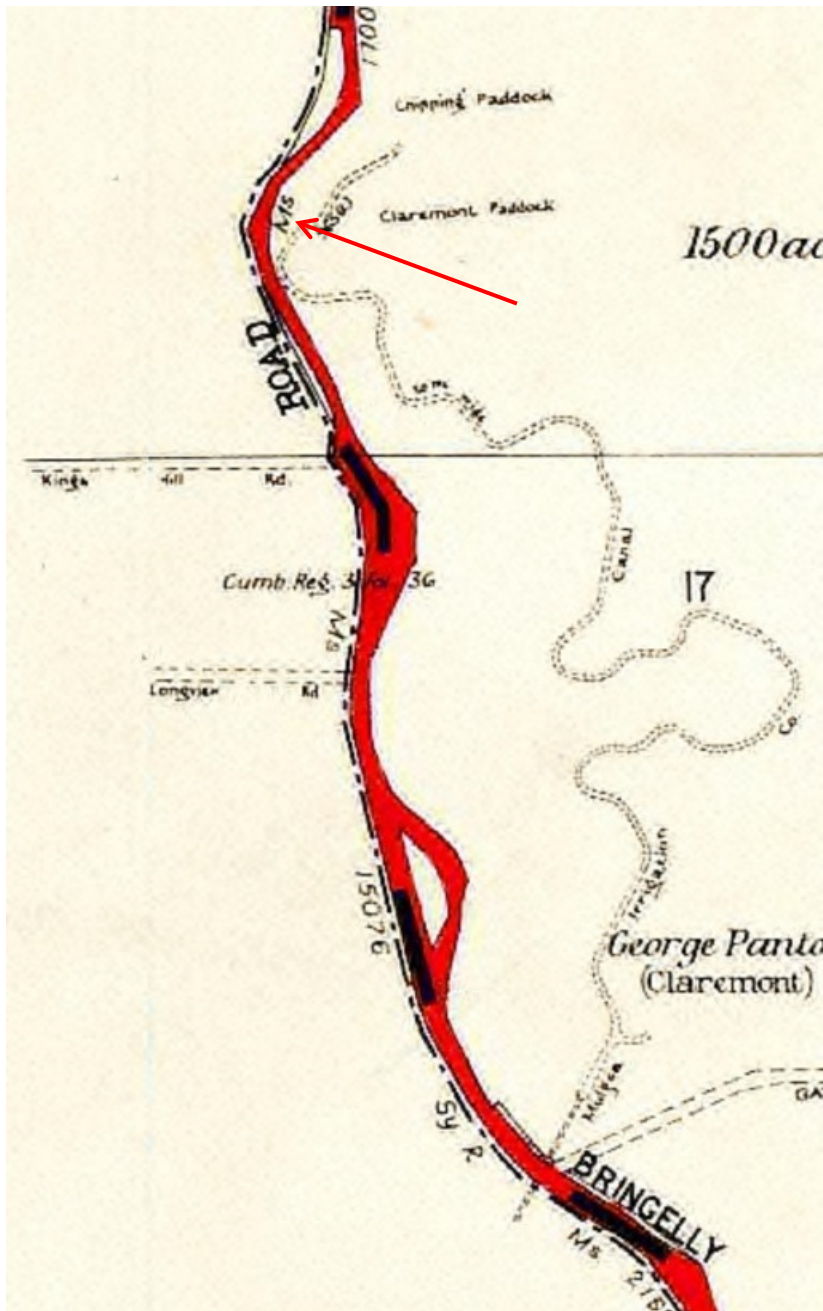


Figure 5-2 : Parish map showing location of Bringelly Road, now Grover Crescent. Source: Extract from parish map, County of Cumberland, Parish of Claremont, 28 February 1772.

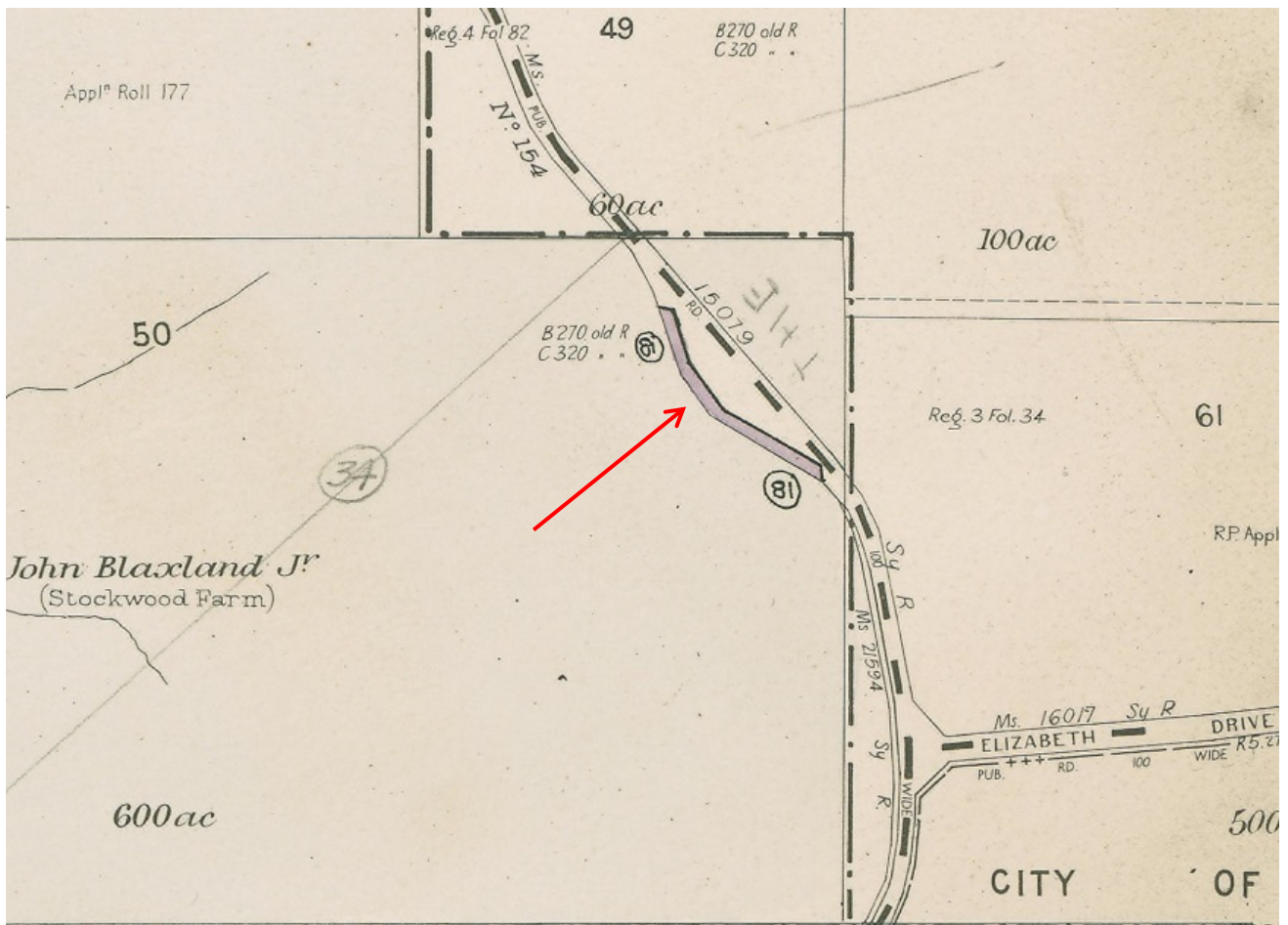


Figure 5-3 : Parish map showing location of old alignment of Bringelly Road. Source: Extract from parish map, County of Cumberland, Parish of Mulgoa, 1971.

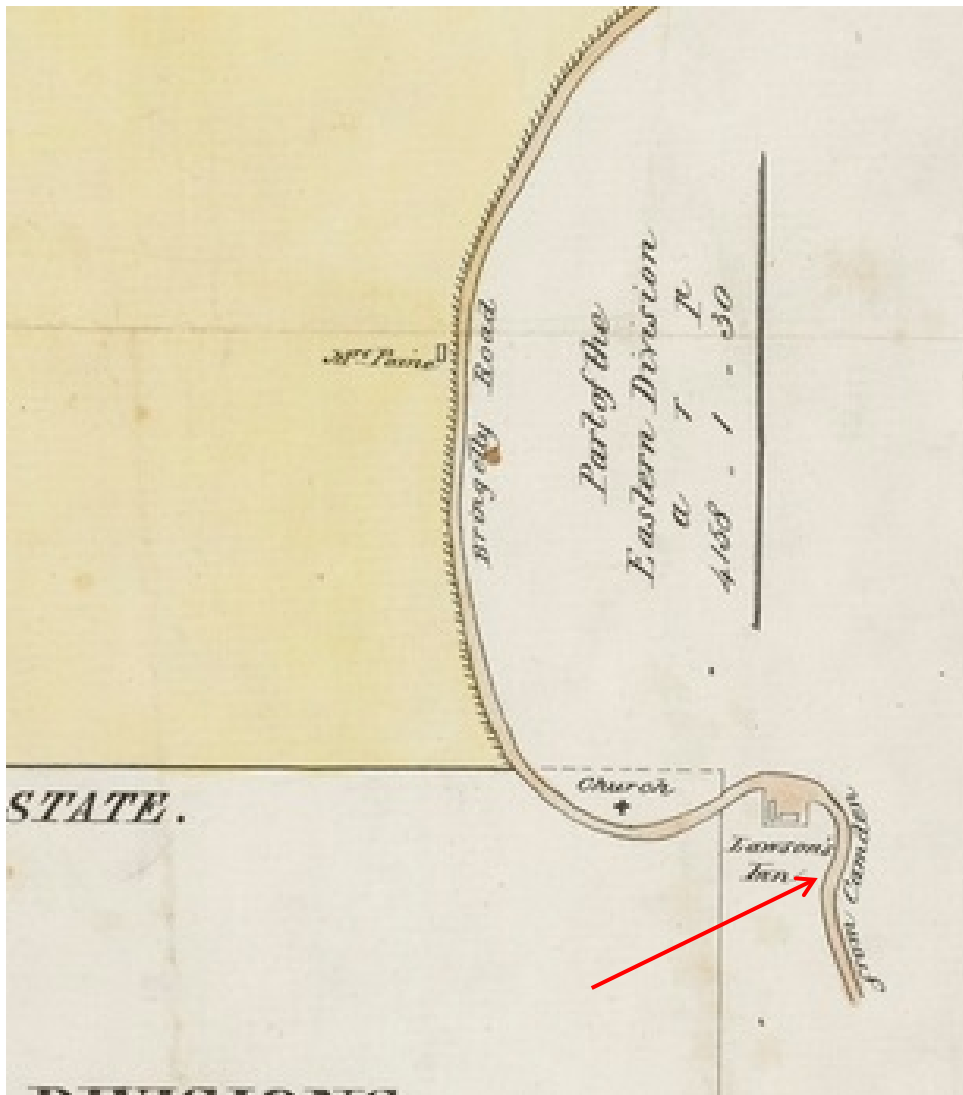


Figure 5-4 : Plan showing location of Bringelly Road, now Eaton Road, in lower right. Source: Plan of the Central and Western Divisions of Luddenham to be sold by public auction by Mt. R.P. Richardson/Samuel Jackson Surveyor, 1864.

5.2.2 Curtilage information

The curtilage of Remnants of The Northern Road includes all of Glover Crescent, Eaton Road and the driveway as described above.

5.2.3 Significance assessment

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. The original road has been so altered in terms of materials that it no longer demonstrates an important historical pattern.
B – Strong or special associations	Does not meet this criterion. The original road has been so altered that it no longer demonstrates any particular association with the life or works of a particular person or group of persons.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The road is not a major work of an important designer or artist, the original road has lost its original design, and upgrading and clearing of trees have downgraded any prior scenic qualities.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The road is only important to the local community for amenity reasons.
E – Potential to yield information	Does not meet this criterion. As little or no physical evidence of the original road remains due to modifications over time the item has little or no research or archaeological potential.
F – Uncommon or rare	Does not meet this criterion. The road is not the only colonial road example within NSW and there are better examples with some original features and physical evidence.
G – Principal characteristics of a class	Does not meet this criterion. The road is a poor example of early historical NSW roads. Modifications and upgrades have resulted in the loss of a range of characteristics.

5.2.4 Statement of significance

A previous assessment (RPS Manidis Roberts 2015: 143) concluded that The Northern Road alignment to the south of the project *is considered to be significant as one of the earliest roads in the area, predating the subdivision of early land grants in the area*. While the three sections of The Northern Road within the construction footprint show the original alignment of The Northern Road (Bringelly Road), the remains have the potential to provide only very limited information due to the modifications and renewal of the road surface over time. The item is considered to have insufficient significance to fulfil the criteria for State or local listing.



Figure 5-5 : Grover Crescent, Mulgoa, facing north. Photo taken by Jennifer Chandler on 23 February 2016.



Figure 5-6 : Grover Crescent, Mulgoa, facing south. Photo taken by Jennifer Chandler on 23 February 2016.



Figure 5-7 : Driveway of 2785-2787 The Northern Road, Luddenham, facing south. Photo taken by Jennifer Chandler on 26 February 2016.



Figure 5-8 : Eaton Road, facing west. Photo taken by Jennifer Chandler on 25 February 2016.

5.3 Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place

The Orchard Hills Cumberland Plain Woodland is listed on the CHL and RNE for its natural heritage values. The assessment of significance, however, also includes reference to historic heritage and Indigenous heritage values. Both the natural heritage values of the site and the historic non-Aboriginal heritage values of the site (ie in relation to the canal) are considered in this assessment.

5.3.1 Description and history

As identified above, the natural heritage values are mainly focused on natural vegetation within the CHP, being retained areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013). Despite historic disturbance, the CHP is a significant site for the protection of significant natural heritage values.

The natural heritage values identified in the CHL citation was produced in lieu of field verification and, based on various years of site-based monitoring, is reported by Godden Mackay Logan (2013) to overstate the actual on-ground condition of natural heritage values. The natural heritage values of the CHP previously identified by DoEE (2017), Godden Mackay Logan (2013) and within the Biodiversity Assessment Report for this project (Appendix I of the EIS) includes the following:

- The CHP is identified as a core biodiversity area for the conservation of the Cumberland Plain Woodland ecological community. Two categories of Cumberland Plain Woodland were present within the site at the time of the Jacobs (2017) biodiversity surveys. Within this survey area, the patches of Category A Cumberland Plain Woodland (patches that met the core thresholds) were located on the southern portion of the project. Category C patches are poorer condition patches of Cumberland Plain Woodland and Derived Native Grasslands that are contiguous with Category A patches, also located on the southern portion of the project. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity and ecosystem values.
- Part of the least disturbed and largest remaining remnant of Cumberland Plain Woodland, of which 90-95% has previously been cleared (NSW National Parks and Wildlife Service 2002). The larger and more diverse a patch of vegetation is, the greater the likely biodiversity value and its self-sustainability. The patches within the CHP are high quality (up to 96 percent native groundcover, native species richness of up to 47 species in a plot) and their protection within the Defence Estate makes a valuable contribution to the conservation status of this ecological community. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem and existence values.
- This size of the remnant within the CHP is such that it provides a relatively large continuous habitat for species likely to be excluded from small and isolated remnants, such as the Cumberland Plain Woodland bird community. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The eastern area of the CHP supports some of the most outstanding examples of mature Forest Red Gum trees remaining in Western Sydney, reaching 50 m high (Godden Mackay Logan 2013). As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, existence and scientific values.
- Some tributaries of Blaxland Creek, which are some of the least disturbed catchments remaining on the Cumberland Plain and on Wianamatta Shale in Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The Blaxland Creek tributaries hold regional conservation significance, acting as a refuge for aquatic macroinvertebrate genera that are dependent on low levels of agricultural and urban development. The aquatic macroinvertebrate community in this catchment has a high representation of disturbance-sensitive species (e.g. Stoneflies, Leptophlebiid Mayflies and pollution-sensitive families of Caddisflies). The Blaxland Creek tributaries are richer in aquatic macroinvertebrate genera than most other creeks in Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.

- The Blaxland Creek tributaries provide a valuable condition benchmark to measure the degradation of creek systems within Western Sydney. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, geodiversity and scientific values.
- Fire has been excluded from the CHP for approximately 50 years and provides opportunity for ecological research on the regeneration of the CPWSGTF and REFCF ecological communities. This understanding of the natural variation in the absence of fire is important for future identification of the impact of prescribed burning (SKM 2014). A long-term Biodiversity Monitoring program has been running since 2010, designed to investigate the effect of burning of vegetation on flora, fauna and aquatic biota. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem and scientific values.
- Habitat for various EPBC Act threatened species, including Swift Parrot, Regent Honeyeater and Grey-headed Flying-fox. As per the Australian Heritage Commission (2003), this is interpreted to present biodiversity, ecosystem, existence and scientific values.
- The CHL suggests the presence of habitat for the Bush Stone-curlew (*Burhinus grallarius*) (endangered, TSC Act).
- The Vulnerable *Pultenaea parviflora* was not recorded within the CHP. However a large population (over 1,700 individuals) of *Pultenaea parviflora* is known to occur in some areas of the CHP.

The DEOH management plan (Godden Mackay Logan (2013) ranks the natural heritage values of the site as identified previously in Figure 3-2. The project construction footprint overlaps with the western periphery of the CHP which has been ranked as being of low to moderate significance. The moderate ranking is related to areas of regrowth natural vegetation communities along the western periphery of the CHP within Sectors B and H, as well as a small group of relic native trees within the north-western section of the CHP within Sector B. This area contains two old Eucalyptus tereticornis trees, relics of cleared Shale Plains Woodland Community which pre-dates military occupation of the site, identified as RNT16 within the Heritage Management Plan for the DEOH site (Godden Mackay Logan 2013). The low natural heritage significance ranking is related to grassland.

Aquatic habitat associated with The Blaxland Creek tributaries is ranked as being of moderate to high significance as previously identified in Figure 3-3. The project does not directly overlap with these areas.

An assessment of the impacts of the project to the natural heritage values of the site, including impacts against the Significant Impact Guidelines 1.2 is provided in the Statements of Heritage Impact in **Section 5**.

The CHP site also comprises the Chaffey Brothers Irrigation Scheme Canal (the canal) which has been identified for its non-Aboriginal heritage values. The canal traverses the DEOH, from the Warragamba Dam to Prospect Reservoir pipeline, to an area adjacent to Grover Crescent, Orchard Hills. The canal was inspected as part of the field survey (Survey Area No. 3S-6) for this assessment. This heritage item extends outside the project construction footprint. **Figure 5-10 to Figure 5-13** show the section of canal within the construction footprint, while **Figure 5-14** and **Figure 5-15** are the sections of canal which are outside the construction footprint. No other areas of archaeological potential relating to this heritage item were identified within the area assessed during the field survey.

The dimensions of the canal vary from shallow depressions in the northern section to 3 m wide and 400-500 mm in depth in the southern section. The banks of the canal are eroding and there is vegetation growing throughout the whole length. Two wooden features were noted in the southernmost section of the canal (outside the construction footprint). The first wooden feature comprised wooden beams laid over the canal and resting about 200 mm above the canal base. The beams were about 300 mm wide and 100 mm thick, although some were in poor condition. The second wooden feature was located 10 m northwest of the first. It also comprises wooden beams crossing the canal (**Figure 5-14**). The timber features may have been a covering for the canal, or perhaps used as crossings for the canal. Concrete debris was also present to the immediate west of the second wooden feature and may have been old posts or pylons.

The canal veered north-east from the second wooden feature and split into two canals, about three metres apart. The canals in this location are about 1.5 m wide and vary from a shallow depression down to a depth of 300 mm. The westernmost canal seemed to largely disappear (although it wasn't entirely absent) for the remainder of the length.

The northernmost extent of the canals within the construction footprint was difficult to find in places with only one visible. The canal remnants in this area were extremely shallow from erosion and covered in thick grass (**Figure 5.10** and **Figure 5.11**). In one section the canal extends towards The Northern Road where it was no longer visible due to an informal vehicle track running along the fenceline within the DEOH, as well as in The Northern Road road reserve. The canal re-entered the DEOH further north in a wooded area (**Figure 5.12**). A concrete culvert was noted at the northern end where it disappeared under a vehicle track along the DEOH boundary (**Figure 5.13**). The overall path of the canal matches that shown on a 1972 Claremont parish map (**Figure 5-9**). The canal was not visible on the ground in the small area of land between The Northern Road and Grover Crescent (which was originally The Northern Road).

An irrigation canal is listed on the PLEP as a locally significant archaeological heritage item (A-137). The item is located about one km south-west of the DEOH and the listing does not include the canal in the DEOH which is registered separately on the CHL (105317). The locations for the PLEP listing include Mulgoa Road, Queenshill Drive, Littlefields Road and The Northern Road (Lots 5, 6, 8 and 9, DP 1046980; Lot 181, DP 230752; Lots 5 and 6, DP 718233), but the length of these canal sections are not provided in the listing. The listing includes: 'sites and areas associated with the ambitious Mulgoa Irrigation Scheme developed by noted irrigators the Chaffey brothers and the Cox family. The failed scheme (from c.1889 to 1896) demonstrates marked advance in agricultural production on a scale unique in County Cumberland' (Paul Davies Pty Ltd 2007:21).

Both the DEOH canal and the PLEP registered canal were constructed by the Canadian Chaffey Brothers (George and William) as part of the overall Mulgoa Irrigation Scheme. The brothers had been involved in irrigation schemes in Canada. George Chaffey travelled to Victoria, Australia in 1886 and set up an irrigation settlement at Mildura. Charles Chaffey travelled to South Australia after 1887 to set up an irrigation settlement in Renmark (Westcott 1979). The 1890s brought drought and economic decline for the early settlers and an irrigation scheme was proposed for the Mulgoa area by George Chaffey, Henry Gorman (a property speculator) and Arthur Winbourn Stephen (nephew of George Henry Cox of Winbourne). The irrigation scheme was authorised in 1890, allowing these men to distribute water from the Warragamba River to South Creek in St Marys (Paul Davies Pty Ltd 2007:154). However, in 1893 the Irrigation Scheme stalled as the Chaffey brothers became bankrupt by the 1890s economic depression. At the time the scheme failed construction of the main channel (within the DEOH land) and the pumping station (outside the DEOH) had been underway but works on the Mulgoa Irrigation Scheme were never completed (Godden Mackay Logan 2013:20).

The CHL listing for Orchard Hills Cumberland Plain Woodland states the following about the canal:

No detailed inspection of the No 1 Central Ammunition Depot has been made for historic national estate values. Orchard Hills appears to retain little evidence of nineteenth century use with the exception of remnant fence lines, the footings of some housing and evidence of the Chaffey Brothers irrigation scheme. The latter can be seen in the south-west corner of the site where the main canal contours across the hillside below Northern (Bringelly) Road on Parish Portions 9 and 17 in the Parish of Claremont. The course of the 50 inch canal can be clearly seen on air photos of the area. Although unexamined, the tunnels under Bringelly Road may also be intact.

The Orchard Hills Defence site is associated with the Mulgoa Irrigation Scheme established in 1890 by the Chaffey Brothers. At Orchard Hills there are remnants of the irrigation canal, and possible remains of the tunnel under Bringelly (now Northern) Road. The scheme was designed to pump water from the Nepean River and potentially irrigate extensive areas of land towards St Mary's. Stopped by the financial depression of the 1890s the remnants of the distribution canal are evidence of the importance of this area, and of the expansion of irrigation, in the late nineteenth century in NSW (Australian Historic Themes: 3.11 Altering the environment). It is possible that other historic national estate values may exist on this defence site. As yet these values have not been identified or assessed (Commonwealth Department of the Environment and Energy 2002).

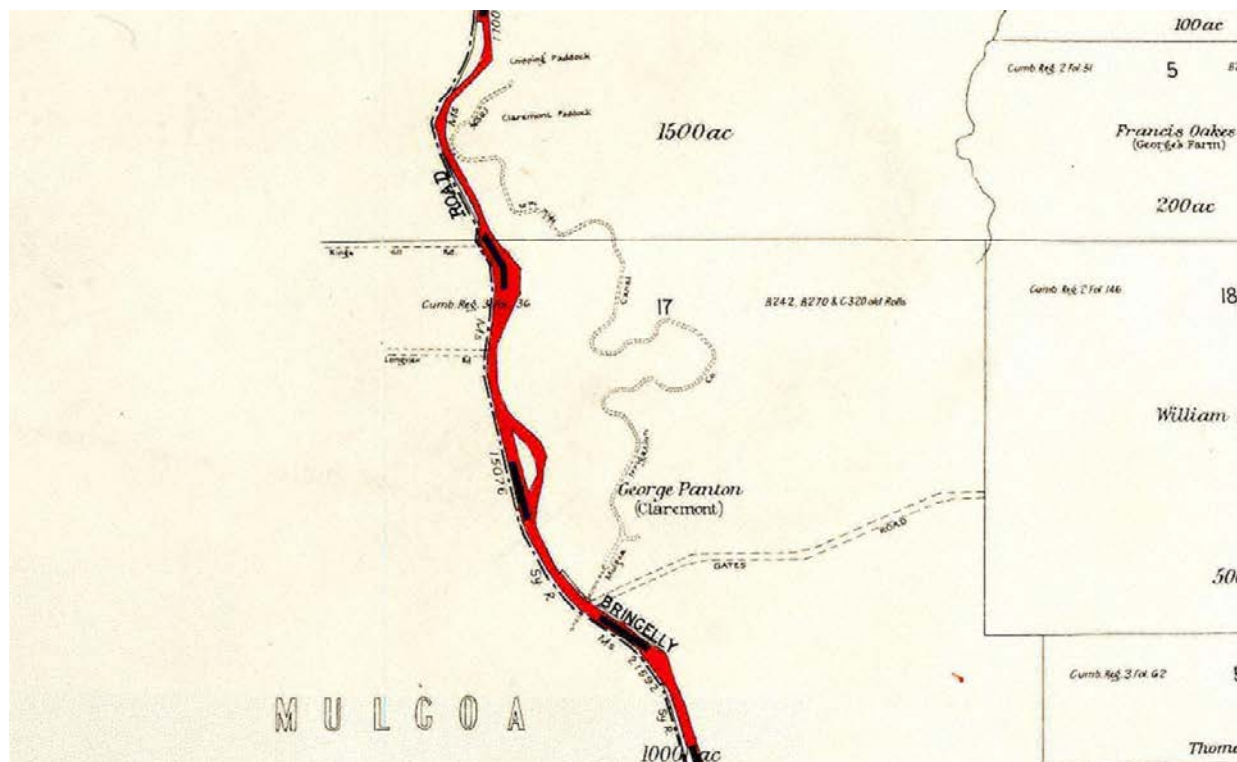


Figure 5-9 : 1972 Claremont parish map showing the canal which is labelled as Mulgoa Irrigation Co. Canal

5.3.2 Curtilage information

The curtilage of the Orchard Hills Cumberland Plain Woodland CHP site is shown in **Figure 7-1**. The curtilage of the Chaffey Brothers Irrigation Scheme Canal defined is shown on **Figure 7-2**.

5.3.3 Significance assessment

The significance assessments against the CHL significance criteria for cultural heritage values are provided in this Section. The following significance assessment is taken directly from the CHL listing (Commonwealth Department of the Environment and Energy 2002) and the Heritage Management Plan (Godden Mackay Logan 2013), with updates to the heritage values assessment by the current author noted in *italics*.

CHL/SHR Criterion	Assessment
CHL A – Importance in the course, or pattern, of Australia's natural or cultural history	Orchard Hills has surviving evidence of canal earthworks from the 1890 Chaffey Brothers irrigation scheme at Mulgoa. The promoters of the scheme planned to pump water from the Nepean River to Mulgoa where a 4,000,000 gallon reservoir was constructed. The surviving earthworks are part of the 12 mile contour canal designed to run from Mulgoa as far as St Mary's. The canal runs through tunnels under the Northern Road (Bringelly Road) towards St Mary's through the site at Orchard Hills. Although the scheme was almost completed the Depression of 1893 resulted in its demise (Fox & Associates 1991: 41).
A - Importance in the course, or pattern, of Australia's natural or cultural history	The Mulgoa Irrigation Scheme is important in the course and pattern of New South Wales and the Mulgoa/Orchard Hills districts because of its place as an attempt to irrigate pastoral lands and allow farming of areas which were otherwise unsuitable for agriculture. The scheme contains important engineering elements that provide an understanding of hydrological systems, including movement of water upslope to a reservoir and distribution through a planned distribution network.

CHL/SHR Criterion	Assessment
	<p>The Mulgoa Irrigation Scheme was comparable with two other irrigation schemes, implemented in Victoria and South Australia, which resulted in the establishment of Mildura and Renmark respectively. As such, the Mulgoa Irrigation Scheme provides evidence for one of the New South Wales government's economic aims in Western Sydney, prior to Federation.</p> <p>The ultimate failure and abandonment of the Mulgoa Irrigation Scheme in 1895 provides evidence of the financial difficulties encountered by the Mulgoa Irrigation Company in New South Wales, along with their comparable sister companies in Victoria and South Australia; as well as the general economic situation in New South Wales, where the government was unwilling to fund and complete the scheme following the withdrawal of the Mulgoa Irrigation Company (Godden Mackay Logan 2013:91-92).</p> <p>The RAAF land at Orchard Hills is the least disturbed and largest remaining remnant of Cumberland Plain Woodlands (NSW NPWS 1997, NSW NPWS 2000, Penrith Council 1997). The size of the East Orchard Hills remnant provides a comparatively large area of continuous habitat for species likely to be excluded from remnants that are small and isolated, particularly the Cumberland Plain woodland bird assemblage. (NSW NPWS 1997).</p> <p>The tributaries of Blaxland Creek at Orchard Hills are among the least disturbed catchments remaining on the Cumberland Plain and are regarded as possibly the most pristine creek system on Wianamatta Shale left in western Sydney (NSW Natural Environment Evaluation Panel 2000, Chessman 1999, NSW NPWS 1997). The macro-invertebrate community of this catchment has a high representation of disturbance-sensitive taxa. Stoneflies, Leptophlebiid mayflies and pollution-sensitive families of caddisflies appear to be confined to such streams within the Cumberland Plain (Chessman 1999). Orchard Hills acts as a refuge and reservoir for disturbance-sensitive aquatic macro-invertebrates (NSW NPWS 1997).</p> <p>The Blaxland Creek supports a higher level of macro-invertebrate diversity at the genera level than most other creeks in western Sydney (Chessman 1999).</p>
<p>B – Uncommon, rare or endangered aspects of Australia's natural or cultural history</p> <p>F – Uncommon, rare or endangered aspects of NSW cultural or natural history</p>	<p><i>The Penrith Heritage study (Paul Davies Pty Ltd 2007) noted that the LEP-listed section of the Chaffey Brothers irrigation scheme (situated outside the CHL boundary) met the requirements of this criterion, but no further detail of that assessment was available for the current assessment. As the canal situated in the construction footprint is part of the same overall irrigation scheme, it also meets this criterion.</i></p> <p>Orchard Hills is almost entirely vegetated with remnants and regenerating areas of Cumberland Plain Woodland and Sydney Coastal River Flat Forest (NSW NPWS 2000). Cumberland Plain Woodland is regarded as an endangered ecological community at both state and Commonwealth level. Sydney Coastal River Flat Forest is regarded as an endangered ecological community at state level that is poorly represented in reserves. Orchard Hills is regarded as a core biodiversity area for conservation of Grey Box Woodland (Cumberland Plain Woodland) and River Flat Forest (NSW NPWS 1997) and an outlier of the Castlereagh Ironbark Forest community.</p> <p>The bush thickknee (<i>Burhinus grallarius</i>), which is listed as endangered in NSW and has been recorded from Orchard Hills is regarded as a species of the greatest conservation concern in the Cumberland region (NSW NPWS 1997).</p> <p>Orchard Hills has one plant listed as vulnerable in NSW, prickly spider-flower (<i>Grevillea juniperina</i>). Six other plant species are found in the place which are regarded as being of regional conservation significance (NSW</p>

CHL/SHR Criterion	Assessment
	<p>NPWS 1997). These are spreading bush-pea (<i>Pultenaea microphylla</i>), fuzzweed (<i>Vittadinia pustulata</i>), water-milfoil (<i>Myriophyllum simulans</i>), dwarf skull-cap (<i>Scutellaria humilis</i>), early nancy (<i>Wurmbea biglandulosa</i>) and the grass (<i>Panicum obseptum</i>). An additional 32 plant species are found at Orchard Hills which are regarded as inadequately conserved in western Sydney (NSW NPWS 1997).</p> <p>The tributaries of Blaxland Creek are regarded as having regional conservation significance for invertebrate species dependant on low levels of agricultural and urban development (NSW NPWS 1997).</p>
<p>C – Potential to yield information that will contribute to an understanding of Australia's natural or cultural history</p> <p>E - Potential to yield information that will contribute to an understanding of NSW cultural or natural history</p>	<p>Further study of the Mulgoa Irrigation Scheme could yield new information on the planned subdivision and establishment of the township of Mulgoa. Investigation of the remains of the Mulgoa Irrigation Scheme could provide further insight into the mode of canal construction, landscape modification and technology for a gravity-fed water canal (Godden Mackay Logan 2013:93).</p> <p><i>The Chaffey Brothers Irrigation Scheme Canal has the potential to yield information about early canal/irrigation practices and construction, such as the wooden features located in the southern section.</i></p> <p>The tributaries of Blaxland Creek at Orchard Hills are some of the least disturbed creeks remaining on the Cumberland Plain (NSW Natural Environment Evaluation Panel 2000, Chessman 1999, NSW NPWS 1997). The creek and its tributaries provide a valuable benchmark to measure the degradation of creek systems generally in western Sydney (NSW NPWS 1997).</p> <p>Fire has been excluded from Orchard Hills for approximately 50 years, and the place provides an opportunity for ecological research on regenerating Cumberland Plain Woodland in the absence of fire (NSW Natural Environment Evaluation Panel 2000).</p>
<p>D –Principal characteristics of:</p> <ol style="list-style-type: none"> 1. A class of Australia's natural or cultural places; or 2. A class of Australia's natural or cultural environments <p>G - Important in demonstrating the principal characteristics of a class of NSW cultural or natural places or cultural or natural environments.</p>	<p>The remnant archaeological remains for the Mulgoa Irrigation Scheme are located within, and are a component of, a rural cultural landscape. The Mulgoa Irrigation Scheme represents an attempt to modify the rural landscape to allow more intensive agricultural purposes, in a similar manner to that undertaken in Mildura and Renmark. The cultural landscape is characterised by undulating low hills; a natural landscape suitable for development of a gravity-fed irrigation canal (Godden Mackay Logan 2013:94).</p> <p>The place comprises the largest and least disturbed remnant of two vegetation units of the Cumberland Plain Woodland as well as some of the most undisturbed areas of Sydney River Flat Forest in the Penrith area (NSW NPWS 1997, 2000). At East Orchard Hills, mature tree heights reach 50 m and include some of the most outstanding examples of Forest Red gum trees remaining in western Sydney (NSW NPWS 1997).</p> <p>Several Indigenous sites were noted during the one day inspection on 17 April 2000. Many more sites are likely along the main stream especially at the third order tributary junctions (pers comm. Peter Mitchell, 2000).</p>
<p>E – Particular aesthetic characteristics valued by a community or cultural group</p> <p>C - Important in demonstrating aesthetic characteristics and/or</p>	<p>No values provided for this criterion in the CHL listing.</p>

CHL/SHR Criterion	Assessment
a high degree of creative or technical achievement in NSW	
F – High degree of creative or technical achievement at a particular period C - Important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW	The Mulgoa Irrigation Scheme demonstrates a high degree of technical achievement, where water needed to be raised from the Nepean River (through a pumping station and a series of pipes) to be held in a reservoir (Square Dam). From this storage point the Mulgoa Irrigation Scheme was to move and distribute water through the landscape by a gravity fed system of canals with a low gradient. The canal distribution network demonstrates considerable technical understanding of topography, planning and hydrological engineering (comparable to that undertaken for the contemporary Upper Nepean Scheme) (Godden Mackay Logan 2013:95).
G – Strong or special association with a particular community or cultural group for social, cultural or spiritual reasons D - Strong or special association with a particular community or cultural group in NSW for social, cultural or spiritual reasons	No values provided for this criterion in the CHL listing or DEOH HMP.
H - Special association with the life or works of a person, group of persons of importance in Australia's natural or cultural history B - Strong or special association with the life or works of a person, or group or persons, of importance in NSW cultural or natural history	The Mulgoa Irrigation Scheme was conceptualised and implemented by George and William Chaffey in 1890. In the 1880s the Chaffey brothers came to Australia on the invitation of Alfred Deakin (a Victorian Cabinet Minister), and establishment of the towns of Mildura (Victoria) and Renmark (South Australia) around comparable irrigations schemes took place. The Chaffey brothers' initial success in Victoria and South Australia led to an invitation to develop a similar scheme in New South Wales – the Mulgoa Irrigation Scheme. Following an initial period of construction, when parts of the Mulgoa Irrigation Scheme infrastructure was built, the scheme failed as a consequence of the economic situation in New South Wales and Victoria/South Australia, combined with the Chaffey brothers' personal monetary difficulties. The residual evidence of the Mulgoa Irrigation Scheme provides a direct connection to the Chaffey brothers, who visualised and engineered it (Godden Mackay Logan 2013:96)
I - Importance as part of Indigenous tradition	No values provided for this criterion in the CHL listing.

5.3.4 Statement of significance

The current statement of significance from the HMP (Godden Mackay Logan 2013:97-98) is as follows:

Defence Establishment Orchard Hills (DEOH) is vegetated with remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal River Flat Forest. Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). At state level, Sydney Coastal River Flat Forest (*River-Flat Eucalypt Forest on Coastal Floodplains of the New South Wales North Coast, Sydney Basin and South East Corner Bioregions*) and Castlereagh Ironbark Forest (*Cooks River/Castlereagh Ironbark Forest in the Sydney Basin Bioregion*) are regarded as endangered ecological communities that are under-represented in reserves. DEOH is regarded as a core biodiversity area for conservation of both these communities.

The place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland. The size of the DEOH remnant provides a comparatively large area of continuous habitat for species likely to be excluded from small and isolated remnants, particularly the Cumberland Plain Woodland bird community. Mature tree heights at Orchard Hills reach 50m and include some of the most outstanding examples of Forest Red gum trees remaining in Western Sydney.

The tributaries of Blaxland Creek at Orchard Hills are among the least disturbed catchments remaining on the Cumberland Plain and Wianamatta Shale in Western Sydney. Blaxland Creek tributaries are richer in aquatic macro-invertebrate genera than most other creeks in Western Sydney. The macro-invertebrate community of this catchment has a high representation of disturbance-sensitive species. Stoneflies, *Leptophlebiid* mayflies and pollution-sensitive families of caddisflies appear to be confined to such streams within the Cumberland Plain. The DEOH therefore acts as a refuge and reservoir of regional conservation significance for such species that are dependent on low levels of agricultural and urban development.

The bush thickknee (*Burhinus grallarius*) a rare bird, is listed as endangered in New South Wales and is regarded as a species of the greatest conservation concern in the Cumberland region. It has been recorded at Orchard Hills. The DEOH has one plant listed as vulnerable at Commonwealth level (*Pultenaea parviflora*), and two plants listed as vulnerable in New South Wales, the prickly spider-flower (*Grevillea juniperina*) and *Dillwynia tenuifolia*. Individuals from the Endangered Population of *Marsdenia viridiflora* subsp. *viridiflora* are found across DEOH. Six other plant species are found in the area, which are regarded as being of regional conservation significance. These are spreading bush-pea (*Puttenaea microphylla*), fuzzweed (*Vittadinia pustulata*) water-milfoil (*Myriophyllum simulans*), dwarf skull-cap (*Scutellaria humilis*), early nancy (*Wurmbea biglandulosa*) and the grass *Panicum obseptum*. An additional 32 plant species are found at Orchard Hills which are regarded as inadequately conserved in Western Sydney.

The low level of disturbance in the tributaries of Blaxland Creek within Orchard Hills provide a valuable benchmark to measure the degradation of creek systems generally in Western Sydney. The absence of fire at Orchard hills for approximately 50 years to 2001 provides an opportunity for ecological research on regenerating Cumberland Plain Woodland.

The DEOH is a component of the Darug Aboriginal people's cultural landscape, where the place contains a representative number of stone artefact sites, situated within intact landforms and soil deposits. Aboriginal sites identified thus far within DEOH represent a low percentage of those which could be present, but provide direct evidence for Darug Holocene occupation and economy in the context of Western Sydney. The DEOH has the potential to contain large numbers of representative archaeological sites which have not been significantly impacted by historical development.

The range of archaeological evidence within the DEOH is important to the Darug people because it provides physical evidence for their land occupation, Aboriginal traditions and the connection to a larger tribal area. Further study of the archaeological resources within the DEOH could provide new evidence for spatial patterning of archaeological deposits, evidence for trade and exchange networks and possibly social regulations in terms of spatial occupation of the landscape.

The Mulgoa Irrigation Scheme was privately funded and engineered by the Mulgoa Irrigation Company; a company owned by the Chaffey brothers who were directly responsible for the establishment of the towns of Mildura (Victoria) and Renmark (South Australia) around comparable irrigation schemes in the 1880s and 1890s. The archaeological remains of the Mulgoa Irrigation Scheme canal, contained within its original as-built landscape context, are integral elements of the scheme, which was intended to transform economic and social aspects of Mulgoa (and Orchard Hills) in the 1890s. Following an initial period of construction, when sections of the Mulgoa Irrigation Scheme infrastructure were built, the scheme failed as a consequence of the economic situation in New South Wales and Victoria/South Australia, combined with the Chaffey brothers' personal monetary difficulties. The resultant physical evidence of the Mulgoa Irrigation Scheme, primarily as archaeological remains within a rural landscape, provides direct evidence to support the history of the Mulgoa Irrigation Scheme, the engineering requirements of the gravity-fed water irrigation scheme, the commencement of construction and ultimately its failure.

The physical evidence and landscape setting of the scheme, within a modified rural landscape, are vital for understanding the extent of the Mulgoa Irrigation Scheme and how it would have operated. The residual

evidence provides a direct connection to the Chaffey brother, who visualised and engineered it. An assessment of the local area has shown that most of the remnant archaeological and landscape evidence for the Mulgoa Irrigation Scheme is to be found within the boundary of the DEOH.



Figure 5.10 : Section of canal within south part of construction footprint, facing south. Photo taken by Jennifer Chandler on 6 April 2016.



Figure 5.11 : Section of canal within south part of construction footprint, facing east. Photo taken by Jennifer Chandler on 6 April 2016.



Figure 5-12 : Canal at northern end, facing north-east. Photo taken by Jennifer Chandler on 6 April 2016.



Figure 5-13 : Culvert, northern end of canal, facing north-west. Photo taken by Jennifer Chandler on 6 April 2016.



Figure 5-14 : Wooden feature 2 at the southern section of the canal, facing west. Photo taken by Jennifer Chandler on 6 April 2016.



Figure 5-15 : Canal at southern section, facing north. Photo taken by Jennifer Chandler on 6 April 2016.

5.3.5 Tolerance for change

A ranking of 'tolerance for change' has been applied across the DEOH site to identify the extent to which a place's heritage values/significance and key attributes are able to tolerate change without having an adverse impact on the nature or degree of its heritage values or the significance of the site overall (Godden Mackay Logan 2013).

As identified above, the key attributes of natural heritage elements on DEOH are the floristics and structure of the ecological communities, and the existence of isolated relic trees (Godden Mackay Logan 2013). These natural heritage elements have different tolerance for change as follows:

- Remnant vegetation communities have some tolerance for change
- Relic native trees have a low tolerance for change
- Regrowth natural vegetation communities have a reasonable tolerance for change
- Aquatic habitats have a low tolerance for change

There are no areas of remnant vegetation communities located within the project construction footprint where it overlaps with the CHP. The project construction footprint overlaps with some areas identified as regrowth natural vegetation communities along the western periphery of the CHP within sectors B and H of the DEOH. These areas would be able to tolerate a reasonable change, being that the sector or element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the DEOH.

The construction footprint also overlaps with one area of relic native trees located within the northern section of the CHP within Sector B of the DEOH. This area has a low tolerance for change meaning the sector/element and its key attributes embody the heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved.

Aquatic habitats mapped within the DEOH have a low tolerance for change; however the project does not overlap with these areas directly and is not expected to indirectly impact them (refer to **Section 7**).

In relation to historic heritage values potentially impacted by the project, the canal and the area in which is situated (Sector H) has a low tolerance for change in relation to new development and demolition/remediation.

5.4 Item 3: Warragamba Dam to Prospect Reservoir pipeline

5.4.1 Description and history

The Warragamba Dam to Prospect Reservoir pipeline currently dissects the construction footprint immediately south of the DEOH (**Figure 5-16, Figure 5-17**) on Lot A DP341629 and Lot A DP341893. It was surveyed on 23 February 2016 (Survey Area No. 3S-5). No areas of archaeological potential were identified during the field survey of this heritage item. The pipeline and associated items are located above the ground surface and clearly visible. There is unlikely to be any associated archaeological deposits relating to the pipeline. The large steel pipeline is on an east/west alignment and located underground at The Northern Road. It emerges about 100 m from The Northern Road on either side.

A second survey was undertaken for additional study areas on 20 September 2016 (Survey Area No. 4-26 and 4-27) and two concrete culverts relating to the pipeline were recorded.

- Survey Area No. 4-26: a concrete culvert covers a drainage channel. The culvert appears to have been built to allow access to four concrete building foundations (located approximately 14 m west of the project). The nearby building foundations are reported to have been a construction depot for the pipeline construction upgrade in the 1950s (pers. comm., Water NSW staff, 20 September 2016). The culvert was therefore likely to have been constructed in the 1950s (**Figure 5-18**)
- Survey Area No. 4-27: a concrete block culvert is likely to be associated with the 1940s construction of the pipeline due to its location adjacent to the 1940s constructed pipeline (**Figure 5-19**).

The Warragamba Dam was constructed to supply water to Sydney. The dam was completed in 1960 and supplies water to the Prospect Reservoir via large-diameter steel pipelines between the two locations. The pipeline was originally laid in 1940 as part of an emergency scheme, with an upgrade of the pipeline undertaken in the 1950s. The Warragamba Water Scheme was part of a large scale plan over a century to establish a water supply to Sydney (Paul Davies Pty Ltd 2007:74). The Penrith Heritage Study (Paul Davies Pty Ltd 2007:206) noted that the pipeline demonstrates steel fabricating technology of the day, but concluded that the pipeline had no particular significance to the history of Penrith.

Construction of the pipeline began in 1940 and involved a substantial number of workers, not all of whom were Australian. Strikes were held by workers during the construction and there were government inquiries into the use of foreign workers. As a result of World War II, large numbers of Chinese immigrants entered Australia due to Japan's involvement with China and in the Pacific. Some of these Chinese men were ship crew members who refused to go back to Japanese held areas on their ships (Williams 1999:7). After the bombing of Pearl Harbour there were hundreds of Chinese seamen stranded at Australian ports. In 1942 the Chinese Seamen's Union was formed by the Chinese Youth League. The Union was associated with the Seamen's Union of Australia (Ward 2015).

It was reported that the Federal Government had made an agreement with the Chinese Government to find work for the stranded Chinese seamen. The work was to be either on ships or land, was subject to conditions determined by the Minister for Shipping (Mr Beasley) and would be temporary, with the men being repatriated afterwards. It was an offence for either employers or Chinese workers to engage in employment outside of these conditions (*The Advertiser*, 18 December 1943).

The *Evening Advocate* (5 May 1942) reported that a Chinese labour corps was recruited by the Sydney Metropolitan Water Board to begin work on the Warragamba Dam to Prospect Reservoir pipeline. Workers were to be paid Australian award rates and live in a community camp. The use of Chinese workers by the Sydney Metropolitan Water Board was to be investigated by the Commonwealth Department of Labour and National Services in Canberra. If the investigation proved that the Water Board were using Chinese workers, work on the pipelines would be suspended pending a full inquiry by the Commonwealth Government. The man responsible for the investigation was Mr Ward, the Minister for Labour.

Some politicians expressed their concern at how the Government inquiry might be seen by 'our Chinese Allies' with Senator Poll (United Australia Party, Queensland) asking the Government to 'consider Mr Ward's impulsive

action' in the Senate on 2 May 1942. A meeting was held between Mr M L Tuan, staff at the Chinese Legation, and Mr Ward. The meeting was reported as being 'most friendly' (*The West Australian*, 2 May 1942).

There were many delays and stoppages during the construction of the pipeline. On 3 June 1943 the *Northern Star* reported that 180 Chinese workers from the Warragamba Dam to Prospect Reservoir pipeline had been taken off the job by the Manpower Department as they were required for 'urgent war work'. The Chinese workers therefore, only worked on the pipeline for a year. The Water Board experts believed there may be a water shortage in Sydney if the second pipeline was not completed by 1945 (*Sydney Morning Herald* (SMH), 19 August 1944). Steel for the pipeline construction had been supplied to contractors but that they could not fabricate the pipes until labour was made available. The workers had been transferred to work on another project and work on the pipeline was suspended. Workmen on the pipeline had been on strike for almost a week when work resumed. A conference between the disputes committee of the Trades and Labour Council and engineering officers of the Water Board resulted in 450 men returning to work (SMH, 2 September 1947).

The Chinese workers on the Warragamba Dam to Prospect Reservoir pipeline included carpenters, fitters and stewards (*Newcastle Morning Herald and Miners' Advocate* (NMHMA), 5 May 1942). The 200 Chinese workers were housed in a camp on Mulgoa Road (SMH, 5 May 1942). The Chinese labourers would camp separately to the other men 'because of special feeding conditions' (*Daily Advertiser*, 30 April 1942). They were also members of the Water Board Union and were told they would receive full pay rates (*Queensland Times*, 4 May 1942). Pipeline workers reportedly lived in open tents, with both theft and health (including pneumonia) being a problem (*Nepean Times* (NT), 7 July 1949, 29 July 1943). The death of a pipeline labourer was also reported. The man, aged 40, was found deceased 'in his tent on the Warragamba Dam to prospect Reservoir pipeline site, six miles from Penrith'. The man had a fractured skull and was known to police from several violent crimes (NMHMA, 11 May 1948). An advertisement for labourers in the SMH (1 December 1945) stated that 'workers must have their own blankets and prepare their own meals. Camping facilities are provided, an adequate camping allowance is paid and transport to and from Rooty Hill railway station provided on Monday morning and Friday night'.

Workers stayed in tents in camps close to the pipeline with two being near the current construction footprint. No. 6 Camp was located on Luddenham Road, about three miles from Luddenham. There was a private pipeline road that ran from the camp to Mulgoa (NT, 22 October 1942). No. 5 Camp was located on Bringelly Road (NT, 4 November 1948).

5.4.2 Curtilage information

The curtilage of the Warragamba Dam to Prospect Reservoir pipeline is shown in **Figure 7-3**.

5.4.3 Significance assessment

There has been no previous significance assessment undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	The pipeline is associated with a significant historical trend – use of foreign labour while Australians were absent due to World War II. It also demonstrates the government response to Chinese men abandoning their ships due to Japanese occupation of China. Around 200 Chinese worked on the pipeline and lived in a camp for at least a year.
B – Strong or special associations	Does not meet this criterion. The pipeline is not associated with any particular individual or group of particular importance to NSW's history.

NSW Criterion	Assessment
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The pipeline is not a major work by an important designer or artist and does not demonstrate any particular degree of technical achievement as it used standard technology of the period.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The pipeline is only important to the local community for amenity reasons.
E – Potential to yield information	The pipeline demonstrates steel fabrication technology during the 1940s-1950s. While the two concrete culverts are associated with the construction of the pipeline over its history, they do not contribute to the historical significance of the site, nor demonstrate the technological significance of the pipeline. As the pipeline and associated items are intact structures situated above the ground surface and clearly visible there is unlikely to be any associated archaeological deposits relating to the pipeline.
F – Uncommon or rare	Does not meet this criterion. The pipeline does not possess uncommon, rare or endangered aspects of NSW's cultural or natural history.
G – Principal characteristics of a class	Does not meet this criterion. While the pipeline has the key characteristics of a utilities pipeline in terms of its structure, it does not demonstrate particularly important construction techniques, changing use of technology, or use of materials.

5.4.4 Statement of significance

The pipeline is associated with an important historical trend relating to the use of foreign labour in Australia during World War II. The pipeline also has the potential to yield information about steel pipe construction techniques employed at the time. The item is therefore considered to have sufficient significance to fulfil the criteria for local listing.



Figure 5-16 : Pipeline, facing east. Photo taken from gate on The Northern Road by Jennifer Chandler on 23 February 2016.



Figure 5-17 : Pipeline, facing west. Photo taken from gate on The Northern Road by Jennifer Chandler on 23 February, 2016.



Figure 5-18 : The concrete culvert in Survey Area No. 4-26. Photo taken by Andrew Roberts on 20/09/16.



Figure 5-19 : The concrete culvert in Survey Area No. 4-27. Photo taken by Andrew Roberts on 20/09/16.

5.5 Item 4: Fruit Orchard, Luddenham

5.5.1 Description and history

The property Lot 23 DP207317 at 2580 The Northern Road, Luddenham was surveyed (Survey Area No. 3S--8) and a small fruit orchard identified. The orchard contains less than 20 fruit trees (possibly apple and/or pear). The age of the trees is unknown (**Figure 5-20, Figure 5-21**). No areas of archaeological potential were identified during the field survey of this heritage item. The item was assessed to not be a heritage item and there is no potential for archaeological deposits to be present.

This property was originally part of a 1000 acre land grant called Claremont. The land was granted to George Panton on 31 August 1819 (Paul Davies Pty Ltd 2007:151).

A title search for this property was unsuccessful due to the address not being recognised. However, a title search is unlikely to yield information about the establishment of an orchard of this size on this particular property. While orchards were important in the area this orchard is a small size and the age of the trees is unable to be established, therefore it is unlikely to be significant.

5.5.2 Curtilage information

The curtilage for the Fruit Orchard includes the remnant trees with a buffer of about 1 m, and is shown in **Figure 5-1**.

5.5.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. The orchard does not demonstrate any particularly important role in NSW's history.
B – Strong or special associations	Does not meet this criterion. The orchard is not associated with any particular person or group of historical importance.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The orchard does not have visual or sensory appeal, or landmark or scenic qualities.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The orchard has no strong or special associations with any identified community or cultural groups.
E – Potential to yield information	Does not meet this criterion. The orchard has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The orchard is not uncommon or rare in this region. The orchard does not possess uncommon or endangered aspects of NSW's cultural history. Orchards are common in the area and this particular one was considered to have no heritage value.
G – Principal characteristics of a class	Does not meet this criterion. The orchard is a poor example of its type.

5.5.4 Statement of significance

While the site is associated with the important historical industry of orcharding, the size of the orchard, the limited information about the history of the property and indeterminate age of the trees provide very little information about the industry. The site is therefore not considered to be significant.



Figure 5-20 : Orchard, facing east. Photo taken by Jennifer Chandler on 23 February 2016.



Figure 5-21 : Orchard, facing south. Photo taken by Jennifer Chandler on 23 February 2016.

5.6 Item 5: Weatherboard House, Slab Hut and Old Dairy, Luddenham

5.6.1 Description and history

The property Lot 502 DP580982 at 2787 The Northern Road, Luddenham was surveyed (Survey Area No. 4-2) on 24 February 2016.

This site comprised a late 19th to early 20th century weatherboard house with a wide, open verandah on three sides (**Figure 5-22, Figure 5-23**). There was a more recent extension at the rear of house, two brick chimneys on opposite sides of the house. The original verandah flooring had been replaced. The house has a gabled corrugated iron roof. Several trees in the garden are almost 50 years old. There was a wooden slab hut located at the back of the property (**Figure 5-24, Figure 5-25, Figure 5-26**). A concrete slab and a single wooden post remains from what the property owner identified as the coolroom/dairy (**Figure 5-27**). There was no evidence of ruins, bottle dumps, grass-covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

This property was originally part of a land grant to John Blaxland called Stockwood Farm. The land was 600 acres in size and granted on 31 August 1819. A full title search for this property was unsuccessful due an old system number preventing further tracking of the land title.

The following information was obtained from the current property owner (Malcolm Turner, pers. comm, 24 February 2016). The original property owners were the Bouffier family.⁴ The weatherboard house was constructed in the late 19th century. The property was then owned by the Orton family. There was another building to the north-west of the existing house which has been demolished. Either this building or the slab hut out the back was used by the Orton family for a kitchen. The property with the weatherboard house was bought from a consortium who subdivided the block. The farm used to operate as a dairy which included a cool house and a well. A date palm and an elm tree planted out the front of the house were probably original. The Orton family had three properties in the area and each one had palm and elm trees. There used to be music lessons in the front room of the house and people used to travel from Penrith by horse and cart. The driveway to the house was an older section of The Northern Road (Bringelly Road) (Malcolm Turner, pers comm. 24 February 2016).

5.6.2 Curtilage information

The curtilage of the Weatherboard House, Shed and Old Dairy includes the house, associated buildings and area of old dairy and is shown on **Figure 5-1**.

5.6.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. While the property is associated with the important local industry of dairying, there is little physical evidence to demonstrate this connection.
B – Strong or special associations	Does not meet this criterion. The property does not demonstrate an association with a significant event, person or groups of people.

⁴ The Bouffier family owned property to the east and west of The Northern Road from around 1900 to 1950 and were cattle dealers who supplied the market in Sydney (Paul Davies Pty Ltd 2007: 155).

NSW Criterion	Assessment
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property demonstrates little aesthetic values and does not demonstrate any particularly creative or technical achievement.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The property has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The property is not rare in this region. There are many properties in this region of a similar age. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property is not particularly representative of a dairying operation as much of the original is not present.

5.6.4 Statement of significance

While item 5 is associated with the important historical industry of dairying and early settlement of the area, the remains of the dairy (if any) and existing house have the potential to provide very limited information about the industry. The site is potentially associated with the Bouffier family with ties to the local area, however, the item is considered to have insufficient significance to fulfil the criteria for State or local listing.



Figure 5-22 : House, facing east. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-23 : Front verandah of house, facing north. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-24 : Slab hut, facing east. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-25 : View inside slab hut, facing south-west. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-26 : Window detail, slab hut, facing north-east. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-27 : Location of previous dairy, facing south-west. Photo taken by Jennifer Chandler on 24 February, 2016.

5.7 Item 6: Weatherboard House and Sheds, Luddenham

5.7.1 Description and history

Item 6 is located on Lot A DP160890 at 2825 The Northern Road Luddenham and was surveyed on 24 February 2016 (Survey Area No. 4-4). No areas of archaeological potential were identified during the field survey at this heritage item. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

This site comprises an old weatherboard house, sheds and stockyards described as follows:

- The weatherboard house has a hipped corrugated iron roof, with a gabled roof at a section at the back of the house which is an extension. It appears that there was two front doors in the building. It has a wide front verandah and small verandah on the back extension. A carport has been added to one side of house. There is a chimney on the back extension. The house is in a poor condition (**Figure 5-29, Figure 5-30**)
- Sheds – There is one large shed with a smaller one to the south, immediately adjacent. Both sheds have timber internal frames and green corrugated iron walls and gabled roof. Both roof beams and the frame are hand sawn on both buildings (**Figure 5-31, Figure 5-32**)
- Stockyards – A set of timber stockyards are located to the east of both sheds.

This property was originally part of a land grant to John Blaxland called Stockwood Farm. The land was 600 acres in size and granted on 31 August 1819. A full title search for this property was unsuccessful due an old system number preventing further tracking of the land title.

According to local Luddenham residents, a local butcher called Jim Roots is said to have lived in the house at this site (Nancy Sales, pers comm., 6 April 2016; Malcolm Turner, pers comm., 24 February 2016). A 1929 photo shows JW Roots slaughterhouse in Luddenham but it is unknown where the exact location is and whether it is associated with item 6 (**Figure 5-28**).

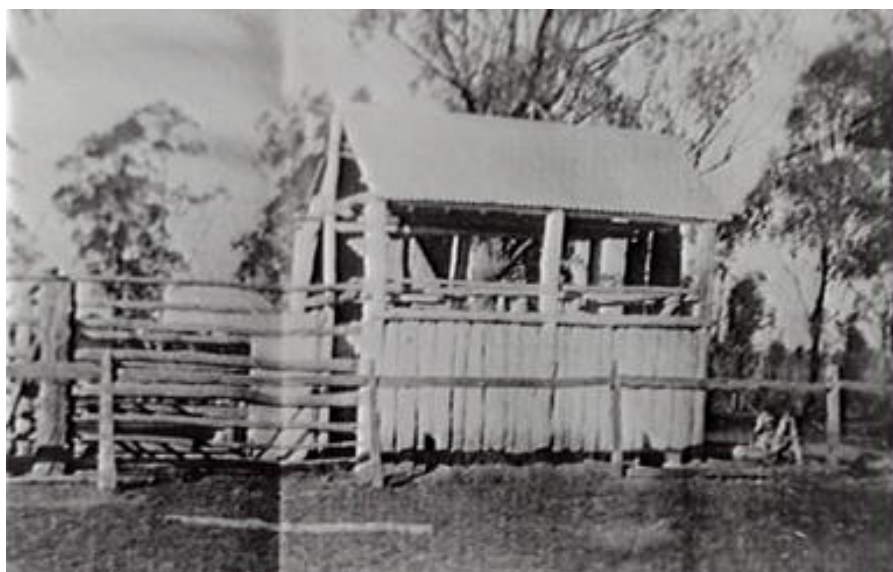


Figure 5-28 : 1929 photo of J W Roots slaughterhouse, Luddenham (Penrith City Council 2016).

5.7.2 Curtilage information

The curtilage of Weatherboard House and Sheds includes the house, sheds and stockyards as described above and is shown on **Figure 5-1**.

5.7.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. There is no physical evidence to demonstrate a connection with historically important activities or processes.
B – Strong or special associations	Does not meet this criterion. While the property is potentially associated with the Roots family, a well-known butchering family with ties to the local area, this association is considered insufficient to meet the criteria.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property is not a major work by a designer or artist, and does not display any particularly aesthetic features.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The property has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.
F – Uncommon or rare	Does not meet this criterion. The property is not rare. There are many properties in this region of a similar age. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property does not demonstrate any particularly important characteristics of a farm house or butchery.

5.7.4 Statement of significance

Item 6 is potentially associated with the Roots family, a well-known butchering family with ties to the local area through much of the 20th century. The house is in poor condition, and the sheds do not appear directly associated with the activity of butchering. Therefore the heritage item has limited potential to provide information about the activity of butchery and supply of meat to the local population. The item is considered to have insufficient significance to fulfil the criteria for State or local listing.



Figure 5-29 : House front, facing north-west. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-30 : House back, facing north. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-31 : Shed, facing south. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-32 : Inside of shed, facing south-west. Photo taken by Jennifer Chandler on 24 February, 2016.

5.8 Item 7: 'Pleasantview' House 1, Luddenham

5.8.1 Description and history

Item 7 is located on Lot 100 DP846962 at 2422-2430 The Northern Road, Luddenham and was surveyed on 24 February 2016 (Survey Area No. 4-7). No areas of archaeological potential were identified during the field survey at this heritage item. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

There are three houses present on the 'Pleasantview' property. House 1 is located within the construction footprint (**Figure 5-33, Figure 5-34**). House 2 is modern and located outside the footprint and House 3 is the original homestead and also located outside the footprint. This assessment only includes House 1.

House 1 is of weatherboard construction with a gabled roof. The original roof was damaged in a storm and it now has a modern roof. There is a brick chimney on the southern side of the house. There is cement sheeting, louvre windows and a small enclosed verandah on the west side of the house.

The property owner stated that he brought the building to the property in around the 1930s-1940s and that it was originally the Llandilo Hall (Kenneth Hughes, pers. comm, 24 February 2016). Background research has determined that there was a new hall built at Llandilo around the time that the owner says he transferred the hall to the 'Pleasantview' property. The original hall was called the Llandilo School of Arts. In 1915 the hall was still uncompleted with 'bare walls' (NT, 31 July 1915). No other historical information about either 'Pleasantview' or the Llandilo Hall was able to be found during this assessment.

House 1 is in moderate condition but has been subject to modification. House 1 appears to have the style of a residence, rather than the appearance of a community hall. There is little information on the history of the Llandilo Hall, and having been relocated to its current position does not add to the building's significance.

5.8.2 Curtilage information

The curtilage of 'Pleasantview' House 1 is shown on **Figure 5-1**.

5.8.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. While the house is likely the original Llandilo Hall, it is not in its original location and has been heavily modified. It therefore does not demonstrate any particular aspect of NSW's history.
B – Strong or special associations	Does not meet this criterion. The property does not demonstrate an association with a significant event, person or groups of people.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The property does not appear to have any particular aesthetic or architectural characteristics of note.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. There is no evidence that the property has strong or special associations with a particular community or cultural group.
E – Potential to yield information	Does not meet this criterion. The property has no archaeological or research potential.

NSW Criterion	Assessment
F – Uncommon or rare	Does not meet this criterion. The property is not rare in this region. The property does not possess uncommon, rare or endangered aspects of NSW's cultural history.
G – Principal characteristics of a class	Does not meet this criterion. The property does not demonstrate any principal features of a community hall.

5.8.4 Statement of significance

There is little information on the history of the Llandilo Hall and its importance to the original community, and having been relocated to its current position does not add to the building's significance. House 1 does not demonstrate any principal features of a community hall. It also does not appear to have any particular aesthetic or architectural characteristics of note. The item is therefore considered to have insufficient significance to fulfil the criteria for State or local listing.



Figure 5-33 : House 1, facing north-east. Photo taken by Jennifer Chandler on 24 February 2016.



Figure 5-34 : House 1, facing east. Photo taken by Jennifer Chandler on 24 February 2016.

5.9 Item 8: 'Luddenham Village' area: Chapel and School Site and Adams Road House

5.9.1 Description and history

Item 8 includes the following lots: Lot 21 DP614481, Lots 22-25 DP700302 and Lot 1 DP7136725 located at 12-26 Eaton Road and 5 Adams Road, Luddenham. Lot 25 DP700302, is a large area including several shops to the west of four houses on Eaton Road (2130 The Northern Road). The properties inside the construction footprint and also at 5 Adams Road were surveyed on 25 and 26 February 2016 (Survey Area No. 4-12 and 4-23).

A previous archaeological assessment (Artefact Heritage 2015: 44) found that there was potential for structural remains of buildings and for burials at the broader Luddenham Village site; however, the current field survey was confined to a small section of the area thought to be the Luddenham Village area and no areas of archaeological potential were identified. There was no evidence of ruins, bottle dumps, grass covered mounds that would indicate any areas of archaeological potential. The potential for archaeological deposits is considered to be unlikely.

Only the eastern-most section of the 'Luddenham village' area (Lot 21 DP614481) is located within the construction footprint. The 'Luddenham village' area contains four modern houses, shopping centre and open space. One of the four modern houses (**Figure 5-36, Figure 5-37**) is the only structure located within the construction footprint. An aerial image from 1965 shows the area with no houses (Australian Museum Consulting 2014: **Figure 4-32**). This heritage item was identified as a chapel and school site in the previous heritage assessment by Artefact Heritage (2015:28). The Chapel and School site was associated with Luddenham Village. The house and thick vegetation obscured the ground surface and no historical heritage items were identified within the survey area.

Lot 1 DP7136725 corresponds to the alignment and arrangement of the lots of the Luddenham Village subdivision. It contains an old house (5 Adams Road) (**Figure 5-38**) which is located adjacent to the construction footprint. It is therefore included in this assessment. An aerial image from 1965 (Australian Museum Consulting 2014: **Figure 4-32**) shows the house within a rural area. This lot contains a house located about 30 m outside the construction footprint. It is of weatherboard and cement sheeting construction with a green painted corrugated iron roof and a hedge out the front. While appearing much modified, the style of the house with its verandah, indicates it may date to the late 19th or early 20th century.

All of the area for this heritage item listing was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division. In 1859 the land was subdivided into lots of one acre and half acres and called 'Luddenham Village'. The subdivision made provisions for a church, school and public reserve (Australian Museum Consulting 2014:24). Apart from newspaper advertisements for the sale of the lots within the village no reference was found relating to a church and school being built at the site. The Penrith Heritage Study (Paul Davies Pty Ltd 2007: 153) appears to suggest that the church was built: 'In the survey of 1859 a church reserve had been dedicated, but it was not until July 1871 that St James' Anglican Church was completed (LU-06)'. However, St James' Anglican Church is actually located to the west of The Northern Road on an entirely different block to that indicated in the 1859 plan (**Figure 5-35**). A title search for these properties was unsuccessful due the documents being unable to be traced back before 1963 on the land title search system.

5.9.2 Curtilage information

The curtilage of the Luddenham Village Area: Chapel and School Site, and Adams Road House as described above is shown on **Figure 5-1**.

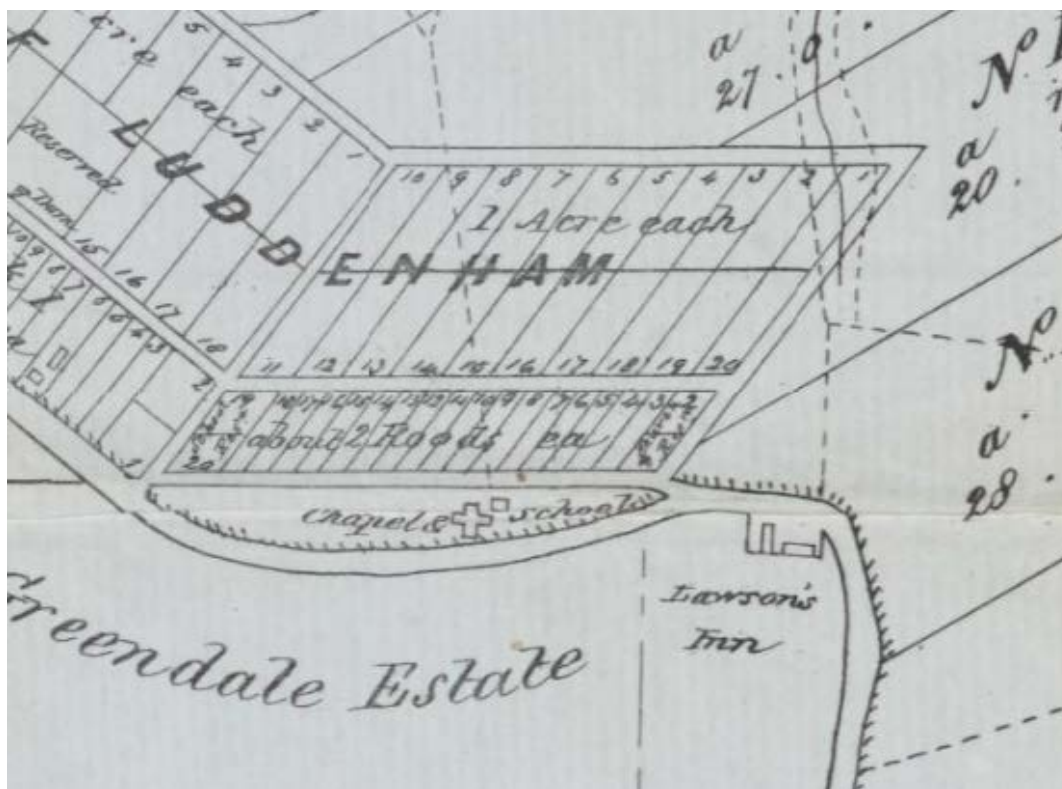


Figure 5-35 : Plan of the eastern division of the Luddenham Estate (cartographic material): to be sold by auction by Mr. R.P. Richardson/Samuel Jackson Surveyor. Source: National Library of Australia digitised item.

5.9.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Does not meet this criterion. No physical evidence of Luddenham village was identified by this assessment as only a small section is within construction footprint which overlaps with modern housing. Additionally it is unclear whether Luddenham Village was ever substantially developed.
B – Strong or special associations	Does not meet this criterion. The heritage item does not demonstrate an association with a significant event, person or groups of people as it is unclear whether Luddenham Village was ever substantially developed.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. The heritage item demonstrates little aesthetic values and does not demonstrate any particular creative or technical achievement as it is unclear whether Luddenham Village was ever substantially developed.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The heritage item has no strong or special associations with a particular community or cultural group as it is unclear whether Luddenham Village was ever substantially developed.

NSW Criterion	Assessment
E – Potential to yield information	Does not meet this criterion. The heritage item has no archaeological or research potential as there is modern housing at the site.
F – Uncommon or rare	Does not meet this criterion. The heritage item is not rare in this region and it is unclear whether Luddenham Village was ever substantially developed.
G – Principal characteristics of a class	Does not meet this criterion. The heritage item is not particularly representative and it is unclear whether Luddenham Village was ever substantially developed.

5.9.4 Statement of Significance

Item 8 is associated with the early settlement of Luddenham, however it is not known whether a chapel or school were ever built at the site. Additionally there is little or no physical or historical evidence that the Luddenham Village was ever actually substantially developed. Even if the chapel and school did exist, it is unlikely that there are subsurface remnants of a chapel and school as they would be under the modern housing at this location. The Adams Road house is in poor condition and has been modified, and it is unclear whether it actually even dates to the time of the Luddenham Village development (mid-19th century). The lots therefore have limited potential to contribute information about early settlement of the area. The heritage item is considered to have insufficient significance to fulfil the criteria for State or local listing.



Figure 5-36 : Current housing on the site, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-37 : Vacant area of land to the east of housing, facing west. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-38 : House located at 5 Adams Road, Luddenham, facing east. Photo taken by Amanda Goldfarb on 26 February 2016.

5.11 Item 9: Miss Lawson's Guesthouse Site, Luddenham

5.11.1 Description and history

Item 9 is located on Lot 1 DP90157 at 26 Adams Road, Luddenham and was surveyed on 25 February 2016 (Survey Area No. 4-13). Areas of archaeological potential were identified during the field survey and are outlined below, including figures showing the items identified during field survey. These items are also identified on **Figure 7-4**.

The site comprises:

- One shallow depression (well) with stone debris on the ground surface around the well, and several visible blocks inside the depression. About ten wooden planks (1.5 – 2 m long) located on the ground surface to the west of the depression (**Figure 5-39, Figure 5-40**).
- Another stone depression (well) with a nearby peppercorn tree (**Figure 5-41**)
- Cutting into the ground surface that is in line with the gate on Eaton Road on a north/south axis (**Figure 5-42**)
- Pieces of stone (squares/blocks) located near the gate on Eaton Road (**Figure 5-43**)

This property was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division. In 1859 the land was subdivided into lots of one acre and half acres and called 'Luddenham Village' (Australian Museum Consulting 2014:24). A title search for this property was unsuccessful due the documents being unable to be traced back before 1963 on the land title search system.

This heritage item was identified in a previous assessment (Artefact Heritage 2015) as being associated with Lawson's Inn, which was operated by John Lawson between the 1830s and the 1880s. However, research undertaken for this assessment suggests that a woman called Miss Lawson (probably John Lawson's daughter) operated a guesthouse after Lawson's Inn had closed down, and was situated on the opposite side of The Northern Road to Lawson's Inn:

I am glad to find myself contemplating the old house that for so many years was the village inn. I write 'was' because it was its day as a public house for the entertainment of man and beast have gone. No longer does 'The Thistle' [Lawson's Inn] beam across the roadway a welcome invitation to the tired traveller, with money in his purse. But the old house still remains a quaint memorial of the 'have beens' – a kind of architectural milestone on time's roadway reminding us of approaching old age. Opposite this house is a neat cottage, where decent travellers may be provided with comfortable and clean bed and board at reasonable charge by Miss Lawson – and thither I wended my way. The road takes a turn on passing Miss Lawson's, and the visitor may look across and see the whole of the remaining part of Luddenham at once, for most of the buildings front the roadway, and the majority of them face the east, and thus catch the morning sun, which imparts a cheerful aspect to the scene (NT, 10 August 1907).

Apart from demolition of the guesthouse building, the site would have been subject to only low levels of disturbance as it is located within a large paddock which has not been subject to recent construction from housing, roads or utilities. The paddock appears to have been used primarily for grazing. There was no evidence of deposits noted during the field survey but the entire ground surface was covered with thick, long grass which would have obscured any less obvious features. The grass was also thicker in the depression/stone block areas, making it difficult to determine whether the depressions were infilled with stone or shallow in original depth. Information from the property owner, Nancy Sales, (pers. comm., 6 April 2016) indicates that the guesthouse kitchen was the only part of the building remaining when the property was bought by her father-in-law in the 1940s and that it was located near the existing peppercorn tree. Nancy Sales, also confirmed that it was known to have been the 'inn' owned by Cassie Lawson.

Inns and hotels were the earliest community site types to be built in the region and were located along main roads in order to cater to travellers. They were in use until railway lines were introduced into the region and road travel decreased. In the later 19th and early 20th century guesthouses came into use. They were a revival of the inn and hotel service and made use of existing old estates as well as being in new purpose-built buildings (Thorp 1986:87-88).

The guesthouse site has the potential to yield information relating to the operation of, and custom of, guesthouses operating in the early 20th century in western Sydney. There is potential for information to be obtained about the materials that people were transporting at the time, and the nature, scale and extent of the guesthouse. Comparisons with other inns in operation at this time can also be made.

5.11.2 Curtilage information

The curtilage of the Miss Lawson's Guesthouse Site includes the wells, wooden items, road cutting and peppercorn tree as described above and is shown on **Figure 7-4**.

5.11.3 Significance assessment

No previous significance assessments have been undertaken for this heritage item.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	Miss Lawson's Guesthouse Site demonstrates a historical change in the way people travelled. For example, a revival of the inn and hotel business after a period of declined road travel.
B – Strong or special associations	The guesthouse is also associated with the Lawson family who had ties to the local area throughout the late 19 th and early 20 th century.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. As there are no extant buildings or structure related to the original guesthouse the site does not demonstrate any design or technical integrity.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The guesthouse has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	Potential to yield information about guesthouses and guests during the early 20 th century.
F – Uncommon or rare	Does not meet this criterion. The guesthouse does not meet the criterion or possess uncommon, rare or cultural history. Guesthouses and inns were common along main roads in NSW at this period of time.
G – Principal characteristics of a class	Does not meet this criterion. As there are no extant buildings or structures related to the original guesthouse it does not demonstrate any particular characteristics of a type.

5.11.4 Statement of significance

The site is of historical significance in demonstrating the change in the area relating to road use and travel. The site is also associated with a family with ties to the local area through the late 19th and 20th century. The wells are potentially related to the occupation and use of the guesthouse, and given the low level of disturbance or development at the site, there is potential for other archaeological remains and deposits to be present at the site. These archaeological remains have the potential to provide information about the operation of, and custom

of, guesthouses operating in the early 20th century in western Sydney. There is potential for information to be obtained about the materials that people were transporting at the time, and the nature, scale and extent of the guesthouse. Comparisons with other inns in operation at this time can also be made. The item is considered to have sufficient significance to fulfil the criteria for local listing.



Figure 5-39 : Well 1, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-40 : Timber located near well 1, facing north. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-41 : Well 2, facing east. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-42 : Possible road cutting near Eaton Road, facing south. Photo taken by Jennifer Chandler on 25 February 2016.



Figure 5-43 : Stone blocks near gate on Eaton Road, facing north-east. Photo taken by Jennifer Chandler on 25 February, 2016.

5.12 Item 10: Lawson's Inn Site

5.12.1 Description and history

The Lawson's Inn site is currently listed on the Liverpool LEP but as this assessment and previous heritage assessments (Artefact Heritage 2015; Australian Museum Consulting 2014) have determined, the location of the listing on the LEP (Lots 1 & 2 DP851626) is not the actual location of Lawson's Inn.

Lot 2 DP623457 has been identified as the correct location of Lawson's Inn, and is situated on the opposite side of The Northern Road, to the north of the LEP listed location. Lot 2 DP623457 was surveyed on 26 February, 2016. Areas of archaeological potential were identified during the field survey and are outlined below and indicated in **Figure 5-49** and **Figure 5-50**. These are also shown on **Figure 7-5**.

The property is currently used as a Christmas tree farm. There are existing rows of trees across the entire property with grass cover between the tree rows. Although most of the grass cover was long, there were some sections which had been slashed. There was some small areas of ground surface visibility located between the tree rows due to erosion by vehicle tracks. There is limited physical archaeological evidence related to Lawson's Inn on the ground surface of Lot 2 DP623457. However, ceramic and glass fragments, and several stone blocks were located on the property (**Figure 5-51**, **Figure 5-52**, **Figure 5-53**, **Figure 5-54**). The mostly glass fragments with lesser amounts of ceramic were found in a scatter about 100 m x 8 m with a maximum density of about 2 per square metre. The dark green, blue, clear and brown glass appeared to be late 19th/early 20th century with some thick bottle base fragments noted. The scatter was located in the north of the block, near Eaton Road in areas of ground surface visibility, between tree plantings, in a location that corresponds with the vicinity of Lawson's Inn as marked on the 1959 plan (**Figure 5-45**). The stone blocks are painted white and currently mark out vehicle tracks on the Christmas tree farm and may not be associated with Lawson's Inn. Apart from demolition of the inn building the site would have been subject to only low levels of disturbance as it is located within a paddock which has not been subject to recent construction from housing, roads or utilities. The paddock appears to have been used primarily for grazing and Christmas tree production. There was no evidence of deposits noted during the field survey but much of the ground surface was covered with grass and trees which would have obscured any less obvious features.

This property was originally part of a land grant to John Blaxland of 6,710 acres called Luddenham Estate, Eastern Division in 1813. In 1843 the land passed to Francis Walker and then to John Lawson in 1860. A plan of the Central and Western Divisions of Luddenham from 1859 clearly shows Lawson's Inn located to the south of The Northern Road (Bringelly Road) (**Figure 5-43**). A survey plan dated April 1859 shows the inn as 'Lawson's Store' (**Figure 5-44**). An undated plan and an undated Parish map show where the sharp corner at Lawson's Inn has been straightened and the old alignment of The Northern Road, now known as Eaton Road (**Figure 5-45**, **Figure 5-46**) is situated. Lawson's Inn (also known as The Thistle Inn) was likely constructed in the 1830s after The Northern Road was built in the 1820s. Lawson's Inn was owned by John Lawson and his wife, Ann Lawson. It was an inn and a store. John died in 1885 aged 84 and Ann died in 1894 aged 71. They had nine children together, two of whom had passed away before her death in 1894. According to her will the property was to be divided among the remaining seven children (NT, 3 November 1894, 1 October 1932). In 1897 ownership of the land passed to Kate Megarrity (formerly Kate Lawson, John Lawson's daughter). In 1915 ownership of the land passed to the Vicary family. A photograph (**Figure 5-44**) included in a local history book (Willmington 2013:8) about Luddenham reportedly shows the Lawson family in front of the inn although there is no source given for the photograph.

The site of Luddenham Village may have been chosen next to Lawson's Inn as it was already a popular place for travellers to stop. In the 1860s Lawson's Inn functioned as a public meeting place for locals as well as supplying goods. Lawson's Inn was demolished in the mid-20th century (Australian Museum Consulting 2014:55).

In 1907 what remained of the Lawson's Inn building, Luddenham village and a building opposite the Inn where travellers could stay which was run by Miss Lawson (most likely John Lawson's daughter) was described as follows:

I am glad to find myself contemplating the old house that for so many years was the village inn. I write 'was' because it was its day as a public house for the entertainment of man and beast have gone. No longer does 'The Thistle' beam across the roadway a welcome invitation to the tired traveller, with money in his purse. But the old house still remains a quaint memorial of the 'have beens' – a kind of architectural milestone on time's roadway reminding us of approaching old age (NT, 10 August 1907).

Lawson's Inn, also still being called the Thistle Inn, was confirmed as long having closed by the beginning of the 20th century, but was still being remembered (*Windsor and Richmond Gazette*, 2 October 1909).

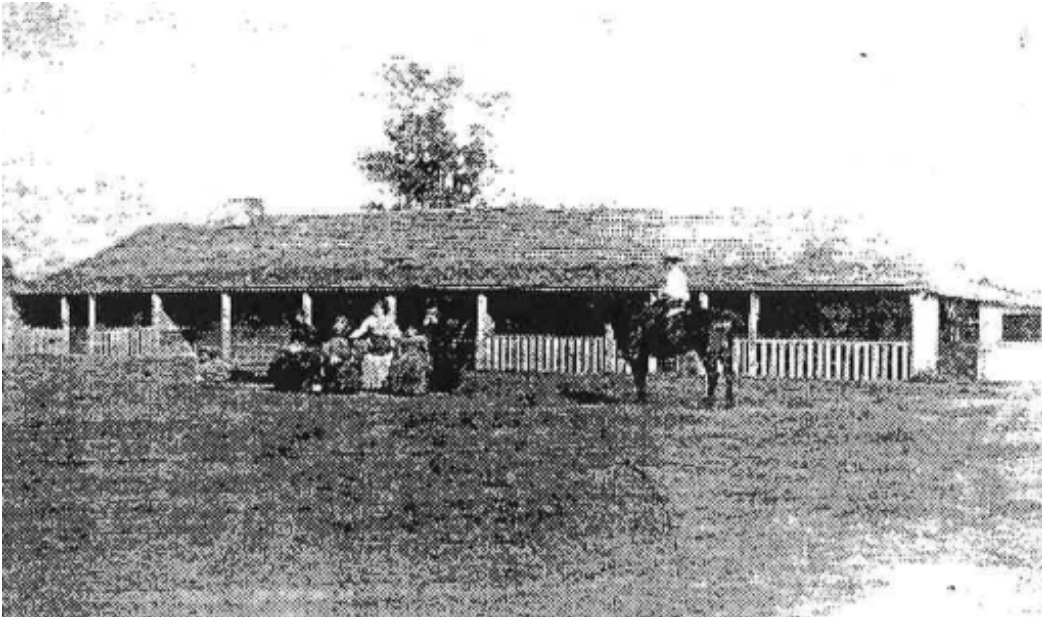


Figure 5-44 : Photo from Willmington (2013:8) titled 'The Thistle with the Lawson family'.

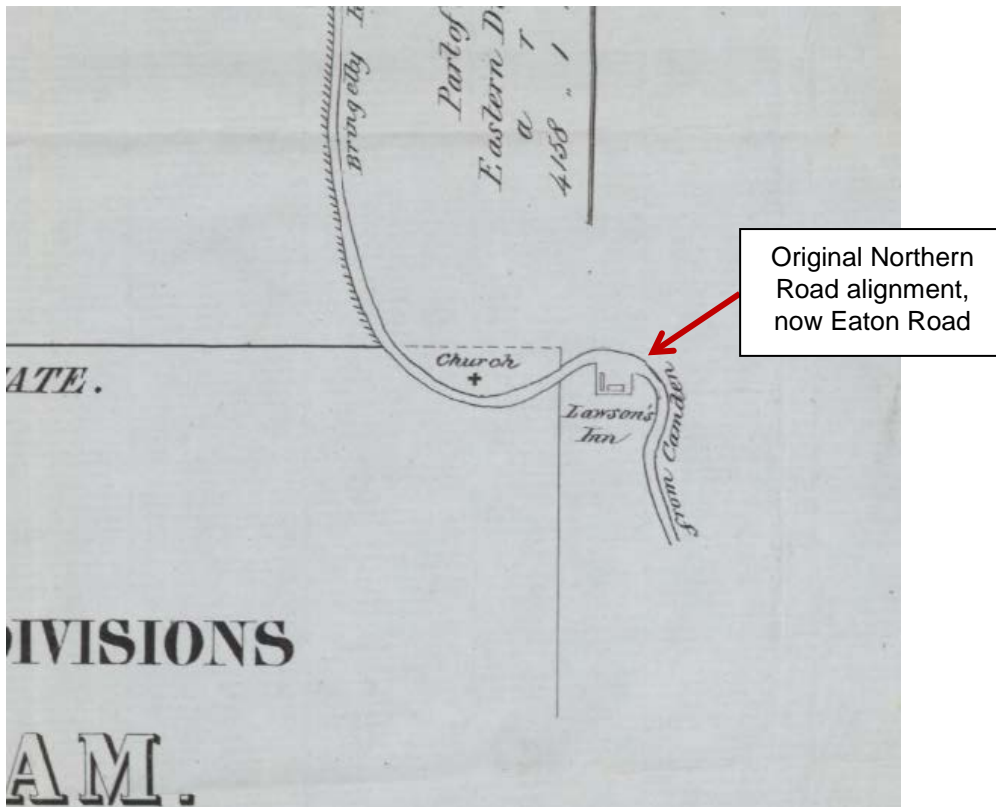


Figure 5-45 : 1859 Plan of the central and western divisions of Luddenham: to be sold by public auction by Mr. R.P. Richardson/Samuel Jackson Surveyor. Source: Trove, National Library of Australia 2016.



Figure 5-46 : Lithographic plan surveyed in April 1859 (173) Source: State Records Authority of NSW.

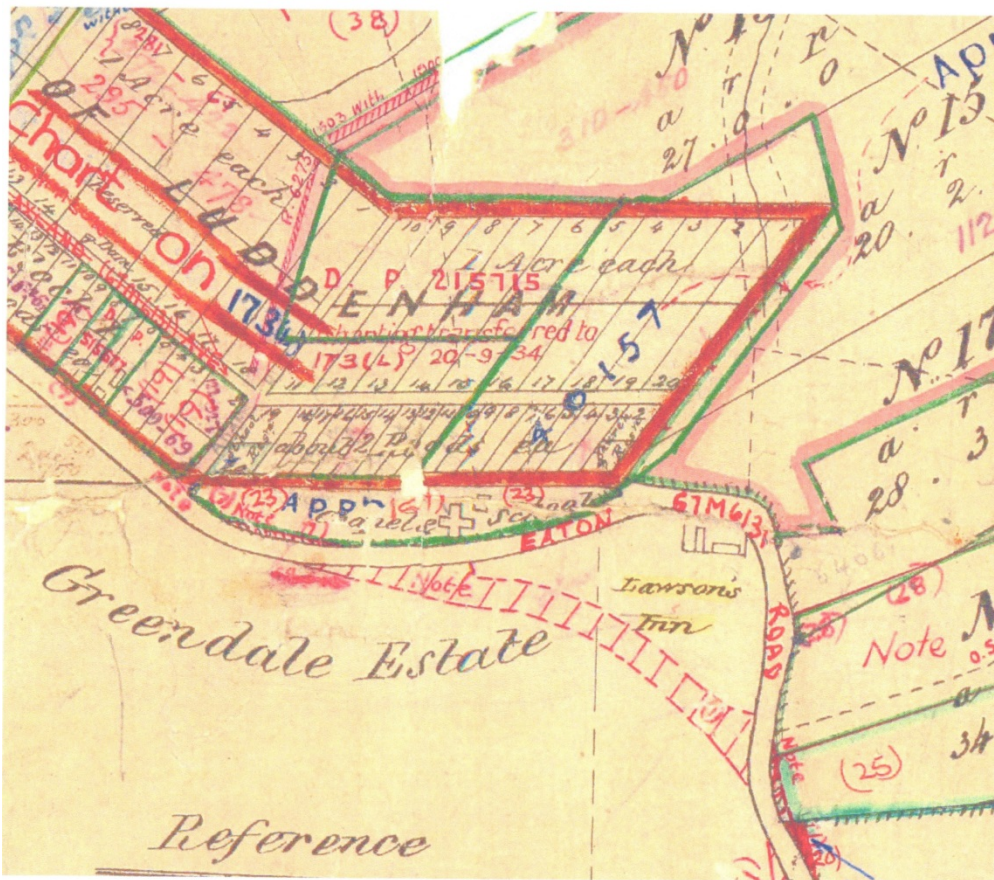


Figure 5-47 : Undated plan showing Lawson's Inn buildings and new section of The Northern Road. Roll Plan 4 (Source: State Records Authority of NSW).

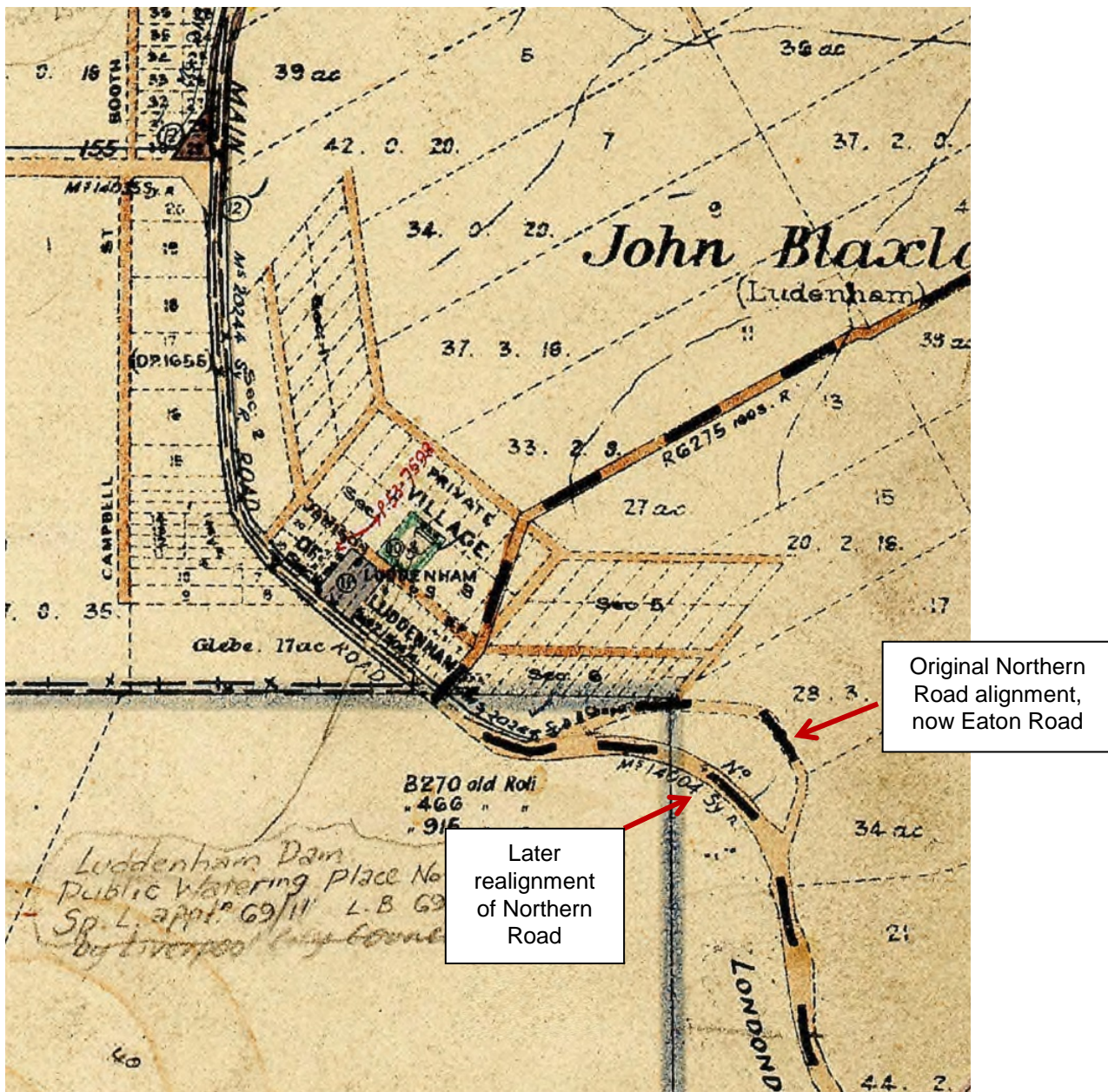


Figure 5-48 : Undated Parish map showing straightening/realignment of The Northern Road. Source: Extract from parish map, County of Cumberland, Parish of Bringelly.

The Lawson's Inn site has been used for Christmas tree production and has therefore been subject to ground disturbance associated with tree production. The Christmas tree farm does not appear to have been established until after 1986, as aerial images sourced by Australian Museum Consulting (2014: Figure 4-32) show no evidence of the farm at that time. It is uncertain what the property has been used for between the time of the removal of the Lawson's Inn building and the establishment of the Christmas tree farm. A black and white aerial image from 1965 (Australian Museum Consulting 2014: Figure 4.32) shows the property before the land was used for Christmas tree production. There is a lighter coloured area on the ground surface which corresponds with the predicted location for the inn. This may indicate a change in vegetation, soil or possible location of the previous building. A field survey failed to locate any building footings associated with the site but did identify fragments of late 19th/early 20th century ceramics and glass in the lighter coloured area (Figure 5-49). A plan superimposed onto an aerial of the property also indicates the location of Lawson's Inn (Figure 5-50).

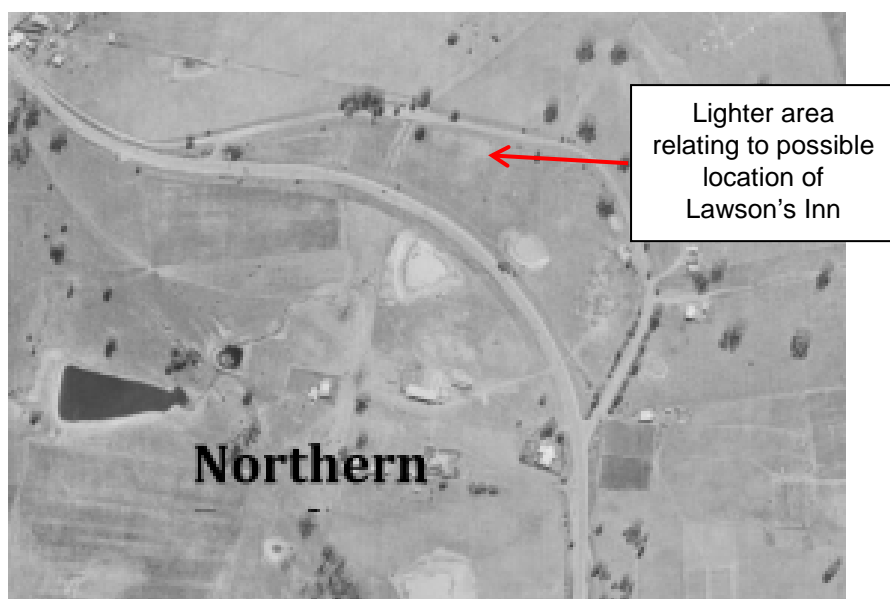


Figure 5-49 : 1965 aerial of the Lawson's Inn site. Source: Land and Property Information in Australian Museum Consulting 2014: Figure 4.32.

The Lawson's Inn site is currently listed on the LLEP (53) and is classed as an archaeological-terrestrial type of item on the OEH listing. While the location on the LEP is incorrect, the existing 2004 Statement of Significance (OEH 2016) is of relevance and states:

The site of Lawson's Inn at Luddenham demonstrates the history of the early settlement of the area. The Inn formed the nucleus of the development of Luddenham which was laid out adjacent to the site in 1864. The site's location beside a major road is indicative of the importance of the early transport networks in facilitating settlement and development and is representative of early Inn and Hotel sites throughout the Sydney region. There is potential to gain more information on the site from further archaeological and documentary research.

The recommended management for this heritage place is that 'prior to any redevelopment or subdivision of this area an archaeological assessment (both Aboriginal and non-Aboriginal) should be undertaken'.

Australian Museum Consulting (2014: 56) reviewed the LLEP listing and viewed the LLEP site from The Northern Road, for Lawson's Inn and concluded that the site would be considered to be a State significant archaeological site:

The lack of extensive development in the local area indicates that the integrity of the archaeological resources associated with the site of Lawson's Inn, The Thistle, is likely to be good. In addition, the potential for the archaeological resources to provide information concerning the historic settlement and development of the local area that would not be available from any other source. As a focus for travellers, there is potential for the archaeological resources to provide information concerning the transport of goods and the mechanisms of the everyday lives of people living in a rural environment at a distance from urban centres.



Figure 5-50 | Plan superimposed onto aerial showing location of Lawson's Inn

5.12.2 Curtilage information

The curtilage of Lawson's Inn is shown on **Figure 7-5** and comprises the area of land between the old The Northern Road alignment (Eaton Road) and the new The Northern Road alignment which is where Lawson's Inn was located.

5.12.3 Significance assessment

The existing significance assessment for Lawson's Inn meets criterion A, E and G. This current assessment concurs with the existing significance assessment as detailed below.

NSW Criterion	Assessment
A – Important in the pattern of NSW's history	The site demonstrates the history of settlement within the area of Luddenham and reflects the importance of early major road networks in facilitating the development of such urban centres.
B – Strong or special associations	The Lawson family was a well-known family in the Luddenham district from the mid-19 th century to the mid-20 th century. They were associated with proprietorship of inns/guesthouses.
C – Demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement	Does not meet this criterion. As there are no extant buildings or structures, the inn does not demonstrate any design or technical integrity.
D – Strong or special associations with a particular community or cultural group	Does not meet this criterion. The inn has no strong or special associations with a particular community or cultural group.
E – Potential to yield information	There is the potential to gain more information on the site from further archaeological and documentary research.
F – Uncommon or rare	Does not meet this criterion. There is likely to be better examples and more intact sites of early hotels/inns in NSW than this example.
G – Principal characteristics of a class	The site is representative of the location of many early hotel and inn sites, on a major road network, in the Sydney area.

5.12.4 Statement of significance

The site of Lawson's Inn at Luddenham demonstrates the history of the early settlement of the area. The Inn formed the nucleus of the development of Luddenham which was laid out adjacent to the site in 1864. The site's location beside a major road is indicative of the importance of the early transport networks in facilitating settlement and development and is representative of early Inn and Hotel sites throughout the Sydney region. The site is also associated with a family with ties to the local area through the late 19th and 20th century. There is potential to gain more information on the site from further archaeological and documentary research, due to its local heritage significance.



Figure 5-51 : Location of Lawson's Inn site, facing north. Photo taken by Jennifer Chandler on 26 February 2016.



Figure 5-52 : Area where ceramic and glass fragments are located, facing west. Photo taken by Jennifer Chandler on 26 February 2016.



Figure 5-53 : Some of the glass fragments located on the site. Photo taken by Jennifer Chandler on 26 February 2016.



Figure 5-54 : Painted stone block. Photo taken by Jennifer Chandler on 26 February 2016.

5.13 Summary

Of the 10 potential heritage items assessed, only four have been assessed as having heritage significance. **Table 5-1** summarises the significance of each of the heritage items. The six which are not of significance are not further considered in this assessment. Statements of Heritage Impact are provided for each of the four heritage items in **Section 0**.

Table 5-1 : List of heritage items within and immediately adjacent to the project

Heritage item number	Source	Heritage item name	Significance
Item 1	Artefact Heritage (2015)	Remnants of The Northern Road	None
Item 2	CHL, RNE	Orchard Hills Cumberland Plain Woodland	Commonwealth
Item 3	Paul Davies Pty Ltd (2007)	Warragamba Dam to Prospect Reservoir pipeline	Local
Item 4	NA	Fruit Orchard, Luddenham	None
Item 5	NA	Weatherboard House, Slab Hut and Old Dairy, Luddenham	None
Item 6	NA	Weatherboard House and Sheds, Luddenham	None
Item 7	NA	"Pleasantview' House 1, Luddenham	None
Item 8	Artefact Heritage (2015)	'Luddenham Village' area: Chapel and School Site and Adams Road House	None
Item 9	Artefact Heritage (2015)	Miss Lawson's Guesthouse Site, Luddenham	Local
Item 10	Liverpool LEP	Lawson's Inn Site	Local

6. Impact assessment

6.1 Proposed works

The project comprises the following key features:

- A six-lane divided road between Mersey Road, Bringelly and Bradley Street, Glenmore Park (two general traffic lanes and a kerbside bus lane in each direction). The wide central median would allow for an additional travel lane in each direction in the future, if required
- An eight-lane divided road between Bradley Street, Glenmore Park and about 100 m south of Glenmore Parkway, Glenmore Park (three general traffic lanes and a kerbside bus lane in each direction separated by a median)
- About eight kilometres of new road between Mersey Road, Bringelly and just south of the existing Elizabeth Drive, Luddenham, to realign the section of The Northern Road that currently bisects the Western Sydney Airport site and to bypasses Luddenham
- About eight kilometres of upgraded and widened road between the existing Elizabeth Drive, Luddenham and about 100 m south of Glenmore Parkway, Glenmore Park
- Closure of the existing The Northern Road through the Western Sydney Airport site
- Tie-in works with the following projects:
 - The Northern Road Upgrade, between Peter Brock Drive, Oran Park and Mersey Road, Bringelly (to the south)
 - The Northern Road Upgrade, between Glenmore Parkway, Glenmore Park and Jamison Road, South Penrith (to the north)
- New intersections including:
 - A traffic light intersection connecting the existing The Northern Road at the southern boundary of the Western Sydney Airport, incorporating a dedicated u-turn facility on the western side
 - A traffic light intersection for service vehicles accessing the Western Sydney Airport, incorporating 160 m of new road connecting to the planned airport boundary
 - A traffic light intersection connecting the realigned The Northern Road with the existing The Northern Road (west of the new alignment) south of Luddenham
 - A 'give way' controlled intersection (that is, no traffic lights) connecting the realigned The Northern Road with Eaton Road (east of the new alignment, left in, left out only)
 - A four-way traffic light intersection formed from the realigned Elizabeth Drive, the realigned The Northern Road and the existing The Northern Road, north of Luddenham
 - A traffic light intersection at the Defence Establishment Orchard Hills entrance, incorporating a u-turn facility
- New traffic lights at four existing intersections:
 - Littlefields Road, Luddenham
 - Kings Hill Road, Mulgoa
 - Chain-O-Ponds Road, Mulgoa
 - Bradley Street, Glenmore Park incorporating a u-turn facility
- Modified intersection arrangements at:
 - Dwyer Road, Bringelly (left in, left out only)
 - Existing Elizabeth Drive, Luddenham (left out only)
 - Gates Road, Luddenham (left in only)

- Longview Road, Luddenham (left in, left out only)
- Grover Crescent south, Mulgoa (left in only)
- Grover Crescent north, Mulgoa (left out only)
- Dedicated u-turn facilities at:
 - The existing The Northern Road at Luddenham, south-west of Elizabeth Drive
 - The existing Elizabeth Drive, Luddenham around 800 m east of The Northern Road
 - Chain-O-Ponds Road, Mulgoa
- Twin bridges over Adams Road, Luddenham
- Local road changes and upgrades, including:
 - Closure of Vicar Park Lane, east of the realigned The Northern Road, Luddenham
 - Eaton Road cul-de-sac, west of the realigned The Northern Road, Luddenham
 - Eaton Road cul-de-sac, east of the realigned The Northern Road, Luddenham
 - Elizabeth Drive cul-de-sac, about 300 m east of The Northern Road with a connection to the realigned Elizabeth Drive, Luddenham
 - Extension of Littlefields Road, east of The Northern Road, Mulgoa
 - A new roundabout on the Littlefields Road extension, Mulgoa
 - A new service road between the Littlefields Road roundabout and Gates Road, including a 'give way' controlled intersection (that is, no traffic lights) at Gates Road, Luddenham
 - Extension of Vineyard Road, Mulgoa between Longview Road and Kings Hill Road
 - A new roundabout on the Vineyard Road extension at Kings Hill Road, Mulgoa
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road
- A new shared path on the western side of The Northern Road and footpaths on the eastern side of The Northern Road where required
- The upgrading of drainage infrastructure
- Operational ancillary facilities including:
 - Heavy vehicle inspection bays for both northbound and southbound traffic, adjacent to Grover Crescent, Mulgoa and Longview Road, Mulgoa respectively
 - An incident response facility on the south-western corner of the proposed four-way traffic light intersection at Elizabeth Drive, Luddenham
- New traffic management facilities including variable message signs (VMS)
- Roadside furniture and street lighting
- The relocation of utilities and services
- Changes to property access along The Northern Road (generally left in, left out only)
- Establishment and use of temporary ancillary facilities and access tracks during construction
- Property adjustments as required
- Clearance of undetonated explosive ordinance (UXO) within the Defence Establishment Orchard Hills as required.

6.2 Summary of potential impacts

6.2.1 Historic heritage

The proposed activities within or adjacent to each heritage item identified for this assessment and the potential impacts of these activities is presented in **Table 6-1**.

A detailed assessment of impacts is provided in the Statements of Heritage Impact in **Section 7**.

Table 6-1 : Potential impacts from proposed works for each heritage item

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
Item 2	Orchard Hills Cumberland Plain Woodland	105317 (CHL) 102211 (RNE)	Clearing of vegetation and construction of carriageway and associated fill slope as well as associated drainage and flood retardation works	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.</p> <p>The main impacts to natural heritage are as a result of clearing of around 9.68 ha of native vegetation within the western periphery of the CHP (Sectors B and H). However this is equivalent to only around 1.3% of the total 726.32 ha of native vegetation within the CHP. The majority of these areas are made up of a mix of regrowth natural vegetation communities identified in the HMP for the DEOH as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013). Of the impacted areas, none are identified as remnant vegetation communities which are ranked as high natural heritage significance in the HMP.</p> <p>The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.</p> <p>Relic native trees have been identified as having a low tolerance for change,</p>

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
				<p>being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.</p> <p>The aquatic environment within the CHP that is ranked in the HMP as being of moderate to high significance (Godden Mackay Logan 2013) is not expected to be impacted by the project due to the distance from the works and the proposed application of effective mitigation measures.</p> <p>Potential impacts to the historic heritage values of this item are related to impacts to the canal located within the south-western portion of the CHP (Sector H of the DEOH). The canal is ranked as high significance in the HMP (Godden Mackay Logan 2013). Construction would overlap with only 2.43% of the northern part of the canal, some of which is in poor condition as it is extremely shallow from erosion. The canal and the area in which is situated (Sector H) has a low tolerance for change in relation to new development and demolition/remediation. However, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the historic heritage values are not considered to be significant.</p> <p>Vibration is unlikely to impact the canal due to the structural nature of the canal and vegetation on the canal.</p>
Item 3	Warragamba Dam to Prospect Reservoir pipeline	-	Construction of carriageway and fill slope. Drainage infrastructure upgrades comprising a concrete drainage channel along the northern perimeter of the Water NSW Precinct (north of the pipeline) and an access track to the east of The Northern Road.	<p>The Northern Road carriageway construction is confined to section of pipeline that is underground. No impact is expected.</p> <p>Proposed access track would impact on culvert located in Survey Area No. 4-26, but not on pipeline, as it is below the ground in this area.</p> <p>Proposed drainage works to the south of the pipeline would impact on culvert located in Survey Area No. 4-27.</p>

Heritage item number	Heritage item name	Register number	Proposed activities	Potential impacts
			A second concrete drainage channel 500 m in length along the southern perimeter of the 1940s pipeline, to the east of The Northern Road.	While there is a physical impact on the culvert, there is not impact on heritage significance.
Item 9	Miss Lawson's Guesthouse Site	-	Construction of dual carriageway, intersection and cut slopes	The full site would be directly impacted by construction
Item 10	Lawson's Inn site	53 (LLEP)	Construction of dual carriageway, a cul-de-sac, an intersection, cut slopes and construction compound and laydown site	Around a quarter of the site would be directly impacted by construction

7. Statements of heritage impact

The implementation of the general and site-specific mitigation measures listed below would minimise impacts on non-Aboriginal heritage to an acceptable level to proceed with the project as assessed.

7.1 Item 2: Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (Lot 3 DP238092)

Proposed works

Proposed works that would interact with the Orchard Hills Cumberland Plain Woodland CHP include clearing of vegetation and construction of a carriageway to the east of the existing The Northern Road, including associated fill slope formations and alterations to existing drainage lines for road-serving drainage and flood retardation works. This would have potential impacts on the natural heritage values of the site (refer to **Figure 7-1**). These works would also overlap with the western-most section of the Chaffey Brothers Irrigation Scheme Canal (the canal) in two locations, which would have potential impacts on the non-Aboriginal heritage values of the site (**Figure 7-2**).

Impact Assessment

Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values of the site through native vegetation removal and associated habitat loss, as well as impacts to the historic heritage values of the site as a result of impacts to the Chaffey Brothers Irrigation Scheme Canal (the canal). These potential impacts are summarised below.

The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:

The natural heritage values of the site are mainly focused on its natural vegetation, which includes areas of original native vegetation (including very old relic trees) as well as the natural regrowth of these original plant communities (Godden Mackay Logan (2013)). This includes small remnants and regenerating areas of Cumberland Plain Woodland, Castlereagh Ironbark Forest and Sydney Coastal Riverflat Forest (River Flat Eucalypt Forest), particularly in the eastern portion of the CHP. It is noted that impacts from the project would be limited to the western periphery of the CHP.

Cumberland Plain Woodland is listed as a critically endangered ecological community at both state (*Cumberland Plain Woodland in the Sydney Basin Bioregion*) and Commonwealth levels (*Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest*). As such, the CHP is considered a core biodiversity area for the conservation of these communities, and the place comprises the least disturbed and largest remaining remnant of Cumberland Plain Woodland (Godden Mackay Logan 2013).

Although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP. These areas are made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). There is also a small patch of relic native trees associated with two trees located within the north-western portion of the CHP that would also be impacted by the project. This area is identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

Additionally of the 9.15 ha of the Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPWSGTF) and River-flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner Bioregions (REFCF) ecological communities that would be removed by the project, this would be equivalent to only around 1.5% of the total 610.60 ha of these communities within the CHP. None of the areas impacted by the project have been identified in the HMP as remnant vegetation communities of high natural heritage value.

Additionally since the area is already disturbed by fencing, roadside and edge effects, impacts to fauna within the CHP as a result of the project (eg edge effects, light pollution, etc.) are not considered to be significant. For impacts to fauna refer to the Biodiversity Assessment (Appendix I of the EIS).

The project would also result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the CHP, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

The entire length of the canal within the CHP is around 2,632 m and is ranked as being of high significance in the HMP (Godden Mackay Logan 2013). There would be minimal impact to the canal as much of its extent is situated outside the construction footprint. The construction footprint (and therefore, area of impact) only overlaps with around 2.43 % of the entire canal. Furthermore, around 36 m of the part of the canal located within the construction footprint is in poor condition as it is extremely shallow from erosion. The section within the construction footprint which is in better condition is very similar to those sections that are outside the construction footprint. The wooden features of the canal structure that have the potential to yield information about the construction of the canal are located outside the construction footprint.

The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:

As identified above, although around 9.68 ha of native vegetation would be removed by the project, this is equivalent to only around 1.3% of the 726.32 ha of native vegetation on the CHP and is mainly made up of a mix of regrowth natural vegetation communities identified in the HMP as being of moderate natural heritage significance, as well as grassland areas ranked as being of low natural heritage significance (Godden Mackay Logan 2013). The small patch of relic native trees within the north-western portion of the CHP that would also be impacted by the project, which has been identified as having moderate natural heritage significance (Godden Mackay Logan 2013).

The key attributes of natural heritage elements on DEOH are the floristics and structure of the ecological communities, and the existence of the isolated relic trees. Therefore, they have different levels of tolerance for change. The regrowth natural vegetation communities have been identified as having a reasonable tolerance for change, being that this element and its key attributes have relatively little heritage value, but may contribute to the overall significance of the site. In general, the element can be altered to a reasonable degree provided it does not impact the heritage values of the site (Godden Mackay Logan 2013). In the context of the CHP overall, impacts to regrowth natural vegetation communities as well as grasslands are expected to be minimal and are therefore considered reasonable. Given this and the moderate to low heritage significance of these elements, impacts as a result of the project are not expected to be significant.

Relic native trees have been identified as having a low tolerance for change, being that this element and its key attributes embody heritage values, retaining a high degree of intactness with no major change or alterations, or only minor alterations that do not detract from the heritage values. In general, the element should be retained and conserved (Godden Mackay Logan 2013). Although impacts to relic native trees in the overall context of the CHP as a result of the project would be minimal, given their moderate natural heritage significance and low tolerance for change, impacts to this element as a result of the project are considered moderate.

The project could potentially introduce invasive weed and pest species. There may be regular mobilisation of typical roadside maintenance fertilisers, herbicides or other chemicals that may stunt the regrowth of native vegetation. However this would be managed through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS).

The project would result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour

potential along these drainage lines would increase and ground conditions would become wetter. However as identified above, impacts to the aquatic areas mapped as moderate to high significance in the DEOH site would be negligible due to the distance of the works from these areas and the implementation of effective mitigation measures.

In relation to the canal, which is ranked as being of high significance in the HMP (Godden Mackay Logan 2013), only 2.43 % of the entire canal extent associated with the DEOH is situated within the construction footprint and would therefore be subject to direct physical impact during construction. The remaining sections of the canal within the study area would potentially be subject to damage or destruction from the use of construction machinery and vehicles if not managed appropriately during construction; however this is not expected given the implementation of mitigation measures as outlined in **Section 8.1**.

Around 36 m of the canal within the construction footprint area is extremely shallow and eroded while the more intact section is similar to the other sections which would not be impacted, therefore it has limited potential to yield information just from that section. Overall the proposed works would have minimal impact to the significance of the site.

Furthermore, there are other remnants of the canal located to the west of The Northern Road about one kilometre south-west of the DEOH site which is listed on the PLEP as a locally significant archaeological heritage item (A-137).

The following impacts have been assessed as follows:

- vibration – vibration is unlikely to impact the canal due to the structural nature of the canal and vegetation on the canal
- demolition – around 2.43 % of the canal extent associated with DEOH overlaps with the construction footprint and would likely be demolished. The remaining section of the canal outside the construction footprint is not expected to be impacted.
- archaeological disturbance – the section of the canal that would be impacted is similar to the other sections of the canal which would not be impacted and would not yield any additional information
- altered historical arrangements and access – the canal is located on Defence land and is therefore subject to restricted access
- landscape and vistas – the landscape within the project would be altered by the construction of the dual carriageway; however, the vistas of the area would not be impacted as part of the area contains trees which obscure the vistas of the canal
- architectural noise treatment – not relevant to this heritage item

The Heritage Management Plan for the DEOH site (Godden Mackay Logan 2013:152-155) outlines management guidelines for the DEOH, including those related to managing impacts to the natural heritage values within Sectors B and H and historic heritage values associated with the canal in Sector H as follows:

- This New development in Sectors B and H should be located so as to avoid impacts on natural heritage. These sectors have a low tolerance for change in relation to new development
- New development in Sector H should not be planned for the southwest area where the Mulgoa Irrigation Scheme (the canal) is located. This southwest area of Sector H has a low tolerance for change in relation to new development.
- Demolition and remediation relating to whole of DEOH land – Remediation should aim to avoid all heritage items and values. If heritage sites cannot be avoided as a consequence of remediation, then heritage mitigation measures should be implemented. Remediation that impacts heritage values must be subject to assessment, development of a HIA, heritage impact mitigation and Defence approval.
- Demolition and remediation relating to Sector H (location of canal) - consideration of proposals for demolition of built elements should take into account the heritage value of the element and its tolerance for change, as well as its relationship to other, related elements of heritage value and the number of its type

remaining. Demolition of elements of moderate and high heritage value should be avoided. Sector H has a low tolerance for change.

As discussed above, some impacts would occur as a result of the project which are unavoidable. Additionally, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the heritage values are not considered to be significant.

However by implementing the relevant mitigation measures identified in the Biodiversity Assessment (Appendix I of the EIS), the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS), impacts to the natural heritage values of the site are expected to be minimised and are not expected to be significant.

By implementing the following mitigation measures the potential impacts on the canal would be minimised:

- An archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
- The section of the canal outside the construction footprint would need to be protected from accidental or incidental damage during construction. Protective barrier fencing would be constructed along the construction footprint boundary in the vicinity of the canal prior to construction commencing and would remain in place until the conclusion of the works, at which time it would be removed.

Implementing these mitigation measures would reduce the impact of the significance of the canal as much as possible given the other constraints in this area of the project.

Additionally, given the project is impacting a small proportion of the overall canal on DEOH land, and that the section being impacted is of relatively poor quality due to erosion, the overall impact on the heritage values are not considered to be significant.

In summary, the project is not expected to have a significant impact on the natural or non-Aboriginal heritage values of the CHP given the heritage significance of these elements, their tolerance for change and proposed implementation of effective mitigation measures in accordance with this assessment (Section 8.1), the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

By implementing the following mitigation measures the potential impacts on the canal would be minimised:

- An archival photographic recording would be made of the extent of the canal to be impacted by the works, in accordance with the Heritage Division of the OEH guidelines (Heritage Council of NSW 2006) prior to its demolition
- The section of the canal outside the construction footprint would need to be protected from accidental or incidental damage during construction. Protective barrier fencing would be constructed along the construction footprint boundary in the vicinity of the canal prior to construction commencing and would remain in place until the conclusion of the works, at which time it would be removed.

Implementing these mitigation measures would reduce the impact of the significance of the canal as much as possible given the other constraints in this area of the project.

In summary, the project is not expected to have a significant impact on the natural or non-Aboriginal heritage values of the CHP given the heritage significance of these elements, their tolerance for change and proposed implementation of effective mitigation measures in accordance with this assessment (Section 8.1), the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).

The Significant Impact Guidelines 1.2 (Department of Sustainability Environment Water Population and Communities 2013) (SEWPac) provides a list of criteria that guide the assessment of actions that are likely to have a significant impact on the environment. These are relevant to the project for identifying the significance of potential impacts to the heritage values of the Orchard Hills Cumberland Plain Woodland CHP, as provided in **Table 7-1**. It is suggested in SEWPac (2013) that where the answer to any of these questions is yes, a significant impact on the environment would be expected.

Where the project does not incur significant impacts to natural heritage values, a referral for the project to undergo further assessment by the Federal Department of the Environment is not required and, subsequently, the need to obtain offsets specific to natural heritage values is also not required. This is separate to the requirement for a referral under the EPBC Act due to biodiversity impacts, which has been assessed in the Biodiversity Assessment for the project (Appendix I of the EIS).

Table 7-1 : Item 2 – significant impact assessment

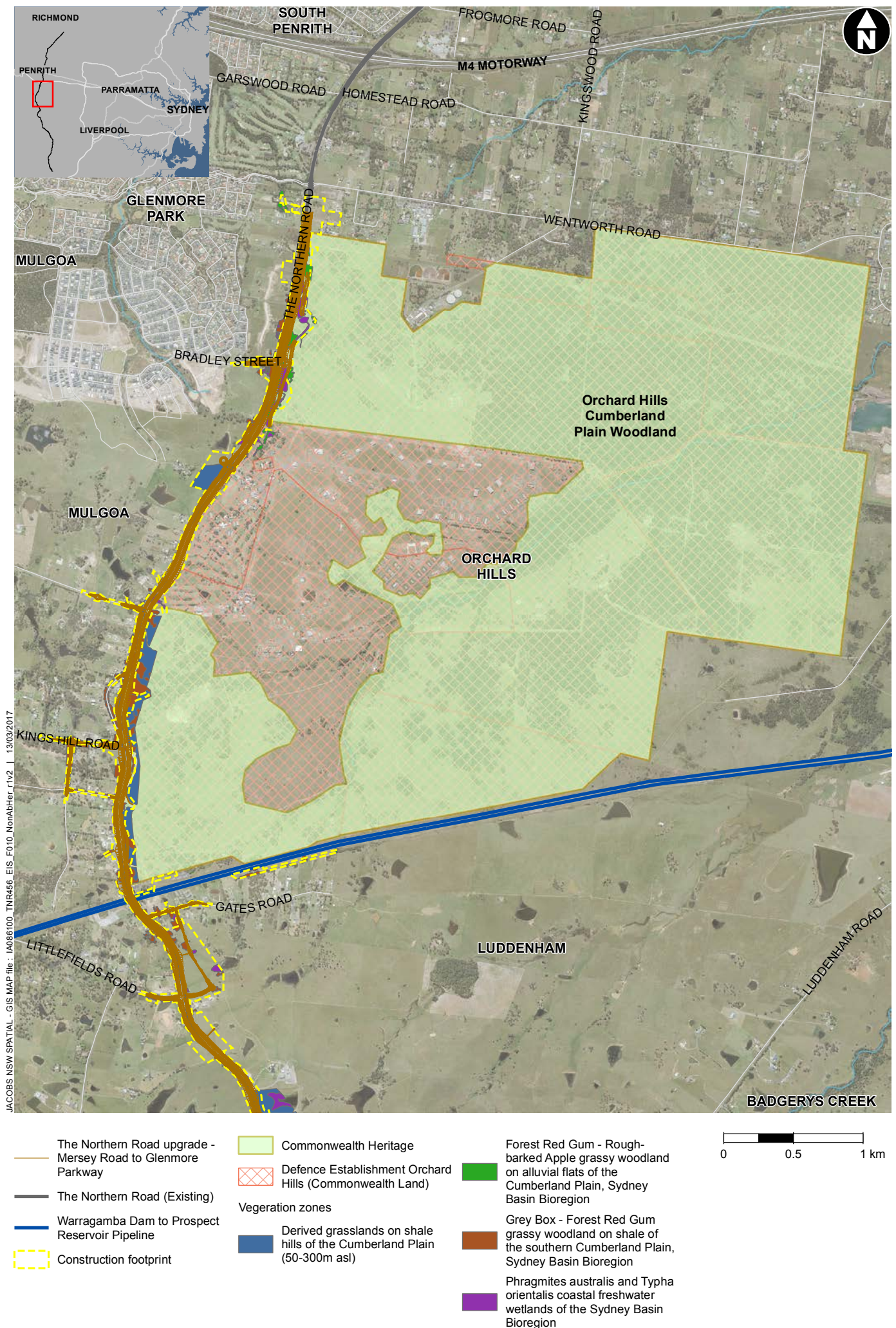
Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
<p>Permanently destroy, remove or substantially alter the fabric (physical material including structural elements and other components, fixtures, contents, and objects) of a heritage place</p>	<p>Approximately 9.68 ha of native vegetation would be removed by the project within the construction footprint. This is equivalent to 1.3% of the 726.32 ha of native vegetation on the CHP.</p> <p>Approximately 9.15 ha of the CPWSGTF and REFCF ecological communities would be removed by the project at the western edge of the CHP. The total area of these communities on the CHP is 610.60 ha. As such, the area removed would be equivalent to 1.5% of the total amount within the CHP. Using the severity guidelines provided in SEWPaC (2013), the Project is a Moderate severity impact. The action would permanently remove some of the components upon which the Orchard Hills Cumberland Plain Woodland CHP is based.</p> <p>However, of the impacted areas, none are identified as remnant vegetation communities which are ranked as high heritage significance (Godden Mackay Logan 2013), but rather would be limited to regrowth natural vegetation communities and a small patch of relic native trees ranked as moderate heritage significance in the HMP (Godden Mackay Logan 2013). In summary, the core vegetation areas in the centre and east of the Orchard Hills Cumberland Plain Woodland would not be affected, therefore impacts to the natural heritage values of the site as a result of vegetation loss are not expected to be significant.</p> <p>Construction of the project involves small scale native vegetation clearance that could potentially introduce invasive weed and pest species. There may be regular mobilisation of typical roadside maintenance fertilisers, herbicides or other chemicals that may stunt the regrowth of native vegetation. However this would be managed through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS).</p> <p>Additionally since the area is already disturbed by fencing,</p>	<p>The proposed action would involve the demolition of a small section of the canal, which would permanently destroy, remove or substantially alter the fabric of the canal. However, an archival photographic recording would be undertaken for the entire canal to capture detailed information that has not previously been captured of a heritage item subject to ongoing environmental erosion.</p>

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	<p>roadside and edge effects, the impact to fauna as a result of the project (eg edge effects, light pollution, etc.) is not considered to be significant.</p> <p>The project would also result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the DEOH site, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS).</p> <p>The impact would be intense, involving vegetation removal and construction of a road. The impact would be permanent and irreversible. However the scale of the impact to the CHP is relatively small (considering the 610.60 ha area of the CPWSGTF and REFCF ecological communities on the CHP site) as the project impacts are limited to the vegetation on the western fringes, and the core biodiversity area for conservation which has been identified as high heritage significance in the HMP (Godden Mackay Logan 2013), would not be impacted.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	
Involve extension, renovation, or substantial alteration of a heritage place in a manner which is inconsistent with the heritage values of the place	The project would result in an increase in the rate and volume of flow discharging to three Blaxland Creek tributaries and existing dams within the Blaxland Creek catchment within the DEOH site. As a result, the scour potential along these drainage lines would increase and ground conditions would become wetter. This does	The heritage values of the place relate to potential to yield information about early canal/irrigation practices and construction which can be obtained from the wooden structures and canal located outside the impact area. The historical significance would not be affected as the majority of the canal would not be affected

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	<p>not accord with the heritage values of the CHP. However, these impacts are not expected to extend to the aquatic areas mapped as moderate to high significance within the DEOH site, therefore the impact on these areas would be negligible. This is due to the distance of the works from these areas and the implementation of effective mitigation measures outlined in the Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS). This would take account of the DEOH Land Remediation Plan and Soil Conservation Manual to take account of the natural at the CHP.</p> <p>Exposure of soils resulting from vegetation clearing and other earth works would create an opportunity for weed invasion which has the potential to be moderately severe in this type of environment due to medium-long term impacts of a small-medium scale. However, this impact would be minimised through the implementation of effective weed and pest management measures as outline in the Biodiversity Assessment (Appendix I of the EIS), which would incorporate relevant elements of the DEOH Weed Management Plan.</p> <p>The native vegetation removal has the potential to limit habitat opportunities and ecological function for native flora and fauna. This is not in accordance with the heritage values of the CHP. However, being that the vegetation loss is of a small area of low to moderate significance (Godden Mackay Logan 2013) and is spread in a linear fashion along an existing habitat edge, this impact is not considered to be significant, being of a small-scale/localised and low-intensity nature.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	<p>and an archival photographic recording would be undertaken for the entire canal thereby capturing information about the heritage item in detail.</p>
Involve the erection of buildings or other structures adjacent to, or within	The Project involves the construction of an (up to) eight-lane road corridor at the western periphery of the CHP. According to	Unlikely. The proposed action would involve the demolition of a small section of the canal which is unlikely to result in visual

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
important sight lines of, a heritage place which are inconsistent with the heritage values of the place	<p>observations made during the biodiversity survey, the existing The Northern Road is likely to be visible from high points within the CHP. The Project alignment is similar to that of the existing roadway and, as such the vistas from the CHP are not anticipated to be substantially changed.</p> <p>This criterion is considered to be consistent with the current heritage values of the CHP.</p>	impacts on the remainder of the canal.
Substantially diminish the heritage value of a heritage place for a community or group for which it's significant	<p>The CHP holds heritage value to a range of community groups, such as the Friends of the Cumberland Plains and the Department of Defence. However, the impact to the CHP is considered to be relatively small, involving the clearance of 0.67% of the available extent of CPWSGTF and REFCF ecological communities within the CHP site that is already disturbed by edge effects relating to the current The Northern Road corridor. Additionally these have been identified as native regrowth areas of low to moderate significance with a reasonable tolerance for change (Godden Mackay Logan 2013). This is not considered to be a significant reduction in the heritage value of the CHP for community groups.</p> <p>As such, this criteria is expected to be consistent with the heritage values of the CHP where mitigation measures are implemented.</p>	The significance assessment for the canal does not provide values for a strong or special association with any particular community group or cultural group associated with the canal.
Substantially alter the setting of a heritage place in a manner which is inconsistent with the heritage values of the place	<p>The Project would involve the loss of a relatively small area (0.67%) of the CHP. In the context of the CHP, this is not considered to be a substantial loss. Additionally these have been identified as native regrowth areas of moderate significance with a reasonable tolerance for change (Godden Mackay Logan 2013). The current setting includes the existing The Northern Road corridor. The Project would result in the widening of this corridor with a similar alignment. As such, the Project is not considered to substantially alter the setting of the existing CHP that would be inconsistent with the heritage values of the CHP.</p> <p>As such, this criteria is expected to be consistent with the</p>	Unlikely. The proposed action would involve the demolition of a small section of the canal which is unlikely to substantially alter the setting of the heritage place.

Significant impact criteria. Is there a real chance or possibility that the action will:	Assessment of impacts to the natural heritage values of the site	Assessment of impacts to the non-Aboriginal heritage values of the site (ie the canal)
	heritage values of the CHP where mitigation measures are implemented.	
Substantially restrict or inhibit the existing use of a heritage place as a cultural or ceremonial site	Being that the CHP is currently used as an active Defence base and is restricted from public access, the Project is not anticipated to result in the CHP being more restricted as a cultural site. No ceremonial sites are present within the CHP site. This criterion is considered to be consistent with the current heritage values of the CHP.	No impact. The heritage place is not used as a cultural or ceremonial site.





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Figure 7-2 | Location of Chaffey Brothers Irrigation Scheme Canal (Item 2) in relation to proposed works

7.2 Item 3: Warragamba Dam to Prospect Reservoir pipeline (Lot A DP341629 & Lot A DP341893)

Proposed works

Construction of carriageway and fill slope to the west of The Northern Road (current) overlaps with the pipeline alignment to the west of The Northern Road (**Figure 7-3**).

Impact assessment

The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:

The carriageway is located over the section of pipeline that is below the ground to the west of The Northern Road and would avoid direct impact to the pipeline. In addition the proposed works include fill slopes within the pipeline corridor.

The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:

Potential for physical damage to the pipeline from road construction machinery, vehicles or other activities accidentally occurring outside the construction footprint. However, measures outlined in *The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012) sets out guidelines when designing, planning or assessing development on land adjacent to this pipeline. The document outlines risks to the pipeline through construction works in the vicinity. A Construction Environmental Management Plan is recommended for major development projects (Sydney Catchment Authority 2012:9).

The two concrete culverts located within a proposed access track and drainage works area would be directly impacted by the proposed works. However, removal of the culverts would not impact on the significance of the pipeline because they do not contribute to the historical significance of the site, nor demonstrate the technological significance of the pipeline. By following the mitigation measures as much information as possible can be preserved which contributes to our knowledge and significance of the heritage item.

The following impacts have been assessed as follows:

- vibration – unlikely due to the application of the measures outlined in *The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines* (Sydney Catchment Authority 2012) and the guidelines and associated safe working distances to be adhered to for heritage structures as outlined in the Noise and vibration assessment (**Appendix H** of the EIS)
- demolition – the pipeline would not be demolished. The two concrete culverts would be demolished and would not impact on the significance of the heritage item
- archaeological disturbance – not applicable
- altered historical arrangements and access – the heritage item is located within WaterNSW land and is therefore subject to restricted access
- landscape and vistas – the landscape and vistas of the heritage item would not be impacted
- architectural noise treatment – not relevant to this heritage item

There would be no overall impact to Item 3 during construction.

There would be no operational impacts to Item 3.



Figure 7-3 | Location of Warragamba Dam to Prospect Reservoir Pipeline (Item 3) in relation to proposed works

7.3 Item 9: Miss Lawson's Guesthouse site (Lot 1 DP90157)

Proposed works

- Construction of dual carriageway and cut slopes
- Construction of an intersection off the new The Northern Road onto Eaton Road (**Figure 7-4**).

Impact assessment

The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:

While the project would have a direct impact on archaeological deposits of the Guesthouse site, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham and the hotel and inn industry in the early 20th century.

The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:

The construction of The Northern Road upgrade would have a direct impact on all surface features identified at the site, and on potential subsurface archaeological deposits from the construction. By following the mitigation measures as much information as possible can be obtained which contributes to our knowledge and significance of the heritage item. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

- Archaeological investigation in the form of salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Archaeological investigation in the form of salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

The following impacts have been assessed as follows:

- vibration – this heritage item would not be impacted by vibration due to the archaeological nature of the site
- demolition – the entire heritage item would be demolished; however, mitigation measures would minimise these impacts
- archaeological disturbance – the entire heritage item would be subject to archaeological disturbance; however, mitigation measures would minimise these impacts
- altered historical arrangements and access – not relevant to this heritage item, as the entire site would be impacted
- landscape and vistas – Not relevant to this heritage item
- architectural noise treatment – not relevant to this heritage item

Construction impacts to Item 9 would be physical damage to the whole site.

There would be no operational impacts to Item 9.

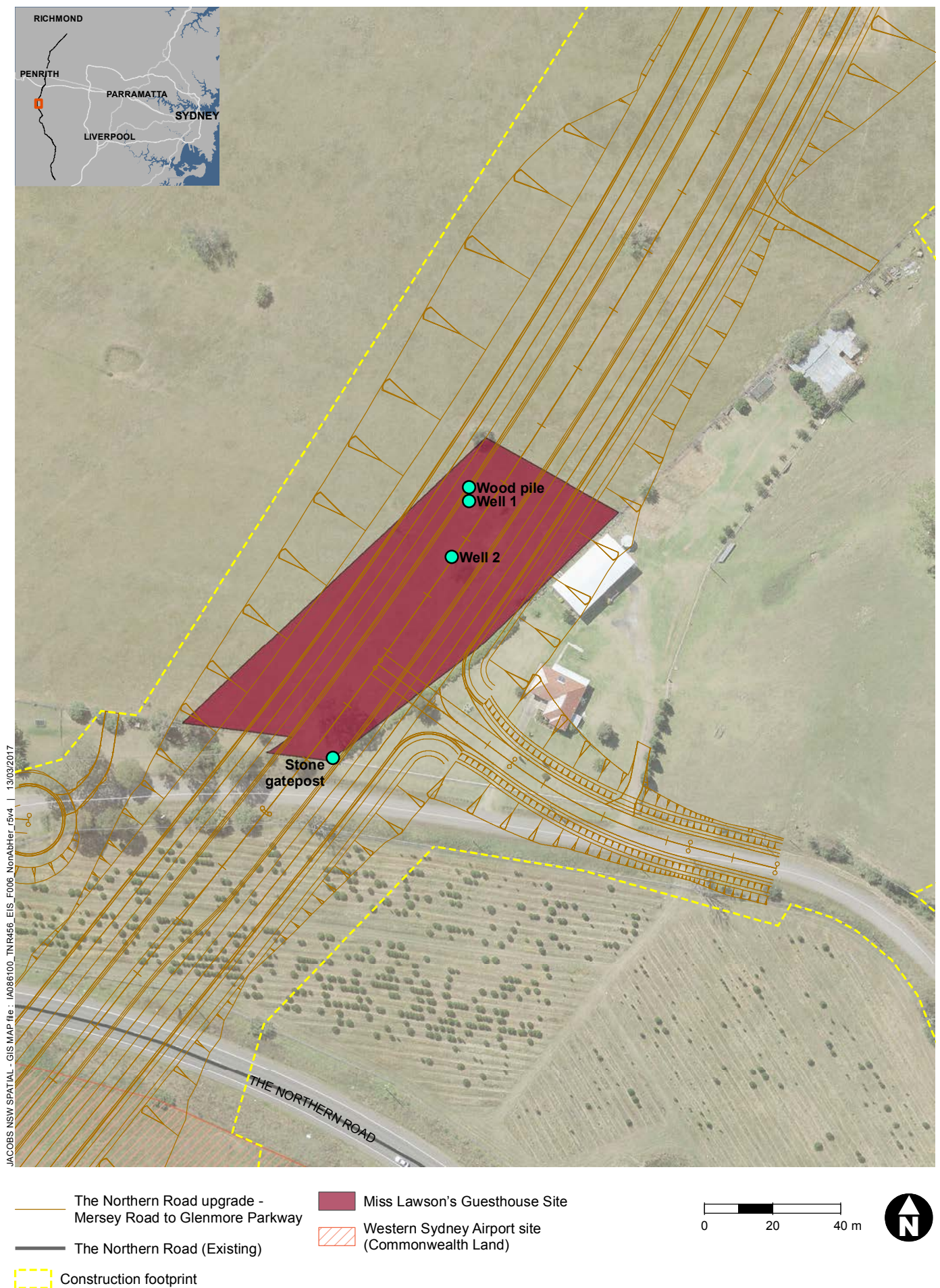


Figure 7-4 | Location of Miss Lawson's Guesthouse Site (Item 9) in relation to proposed works

7.4 Item 10: Lawson's Inn Site (Lot 2 DP623457) (LLEP 53)

Proposed works

- Construction of new dual carriageway (The Northern Road)
- Construction of a cul-de-sac on the existing Eaton Road, to the west of the new The Northern Road. The southern section of the cul-de-sac extends into the inn site
- construction of an intersection off the new The Northern Road onto Eaton Road
- Cut slopes for all of the above
- Construction compound and laydown site (**Figure 7-5**)

Impact assessment

The following aspects of the project respect or enhance the heritage significance of the item for the following reasons:

While the project would have a direct impact on archaeological deposits of the inn, the opportunity for undertaking a detailed archaeological investigation of the site prior to its destruction may enhance its significance through the realisation of its research potential. Undertaking archaeological investigation of the site under a well-structured research design by an appropriately qualified historical archaeologist would reveal information and answer questions particularly in relation to the early settlement of Luddenham, and the hotel and inn industry related to use of early roads in NSW.

The following aspects of the project could detrimentally impact on heritage significance. The reasons are explained as well as the measures to be taken to minimise impacts:

The construction of The Northern Road upgrade would directly impact on the entire curtilage of the site, including the potential archaeological deposits. By following the mitigation measures as much information as possible can be obtained which contributes to our knowledge and significance of the heritage item. To minimise impacts and maximise the opportunity for realising research potential at the site the following actions would be undertaken:

- Archaeological investigation in the form of salvage excavation to be undertaken in accordance with the Heritage Division of OEH guidelines including an appropriate research design and methodology in order to best realise the research potential of this area of the site
- Archaeological investigation in the form of salvage excavation would be undertaken under the supervision of an appropriately qualified and experienced historical archaeologist in accordance with the Heritage Division of OEH criteria.

The following impacts have been assessed as follows:

- vibration – this heritage item would not be impacted by vibration due to the archaeological nature of the site
- demolition – part of this heritage item would be demolished; however, mitigation measures would minimise these impacts
- archaeological disturbance – part of the heritage item would be subject to archaeological disturbance; however, mitigation measures would minimise these impacts
- altered historical arrangements and access – the historical arrangements and access would not change for the remaining part of the heritage item which would not be impacted
- landscape and vistas – not relevant to this heritage item
- architectural noise treatment – not relevant to this heritage item

Construction impacts to Item 10 would be physical damage to part of the site.

There would be no operational impacts to Item 10.

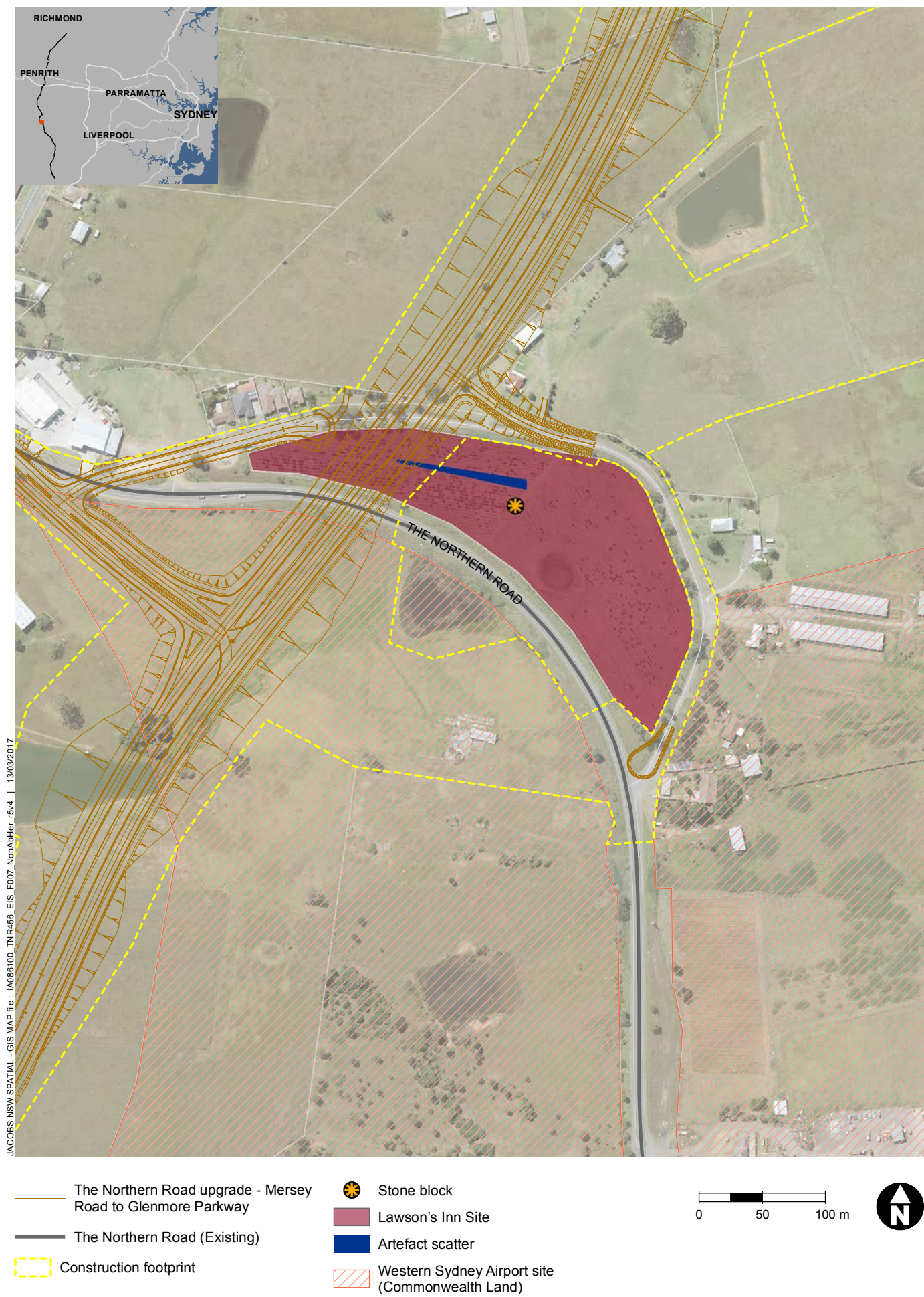


Figure 7-5 | Location of Lawson's Inn Site (Item 10) in relation to proposed works

7.5 Residual impacts

The following assessment of residual impacts identifies the level of impact to non-Aboriginal heritage without implementation of the proposed mitigation measures, and the level of impact with the implementation of the proposed mitigation measures, for each heritage item potentially impacted by the project.

The criteria used in the assessment of residual impacts to heritage is shown in **Table 7-2** below. Additionally the assessment of residual impacts to natural heritage is based on the impact severity criteria provided in the Significant Impact Guidelines 1.2 (SEWPaC 2013).

The assessment of residual impacts during construction and operation of the project is shown in **Table 7-3** below. Additional detail on the measures to mitigate impacts to biodiversity-related natural heritage values can be found in the project Biodiversity Assessment Report (Jacobs 2017).

Table 7-2 : Impact rating criteria

Level of Impact	Consequence
Negligible	No impact to non-Aboriginal heritage item
Low	Partial disturbance, damage or removal of non-Aboriginal material, fabric or objects from a heritage item / minor reduction in heritage significance
Medium	Disturbance, damage or removal of up to half of a heritage item / moderate reduction in heritage significance
High	Complete disturbance, damage or removal of a non-Aboriginal heritage item / complete reduction in heritage significance

Table 7-3 : Residual impacts during construction and operation of the project

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
Orchard Hills Cumberland Plain Woodland	<p>Clearing of native vegetation (9.15 ha), including regrowth areas of critically endangered ecological communities</p> <p>Changed hydrological conditions within the Blaxland Creek catchment</p>	<p>Low to medium. Clearing impacts would be permanent, irreversible and intense, however these impacts would be limited to areas ranked as low to moderate significance in the HMP for the DEOH (Godden Mackay Logan 2013)</p> <p>Negligible. Increased volume and rate of flow discharged to waterways, increased scour, erosion and sedimentation along waterways and wetter ground conditions. However these would not impact areas ranked as moderate to high significance in the HMP for the DEOH (Godden Mackay Logan 2013)</p>	Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site.	<p>Minor (or negligible) changed hydrological conditions within the Blaxland Creek catchment,</p> <p>Minor (or negligible) weed and pathogen impacts</p> <p>Minor light impacts to fauna</p>	<p>Moderate. Changed hydrological conditions within the Blaxland Creek catchment</p> <p>Degradation of ecological condition by proliferation of weed species at the CHP</p> <p>Light pollution due to increased road lighting</p>	Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site.

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
	Degradation of ecological condition by proliferation of weed species	Low. Weed invasion degrades biodiversity values				
	Introduction / disturbance of pathogen and/or disease vectors	Low. Pathogens and disease presence to be tested / confirmed. Impact includes degradation of ecological resources.				
	Light pollution	Low. Light impact includes habitat unsuitability for some native fauna				
	Physical damage to northern section of canal adjacent to The Northern Road	Low. Only small section of overall canal system would be removed.	Archival photographic recording of the canal and erection of protective barrier fencing	Recording of northern section of canal allows for interpretation and understanding of site even though partially destroyed.	No impact as operation would be confined to road which is located adjacent to remaining canal section.	Negligible. Traffic use of the road is located adjacent to the remaining canal and separated by fill slope.
Warragamba Dam to Prospect Reservoir pipeline	Potential for accidental impact	Low. Two concrete culverts would be impacted by the proposed works; however, neither of these contribute to the overall significance of the pipeline. The pipeline would not be impacted.	Follow measures outlined in <i>The Guidelines for development adjacent to the Upper Canal and Warragamba Pipelines</i> (Sydney Catchment Authority 2012)	Negligible. Guidelines (Sydney Catchment Authority 2012) set out measures when designing, planning or assessing development on land adjacent to the pipeline.	No impact as Guidelines (Sydney Catchment Authority 2012) would be followed during operation.	Negligible. Guidelines (Sydney Catchment Authority 2012) would be followed during operation.

Heritage item name	Potential impacts during construction	Impact	Proposed mitigation	Impact after mitigation	Potential impacts during operation	Impact during operation
Miss Lawson's guesthouse site	Physical impact to entire site	High. The construction would have a direct impact on all surface features identified at the site and on potential subsurface archaeological deposits.	Detailed salvage archaeological investigation of the site	Medium. Salvage excavation allows for data to be collected about the site which contributes to our knowledge and understanding of site	No impact as site would have been removed through salvage excavation and subsequent construction.	Negligible as site would have been removed through salvage excavation and subsequent construction.
Lawson's Inn site	Physical impact to part of the site	High The construction would directly impact on the potential archaeological deposits of the site.	Detailed salvage archaeological investigation of the site	Medium. Salvage excavation allows for data to be collected about the site which contributes to our knowledge and understanding of site	No impact as site would have been removed through salvage excavation and subsequent construction.	Negligible as site would have been removed through salvage excavation and subsequent construction.

8. Conclusion

8.1 Site-specific mitigation measures

A construction heritage management plan would be prepared as part of the CEMP prior to construction in consultation with the NSW Heritage Division of OEH. As a minimum, the plan would include the following:

- Induction protocols for staff and project personnel to undertake a cultural heritage induction, to assist them in understanding and complying with their legal obligations under the Heritage Act 1977
- A list, plan and GIS layer showing the location of identified heritage items
- A significance assessment and statement of significance for each item
- Detail the mitigation measures identified and when the measures are to be implemented
- Provide protocols and procedures to be enacted during construction to ensure the protection of items of heritage significance
- An unexpected finds procedure in the event that further sites are identified during works
- The separate procedure for the discovery of skeletal remains (highly effective).

A summary of the mitigation measures discussed above in Impact Assessment (**Section 7**) are provided in **Table 8-1**.

Table 8-1 : Mitigation measures for non-Aboriginal heritage items.

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Orchard Hills Cumberland Plain Woodland	CHL 105317 RNE 102211	<p>Potential impacts to the Orchard Hills Cumberland Plain Woodland Commonwealth Heritage Place (CHP) as a result of the project include impacts to the natural heritage values and impacts to the historic heritage values of the site as summarised below:</p> <p>Natural heritage impacts would be related to:</p> <ul style="list-style-type: none"> Clearing of around 9.68 ha of moderate to low significance native vegetation within the western periphery of the CHP including two relic trees located within the north-western portion of the CHP The regrowth natural vegetation communities impacted have been identified as having a reasonable tolerance for change, while the relic trees have a low tolerance for change Additional potential impacts to natural heritage values may include degradation of ecological condition by proliferation of weed species at the CHP, Introduction / disturbance of pathogen and/or disease vectors and indirect impacts to fauna from light pollution (construction and operation). <p>Historic heritage impacts would be related to:</p> <ul style="list-style-type: none"> Impacts to historic heritage as a result of physical damage to northern section of canal adjacent to The Northern Road, located within the south-western portion of the CHP. 	<ul style="list-style-type: none"> Relevant mitigation measures as per the Biodiversity Assessment (Appendix I of the EIS), Hydrology and Flooding Assessment (Appendix K of the EIS) and the Soils, water and contamination assessment (Appendix L of the EIS) would be implemented to appropriately manage potential impacts to the natural heritage values of the site Archival photographic recording in accordance with the Heritage Division of the OEH guidelines. This would include: <ul style="list-style-type: none"> Report (paper), thumbnails, CD-R and prints (10.5x14.8cm) to NSW Heritage Office Report (paper), thumbnails and CD-R to State Library of NSW Report (paper), thumbnails and CD-R to Owner/client Report (paper), thumbnails and CD-R to Local Council Report (paper), thumbnails and CD-R to Local Council Library
Warragamba Dam to Prospect Reservoir pipeline	-	No impact	None required

Heritage item name	Number (if applicable)	Potential impacts	Mitigation measures
Miss Lawson's guesthouse site	-	Physical damage to entire site	Detailed salvage archaeological investigation of the site
Lawson's Inn site	LLEP 53	Physical damage to part of the site	Detailed salvage archaeological investigation of the site

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Land records

173 (Litho) –surveyed April 1859

Roll Plan 4 – no apparent date

Indenture of Release (Conveyance) No. 27 Book 4 – 17th May 1843

Conveyance No. 70 Book 65 – 14th January 1860

Conveyance No. 132 Book 604 – 3rd August 1897

Conveyance No. 979 Book 1057 – 6th April 1915

Acknowledgment No. 62 Book 2040 – 18th November 1947

Conveyance No. 683 Book 2130 – 17th July 1950

Conveyance No. 21 Book 2555 – 27th September 1960