Little Burra Road to London Bridge Road REF

Queanbeyan-Palerang Regional Council

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Template 2.8.1

Executive summary

This Review of Environmental Factors (REF) has been prepared by Eco Logical Australia Pty Ltd under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) on behalf of the Queanbeyan-Palerang Regional Council (Council). This REF assesses the potential environmental impacts associated with the proposed road reconstruction of Burra Road, from Little Burra Road to London Bridge Road.

The project will deliver improved road connectivity and safety and will reduce the long-term maintenance costs to Council and rate payers.

This REF considers the potential environmental impacts that may result from the proposed works and proposes appropriate mitigation measures to negate, offset or minimise these impacts. To support the preparation of this environmental impact assessment, a review of previous reports and database information, site investigations and assessments has been carried out.

Impacts to biodiversity and Aboriginal heritage were key environmental considerations in the preparation of this REF and detailed assessment reports for both can be found in the appendices.

Findings of the supplementary reports were:

- Biodiversity
  - *Threatened flora species* were not identified on site.
  - *Threatened Ecological Communities* were not identified on site.
  - *Threatened fauna species* were identified on site. A flock of *Callocephalon fimbriatum* (Gang-gang Cockatoos) listed as Endangered under the *Biodiversity Conservation Act 2016* (BC Act) were observed during the field survey.
  - Of the 37 hollow bearing trees identified within the site, 18 are considered potential Gang-gang Cockatoo breeding habitat and 14 are considered potential *Calyptorhynchus lathami* (Glossy Black-Cockatoo) breeding habitat.
  - Hollow Bearing Trees containing potential breeding habitat for threatened cockatoos should be checked for breeding birds within the relevant breeding season. Trees that don't contain breeding birds can be removed; any trees that contain breeding pairs of either species should be retained until the pair vacate and chicks are fledged.
  - Alternatively, removal of trees with breeding birds may be considered a significant impact and therefore a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) under the BC Act may be required.
- Aboriginal Heritage
  - No significant impact to Aboriginal Heritage

It is recommended that a Construction Environmental Management Plan (CEMP) and associated sub-plans are developed prior to the commencement of the works to mitigate potential environmental impacts. It is recommended that all mitigation measures set out in this REF are incorporated into the site-specific CEMP and adopted for the duration of works, or longer as required.

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Abbreviations

Abbreviation	Description
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASS	Acid Sulfate Soils
BAM	Biodiversity Assessment Method
BC Act	*NSW Biodiversity Conservation Act 2016*
BDAR	Biodiversity Development Assessment Report
BS Act	*Biosecurity Act*
C/EEC	Critically Endangered/Endangered Ecological Community
CEMP	Construction Environmental Management Plan
CoP	Code of Practice
DoEE	Department of the Environment and Energy
DPI	Department of Primary Industries
ELA	Eco Logical Australia
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPA	NSW Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FM Act	*Fisheries Management Act 1994*
KFH	Key Fish Habitat
LEP	Local Environment Plan
NES	National Environmental Significance
NML	Noise Management Level
NPW Act	*National Parks & Wildlife Act 1974*
MEMP	*Murrumbidgee Ecological Monitoring Programme*
OEH	Office of Environment and Heritage
OH&S	Occupational Health and Safety
PAD	Potential Archaeological Deposit
PCT	Plant Community Type
RBL	Rating Background Level
RCP	Reinforced Concrete Pipe
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy
SIS	Species Impact Assessment
TEC	Threatened Ecological Community
TMP	Traffic Management Plan
WM Act	*Water Management Act 2000*

1. Introduction

1.1 Background

The Queanbeyan-Palerang Regional Council (herein Council) propose to upgrade approximately 1.7 kilometres (km) of Burra Road between Little Burra Road and London Bridge Road, Burra to improve road safety and connectivity.

This Review of Environmental Factors (REF) has been prepared by Eco Logical Australia (ELA) on behalf of Council to assess the potential environmental impacts associated with the proposal. Proposed works include:

- Survey and design of the existing alignment with the possibility of realignment to meet road design standards.
- Clearing and grubbing of the construction footprint, earthworks, pavement building and bituminous sealing.
- Construction of drainage infrastructure, such as culverts to protect the road from flooding events.

The section of Burra Road to be upgraded that is subject to this REF is shown in **Figure 1** ("study area").

Figure 1 Site Location

1.2 Purpose of REF

This REF is an environmental assessment made under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The proposed works shall be carried out under Division 7, Clause 50 of the *State Environmental Planning Policy (Infrastructure) 2007* (Infrastructure SEPP) and are permitted without consent. The Council is the proponent and the determining authority for the proposed works.

The purpose of this REF is to describe the proposal, identify and discuss relevant planning legislation, carry out assessments to identify potential ecological and heritage values, document the likely impacts of the proposal on the environment and detail mitigation measures to be implemented. This will allow Council to fulfil the requirements of Section 5.5 of the EPA&A Act, namely in their examination and consideration of all matters affecting or likely to affect the environment by reason of the activity.

The layout of this REF is based, in part, on the *Guidelines for the Review of Environmental Factors* published by the Department of Environment and Climate Change NSW, July 2008. For this REF, the detailed reports, being Terrestrial Biodiversity Report and the Aboriginal Due Diligence Assessment are attached as appendices, with their results summarised and discussed within this REF.

1.3 Description of Proposal

The proposal is for the upgrade of approximately 1.7 km of Burra Road between Little Burra Road and London Bridge Road. This section of Burra Road serves as a link between the greater Queanbeyan area and Michelago through to the Cooma Monaro region. It is a moderately trafficked road that attracts some degree of tourist traffic but mostly carries movements associated with local and recreational trips.

Key elements of the proposal include:

- Survey and design of the existing alignment with the possibility of some realignment
- Clearing and grubbing of the new construction footprint
- Earthworks to shape batters and form the road
- Construction of drainage requirements to protect the road from flooding events
- Construction of the road pavement using a flexible gravel pavement
- Sealing of the road surface for waterproofing
- Installation of road furniture for road safety requirements.

The road upgrade works subject to this REF will occur within the existing road reserve and within some adjacent landholdings. The new road reserve areas will be acquired by Council prior to works commencing.

The road upgrade will be constructed to a design standard of 90 kilometres per hour (kph) and will include general road pavement with a two-coat bitumen seal. Following the completion of preliminary activities including site establishment, utility adjustment, fencing, erosion and sediment control installation and clearing and grubbing, the works will be broken into two stages (Stage 1: CH1528.40 to CH2180 and Stage 2: CH2180 to CH3250). Each stage will include earthworks, pavement, culvert and drainage works and sealing. Following completion of both stages, line-marking and road furniture installation will complete the project.

The proposed works are expected to be completed by the end of the 2019/2020 financial year. Construction works will be undertaken between 6:30 a.m. and 5:30 p.m. Monday to Friday and 6:30 a.m. and 2 p.m. on Saturday. There will be no work on Sundays or Public Holidays. Normal road construction mobile plants will be used including 6 to 20 tonne excavators, a grader, pad foot roller, smooth drum roller, water cart and truck and dog trucks, whacker packers and jumping jacks.

The detailed engineering plans including the existing road and the proposed upgrade design have been attached as **Appendix A** in this report.

1.4 Subject Site and Study Area

The subject site for this report comprises all areas that will be directly disturbed by the proposal. The subject site is the existing road footprint and additional areas beyond the existing road that will be modified to achieve the new road alignment and width, and any other areas affected directly by the proposal, including culvert installations and upgrades and stockpile/equipment or facilities storage.

The study area, identified in **Figure 1** refers to the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly. The direct impact boundary was taken as 10 metres (m) either side of the proposed road batters.

1.5 Justification for the Activity

The proposal is justified for the following reasons:

- It contributes to the completion of regional road upgrades in the Queanbeyan-Palerang local government area, providing a safer link for all road users and enhancing road connectivity.
- It addresses site specific road safety improvement needs, associated with the current condition of the road.
- The serviceable width and vertical and horizontal alignment of the current road is not safe for high speed traffic, which includes trucks, buses, 4WDs and ordinary vehicles.
- The upgrade will reduce the long-term maintenance costs to Council and rate payers.

The ‘do nothing’ option will compromise road safety.

1.6 Consultation

This REF process is designed to meet Council and other stakeholders’ standards of due diligence prior to undertaking the road upgrade.

1.6.1 Infrastructure SEPP

Part 2 Division 1 of the Infrastructure SEPP identifies situations where consultation needs to be undertaken by public authorities with local council or other government agencies prior to the commencement of some forms of development. In this case, consultation with Council is not required as Council is the proponent and therefore Clauses 13, 14 and 15 do not apply. Clause 16 identifies consultation triggers for public authorities other than local council, however following review of this Clause it can be concluded that there is no requirement for Council to consult with public authorities in terms of the Infrastructure SEPP.

1.6.2 Stakeholder Consultation

Other stakeholders have been identified for consultation to ensure a thorough assessment of potential issues, and include:

- NSW Roads and Maritime Services (RMS)
- NSW Office of Environment and Heritage (OEH)
- NSW Department of Primary Industries (DPI)
- Commonwealth Department of the Environment and Energy (DoEE)
- WaterNSW.

WaterNSW was consulted as part of a previous REF (ELA 2016) for a similar proposal to upgrade roads within the local government area to determine the specific requirements for assessment under the State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011. This consultation informed the approach taken in the present REF.

ELA have undertaken consultation with the DPI regarding the requirement to obtain a permit under the *Fisheries Management Act 1995* (FM Act). A permit is not required under Section 219 (or 200) of the FM Act; **Sections 2** and **3.2** provide further information in relation to this.

RMS are in consultation with Council regarding this proposal.

1.6.3 Community Consultation

ELA understand that residents have been consulted by Council as part of the land acquisitions required to accommodate the new alignment.

1.7 Environmental Safeguards

A Construction Environmental Management Plan (CEMP) will be prepared to guide the construction works and will incorporate the findings of the REF and the associated mitigation and management measures.

2. Planning and Statutory Matters

Table 1 provides a description of the legislative context for the project. Where an approval or consideration is required, this report addresses the objectives and requirements of the legislation.

Table 1 Legislative Context

Name	Relevance to the project	Section in this report
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act aims to protect Matters of National Environmental Significance (MNES) including wetlands of international importance, threatened species and communities and listed migratory species. An action that may or is likely to have a significant impact on MNES should be referred to the Commonwealth to determine whether it is a Controlled Action that requires approval from the Commonwealth. MNES have been identified on or near the site. This report assesses impacts to MNES and concludes that the development is not likely to have a significant impact on MNES.	Section 3.1 and Appendix D
State		
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act is the principal planning legislation for NSW. It provides a framework for the overall environmental planning and assessment of development proposals. The project is development permitted without consent under the NSW State Environmental Planning Policy (SEPP) (Infrastructure) 2007 as development for a road or road infrastructure facilities and is therefore to be assessed under Part 5 of the EP&A Act 1979. This report addresses the requirements of Division 1 clause 228 of the *EP&A Regulation 2000*.	Section 1.6.1
Biodiversity Conservation Act 2016 (BC Act)	The purpose of the BC Act is to maintain a healthy and productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. Assessments of significance for the impact to threatened species and endangered ecological communities in accordance with s7.3 of the Act have been undertaken for the proposed works. A significant impact may result depending on further site assessment, and therefore a BDAR or a Species Impact Statement may be required.	Section 3.1 Section 3.1.4 and Appendix D
National Parks and Wildlife Act 1974 (NP&W Act)	The NP&W Act regulates the proper care, preservation and protection of 'Aboriginal objects' and 'Aboriginal places' in NSW. Under the provisions of the NP&W Act, all Aboriginal objects are protected, and Part 6 of the Act provides specific protection for Aboriginal objects and places making it an offence to destroy, deface, damage or move them from the land. The Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales provides guidance to exercise due diligence when carrying out activities that may harm Aboriginal objects. The proposed development will not harm Aboriginal objects and therefore a permit under the NP&W Act is not required.	Section 3.3 and Appendix E
Heritage Act 1977	The Heritage Act aims to conserve the environmental heritage of NSW and regulates development impacts on the state's heritage places, buildings, works, relics, moveable objects or precincts that are important to the people of NSW. These include items of Aboriginal and historic heritage significance. Where these items have importance to the state of NSW, they are sited on the State Heritage Register (SHR). The proposed development does not involve an item or place listed on the NSW State Heritage Register. Approval of works on the site is therefore not required under s57 of the Heritage Act.	Section 3.4

Name	Relevance to the project	Section in this report
Local Land Services Amendment Act 2016	The *Local Land Services Amendment Act 2016* (LLS Amendment Act) repealed the *Native Vegetation Act 2003*. The proposal would involve clearing of native vegetation as defined in Part 5A Division 1 Section 60B and 60C of the LLS Amendment Act. Clearing that is authorised under the provisions of Division 3 Section 60O of the LLS Amendment Act includes clearing that is: "(ii) a State significant infrastructure approval under Part 5.1 of the EPA&A Act" This REF provides an assessment of the proposed works under Part 5 of the EP&A Act and the proposed works would be carried out by Council, a determining authority as defined by the Act. Therefore, the proposal is not subject to the LLS Amendment Act.	
Protection of the Environment Operations Act 1997	The *Protection of the Environment Operations Act 1997* includes provisions relating to the protection of the environment. There are serious offences under this Act for causing pollution of air, noise, water or land. The proposed development does not involve carrying out of scheduled development under Section 43 of the Act and, therefore, does not require an Environmental Protection Licence.	Section 3
Fisheries Management Act 1994 (FM Act)	The objects of the FM Act are to conserve, develop and share the fishery resources of the State for the benefits of present and future generations. The Act provides protection and approval processes for activities which may impact on threatened species, protected marine vegetation or involve dredging, reclamation or obstruction of fish passage. The development involves potential impacts to threatened species or their habitats listed in the FM Act. Assessments of significance have been undertaken and conclude that there are no significant impacts to threatened species. The development does not involve harm to marine vegetation and, therefore a permit under s205 of the FM Act is not required. Key Fish Habitat (KFH) is mapped within the subject site on 1st and 2nd order watercourses, however the *Policy and guidelines for fish habitat conservation and management* (DPI, 2013) states that 1st and 2nd order streams are not considered KFH. Consultation with DPI has been undertaken and a permit is not required under the FM Act.	Section 3.2
Biosecurity Act 2015 (BS Act)	The Act provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. Whilst the Act provides for all biosecurity risks, implementation of the Act for weeds is supported by Regional Strategic Weed Management Plans (RSWMP) developed for each region in NSW. **Appendix 1** of the South East Regional Strategic Weed Management Plan identifies the priority weeds for control at a regional scale.	Section 3.1
Water Management Act 2000 (WM Act)	The WM Act is the sustainable and integrated management of the state's water for the benefit for both present and future generations. If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the *Water Management Act* (s91). 'Controlled activities' include: • the construction of buildings or carrying out of works (except for land based private dwellings, a dual occupancy building or related ancillary facilities); • the removal of material or vegetation from land by excavation or any other means; • the deposition of material on land by landfill or otherwise; or	

Name	Relevance to the project	Section in this report
	• any activity that affects the quantity or flow of water in a water source. The project involves works on waterfront land however a Controlled Activity Approval under s91 of the WM Act is not required as the proponent is a public authority and is therefore exempt under s41 of the WM Regulation 2018.	
Roads Act 1993	The *Roads Act 1993* regulates the carrying out of certain activities on public roads, provides a classification of roads, and establishes procedures for opening and closing public roads. Section 138 of the *Roads Act 1993* requires the consent of the appropriate roads authority for the following works: • Erecting a structure or carrying out a work in, on or over a public road, or • Digging up or disturbing the surface of a public road, or • Removing or interfering with a structure, work or tree on a public road, or • Pumping water into a public road from any land adjoining the road, or • Connecting a road (whether public or private) to a classified road. The proposed works involve the upgrading of a section of Burra Road, which is a regional road maintained by Council. Financial assistance for maintenance is provided by the Roads and Maritime Services.	
Planning Instruments		
SEPP (Infrastructure) 2007 (Infrastructure SEPP)	The Infrastructure SEPP simplifies the process for providing essential infrastructures such as schools, hospitals, roads, railways, sewer, water supply and electricity delivery by providing specific planning provisions and development controls. It specifies when development consent is (and is not) required for such development to be carried out in certain zones. The proposed works are permissible without consent if carried out by or on behalf of a public authority under Division 17 clause 94 of the Infrastructure SEPP.	Section 1.6.1
SEPP (Sydney Drinking Water Catchment) 2011	The aims of this policy are to support water quality objectives in the drinking water catchment, and to ensure that consent authorities only allow proposed developments that have a neutral or beneficial effect (NorBE) on water quality. Clause 12 of this policy requires that public authorities, before carrying out any activity that will be assessed under Part 5 of the EP&A Act, must consider whether the activity would have a neutral or beneficial effect on water quality. WaterNSW has developed a standard format for NorBE assessment and has published the *Neutral or Beneficial Effect Water Quality Assessment Guideline* 2015 (Water NSW 2015) to assist applicants and consent or public authorities consider whether proposed developments in the drinking water catchment will have a NorBE. Water NSW has developed an online tool for local councils to access which has been designed to prompt council when the proposal needs to be referred to Water NSW for concurrence. The study area falls within the boundaries of the Sydney Drinking Water Catchment as mapped by WaterNSW. As such this SEPP and the requirement for a NorBE assessment applies. ELA have carried out the NorBE assessment manually. If required, ELA can carry out the online assessment on behalf of council.	Section 1.6.2 and Section 3.6 and Appendix C
SEPP 44 – Koala Habitat Protection	The SEPP encourages the conservation and management of areas of natural vegetation providing habitat for *Phascolarctos cinereus* (koala). The consent authority must determine whether the land contains potential koala habitat and core koala habitat. Schedule 1 of the SEPP lists local government areas to which the plan applies.	Section 3.1 and Appendix D

Name	Relevance to the project	Section in this report
	SEPP 44 applies to the local government area in which the development is proposed, however the project is being assessed under Part 5 of the EP&A Act and therefore SEPP 44 does not apply.	
Palerang Local Environment Plan 2014	Properties on the western side of Burra Road within the subject site are zoned RU1 Primary Production under Palerang Local Environmental Plan 2014 (LEP) administered by Council. Properties to the east of Burra Road (excluding Lot 12 DP1184649) are zoned E4 Environmental Living. Most of the site is also covered by the Biodiversity overlay which requires consideration of matters listed in clause 6.3 of the LEP. Clause 5.12 of the LEP states that the LEP does not restrict or prohibit the carrying out of any development by or on behalf of a public authority that is permitted to be carried out with or without development consent, under the Infrastructure SEPP. Clause 8 of the Infrastructure SEPP states that should there be any inconsistency between the SEPP and other EPI (including LEP) then the SEPP prevails. Therefore, the LEP provisions do not apply to the works however, they should be considered. This REF will consider the consistency of the proposal with the LEP.	

3. Environmental Assessment

This section of the report provides an assessment of the potential environmental impacts of the proposed development. This chapter describes the existing characteristics, potential impacts and mitigation measures for the following:

- Terrestrial Biodiversity
- Aquatic Biodiversity
- Aboriginal Heritage
- Non-Aboriginal Heritage
- Geology and Soils
- Hydrology and Water Quality
- Air quality
- Noise and Vibration
- Traffic and Safety
- Visual Amenity and Landscape
- Socio-economic
- Energy and Climate Change
- Waste Management
- Cumulative Impacts.

3.1 Terrestrial Biodiversity

An Ecological Impact Assessment, titled *Burra Road upgrade, Burra - Terrestrial Biodiversity Report*, was completed by ELA (2019). This involved a desktop review and field survey as briefly outlined below and detailed in **Appendix D**.

The objective of the report was to describe potential impacts of the proposed upgrade on native vegetation, threatened species, populations and communities listed under the BC Act and EPBC Act, as well as associated habitat features, and to determine appropriate recommendations to mitigate or minimise impacts.

3.1.1 Methodology

3.1.1.1 Desktop Review

A review of relevant literature, databases and aerial photography was undertaken prior to conducting the field surveys.

The list of threatened species and ecological communities returned by the database searches was supplemented or amended based on local ecological knowledge of the area, including known species occurrences. A list of species (defined as 'yes', 'likely' or 'potential') was then used to inform the need for any targeted surveys.

3.1.1.2 Field Survey

The initial field survey was conducted on 28 February and 5 March 2019 by ELA Ecologists David Allworth and Clare Duck. This involved traversing the full extent of the subject site to assess:

- vegetation (including assessment of floristic structure and composition, and of vegetation communities against key listing criteria for relevant Threatened Ecological Communities (TECs))
- the presence of, or potential habitat for, threatened flora and fauna (including hollow-bearing trees)
- opportunistic fauna sightings
- Koala habitat.

Vegetation community descriptions were based on multiple rapid survey assessments conducted within each vegetation community. Two detailed floristic surveys were also undertaken using the Biodiversity Assessment Method (BAM) as per the BC Act. Following the initial field survey, the vegetation communities were assigned a Plant Community Type (PCT).

Based on the ELA ecologists' knowledge and understanding of potential threatened species and their associated habitats, as well as the results of database searches undertaken, targeted threatened species flora surveys were undertaken by parallel traverse in areas of suitable habitat by Clare Duck and Andrew Mitchell on 2 April 2019.

Assessments of the suitability of the available habitat for threatened flora and fauna species included locating any specific features of importance to threatened biodiversity, and recording its location using a handheld GPS unit. Elements of specific interest included hollow-bearing trees, rock outcrops, stick nests, stands of winter-flowering trees and riparian areas.

3.1.2 Existing Environment

The desktop review identified that, although much of the vegetation in the wider landscape has been cleared and exotic vegetation species associated with agriculture and pastoral cultivation have been introduced, there are some nearby patches of native vegetation, including 265 hectares (ha) of native vegetation within 1 km of the site. Where remnant vegetation is extant, it is characterised by woodland species (Jenkins 2000:44).

Field survey identified one Plant Community Type (PCT), which covered 6.67 ha of the study area:

- PCT 999 Ribbon Gum - Norton's Box - Broad-leaved Peppermint open forest on footslopes, central and southern South Eastern Highlands Bioregion (**Plate 1**).

Three condition states of PCT 999 occur within the study area:

- Intact: canopy trees present, moderate diversity in midstorey and ground layer (3.20 ha)
- Derived Native Grassland (DNG): canopy and midstorey mostly cleared, scattered individual trees; ground layer predominantly native (3.47 ha)

The remainder of the site consisted of 0.62 ha of planted and exotic vegetation and 0.74 ha of treeless vegetation with exotic groundcover species.

Three declared priority weed species in the Regional Strategic Weed Management Plan (South East Region), *Rubus fruticosus* sp. agg. (Blackberry), *Hypericum perforatum* (St. John's Wort) and *Cytisus proliferous* (Scotch Broom), as well as several other exotic species, were identified within the subject site.

Plate 1: PCT 999

3.1.2.1 Threatened Ecological Community

The desktop review identified three Threatened Ecological Communities (TECs) listed under the BC Act as having potential to occur within the study, however no TECs were found to occur through the field survey.

3.1.2.2 Threatened Flora Species

Desktop review identified 15 threatened flora species listed under the BC or EPBC Acts as having potential to occur within the subject site. Based on local ecological knowledge of the area and utilising the Australasian Virtual Herbarium (AVH) database, one additional threatened species was identified as potentially occurring. However, no threatened flora species were found during field surveys.

3.1.2.3 Threatened Fauna Species & Habitat Features

Desktop review identified 49 threatened, migratory or marine fauna species as having potential to occur with a 15 km radius of the site. Based on local ecological knowledge of the area and the AVH database, an additional six species were identified as potentially occurring. *Callocephalon fimbriatum* (Gang-gang Cockatoo) was the only threatened fauna species observed during the field survey (noting that targeted fauna surveys were not undertaken).

Key fauna habitat components within the study area included fallen timber and other large woody debris, hollow-bearing trees, native tree and shrub canopy, and ephemeral creeklines. Several wombat burrows were also recorded. The native vegetation in the subject site is likely to provide foraging habitat for forest birds, megachiropteran and microchiropteran bats, frogs and reptiles.

Specific habitat features identified on site are shown in Figure 2. The field survey identified 37 hollow-bearing trees in the study area that have the potential to support denning, roosting and nesting habitat for a range of small to large birds, arboreal frogs and reptiles, arboreal mammals and microchiropteran bat species.

Gang-gang Cockatoo and *Calyptorhynchus lathami* (Glossy Black-Cockatoo) are both listed as Endangered under the BC Act. 14 trees within the survey area contained hollows greater than 15 cm in diameter and more than 5 m above ground, which indicates that they are potential Glossy Black-Cockatoo breeding habitat (OEH 2019) (**Figure 2**). 18 trees within the subject site are considered potential Gang-gang Cockatoo breeding habitat, with hollows greater than 9 cm in diameter and more than 5 m from the ground (**Figure 3**).

The secondary Koala feed trees *Eucalyptus bridgesiana* (Apple Box), *E. mannifera* (Brittle Gum), *E. nortonii* (Norton's Box) and *E. melliodora* (Yellow Box) were recorded within the subject site. The study area therefore constitutes potential Koala habitat.

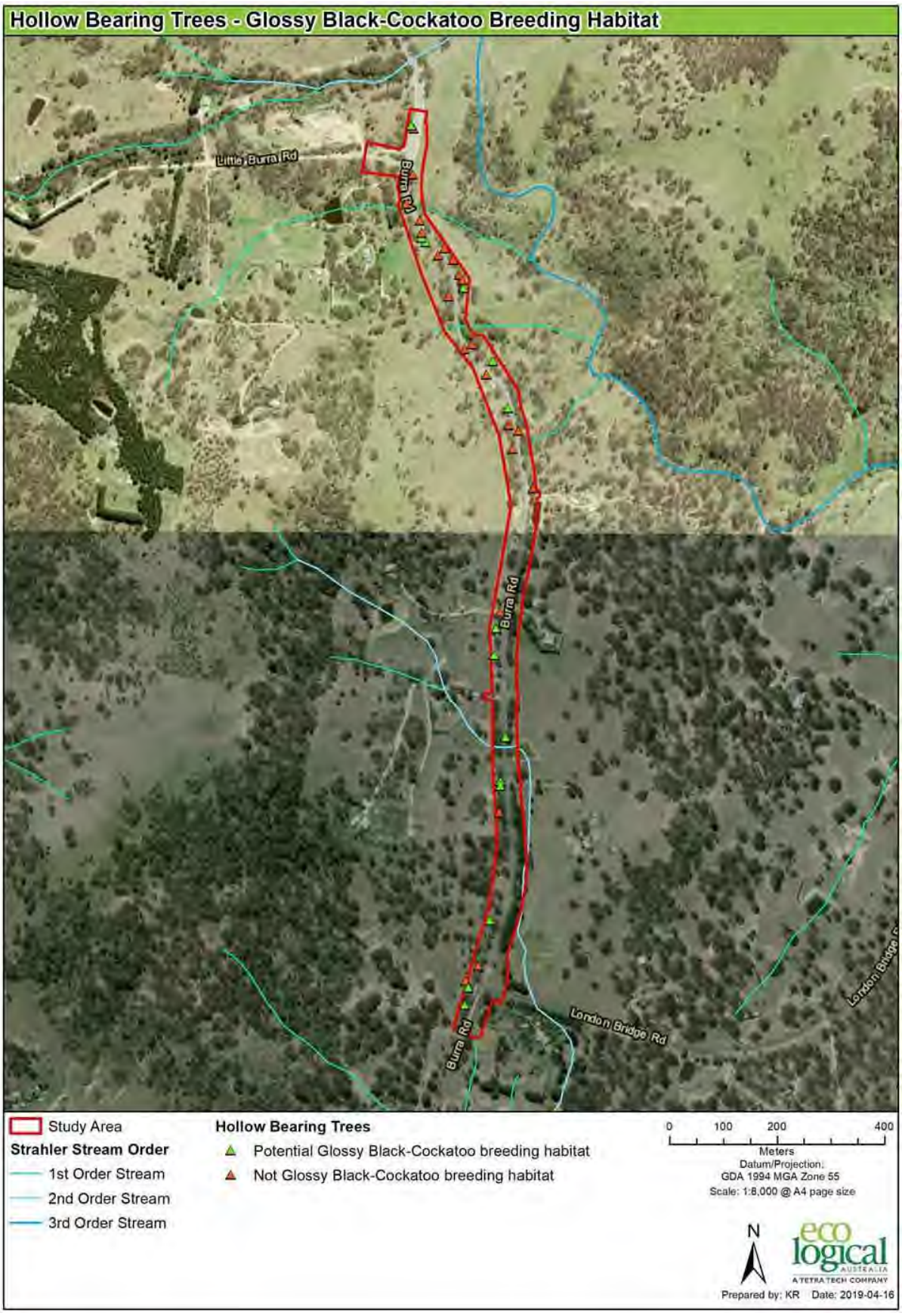

Figure 2: Potential Glossy Black-Cockatoo breeding habitat

Figure 3: Potential Gang-gang Cockatoo breeding habitat and location of Gang-gang Cockatoo flock recorded during survey

3.1.3 Impact

3.1.3.1 Flora

The proposed work will result in the direct impact of up to 6.67 ha of native vegetation, mapped within the study area. No significant impacts on flora species or vegetation communities, as per the BC Act or EPBC Act, are likely to occur as a result of the proposed development.

3.1.3.2 Fauna

The Terrestrial Biodiversity Report (**Appendix D**), concludes that the identified impacts of the proposal are unlikely to have significant adverse impact on any threatened fauna species, provided that the recommended mitigation measures are adopted.

An impact assessment under the EPBC Act was undertaken for six migratory fauna species and concluded that the proposal was unlikely to have a significant impact on these species. Therefore, a referral to the Commonwealth DoEE is not required.

An Assessment of Significance under the NSW BC Act was undertaken for 12 threatened species (11 birds and one microbat). This concluded that, if the mitigation measures are followed, the proposal is unlikely to have significant impacts on any threatened fauna species under the BC Act and, therefore, neither an SIS nor a BDAR is required.

The proposed work will potentially impact 37 hollow-bearing trees, located within the study area.

14 trees within the survey area contained hollows greater than 15 cm in diameter and more than 5 m above ground, which indicates that they are potential Glossy Black-Cockatoo breeding habitat. 18 trees within the subject site are considered potential Gang-gang Cockatoo breeding habitat, with hollows greater than 9 cm in diameter and more than 5 m from the ground. Therefore 18 trees within the study area are potential habitat trees for endangered Cockatoos.

These trees may provide roosting, denning or nesting habitat for Gang-gang Cockatoos and Glossy Black-Cockatoos. Of concern is the potential for the removal of potential or known breeding trees of these species during their respective breeding seasons. It is concluded that the proposal is unlikely to result in a significant impact provided that:

- Potential breeding trees are removed outside of the respective breeding seasons; or
- During the breeding season, targeted pre-dusk hollow-bearing tree watching surveys are undertaken for the relevant cockatoo species, based on the time of year and recommended mitigation measures are followed.

Specific mitigation measures to avoid a significant impact are outlined in **Table 2**.

3.1.3.3 Ecological Connectivity

Given the narrow nature of the study area and the proposed habitat modifications, the proposal is unlikely to disrupt connectivity between fauna habitats. In addition, >1000 ha of remnant open forest and woodland vegetation is contained within the adjacent properties.

3.1.4 Mitigation Measures

Table 2: Biodiversity Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
TB1	Threatened flora and vegetation communities	• Avoid further clearing and modification, wherever possible, of all native vegetation. • The limits of the corridor of works (disturbance footprint) should be clearly marked (for example, using temporary fencing or bunting) to ensure site disturbance occurs only within the designated works areas and is not unnecessarily extended. • Material stockpile and equipment storage areas should be restricted to existing disturbed areas. • Vegetation clearing should be undertaken in a manner to avoid damage to adjacent vegetation. • Fallen logs and felled tree trunks should be retained on site and used in rehabilitation works on or off site. The remaining portions of felled trees (e.g. upper branches and leaves) should be mulched/chipped and used in erosion mitigation and/or revegetation works. • Vehicle movements should be confined to the disturbance footprint. • Machinery coming from outside the works area should be thoroughly washed down prior to entering the site to reduce the risk of introducing weed species and pathogens. • Priority weed species should be targeted in accordance with the NSW DPI WeedWise recommended control measures (DPI 2019). • Any revegetation of disturbed areas should utilise a seed mix consisting of local provenance species that are typical of the vegetation in the study area. • Council should develop an induction plan to inform workers of appropriate safeguards to limit impacts on vegetation to be retained and to limit impacts on vegetation beyond the disturbance footprint.
TB2	Threatened fauna - general	• Modify the design where possible to retain hollow bearing trees. • Undertake pre-clearing assessment immediately prior to felling of any hollow-bearing trees to identify any resident fauna. Should fauna roosts/nests be identified during this survey, a qualified ecologist should be consulted to determine the appropriate course of action prior to any disturbance. • Felling of any hollow-bearing trees should be supervised by a qualified ecologist or fauna handler. • Hollow-bearing trees should be removed in a way that minimises the risk of harm to fauna (e.g. by clearing surrounding, non-hollow-bearing trees at least one day prior to removing hollow-bearing trees; and by bumping the tree several times to initiate evacuation of any fauna prior to felling). Hollows should be inspected for fauna after felling. • Retain, where possible, all felled hollow-bearing trees or hollow limbs on site or within adjacent vegetation to provide fauna habitat. • Any occupied nests located or any fauna which are inadvertently injured should be reported to WIRES or a similar organisation and relocated from the works area by a suitably qualified fauna handler.
TB3	Threatened fauna Gang-gang and Glossy Black Cockatoos	• Modify the design where possible to retain hollow bearing trees. • Targeted pre-dusk hollow-bearing tree watching surveys (1.5-person hours per tree) should be undertaken for the relevant cockatoo species, based on the time of year. ○ Gang gang Cockatoos breed between October and January

Reference	Environmental Aspect	Mitigation Measures
		○ Glossy Black Cockatoos breed between March and August • If there is no breeding pair present, the tree can be removed during the breeding season of the species surveyed for. • If there is a breeding pair, the tree will be retained with a 20 m buffer around it until the breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair. • Should works continue into the breeding season of the second species and clearing has not yet been undertaken, the tree must be checked for a breeding pair/s of the other species. If there is a breeding pair, the tree will be retained with a 20 m buffer around it until breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair. • Any clearing of trees that contain hollows must follow procedures specified in TB1 and TB2, above.

3.2 Aquatic Biodiversity

An assessment of aquatic biodiversity was undertaken to assess the condition of watercourses within the subject site, identify KFH areas on site or in the vicinity as well as identify any potential threatened aquatic fauna, specifically fish and invertebrates. Potential impacts have been identified and mitigation measures recommended.

3.2.1 Methodology

The assessment involved a desktop review to identify current records of aquatic species and habitat within the study area and surrounding catchments. This included searches of online databases and a review of available spatial data and literature relevant, including the following:

- Review of the FM Act, including determination of KFH
- Potential for the works to impact threatened species under the FM Act have also been considered
- Review of the WM Act and relevant requirements pertaining to Controlled Activity Approval
- KFH Mapping (NSW DPI)
- Consultation with the DPI in relation to determination of KFH
- Review of literature and species records.

A field survey was also undertaken in conjunction with the targeted flora surveys, with results and recommendations focusing on areas of mapped KFH, identified in two locations within the subject site.

3.2.2 Existing Environment

The proposed works cross 3 watercourses identified on 1:25,000 topographic mapping, ranging from 1st to 2nd order (Strahler classification). Two of these crossings are identified as KFH by DPI Fisheries mapping (**Figure 4**).

One of the objectives of the FM Act is to 'conserve key fish habitats'. However. the term 'key fish habitats' is not defined in the FM Act. The *Policy and guidelines for fish habitat conservation and management* (DPI, 2013) attempts to define and map KFH. In this case, two of the three watercourses

are mapped by the DPI as KFH. However, the Policy states that 1st and 2nd order streams on gaining streams are not considered KFH. Due to the contradiction between the mapping and the policy, consultation with DPI was undertaken. DPI have confirmed that as these streams are 1st and 2nd order streams, a permit under the FM Act will not be required.

The proposed works and waterway characteristics at the two crossings are described below.

Figure 4: KFH mapping (overridden by the Policy and guidelines for fish habitat conservation and management)

3.2.2.1 Crossing 1

The watercourse is a 1st order stream and with no mapped freshwater fish community status (Riches et al 2016). The creek is mapped as KFH approximately 250 m upstream of the crossing. Upstream and downstream of the creek has a sensitivity rating of Type 3 – *minimally sensitive key fish habitat* and a waterway classification of Class 4 – *unlikely key fish habitat*. The Policy (DPI, 2013) determines that this 1st order stream is not KFH.

The existing crossing of this creek is located at the northern end of the study boundary. There was a single pipe culvert beneath a bitumen road. The proposed work includes widening the road and extending the existing 900 mm pipe RCP by 4.88 m either side with a new pre-cast headwall and energy dissipator rock. Upstream, the creek was a grassy depression that had no water, aquatic vegetation or instream features (**Plate 3**). Downstream of the road, the channel was approximately 1.5 m wide, with gently sloped banks (**Figure 4**). It was dry, with no aquatic vegetation. The substrate consisted of compact fine sediment, with scattered boulders. The riparian vegetation along the reach was predominately grasses and sedges with *Cyperus* sp., *Phalaris* sp., *Rytidosperma* sp. and *Poa sieberiana*. *Rubus fruticosus* (Blackberry), the exotic shrub, was also present. *Eucalyptus* sp. was the dominate canopy species.

Plate 2: Facing upstream west of the road

Plate 3: Facing downstream east of the road

3.2.2.2 Crossing 2

This watercourse is a 2nd order stream with no mapped freshwater fish community status. It runs over the road, before flowing south alongside the road for approximately 340 m. The entirety of this stretch was assessed. There is approximately 400 m of mapped KFH upstream of where the creek crosses the road. Upstream and downstream of the creek has a sensitivity rating of Type 3 – *minimally sensitive key fish habitat* and a waterway classification of Class 4 – *unlikely key fish habitat*. The Policy (DPI, 2013) determines that this 1st order stream is not KFH.

Upstream of Burra Road, the creek is a wide grassy swale that overflows from the dam. There is no crossing under the road, and it appears the water would flow across the road in times of heavy rain. To the east of Burra Road, are planted Eucalyptus and Pine trees. There was no defined channel here, and the trees would disperse the run off from the road. Approximately 20 m to the east of these trees, a channel was created from the overflow of the dam to the north. This was predominately a grassy depression approximately 1.5 m wide, meandering through the paddock to the downslope dam (**Plate 4** and **Plate 5**). No aquatic flora or fauna was observed during the survey.

Plate 4: Downstream east of Burra Road, facing north

Plate 5: Downstream east of Burra Road, facing south

3.2.2.3 Threatened species

The Murrumbidgee Ecological Monitoring Programme (MEMP) has conducted fish surveys along the Queanbeyan River and Burra Creek since 2010 (GHD 2014). Both are downstream of the crossings. All fish species caught in Burra Creek have been exotic species, and the non-threatened *Galaxias olidus* (Mountain Galaxias) has been found in the Queanbeyan River.

As both creeks are ephemeral, and no instream habitat was present it is unlikely these fish would use the creeks or rely on them for habitat in times of flow. Burra Creek and the Queanbeyan River, downstream of both crossings offer better, more consistent habitat.

Historically, threatened species such as *Macquaria australica* (Macquarie Perch) may have been present in the catchment. However, this species has not been detected upstream of the dam on the Queanbeyan River since 2001 (Lintermans 2013). No threatened species are known to occur or are modelled near the site or in the broader catchment.

The Burra Creek and Queanbeyan River have been mapped as 'poor' and 'very poor' fish community status, respectively (Riches et al 2016). No other threatened aquatic invertebrates (e.g. dragonflies) have expected distributions in the region (DPI Primefact publications).

3.2.3 Impact

No threatened fish listed under the FM or EPBC Act are likely to occur near the crossings, therefore, the works would not directly impact threatened fish or their habitats.

Indirect impacts on downstream habitat may occur if mitigation measures are not in place and effective. Indirect impacts during construction include turbid water, sediment deposition, and oil and pollutant spills. These impacts can reduce water quality, decrease light penetration through the water column, and fill pools and cover hard substrate with sediment. This may alter primary (plant) and secondary (animal) production that supports or regulates the aquatic food web.

Works are unlikely to obstruct fish passage. **Table 3** provides mitigation measures to ensure that impacts are avoided or minimised.

3.2.4 Mitigation Measures

Table 3: Aquatic Biodiversity Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
AB1	Fish Passage - maintain and/or enhance	• New or replacement waterway crossings should be designed and constructed in accordance with the national guidelines entitled 'Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings' (Fairfull and Witheridge 2003). Crossings should be designed to allow adequate fish passage during operation (Fairfull 2013). The crossings are on *Class 3 – Minimal key fish habitat* and *Class 4 – Unlikely Key Fish Habitat.* Some key points of design are: ○ For waterway crossings incorporating culverts (including low flow culvert cells), a minimum of 300 mm of water should pool through the structure, with a centrally placed low-flow cell being preferable. ○ Waterway crossings should be constructed perpendicular to the flow of the water and should be positioned away from channel bends. ○ Crossings should not increase stream velocity for a given cross-section through the constriction of flow (through pipes or culverts) or lead to significant reductions in water depth. • The timing of works should coincide with low or no flow periods, if possible.

Reference	Environmental Aspect	Mitigation Measures
AB2	Indirect impacts on aquatic fauna – decreased water quality	• Develop a CEMP to address pollution and contamination issues, such as silt control and oil/fuel/chemical storage/spill management, which could arise during construction. • Install sediment fences to prevent fine material from entering the waterway. If working directly alongside a pool, install a floating boom with a silt curtain to capture fine material. • Stabilise exposed banks and earthworks around culverts to prevent erosion before vegetation or rock armour is established. This may include placing geofabric on bare soil beneath rock armour, coir logs along drainage lines and jute matting on proposed planting areas. • Avoid using contaminated fill and waste material (tyres, building rubble, etc) near waterways. • All temporary works, flow diversion barriers and in-stream sediment control barriers must be removed as soon as practicable and in a manner that does not promote future channel erosion. • The construction site should be left in a condition that actively promotes native revegetation and creek habitat.
AB3	Direct impacts on aquatic fauna – dewatering	• If dewatering of pools is required, engage a qualified aquatic ecologist to relocate fish and other aquatic fauna upstream.

3.3 Aboriginal Heritage

An Aboriginal Due Diligence Assessment was completed by ELA (2019) in accordance with the Due Diligence Code of Practice as set out in the Office of Environment and Heritage's *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (hereafter referred to as 'CoP') (DECCW 2010).

The principle aim of this assessment was to identify the likelihood of Aboriginal cultural heritage sites and/or objects being present within the area of the proposed works and, if so, whether the proposed works have the potential to harm those sites and/or objects.

3.3.1 Methodology

A desktop study of the area of proposed works was conducted to determine the likelihood of previously unrecorded Aboriginal artefacts or areas of Aboriginal archaeological sensitivity being present.

The Aboriginal Heritage Information Management System (AHIMS) is a database that retains information and records pertaining to the identified and recorded Aboriginal cultural heritage sites, objects, and declared places throughout New South Wales. It is maintained and regulated by OEH under Section 90Q of the NP&W Act.

A search of the AHIMS database was conducted on 20 February 2019, to determine if any registered Aboriginal sites are present within or in proximity to the study area.

Searches of the Australian Heritage Database, State Heritage Inventory and Queanbeyan LEP (2012) and the Palerang LEP (2014) were conducted on the 20 February 2019 to determine if any areas of Aboriginal heritage significance or European significance have been identified within proximity to the study area. The search terms "Burra" and "London Bridge" were used.

An extensive search of the relevant heritage registers and review of the available archaeological literature has enabled the development of a predictive model for the study area, aiding the identification of archaeologically sensitive areas and the most common site types which could be expected to be present. The predictive model is based on evidence from the surrounding region, including adjacent properties.

A visual inspection of the study area was undertaken by Alistair Grinbergs (Principal Heritage Consultant) and Elise Jakeman (Graduate Archaeologist) on 28 February 2019. The survey aimed to identify whether Aboriginal sites or objects are present and assess the archaeological potential of the study area.

3.3.2 Existing Environment

The desktop review indicated that several archaeological investigations have been undertaken in the Burra area, culminating in the recording of 86 Aboriginal cultural heritage sites in proximity to the present study area (Figure 5). These sites largely comprise of artefact scatters and isolated artefacts, although several Potential Archaeological Deposits (PADs) and culturally modified trees have also been recorded.

The study area contains landform elements that are typically regarded as archeologically sensitive, such as well drained lower slopes and slope terminations. It is very likely that this landscape was once utilised by Aboriginal communities. However, the site assessment did not identify any Aboriginal cultural heritage material.

The land comprised within the Burra Road study area has been extensively disturbed through historical vegetation clearance, installation of erosion and sediment controls, levelling of the road surface and the construction of road pavement. As a result, it is unlikely that either *in situ* surface or subsurface archaeological materials remain within the current road corridor.

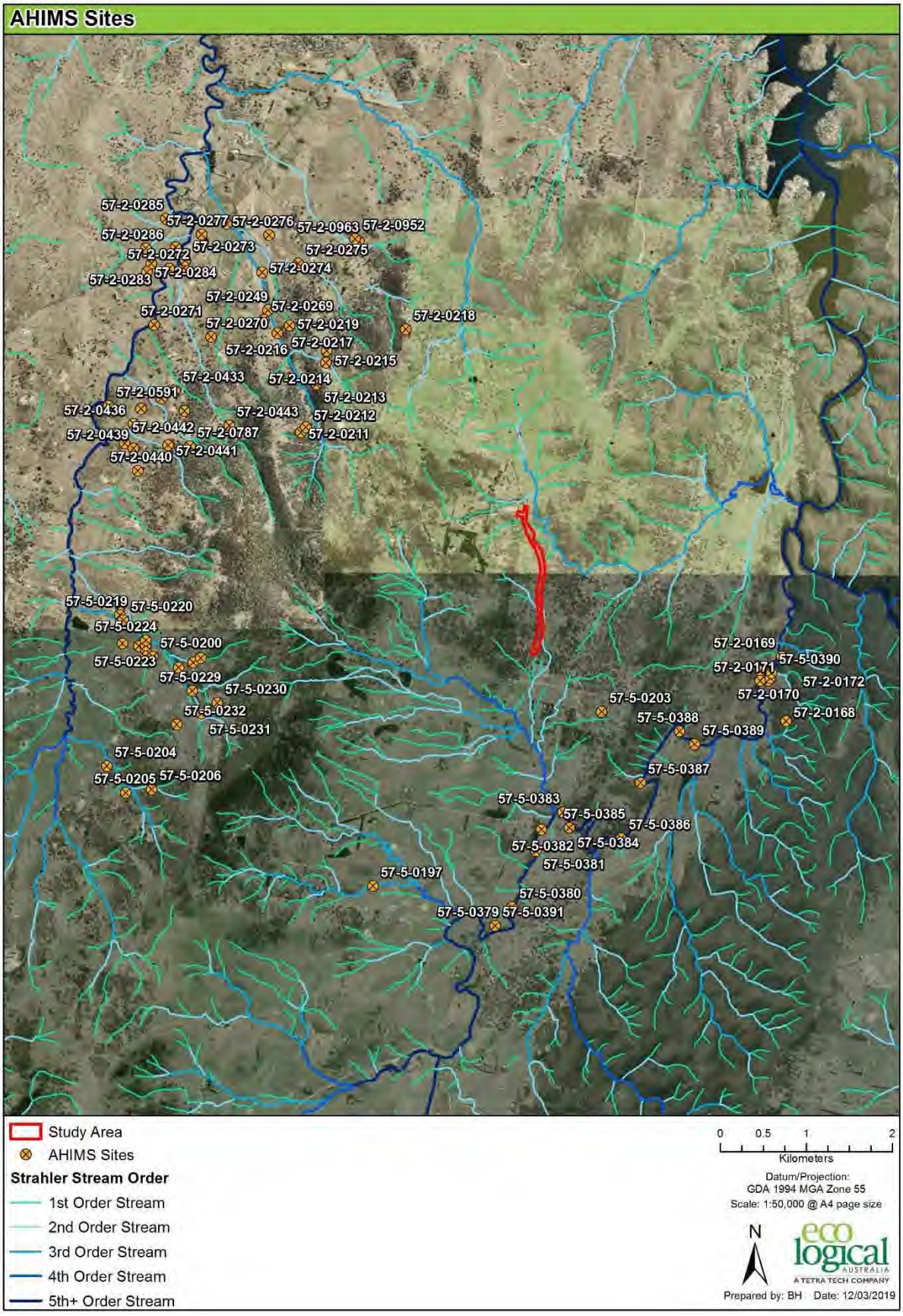

Figure 5: AHIMS registered sites within the vicinity of the study area

3.3.3 Impact

All Aboriginal cultural heritage sites, whether recorded or not, are protected under the NP&W Act. It is an offence to disturb or damage these sites without first having obtained an AHIP. Works or activities that could potentially disturb the ground surface include earthworks, building construction, services installation, repetitive vehicular movement, and landscaping. These works have the potential to disturb surface and *in situ* subsurface Aboriginal sites.

In this case, no Aboriginal sites are recorded within the study area on the AHIMS database. Similarly, no Aboriginal archaeological sites or other heritage items are recorded on these databases within or in proximity to the study area.

Based on the findings of the Due Diligence Assessment and the requirements of the NP&W Act, the following actions are recommended.

3.3.4 Mitigation Measures

Table 4: Aboriginal Heritage Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
AH1	Aboriginal Heritage	If suspected Aboriginal objects (such as stone artefacts or midden materials like faunal remains or shell) are encountered during development, all activities must cease in the affected area and an archaeologist contacted to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under Section 89A of the NP&W Act. Appropriate management and avoidance or approval under a Section 90 AHIP should be sought if the Aboriginal objects are to be moved or harmed.
AH2	Aboriginal Heritage	In the extremely unlikely event that human remains are found, all activities should immediately cease, and the New South Wales Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.

3.4 Non-Aboriginal Heritage

3.4.1 Existing Environment

The Australian Heritage Database was searched to identify any items of Commonwealth heritage significance that may occur in or near the subject site. This Database contains listings for the World Heritage List, Commonwealth Heritage List and the Register of the National Estate (non-statutory archive). The Googong Foreshores Cultural and Geodiversity Heritage Area, approximately 3 km to the east of the site is an important heritage area listed on the Commonwealth Heritage List. Given the distance from the subject site, works will not impact this heritage area.

The State Heritage Inventory was searched to identify items of state heritage significance that may occur in or near the project area. This inventory contains listings for the State Heritage Register and the Section 170 NSW State Agency Heritage Register. No historic heritage places were identified in the State Heritage Inventory. Similarly, no heritage places are listed or mapped within or in proximity to the subject site in the Palerang LEP Schedule 5 Environmental Heritage.

3.4.2 Impact

There are no places likely to be impacted by the proposed works given their distance from the project area.

It is unlikely that items of heritage significance will be uncovered during site works, however the following mitigation measure is provided for guidance.

3.4.3 Mitigation Measures

Table 5: Non-Aboriginal Heritage Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
NAH1	Previously unidentified heritage sites or places are discovered	If any suspected non-Aboriginal objects or sites are uncovered during construction, works near the find will cease immediately, and Council's representative will be notified.

3.5 Geology and Soils

3.5.1 Existing Environment

The topography of the study area is characterised by undulating to rolling low hills and alluvial fans on Silurian volcanics, with most of the study area located at elevations of 650 – 900 m.

3.5.1.1 Soil Landscapes

The study area is situated in the Canberra Lowlands, which falls within the South Eastern Highlands Bioregion. The soil and underlying geomorphology of the study area is characterised by the 'Burra' soil landscape profile (Jenkins 2000). Its geomorphology is comprised of the Colinton volcanics group and the Cappanana Formation, and includes various tuffs with minor siltstone, shale, sandstone, and limestone (Jenkins 2000:44). This soil landscape is classified as a transferral landscape, which has resulted from the accumulation of eroded parent materials washed downslope. Localised landscape limitations include strongly acidic soils with low available waterholding capacity, sheet erosion, and run-on (Jenkins 2000:44).

3.5.1.2 Acid Sulfate Soils

Inland Acid Sulfate Soils (ASS) occur on inland waterways, wetlands and drainage channels and develop in waterlogged, saline and anaerobic conditions. A review of the OEH Acid Sulfate Soil Risk Maps indicate that ASS have not been mapped within or in proximity to the subject site.

3.5.1.3 Contaminated Land

A search of the contaminated land record (NSW EPA) for the Palerang Council LGA identified no contaminated land sites within a 10 km radius of the subject site.

3.5.2 Impact

3.5.2.1 Construction

Impacts to soils and landscapes within the proposal footprint would primarily result from earthworks during the construction phase.

Excavation would remove vegetation that currently stabilises soils and would expose soils to weathering processes, increasing the risk of erosion and sedimentation. Removal of vegetation can expose the topsoil layer to erosive forces, including water and wind, which can induce erosion and subsequent loss of this valuable soil resource. Topsoil loss can reduce agricultural value and slow rehabilitation and the re-establishment of native ecosystems. Further to this, stockpiling of fill material or stripped topsoil could also be susceptible to wind and water erosion, if not placed in appropriate locations (outside drainage lines) and appropriately stabilised (covered or seeded).

Compaction of soils may occur because of machinery movement and parking, stockpiling of materials and soil (including imported fill). Compaction of soils can retard the natural regeneration of ground cover and adversely affect soil stability.

A rehabilitation plan would be developed for the works to ensure that disturbed areas are stabilised. It would include triggers for further management action if natural regeneration is not enough to stabilise surfaces.

During this process, there is potential to excavate contaminated material which may further impede natural regeneration. The works are unlikely to disturb acid sulphate soils, which are not mapped for the area.

The proposed works have the potential to introduce contaminants to soils via construction machinery. These include the following:

- Hydrocarbons, lubricants, oils or other chemical pollutants, particularly at the site compound where vehicle, machinery and other equipment may be stored.
- Spillage, dust or leachate from concrete or concrete wash.
- Water containing biological contaminants such as nutrients and bacteria from site toilets and taps.

Overall, short term risks to soils would be high, but localised. Known (demonstrated to be effective on similar projects) mitigation strategies are considered highly likely to be able to adequately address these risks. Medium to long term impacts would be low provided stabilisation strategies are effectively implemented. Stabilisation and revegetation would act to resist soil erosion to the same extent that existing vegetation now functions.

3.5.2.2 Operational

The proposal has the potential to increase the volume and velocity of runoff from the impermeable road surface following the sealing of the roadway.

This could result in localised erosion on the road sides if appropriate drainage structures are not constructed.

Post construction, the risk of soil and landform impacts, such as erosion, scouring or slumping, is considered low given the ability to stabilise and rehabilitate areas that were disturbed during construction.

3.5.3 Mitigation Measures

Table 6: Geology and Soils Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
GS1	Earthworks and excavation may result in increased erosion risk and sedimentation of waterways	• Ensure that any site access is stabilised to reduce tracking of sediment off site with approaches kept free of dust during works. • Minimise extent of disturbed area through appropriate staging and completion of works in shortest possible timeframe. • Topsoil stripping shall occur while soil is reasonably moist if possible. • Loads of soil and other erodible materials transported to and from the site to be kept covered at all times during transportation and remain covered until unloading for use or disposal at appropriate waste facility. • Excess spoil will be placed in stockpiles, reused on site or properly disposed of offsite. • Work areas to be watered as necessary particularly during dry and windy conditions. • Progressive rehabilitation and revegetation of disturbed areas to be undertaken during construction period to the greatest extent possible • Topsoil shall not be respread during high wind conditions.
GS2	Discovery of contaminated soil	• If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Council and/or EPA.
GS3	Soil contamination resulting from accidental spills	• A site-specific emergency spill plan will be developed.
GS4	Rehabilitation of disturbed areas	• A rehabilitation plan would be prepared for all areas disturbed by construction works proposal and would include the following: ○ Ensure areas disturbed during construction (including laydown areas and ancillary sites) are stabilised progressively during construction and restored back to original condition or re-vegetated with appropriate species (native in native dominated areas) as soon as practical. ○ Include monitoring to meet clear targets, regarding vegetation establishment and stabilisation of bare areas of soil.

3.6 Hydrology and Water Quality

3.6.1 Existing Environment

The proposed works cross 3 watercourses identified on 1:25,000 topographic mapping, ranging from 1st to 2nd order (Strahler classification) (**Figure 4**). All watercourses are in the catchment of the Queanbeyan River, which is located approximately 3 km to the east of the site. The Queanbeyan River is a perennial stream that is part of the Molonglo catchment within the Murray-Darling basin.

The watercourses identified within the subject site are mapped as Riparian lands or Watercourse on the Palerang LEP Riparian Lands and Watercourses Map and as such the provisions of Section 6.5 of the LEP should be considered.

The site is within the Sydney Drinking Water Catchment.

3.6.1.1 Flooding and Drainage

The subject site is characterised by undulating low hills and rises with most of the study area located at elevations of between 500 and 700 m above sea level. Flooding and drainage issues are present on site, particularly within the southern extent of the site associated with the mapped 2nd order watercourse. Upstream of Burra Road, the watercourse is a wide grassy swale that overflows from a dam. There is no crossing under the road, and it appears likely that water would flow across the road in times of heavy rain.

Minor localised flooding during large rain events is possible in and around the drainage lines that cross the site.

3.6.2 Impact

3.6.2.1 Construction

Impacts on water quality associated with the proposed works have the potential to occur during the construction phase within the subject site and downstream. Key risks relate to the generation and release of contaminated runoff to drainage lines and watercourses and include the following:

- Vegetation clearing, and exposure of soils could result in soil erosion through wind or stormwater action. Sediment could be transported into watercourses with indirect impacts on downstream environments including turbidity, sedimentation and increased nutrient loads.
- Accidental spill or leak of petrochemicals or other chemicals from the use and storage of vehicles, plant and machinery could occur on site. Such chemicals could pollute surface water.
- Solid waste including construction and general domestic waste, if not appropriately collected and disposed of could be released to the environment and watercourses.
- Loss of stockpiled material could occur through wind or stormwater action and transported to watercourses. Similarly, inappropriate placement of stockpiles and construction materials could result in impacts to watercourses.

These impacts can have implications for both aquatic ecosystem health and human health when considering potential effects on sensitive receiving environments downstream. Reduced water quality, decreased light penetration through the water column, filling pools and covering hard substrate with sediments may alter primary (plant) and secondary (animal) production that supports or regulates the aquatic food web.

Water quality impacts associated with construction works in and around watercourses can be mitigated with appropriate erosion and sediment controls, chemical and waste management procedures and appropriately sequenced construction. Activities and scheduling should be responsive to changing weather conditions.

A neutral or beneficial effect (NorBE) on water quality assessment was undertaken for the proposed works (refer **Appendix C**). The assessment concluded that while there would be risks of water quality

impacts during the construction of the proposal, the safeguards and mitigation measures proposed would contain water quality impacts to the site. The construction of the proposal would not lead to a long-term reduction in the quality of the water within the Sydney Drinking Water Catchment.

Impacts on water quality during construction can be minimised effectively with the diligent implementation of mitigation measures.

3.6.2.2 Operational

Operationally, the upgrade of Burra Road should not decrease water quality. Widening of the road pavement will result in a reduction / cessation of dust disturbance associated with regular vehicular use of the existing gravel shoulders. Furthermore, the proposal includes measures to clean out and upgrade drains and culverts, including the following:

- Extension of the existing Reinforced Concrete Pipes (RCP) drain pipes
- Addition of new culverts
- Replacement of some RCPs with those of a greater diameter
- New headwalls and energy dissipators.

The proposal is likely to have a beneficial impact on water quality, provided the recommendations in this report are adopted.

The proposal could result in an increase in the volume and rate of stormwater runoff due to an increase in impervious areas (i.e. widening of the road). Increased runoff has potential to result in scouring of adjacent areas and increased localised flooding. These impacts should be minimised through the appropriate design of roadside drainage system, including the addition of drainage infrastructure in areas where none currently exist and implementation of energy dissipating solutions, both engineered and natural revegetation.

The upgrade of drainage infrastructure will result in improvement to flooding and drainage, providing conveyance of water underneath the road in times of flow.

Consequently, the potential impacts on water quality and quantity associated with the proposal are expected to be minor, and the overall benefits from the proposed action on water quality in the Sydney Water Drinking Catchment are predicted to be beneficial (see **Appendix C**).

3.6.3 Mitigation Measures

Table 7: Hydrology and Water Quality Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
HWQ1	Loss of soil and sediment during construction	• Erosion and sediment control measures should be implemented prior to any construction works commencing and remain in place until exposed areas are rehabilitated and stabilised. Measures should include some or all the following: ○ Placement of geofabric on exposed banks before vegetation is established (and beneath rock armour) ○ Coir logs along drainage lines ○ Jute matting on proposed planting areas ○ Silt fencing downstream of the works ○ Silt curtains

Reference	Environmental Aspect	Mitigation Measures
		○ Temporary catch drains to divert clean run on water ○ Bunding around stockpiles ○ Sediment fences upslope of all drainage lines ○ ESC measures to be implemented in accordance with the CEMP, manufacturers specifications and appropriately maintained at regular intervals and following any rainfall and runoff events ○ Ground disturbance works including vegetation removal and earthworks to be scheduled or periods of dry weather and not during heavy rainfall events ○ Newly constructed batters to be stabilised as soon as practicable by topsoiling and sowing an appropriate cover crop ○ All spills or soil or other erodible material on sealed access routes or roadways to be immediately cleaned up and removed (by manual means where possible)
HWQ2	Accidental petrochemical spills during construction	• Petrochemicals or other chemicals to be stored in appropriate transportable storage containers, away from watercourses and drainage lines, flow paths. • Refuelling of plant and equipment to be undertaken away from watercourses and within areas appropriately bunded. • A spill kit to be kept onsite and staff trained in its use. • Equipment, machinery and vehicles should be regularly maintained (documented).
HWQ3	Flooding during construction	• A Flood Contingency Plan would be developed to manage the potential impacts of flooding on the construction site.
HWQ4	Loss of construction and domestic waste	• General solid waste to be collected and disposed of at Council Waste Transfer facilities. • Onsite portable toilets to be maintained and waste collected and properly disposed of by licensed contractor.

3.7 Air Quality

3.7.1 Existing Environment

The proposal site is in a rural area made up of large lot rural residential properties. The air quality in the locality would be generally expected to be of good quality. The existing Burra Road is sealed, however unsealed shoulders may currently generate some localised dust. Dust levels would be exacerbated by vehicle use and in dry windy conditions.

Emissions from motor vehicles would be the secondary source of air pollutants at the proposal site. The impact of this source is considered minimal due to the low population density and relatively low traffic volumes. Also, emissions from agricultural activities within the area may periodically affect air quality (slashing, ploughing, harvesting).

Smoke emissions from domestic fire places and from hazard reduction burns may also affect local air quality, particularly in autumn and winter.

3.7.2 Impact

3.7.2.1 Construction

During construction, temporary reductions in air quality are likely to occur due to elevated particulate matter from dust generating activities and exhaust emissions from diesel-powered construction equipment and include the following:

- Clearing and grubbing of vegetation
- Earthworks to widen and form the roadway including batter excavation and reshaping
- Vehicle movements to and from, and within the site
- Uncovered loads of materials during transportation
- Unloading materials from trucks and placement
- Aeolian transport from stockpiles (if any) during dry and windy conditions.

Significant impacts on sensitive receivers from elevated particulate matter and dust deposition are not anticipated given the location of the subject site in the rural zone and generally away from residences. Any impacts would be temporary and should only arise during dry weather with the wind blowing towards a receptor, at a time when dust is being generated and mitigation measures are not fully effective.

Similarly, relevant emissions generating activities include the general operation of plant equipment as well as stationary and idling local traffic because of the impositions of traffic controls to single lane availability. It is considered that the resulting additional exhaust emissions and associated odour from this activity will be negligible. This determination considered that any additional impacts are negligible when compared to the emissions associated with other activities in the locality i.e. agriculture as well as the existing use of the road.

3.7.2.2 Operation

The proposal involves the upgrade, including widening of an existing road. Operationally, this should result in the cessation of any dust disturbance associated with regular vehicular use of the existing unsealed road shoulders and therefore, improvements to local air quality.

3.7.3 Mitigation Measures

It is considered unlikely that the proposed works, or any resulting changes in traffic movements would have a significant impact on air quality, however mitigation measures are recommended in Table 16**Table 8**.

Table 8: Air Quality Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
AQ1	Construction air quality impacts – transportation	• Materials to be covered during transport to minimise dust emissions. • Stabilised and well-maintained site access to reduce tracking of sediment off site and to ensure approaches kept dust free.
AQ2	Erosion and sedimentation from exposed soils	• Refer to relevant measures in **Table 6.**
AQ3	Exhaust emissions	• Vehicles and machinery should not be left idling when not in use.

Reference	Environmental Aspect	Mitigation Measures
		• Equipment, machinery and vehicles should be regularly maintained (documented). • Traffic control measures implemented in accordance with Council's Traffic Management Plan (TMP) to minimise stationary idling vehicles.

3.8 Noise and Vibration

3.8.1 Existing Environment

The proposed works are situated within a rural residential setting with the surrounding areas primarily used for large lot living and equine purposes. Generally, this land use would not create substantial background and ambient noise within the local area. The main source of noise at the site would typically be from traffic and possibly from agricultural activities such as the use of farm machinery.

Sensitive land uses within the vicinity include residences located within large lot properties. A review of aerial imagery indicates that four residences are in proximity to the west of Burra Road and five to the east. The existing background noise and vibration levels in these areas would be generally typical of a rural area and natural noise sources, with some influence by traffic on the existing Burra Road.

There are no other sensitive receivers (residences, schools, churches, hospitals etc.) within 200 m of the study area.

While the subject site already includes elevated noise levels in association with traffic noise from Burra Road, there will be temporary increases in noise emissions during construction operations.

3.8.2 Impact

Given the land use of the surrounding area, and the linear nature of the activity and progression of works along the corridor, the impacts resulting from noise and vibration during the construction phase are expected to be minimal and temporary. While the proposal may result in some minor short-term noise impacts to these properties and residents, in the long term the impacts associated with the proposed road upgrade are positive. Attenuation effects of soft ground and existing vegetation have been considered and will assist with amelioration of noise and vibration impacts.

3.8.2.1 Construction Noise

Rural residential properties located on Burra Road are likely to be the closest sensitive receivers during the proposed works. The closest residential property is located about 40 m from the subject site. These residences may be affected by noise from plant and machinery (performing site works as well as a general increase in traffic movements of plant, machinery and personnel vehicles) for the duration of the proposed works.

The NSW 'Interim Construction Noise Guideline' (ICNG, DECC 2009) sets out the Noise Management Level (NML) for residences (**Table 9**). The Rating Background Level (RBL) is used when determining the management level. The RBL is the overall single-figure background noise level. Residential receivers are considered 'noise affected' where construction noise levels are greater than the noise levels identified below.

Table 9: Noise Management Levels (NML)

Time of day	Management Level
Recommended Standard Hours:	Noise affected RBL + 10dB(A)
Monday to Friday 7 a.m. - 6 p.m. **Saturdays 8 a.m. – 1 p.m.**	Highly noise affected 75dB(A)
Outside recommended standard hours	Noise affected RBL + 5dB(A)

Given that the closest receiver is located within a rural setting, the RBL for the area surrounding the proposal is assumed to be a minimum of 30dB(A). This is a conservative assumption and the lowest allowable level, as described in the NSW Noise Policy for Industry (2017).

Using the RBL of 30dBA(A), the construction noise management level for the closest receiver will be 40dB(A). Given the construction works would be carried out during standard construction hours, only the daytime period is assessed.

Noise modelling was not undertaken as part of this assessment. Review of past noise modelling done for the Charleyong Bridge REF (RMS 2016) indicated that plant equipment would exceed the construction management noise level at the closest receiver. No receiver was predicted to be highly noise affected, as all predicted levels were below 75dB(A).

Given these past findings in the same noise environment as that currently present in and around the study area, it is recommended that a 'feasible and reasonable" approach towards noise management measures be applied to reduce noise levels as much as possible for the closest receiver. No other receivers are considered likely to be affected by construction noise.

3.8.2.2 Construction Vibration

For disturbance to human occupants of buildings, NSW EPA's 'Assessing Vibration; a technical guideline' (DECC 2006) provides the relevant criteria. It is based on the British Standard BS 6472-1992, 'Evaluation of human exposure to vibration in buildings (1-80Hz)'.

For damage to structures due to construction generated vibration, vibration limits are established in accordance with the German Standard DIN 4150 Part 3-1999 'Structural Vibration in Buildings – Effects on Structures'.

The vibration levels during construction would vary depending on the type of activity being carried out. Construction equipment most likely to cause significant vibration includes:

- Excavators / graders
- Compactors
- Vibratory rollers
- Truck traffic.

The above equipment would generally operate no closer than about 50 m from the closest receiver during work except for one residence approximately 40 m from existing Burra Road. Due to this distance, the risk of structural damage during construction is generally assessed as being very low. In general, the risk of structural damage during construction is generally assessed as being very low with

the risk of human disturbance also low. Specific recommendations have been provided to minimise impact to the residences nearby and it is recommended that the previously listed noise and vibration guidelines be consulted in preparation of the CEMP.

3.8.2.3 Operational Noise and Vibration

The proposal may result in a slight increase in the volume of traffic. However, a quieter pavement will be achieved through the combined effect of a wider and smoother pavement.

3.8.3 Mitigation Measures

Table 10: Noise and Vibration Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
NV1	Elevated noise levels during construction	• Hours of work limited to specified hours (Monday to Friday between 6:30 a.m. and 5:30 p.m. and Saturday 6:30 a.m. and 2 p.m. • Vehicles and machinery should not be left idling when not in use • Equipment, machinery and vehicles should be regularly maintained (documented). • Well planned site layout to ensure where practical that noisy plant and machinery and overnight parking locations are located away from nearby residences with reversing also minimised in these locations. • Community consultation and notification for potentially noise affected residences detailing timing of noisy activities. • Mechanism to provide noise complaints using signage and usage of a complaints register with relevant triggers for noise monitoring if required.

3.9 Traffic and Safety

3.9.1 Existing Environment

The road network near the subject site consists generally of Burra Road which is approximately 20 km in length. It is a through road commencing at the Old Cooma Road intersection that heads in a southerly direction to Michelago, providing connection to the Monaro Highway. It represents an important route for local traffic from these areas to access rural residential areas such as Urila, Williamsdale and Little Burra. The section of road to be upgraded is known as Burra 's' Bends due to its winding path. Burra Road is Council controlled and is used predominantly by local rural residents, commuters and tourists. The Googong Foreshore reserve to the east of the site is accessible from Burra Road and attracts mostly local and recreational visitors all year round.

3.9.2 Impact

3.9.2.1 Construction

Negative impacts on traffic would be restricted to inconveniences associated with traffic control measures during the construction activities and impacts associated with construction noise and increase in construction traffic.

3.9.2.2 Operational

The impacts of the proposal on community safety will be positive. The proposed works will enhance the road network and improve road safety.

Community safety gains associated with the proposal relate primarily to the realigned, widened and resurfaced road. More specifically, vertical alignment changes will improve sight and stopping distances, horizontal alignment changes will remove / improve sharp curves and improve sight and the wider pavement will provide safer access and egress onto the road shoulder.

The upgrade will also reduce the risk associated with failure of existing drainage infrastructure at waterway crossings, and flooding in areas currently devoid of drainage infrastructure.

3.9.3 Mitigation Measures

Table 11: Traffic and Community Safety Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
TCS1	Increased heavy vehicle traffic and lane closures may disrupt traffic movement and access on local roads	• Ensure that a best practice TMP is prepared prior to works commencing to ensure traffic is safely managed and that residents with local properties continue to have road access during the implementation of the proposal. • Ensure all workers adhere to relevant OH&S standards and provide workers compensation insurance. • Construction traffic movements associated with the proposal will be kept to the minimum necessary to efficiently and safely implement the proposal. • Traffic impacts in association with the proposal will be restricted to the hours of construction, which would be undertaken between 6:30 a.m. to 5:30 p.m. Monday to Friday and Saturday 6:30 a.m. to 2 p.m. with no work on Sundays or public holidays. • Consultation with residents regarding access, closures and work scheduling prior to works commencing.

3.10 Visual Amenity and Landscape

3.10.1 Existing Environment

The study area is situated in the undulating Canberra Lowlands, which falls within the South Eastern Highlands Bioregion. The study area and surrounds are a rural residential landscape with scenic values typical of much of the Burra area and other rural areas in the Lowlands. Much of the vegetation in the wider landscape has been cleared and exotic vegetation species associated with agricultural and pastoral cultivation have been introduced. Where remnant vegetation is extant, it is characterised by woodland species (Jenkins 2000:44).

The original construction of Burra Road and subsequent maintenance activities have required the lower slope landform to be cut and benched, resulting in severe ground displacement. Drainage lines have been created to prevent erosion and assist in the removal of excess water however, there is still evidence of substantial soil movement in places where natural drainage channels have formed. The road batters have been affected similarly.

The eastern verge of Burra Road is heavily grassed and vegetated by a dense mixture of native and introduced exotic species, serving as screening for the adjacent properties. The western verge comprises more native vegetation.

3.10.2 Impact

3.10.2.1 Construction

Proposed works have the potential to result in a minor decline in visual amenity of the subject site and subject area due to the presence of the construction site itself. Untidy work practices, cleared vegetation, haphazard storage of machinery and areas of bare earth all contribute to a reduction in visual amenity. However, it is considered unlikely that the decline in visual amenity at the site-specific scale would extend to a decline in the broader landscape.

3.10.2.2 Operational

Proposed works will result in an improvement to visual amenity upon completion of the construction and rehabilitation works. The following may assist in improving visual amenity:

- Formalisation of the road and adjacent road edges will remove gravel and road side disturbances thereby improving the overall appearance of the road corridor.
- Implementation of natural rehabilitation to reduce visual intrusiveness of the road corridor.
- Implementation of engineered road infrastructure and furniture, particularly in areas of erosion, bank cutting, scour will improve amenity in these locations.

Furthermore, the removal of existing drainage infrastructure and replacement with culverts will see an improvement in visual amenity at creek crossings and provides an opportunity to revegetate exposed waterway banks and bare earth adjacent to new culverts with natural rehabilitation techniques, minimising hard engineered solutions where possible. Where hard solutions are required, consideration of a combined approach i.e. pocket planting within rock armouring, is preferred.

3.10.3 Mitigation Measures

Table 12: Visual Amenity and Landscape Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
VAL1	Construction stage decline in visual amenity	• Maintain tidy work practices with the site kept clean of general litter. Refer to measures relating to waste management mitigation measures. • All disturbed areas shall be rehabilitated and maintained until established.
VAL2	Operational decline in visual amenity	• Design should incorporate soft approaches to rehabilitation of construction footprint as follows: o Hydro mulching and/or revegetation of roadside batters depending on slope o Native revegetation of disturbed watercourse banks and areas exposed around new drainage infrastructure o Where soft approaches are not adequate in providing stabilisation, it is recommended that a combined approach be considered i.e. pocket planting within rock armouring. • Adopting the recommendations of the Aquatic and Terrestrial Biodiversity sections will naturally result in improved visual amenity.

3.11 Socio Economic

3.11.1 Existing Environment

Whilst the population of the rural residential area between Burra and Googong is not high, it is assumed that there is high dependency on local travel by car given the rural land uses and lack of public transportation. It is also known that Burra Road is used by recreational users and tourists accessing the Googong Foreshore reserve and travelling throughout the region.

3.11.2 Impact

3.11.2.1 Construction

The proposed road upgrade will have a temporary, negative impact on Burra Road and the residents who use the road regularly, as well as additional intermittent users; resulting from traffic management delays and noise, air quality and visual amenity impacts.

On the contrary, some local expenditure would occur during the construction phase potentially resulting in some economic benefit to the local community. This may be through the contracting and purchasing of local supplies and services as well as ad hoc visitation to local businesses by project employees and site personnel.

3.11.2.2 Operational

The proposed road upgrade will have a long term positive socio-economic impact, including but limited to the following benefits:

- Increasing local and regional tourism expenditure, through provision of a safe road connection to tourist areas.
- Providing an improved bus stop and bus parking area at the corner of London Bridge Road.
- Decreasing maintenance costs to Council and ratepayers – the existing pavement is near the end of its serviceable life and therefore, current maintenance costs are high.
- Decreasing vehicle operating maintenance costs – the existing surface is uneven and is hard on vehicles in places with particularly severe eroded edges. The widened pavement will go a long way in eliminating these problems and hence wear and tear on vehicles.
- Decreasing public and personal costs associated with road accidents, including the provision of emergency services, medical treatment, insurance, vehicle repairs and road and road furniture repair and replacement.

3.11.3 Mitigation Measures

Table 13: Socio-economic

Reference	Environmental Aspect	Mitigation Measures
SE1	Traffic delays	• The proposed works should be undertaken outside of the peak summer season and holiday periods. • Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels. • Development of TMP.

3.12 Energy and Climate Change

3.12.1 Impact

During the construction period, energy consumption will occur in association with the use of vehicles, plant and machinery. This energy use is negligible in the context of the energy use elsewhere in the locality. Despite this, it can be further mitigated by implementing the mitigation measures identified below.

3.12.2 Mitigation Measures

Table 14: Energy use and Climate Change

Reference	Environmental Aspect	Mitigation Measures
ECC1	Increased energy consumption and production of emissions	• Vehicles, plant and machinery should be kept in good working order and used in an efficient manner. Vehicles should not be left idling when not in use.

3.13 Waste Management

3.13.1 Impact

The proposed works are not expected to generate a significant volume of waste. However, some may be produced during the construction phase, potentially including:

- Construction packaging materials
- Domestic waste
- Excess spoil from earthworks
- Vegetation waste form clearing of vegetation
- Liquid wastes from cleaning, repairing and/or maintaining heavy construction equipment.

No impact further impact is expected to occur during the operational phase, provided the site is managed in accordance with the waste management procedures set out in the CEMP and all waste is removed.

3.13.2 Mitigation Measures

Table 15: Waste Management

Reference	Environmental Aspect	Mitigation Measures
WM1	Generation of construction waste	• Cleared vegetation to be mulched and used for site rehabilitation where possible. • Spoil excavated from the site to be used on site where possible. • Implementation of waste management strategy documented within the CEMP. The strategy should include details of the type of waste material likely to be generated, and how it would be managed (including sorting, storage and disposal), materials to be recycled, as well as measures to reduce or avoid waste generation.

3.14 Cumulative Impacts

Clause 228(2) of the EPA&A Regulations requires that cumulative impacts of the proposed works with other existing or planned future activities are considered.

The potential negative impacts identified by this report are unlikely to have significant effects at the local or regional scale since they will be minor and site-specific. The small-scale potential impacts are not envisaged to have substantial adverse effects on the environment including threatened and migratory species, cultural heritage, microclimate, greenhouse gas emissions, air, water, or soils or the community, as work practices will be implemented to protect such values.

The upgrade of Burra Road is one part of a broader roads project in the area, being delivered by the Council. Given that the Council are responsible for associated projects, it is assumed that works have been appropriately scheduled to minimise any effects of the proposal on other projects occurring or set to occur in the area. However, there remains potential for other local and/or regional development projects to occur in the vicinity which may lead to cumulative impacts.

Prior to construction works, the Council should confirm that other local development near the works would not coincide with the proposed development; and if such occurs, ensure that they can occur simultaneously without further impacts. It is also recommended that due consideration is given to these projects when determining the CEMP, particularly with respect to traffic movement and access.

4. Environmental Management

4.1 Environmental Management Plan

A CEMP will be prepared by the construction contractor, to include all the mitigation measures listed in this REF, as well as any relevant conditions under any permits, licenses or other approvals obtained for the project.

4.2 Summary of Proposed Mitigation Measures

Environmental mitigation measures relating to each of the aspects considered in this REF are summarised in **Table 16**.

Table 16: Summary of Proposed Mitigation Measures

Reference	Environmental Aspect	Mitigation Measures
TB1	Threatened flora and vegetation communities	• Avoid further clearing and modification, wherever possible, of all native vegetation. • The limits of the corridor of works (disturbance footprint) should be clearly marked (for example, using temporary fencing or bunting) to ensure site disturbance occurs only within the designated works areas and is not unnecessarily extended. • Material stockpile and equipment storage areas should be restricted to existing disturbed areas. • Vegetation clearing should be undertaken in a manner to avoid damage to adjacent vegetation. • Fallen logs and felled tree trunks should be retained on site and used in rehabilitation works on or off site. The remaining portions of felled trees (e.g. upper branches and leaves) should be mulched/chipped and used in erosion mitigation and/or revegetation works. • Vehicle movements should be confined to the disturbance footprint. • Machinery coming from outside the works area should be thoroughly washed down prior to entering the site to reduce the risk of introducing weed species and pathogens. • Priority weed species should be targeted in accordance with the NSW DPI WeedWise recommended control measures (DPI 2019). • Any revegetation of disturbed areas should utilise a seed mix consisting of local provenance species that are typical of the vegetation in the study area. • Council should develop an induction plan to inform workers of appropriate safeguards to limit impacts on vegetation to be retained and to limit impacts on vegetation beyond the disturbance footprint.
TB2	Threatened fauna - general	• Modify the design where possible to retain hollow bearing trees. • Undertake pre-clearing assessment immediately prior to felling of any hollow-bearing trees to identify any resident fauna. Should fauna roosts/nests be identified during this survey, a qualified ecologist should be consulted to determine the appropriate course of action prior to any disturbance. • Felling of any hollow-bearing trees should be supervised by a qualified ecologist or fauna handler. • Hollow-bearing trees should be removed in a way that minimises the risk of harm to fauna (e.g. by clearing surrounding, non-hollow-bearing trees at least one day prior to removing hollow-bearing trees; and by

Reference	Environmental Aspect	Mitigation Measures
		bumping the tree several times to initiate evacuation of any fauna prior to felling). • Retain, where possible, all felled hollow-bearing trees or hollow limbs on site or within adjacent vegetation to provide fauna habitat. • Any occupied nests located or any fauna which are inadvertently injured should be reported to WIRES or a similar organisation and relocated from the works area by a suitably qualified fauna handler.
TB3	Threatened fauna Gang-gang and Glossy Black Cockatoos	• Modify the design where possible to retain hollow bearing trees. • Targeted pre-dusk hollow-bearing tree watching surveys (1.5-person hours per tree) should be undertaken for the relevant cockatoo species, based on the time of year. o Gang gang Cockatoos breed between October and January o Glossy Black Cockatoos breed between March and August • If there is no breeding pair present, the tree can be removed during the breeding season of the species surveyed for. • If there is a breeding pair, the tree will be retained with a 20 m buffer around it until the breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair. • Should works continue into the breeding season of the second species and clearing has not yet been undertaken, the tree must be checked for a breeding pair/s of the other species. If there is a breeding pair, the tree will be retained with a 20 m buffer around it until breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair. • Any clearing of trees that contain hollows must follow procedures specified in TB1 and TB2, above.
AB1	Fish Passage - maintain and/or enhance	• New or replacement waterway crossings should be designed and constructed in accordance with the national guidelines entitled 'Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings' (Fairfull and Witheridge 2003). Crossings should be designed to allow adequate fish passage during operation (Fairfull 2013). The crossings are on *Class 3 – Minimal key fish habitat* and *Class 4 – Unlikely Key Fish Habitat.* Some key points of design are: o For waterway crossings incorporating culverts (including low flow culvert cells), a minimum of 300 mm of water should pool through the structure, with a centrally placed low-flow cell being preferable. o Waterway crossings should be constructed perpendicular to the flow of the water and should be positioned away from channel bends. o Crossings should not increase stream velocity for a given cross-section through the constriction of flow (through pipes or culverts) or lead to significant reductions in water depth. • The timing of works should coincide with low or no flow periods, if possible.
AB2	Indirect impacts on aquatic fauna – decreased water quality	• Develop a CEMP to address pollution and contamination issues, such as silt control and oil/fuel/chemical storage/spill management, which could arise during construction.

Reference	Environmental Aspect	Mitigation Measures
		• Install sediment fences to prevent fine material from entering the waterway. If working directly alongside a pool, install a floating boom with a silt curtain to capture fine material. • Stabilise exposed banks and earthworks around culverts to prevent erosion before vegetation or rock armour is established. This may include placing geofabric on bare soil beneath rock armour, coir logs along drainage lines and jute matting on proposed planting areas. • Avoid using contaminated fill and waste material (tyres, building rubble, etc) near waterways. • All temporary works, flow diversion barriers and in-stream sediment control barriers must be removed as soon as practicable and in a manner that does not promote future channel erosion. The construction site should be left in a condition that actively promotes native revegetation and creek habitat.
AB3	Direct impacts on aquatic fauna – dewatering	• If dewatering of pools is required, engage a qualified aquatic ecologist to relocate fish and other aquatic fauna upstream.
AH1	Aboriginal Heritage	• If suspected Aboriginal objects (such as stone artefacts or midden materials like faunal remains or shell) are encountered during development, all activities must cease in the affected area and an archaeologist contacted to assess the finds. If the finds are found to be Aboriginal objects, the OEH must be notified under Section 89A of the NP&W Act. Appropriate management and avoidance or approval under a Section 90 AHIP should be sought if the Aboriginal objects are to be moved or harmed.
AH2	Aboriginal Heritage	• In the extremely unlikely event that human remains are found, all activities should immediately cease, and the New South Wales Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.
AH3	Aboriginal Heritage	• In the extremely unlikely event that human remains are found, all activities should immediately cease, and the New South Wales Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.
NAH1	Previously unidentified heritage sites or places are discovered	• If any suspected non-Aboriginal objects or sites are uncovered during construction, works near the find will cease immediately, and Council's representative will be notified.
GS1	Earthworks and excavation may result in increased erosion risk and sedimentation of waterways	• Ensure that any site access is stabilised to reduce tracking of sediment off site with approaches kept free of dust during works. • Minimise extent of disturbed area through appropriate staging and completion of works in shortest possible timeframe. • Topsoil stripping shall occur while soil is reasonably moist if possible. • Loads of soil and other erodible materials transported to and from the site to be kept covered at all times during transportation and remain covered until unloading for use or disposal at appropriate waste facility. • Excess spoil will be placed in stockpiles, reused on site or properly disposed of offsite. • Work areas to be watered as necessary particularly during dry and windy conditions.

Reference	Environmental Aspect	Mitigation Measures
		• Progressive rehabilitation and revegetation of disturbed areas to be undertaken during construction period to the greatest extent possible • Topsoil shall not be respread during high wind conditions.
GS2	Discovery of contaminated soil	• If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with Council and/or EPA.
GS3	Soil contamination resulting from accidental spills	• A site-specific emergency spill plan will be developed.
GS4	Rehabilitation of disturbed areas	• A rehabilitation plan would be prepared for all areas disturbed by construction works proposal and would include the following: o Ensure areas disturbed during construction (including laydown areas and ancillary sites) are stabilised progressively during construction and restored back to original condition or re-vegetated with appropriate species (native in native dominated areas) as soon as practical. o Include monitoring to meet clear targets, regarding vegetation establishment and stabilisation of bare areas of soil.
HWQ1	Loss of soil and sediment during construction	• Erosion and sediment control measures should be implemented prior to any construction works commencing and remain in place until exposed areas are rehabilitated and stabilised. Measures should include some or all the following: o Placement of geofabric on exposed banks before vegetation is established (and beneath rock armour) o Coir logs along drainage lines o Jute matting on proposed planting areas o Silt fencing downstream of the works o Silt curtains o Temporary catch drains to divert clean run on water o Bunding around stockpiles o Sediment fences upslope of all drainage lines o ESC measures to be implemented in accordance with the CEMP, manufacturers specifications and appropriately maintained at regular intervals and following any rainfall and runoff events o Ground disturbance works including vegetation removal and earthworks to be scheduled or periods of dry weather and not during heavy rainfall events o Newly constructed batters to be stabilised as soon as practicable by topsoiling and sowing an appropriate cover crop • All spills or soil or other erodible material on sealed access routes or roadways to be immediately cleaned up and removed (by manual means where possible)
HWQ2	Accidental petrochemical spills during construction	• Petrochemicals or other chemicals to be stored in appropriate transportable storage containers, away from watercourses and drainage lines, flow paths. • Refuelling of plant and equipment to be undertaken away from watercourses and within areas appropriately bunded.

Reference	Environmental Aspect	Mitigation Measures
		• A spill kit to be kept onsite and staff trained in its use. • Equipment, machinery and vehicles should be regularly maintained (documented).
HWQ3	Flooding during construction	• A Flood Contingency Plan would be developed to manage the potential impacts of flooding on the construction site.
HWQ4	Loss of construction and domestic waste	• General solid waste to be collected and disposed of at Council Waste Transfer facilities. • Onsite portable toilets to be maintained and waste collected and properly disposed of by licensed contractor.
AQ1	Construction air quality impacts – transportation	• Materials to be covered during transport to minimise dust emissions. • Stabilised and well-maintained site access to reduce tracking of sediment off site and to ensure approaches kept dust free.
AQ2	Erosion and sedimentation from exposed soils	• Refer to relevant measures in **Table 6.**
AQ3	Exhaust emissions	• Vehicles and machinery should not be left idling when not in use. • Equipment, machinery and vehicles should be regularly maintained (documented). • Traffic control measures implemented in accordance with Council's TMP to minimise stationary idling vehicles.
NV1	Elevated noise levels during construction	• Hours of work limited to specified hours (Monday to Friday between 6:30 a.m. and 5:30 p.m. and Saturday 6:30 a.m. and 2 p.m. • Vehicles and machinery should not be left idling when not in use. • Equipment, machinery and vehicles should be regularly maintained (documented). • Well planned site layout to ensure where practical that noisy plant and machinery and overnight parking locations are located away from nearby residences with reversing also minimised in these locations. • Community consultation and notification for potentially noise affected residences detailing timing of noisy activities. • Mechanism to provide noise complaints using signage and usage of a complaints register with relevant triggers for noise monitoring if required.
TCS1	Increased heavy vehicle traffic and lane closures may disrupt traffic movement and access on local roads	• Ensure that a best practice TMP is prepared prior to works commencing to ensure traffic is safely managed and that residents with local properties continue to have road access during the implementation of the proposal. • Ensure all workers adhere to relevant OH&S standards and provide workers compensation insurance. • Construction traffic movements associated with the proposal will be kept to the minimum necessary to efficiently and safely implement the proposal. • Traffic impacts in association with the proposal will be restricted to the hours of construction, which would be undertaken between 6:30 a.m. to 5:30 p.m. Monday to Friday and Saturday 6:30 a.m. to 2 p.m. with no work on Sundays or public holidays. • Consultation with residents regarding access, closures and work scheduling prior to works commencing.

Reference	Environmental Aspect	Mitigation Measures
VAL1	Construction stage decline in visual amenity	• Maintain tidy work practices with the site kept clean of general litter. Refer to measures relating to waste management mitigation measures. • All disturbed areas shall be rehabilitated and maintained until established.
VAL2	Operational decline in visual amenity	• Design should incorporate soft approaches to rehabilitation of construction footprint as follows: o Hydro mulching and/or revegetation of roadside batters depending on slope. o Native revegetation of disturbed watercourse banks and areas exposed around new drainage infrastructure. o Where soft approaches are not adequate in providing stabilisation, it is recommended that a combined approach be considered i.e. pocket planting within rock armouring. • Adopting the recommendations of the Aquatic and Terrestrial Biodiversity sections will naturally result in improved visual amenity.
SE1	Traffic delays	• The proposed works should be undertaken outside of the peak summer season and holiday periods. • Undertake early community engagement, early notification / advertisement of construction period through both local and regional channels. • Development of TMP.
ECC1	Increased energy consumption and production of emissions	• Vehicles, plant and machinery should be kept in good working order and used in an efficient manner. Vehicles should not be left idling when not in use.
WM1	Generation of construction waste	• Cleared vegetation to be mulched and used for site rehabilitation where possible. • Spoil excavated from the site to be used on site where possible. • Implementation of waste management strategy documented within the CEMP. The strategy should include details of the type of waste material likely to be generated, and how it would be managed (including sorting, storage and disposal), materials to be recycled, as well as measures to reduce or avoid waste generation.

5. Conclusion

This REF has identified and assessed the potential impacts of the proposal to upgrade approximately 1.7 km of Burra Road, between Little Burra Road and London Bridge Road. The long-term operational impacts of the proposed works are expected to be positive as road safety and the road network will be improved for road users.

After consideration of the outcomes of the field investigations and analyses undertaken for this report, the identified impacts of the proposal are unlikely to have a significant impact on Aboriginal cultural heritage, threatened flora and threatened ecological communities. Further, KFH is not present within the study area. However, the loss of hollow bearing habitat trees providing known breeding habitat for the Gang-gang and/or Glossy Black Cockatoos (threatened fauna under the BC Act), may constitute a significant impact. To ensure that the proposal does not result in a significant impact and require an SIS/BDAR, it is recommended that:

- Potential breeding trees are removed outside of the respective breeding seasons; or
- During the respective breeding seasons, targeted pre-dusk hollow-bearing tree watching surveys are undertaken for the relevant cockatoo species, and:
    - If there is no breeding pair present, the tree can be removed during the breeding season of the species surveyed for.
    - If there is a breeding pair, the tree will be retained with a 20 m buffer around it until the breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair.
    - Should works continue into the breeding season of the second species and clearing has not yet been undertaken, the tree must be checked for a breeding pair of the other species. If there is a breeding pair, the tree will be retained with a 20 m buffer around it until breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair.
- Any clearing of trees that contain hollows must also follow the procedures specified in **Table 16**, specifically in relation to supervision of clearing by a qualified ecologist or fauna handler and with consideration given to the retention of felled hollow-bearing trees or hollow limbs on site or within adjacent vegetation.

Other environmental impacts identified and addressed in this REF are unlikely to have a significant adverse impact provided that the mitigation measures set out in **Section 4.2** are adopted, and the proposal is implemented as described in **Section 1.3**. It is recommended that all mitigation measures are incorporated into the site-specific CEMP and adopted for the duration of works, or longer as required.

6. References

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Appendix A Detailed Design

QUEANBEYAN-PALERANG REGIONAL COUNCIL
BURRA ROAD, BURRA

RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD

DRAWING INDEX

ORIGINAL A3 SHEET
100mm
0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
COVER SHEET & DRAWING SCHEDULE

SCALE:
FILE: PN11585 A3– 546374_4A
ACAD: 11585A19–1 CCAD: 11585A19–2
DRN: AL CHK: AL
SHEET 1 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

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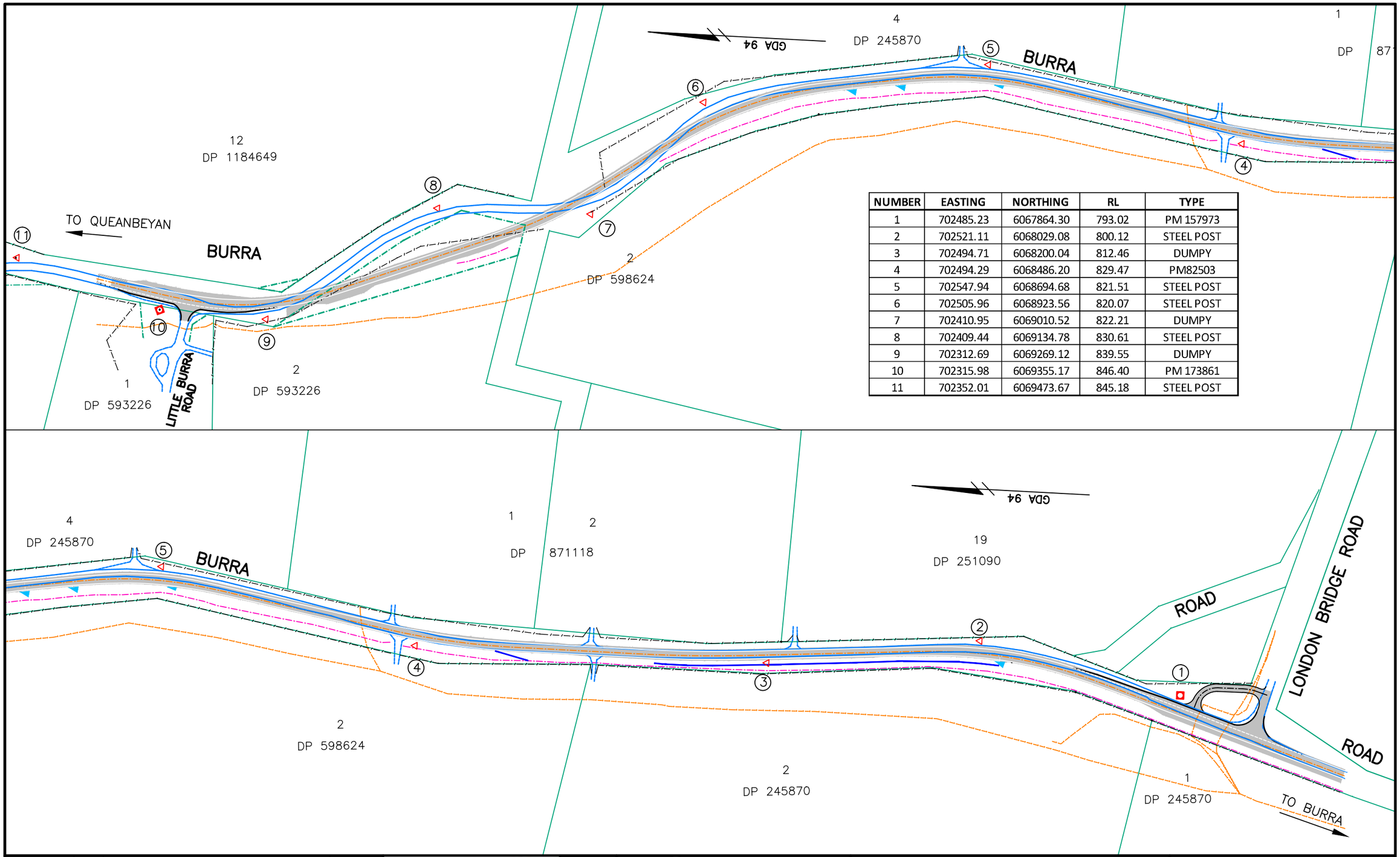

NUMBER	EASTING	NORTHING	RL	TYPE
1	702485.23	6067864.30	793.02	PM 157973
2	702521.11	6068029.08	800.12	STEEL POST
3	702494.71	6068200.04	812.46	DUMPY
4	702494.29	6068486.20	829.47	PM82503
5	702547.94	6068694.68	821.51	STEEL POST
6	702505.96	6068923.56	820.07	STEEL POST
7	702410.95	6069010.52	822.21	DUMPY
8	702409.44	6069134.78	830.61	STEEL POST
9	702312.69	6069269.12	839.55	DUMPY
10	702315.98	6069355.17	846.40	PM 173861
11	702352.01	6069473.67	845.18	STEEL POST

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
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16/04/2018	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

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COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

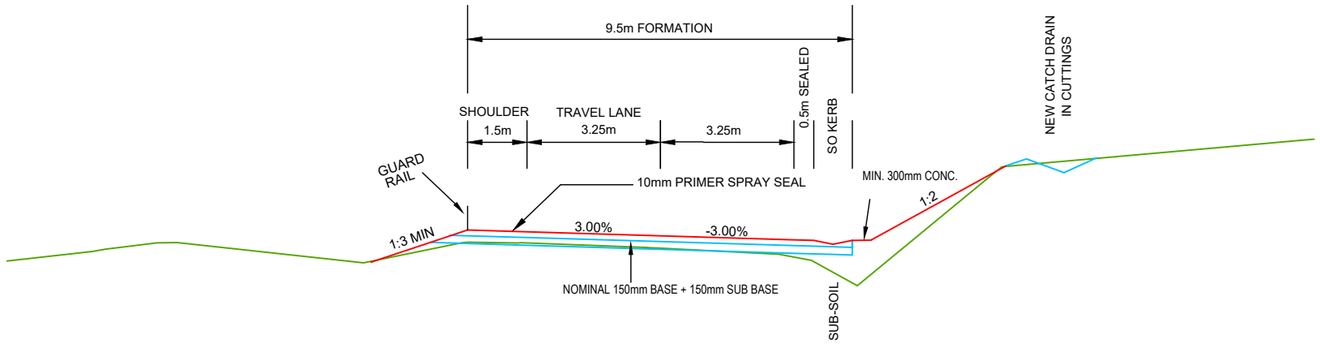
CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
OVERALL LAYOUT & SURVEY CONTROL

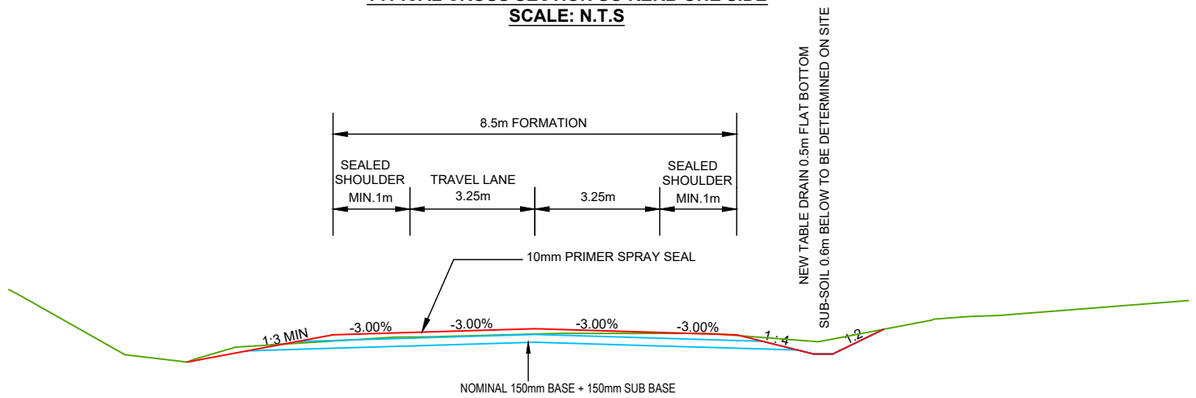
SCALE: 1:3000

FILE: PN11585	A3– 546375_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 2 OF 43 SHEETS



TYPICAL CROSS SECTION SO KERB ONE SIDE
SCALE: N.T.S



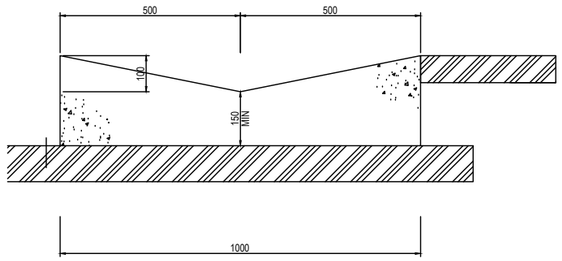
TYPICAL CROSS SECTION
SCALE: N.T.S

EARTHWORK QUANTITIES

PAVEMENT VOLUME BASE COURSE 150mm	2709 m ³
SUB-BASE VOLUME OR UNCRUSHED ROCK 150mm	2967 m ³
TOTAL CUT	8221 m ³
TOTAL FILL	6572 m ³
NET VOLUME CUT	1648 m ³ (1.25:1)

ADDITIONAL FILL AVAILABLE FROM BURRA PIT

APPROX SQUARE METRES OF SEAL 14700 m ²



SO KERB
NOT TO SCALE

ALIGNMENT DETAILS

Chainage	Easting	Northing	Radius	TanLength1	TanLength2	DefAngle / Azimuth	
1512.940	702338.902	6069406.152				190°40'10" Straight	
1554.774	702331.157	6069365.041				190°40'10" Straight	
1554.774	702331.157	6069365.041				190°40'10" Spiral	TS
1604.774	702323.614	6069315.638				184°42'04" Spiral1	SC
1604.774	702323.614	6069315.638	240.000	0.000	0.000	184°42'04" Arc	SC
1681.586	702329.572	6069239.386	240.000	0.000	0.000	166°21'49" Arc	CS
1681.586	702329.572	6069239.386				166°21'49" Spiral	CS
1731.586	702344.696	6069191.753				160°23'43" Spiral1	ST
1731.586	702344.696	6069191.753				160°23'43" Straight	
1822.589	702375.230	6069106.025				160°23'43" Straight	
1822.589	702375.230	6069106.025				160°23'43" Spiral	TS
1872.589	702393.303	6069059.422				155°37'14" Spiral1	SC
1872.589	702393.303	6069059.422	300.000	0.000	0.000	155°37'14" Arc	SC
1911.518	702411.624	6069025.105	300.000	0.000	0.000	148°11'09" Arc	CS
1911.518	702411.624	6069025.105				148°11'09" Spiral	CS
1961.518	702440.292	6068984.159				143°24'40" Spiral1	ST
1961.518	702440.292	6068984.159				143°24'40" Straight	
1984.041	702453.717	6068966.075				143°24'40" Straight	
1984.041	702453.717	6068966.075				143°24'40" Spiral	TS
2034.041	702482.385	6068925.128				148°11'09" Spiral1	SC
2034.041	702482.385	6068925.128	300.000	0.000	0.000	148°11'09" Arc	SC
2129.232	702519.003	6068837.695	300.000	0.000	0.000	166°21'57" Arc	CS
2129.232	702519.003	6068837.695				166°21'57" Spiral	CS
2179.232	702528.070	6068788.539				171°08'26" Spiral1	ST
2179.232	702528.070	6068788.539				171°08'26" Straight	
2191.492	702529.958	6068776.426				171°08'26" Straight	
2191.492	702529.958	6068776.426				171°08'26" Spiral	TS
2241.492	702536.282	6068726.843				175°54'55" Spiral1	SC
2241.492	702536.282	6068726.843	300.000	0.000	0.000	175°54'55" Arc	SC
2290.975	702535.729	6068677.418	300.000	0.000	0.000	185°21'57" Arc	CS
2290.975	702535.729	6068677.418				185°21'57" Spiral	CS
2340.975	702528.298	6068627.989				190°08'26" Spiral1	ST
2340.975	702528.298	6068627.989				190°08'26" Straight	
2463.018	702506.811	6068507.853				190°08'26" Straight	
2463.018	702506.811	6068507.853	600.000	0.000	0.000	190°08'26" Arc	PC
2567.532	702497.441	6068403.893	600.000	0.000	0.000	180°09'37" Arc	PT
2567.532	702497.441	6068403.893				180°09'37" Straight	
2666.880	702497.163	6068304.545				180°09'37" Straight	
2666.880	702497.163	6068304.545	1200.000	0.000	0.000	180°09'37" Arc	PC
2758.748	702500.421	6068212.757	1200.000	0.000	0.000	175°46'26" Arc	PT
2758.748	702500.421	6068212.757				175°46'26" Straight	
2877.624	702509.181	6068094.204				175°46'26" Straight	
2877.624	702509.181	6068094.204				175°46'26" Spiral	TS
2927.624	702511.677	6068044.278				179°51'59" Spiral1	SC
2927.624	702511.677	6068044.278	350.000	0.000	0.000	179°51'59" Arc	SC
3013.396	702501.418	6067959.338	350.000	0.000	0.000	193°54'27" Arc	CS
3013.396	702501.418	6067959.338				193°54'27" Spiral	CS
3063.396	702487.107	6067911.441				198°00'00" Spiral1	ST
3063.396	702487.107	6067911.441				198°00'00" Straight	
3257.175	702427.226	6067727.146				198°00'00" Straight	

DATE	NO	REVISION	AUTHORISED
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16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD**
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
TYPICAL DRAWINGS

SCALE: AS SHOWN

FILE: PN11585	A3– 546376_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL
SHEET 3 OF 43 SHEETS	

ORIGINAL A3 SHEET
100mm
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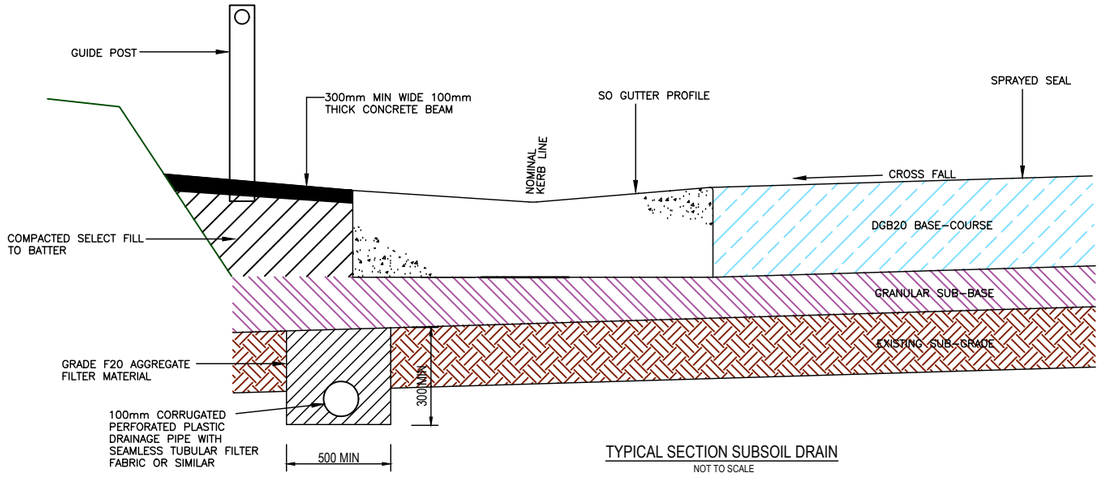
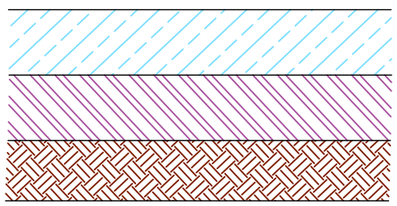


TYPICAL SECTION SUBSOIL DRAIN

NOT TO SCALE



10mm PRIME & SEAL

150mm BASE COURSE GRAVEL

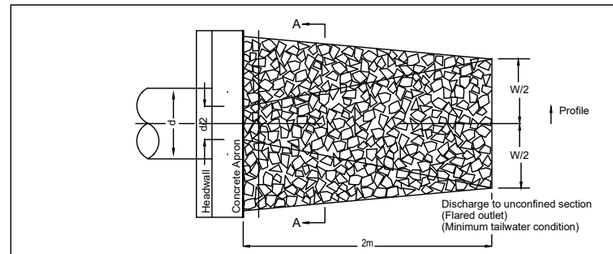
150mm SUB BASE

EXISTING SUB GRADE

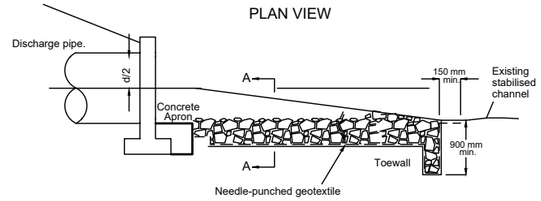
PROPOSED PAVEMENT

NOT TO SCALE

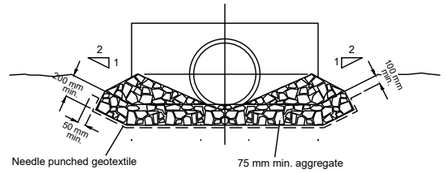
(SUBJECT TO GEO TECHNICAL DESIGN)



PLAN VIEW



PLAN VIEW



CROSS SECTION AA

Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

ENERGY DISSIPATER SD 5-8

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD TYPICAL DRAWINGS

SCALE: AS SHOWN

FILE: PN11585	A3- 546377_3A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 4 OF 41 SHEETS

ORIGINAL A3 SHEET

100mm

0

ORIGINAL A3 SHEET

100mm

0

EXISTING 375mm RCP
EXTEND 2.44m EAST SIDE.
RELOCATE PRECAST H/W.
SEE DETAILS SHEET 29

12
DP 1184649

REMOVE OLD ROAD SURFACE,
REGRADE & REHABILITATE

DIAL BEFORE YOU DIG
www.1100.com.au

NEW BURRA ROAD

RELOCATE STREET SIGN
"LITTLE BURRA RD"
"NO THROUGH RD"

LAND RESUMPTION A
136m²

PLACE ROCK GABION WALL

FENCE

1512.94
1520.00
LIMIT OF WORKS 1528.40
1540.00
TS 1551.15
1560.00
1580.00
SC 1601.15
1600.00
LIMIT OF WORKS
1620.00
PI 1644.81
1640.00
1660.00
1668.00
1680.00
CS 1684.68
1700.00
1720.00
ST 1734.68
1740.00
1760.00
1780.00
1800.00
1820.00
TS 1829.40
1840.00
1860.00
SC 1879.40

⑧ ⑨ ⑩

PROTECT SURVEY MARK
PM 173896

PROPOSED ROAD BOUNDARY
(QPRC 2015 PROPOSAL)

GIVE WAY

LITTLE BURRA ROAD
(PRIVATE ROAD)

EXISTING 900mm RCP
EXTEND 2 LENGTHS EACH SIDE.
CAST INSITU EXTENDED HEIGHT H/W &
PRECAST H/W.
SEE DETAILS SHEET 30

LAND RESUMPTION B
5949m²

1
DP 593226

2
DP 593226

2
DP 598624

ROAD

JOINS SHEET 6

LINE ALL TABLE DRAINS WITH
JUTE MESH & SPRAY GRASS

INTERSECTION DETAILS
SEE SHEET 43

GDA 94

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- DESIGNED SHOULDER
- DESIGNED BATTER
- NEW PIPES
- NEW PROPOSED TELSTRA
- EXISTING TELSTRA TO REMOVE
- EXISTING TELSTRA
- EXISTING FENCE
- BOUNDARY
- EXISTING ROAD
- EXISTING GATE
- NEW PROPOSED BOUNDARY
- NEW ROAD
- NEW TABLE DRAIN
- NEW SO KERB
- NEW CATCH DRAIN
- NEW ROAD BATTER
- RESUMPTION BOUNDARY
- CONTOURS 0.50m
- EXISTING TREES

DATE	NO	REVISION	AUTHORISED
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PLAN REVISIONS

QPRC

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COORD.SYSTEM MGA ORIGIN

phl surveyors
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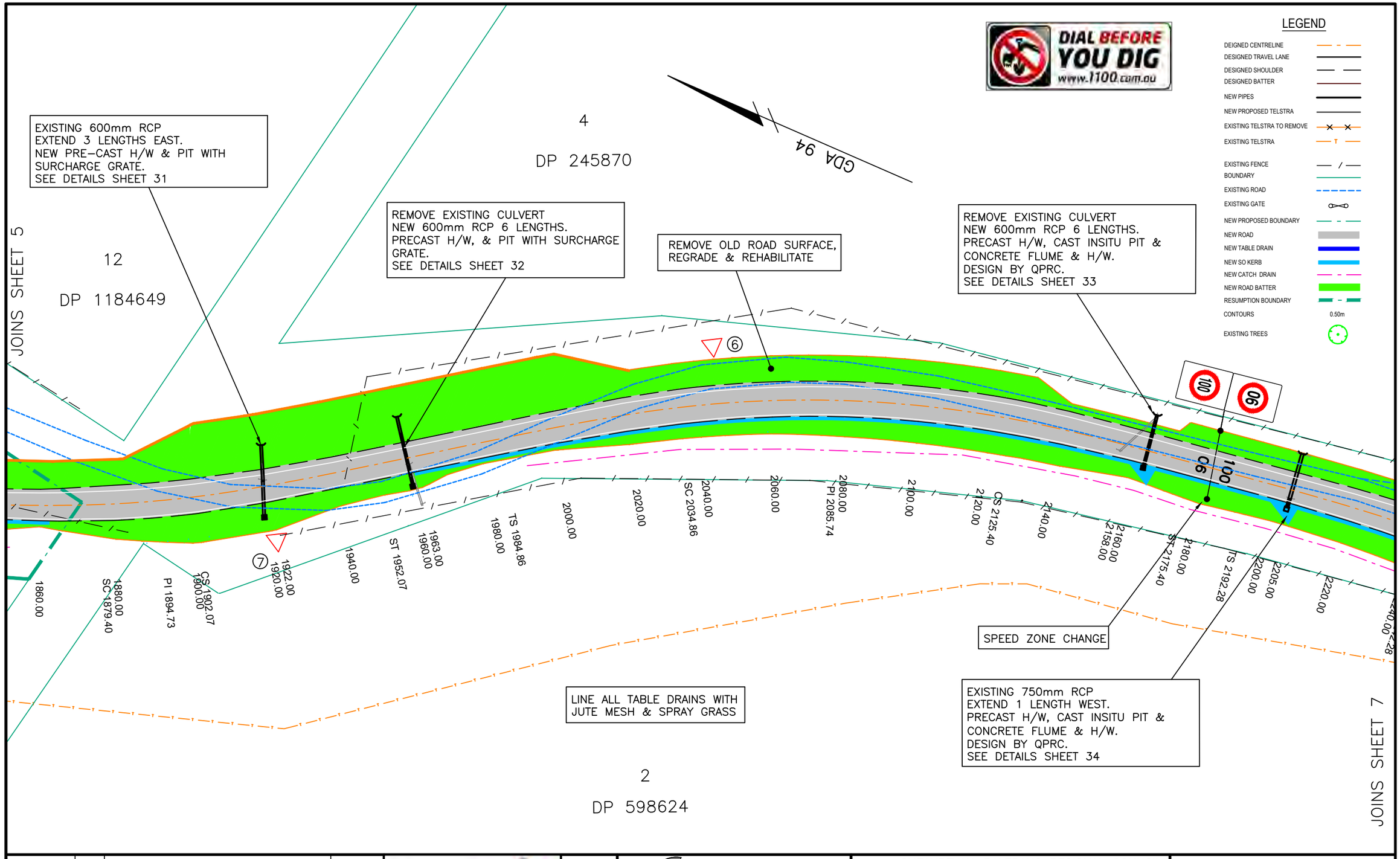
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
PLAN

SCALE: 1:1000

FILE: PN11585	A3– 546378_3A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 5 OF 41 SHEETS



DATE	NO	REVISION	AUTHORISED
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16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD PLAN**

SCALE: 1:1000

FILE: PN11585	A3- 546379_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 6 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

0

JOINS SHEET 6

JOINS SHEET 8

REGRADE ENTRANCE TO SUIT TYPE A

DAM

4
DP 245870

1
DP 871118

2
DP 598624

BURRA

GDA 94

TS 2192.28
2200.00
2205.00
2220.00
SC 2242.28
2240.00
PI 2272.88
2260.00
2280.00
CS 2298.55
2288.00
2300.00
2320.00
ST 2338.55
2340.00
2360.00
2380.00
2400.00
2420.00
2440.00
PC 2462.28
2460.00
2480.00
2500.00
PI 2522.57
2520.00
2540.00
PT 2566.76
2560.00
2580.00
2581.00
2600.00

REMOVE EXISTING 525mm CULVERT
NEW 600mm RCP 5 LENGTHS.
PRECAST H/W, CAST INSITU PIT &
CONCRETE FLUME & H/W.
DESIGN BY QPRC.
SEE DETAILS SHEET 35

RELOCATE TELSTRA BY OTHERS

REGRADE ENTRANCE TO SUIT TYPE A

ROAD

EXISTING CATCH DRAIN
RESHAPE OR FORM NEW

REGRADE ENTRANCE TO SUIT TYPE A

LINE ALL TABLE DRAINS WITH
JUTE MESH & SPRAY GRASS

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- DESIGNED SHOULDER
- DESIGNED BATTER
- NEW PIPES
- NEW PROPOSED TELSTRA
- EXISTING TELSTRA TO REMOVE
- EXISTING TELSTRA
- EXISTING FENCE
- BOUNDARY
- EXISTING ROAD
- EXISTING GATE
- NEW PROPOSED BOUNDARY
- NEW ROAD
- NEW TABLE DRAIN
- NEW SO KERB
- NEW CATCH DRAIN
- NEW ROAD BATTER
- CONTOURS 0.50m
- EXISTING TREES

DIAL BEFORE YOU DIG www.1100.com.au

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD PLAN**

SCALE: 1:1000

FILE: PN11585	A3– 546380_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 7 OF 43 SHEETS

EXTEND TWIN 600mm RCPs BY
1 LENGTH EACH SIDE.
CAST INSITU H/W TO SUIT.
SEE DETAILS SHEET 36

REGRADE ENTRANCE TO SUIT
TYPE A

NEW 450mm RCP
5 LENGTHS PRECAST H/W.
GRADE OUTFALL TO FARM DAM.
SEE DETAILS SHEET 37

REGRADE ENTRANCE TO SUIT
TYPE A

LINE ALL TABLE DRAINS WITH
JUTE MESH & SPRAY GRASS

GDA 94

2
DP 871118

19
DP 251090

2
DP 245870

PT 2566.76
2581.00
2580.00
2600.00
2620.00
2640.00
2660.00
PC 2666.11
2680.00
2700.00
PI 2720.26
2720.00
2740.00
PT 2757.98
2760.00
2780.00
2800.00
2820.00
2840.00
2860.00
2880.00
TS 2878.85
2900.00
2920.00
SC 2926.85
2940.00
2960.00
2963.00

JOINS SHEET 7

JOINS SHEET 9

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- DESIGNED SHOULDER
- DESIGNED BATTER
- NEW PIPES
- NEW PROPOSED TELSTRA
- EXISTING TELSTRA TO REMOVE
- EXISTING TELSTRA
- EXISTING FENCE
- BOUNDARY
- EXISTING ROAD
- EXISTING GATE
- NEW PROPOSED BOUNDARY
- NEW ROAD
- NEW TABLE DRAIN
- NEW SO KERB
- NEW CATCH DRAIN
- NEW ROAD BATTER
- CONTOURS 0.50m
- EXISTING TREES

DIAL BEFORE YOU DIG www.1100.com.au

ORIGINAL A3 SHEET
100mm
0

DATE	NO	REVISION	AUTHORISED
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14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD PLAN**

SCALE: 1:1000

FILE: PN11585	A3– 546381_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 8 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

0

JOINS SHEET 9

GDA 94

19

DP 251090

S – NEW SCHOOL BUS STOP.
SEE DETAILS SHEET 38

INTERSECTION DETAILS
SEE SHEET 38

DIAL BEFORE YOU DIG
www.1100.com.au

W8–213'B'
SCHOOL BUS STOP AHEAD

ROAD

PROTECT SURVEY MARK
PM 157973

ALLOW ACCESS TO
STOCK LOADING RAMP

NO ENTRY

NO EXIT

LONDON BRIDGE ROAD

GIVE WAY

LIMIT OF WORKS

8

DP 251090

2880.00 TS 2878.86
2900.00
2920.00 SC 2926.85
2940.00
2960.00 2963.00 PI 2978.90
2980.00
3000.00 CS 3012.62
3020.00
3040.00
3060.00 ST 3062.62
3080.00
3100.00
3120.00
3140.00
3160.00
3180.00
3200.00
3220.00

EXISTING 3 CELL 900mm RCP
EXTEND 2 LENGTHS TO WEST.
CAST INSITU H/W & FLUME
DESIGN BY QPRC.
SEE DETAILS SHEET 38

NEW 450mm RCP
CAST IN SITU DROP DOWN
PIT w/ SO V GRATE
SEE DETAILS SHEET 39

2

DP 245870

RELOCATE TELSTRA
BY OTHERS

LINE ALL TABLE DRAINS WITH
JUTE MESH & SPRAY GRASS

INTERSECTION DETAILS
SEE SHEET 40

RELOCATE STREET SIGN
"LONDON BRIDGE RD"
"NO THROUGH RD"

1

DP 245870

BURRA ROAD

DRAINS TO EXISTING
750mm RCP
AT CH. 3270

LIMIT OF WORKS

W8–213'B'
SCHOOL BUS STOP AHEAD
AT CH. 3300
WEST SIDE

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- DESIGNED SHOULDER
- DESIGNED BATTER
- NEW PIPES
- NEW PROPOSED TELSTRA
- EXISTING TELSTRA TO REMOVE
- EXISTING TELSTRA
- EXISTING FENCE
- BOUNDARY
- EXISTING ROAD
- EXISTING GATE
- NEW PROPOSED BOUNDARY
- NEW ROAD
- NEW TABLE DRAIN
- NEW SO KERB
- NEW CATCH DRAIN
- NEW ROAD BATTER
- CONTOURS 0.50m
- EXISTING TREES

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
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14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

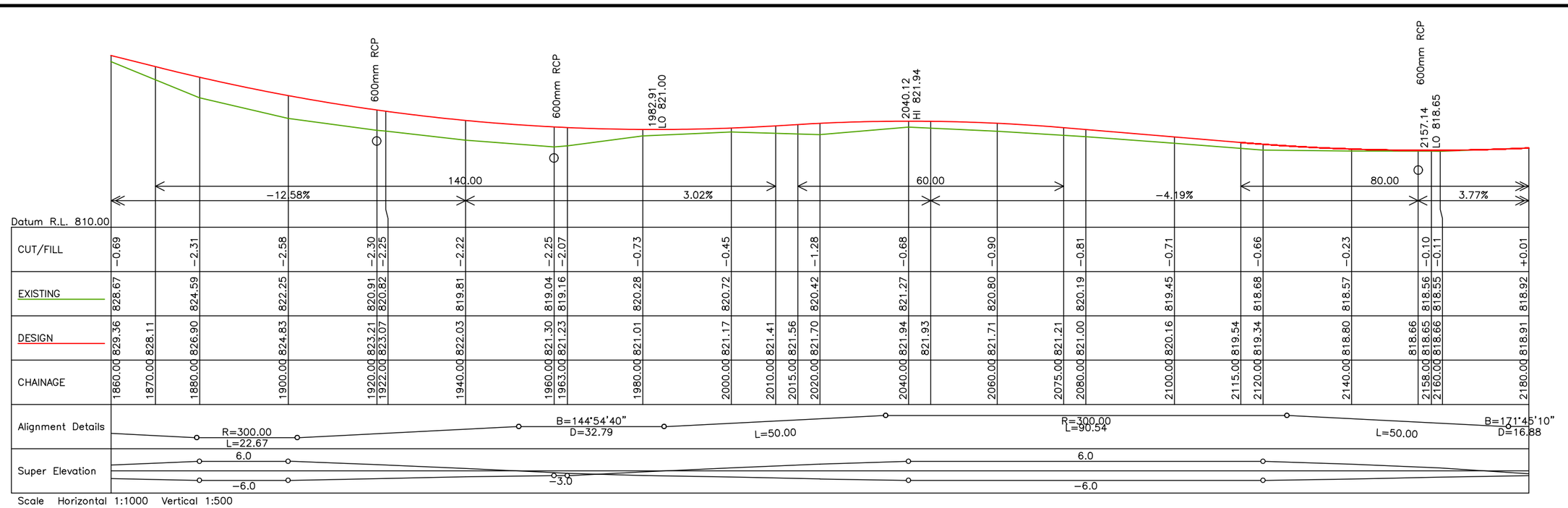
CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

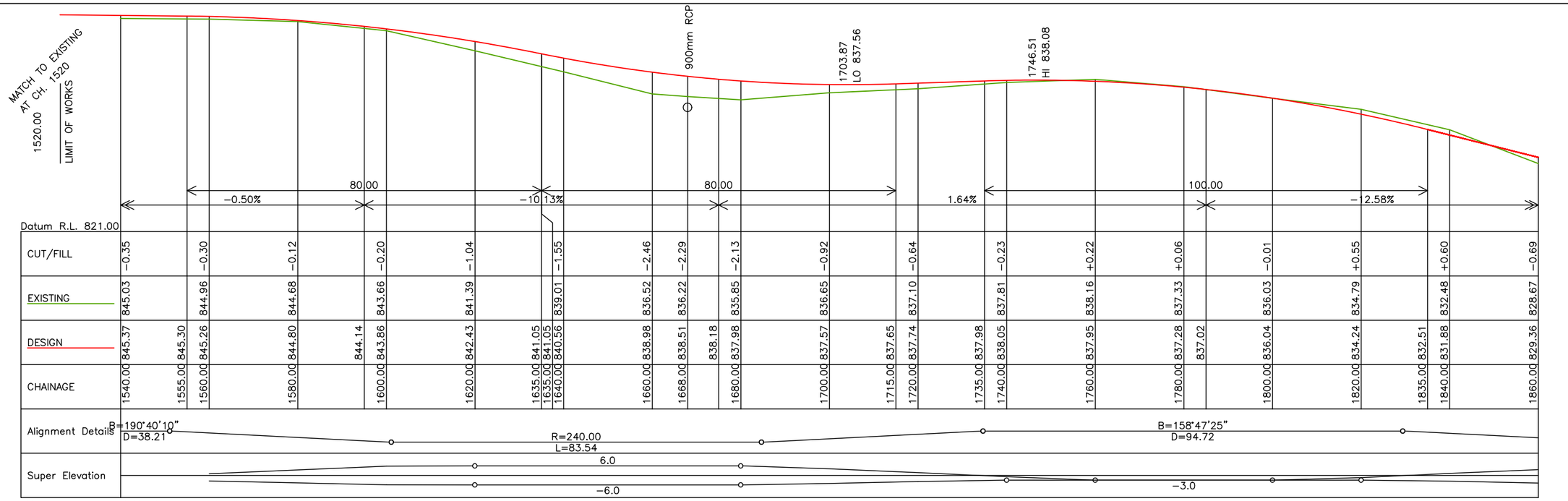
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
PLAN

SCALE: 1:1000

FILE: PN11585	A3– 546382_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 9 OF 43 SHEETS





DATE	NO	REVISION	AUTHORISED
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14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

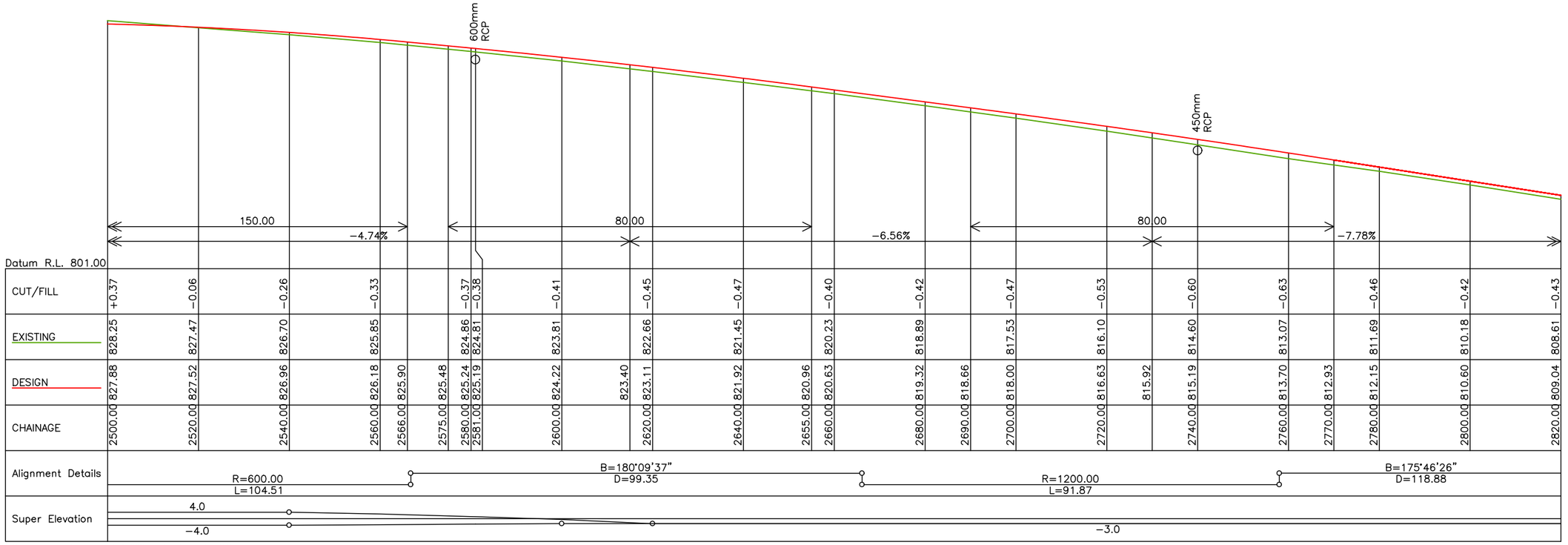
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD LONG SECTIONS**

SCALE: AS SHOWN

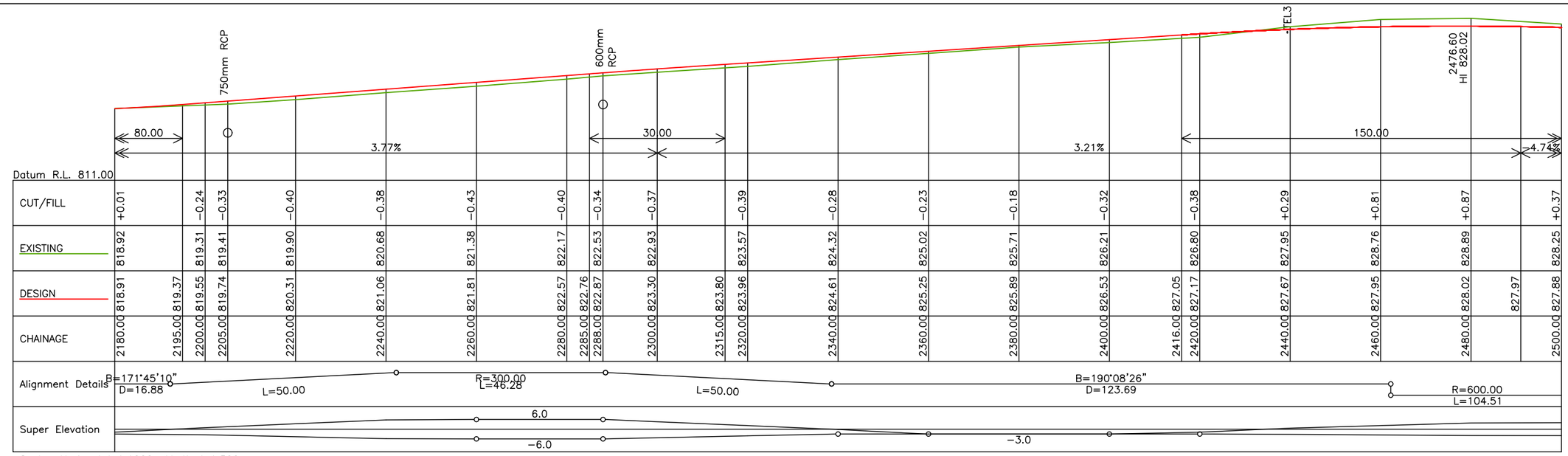
FILE: PN11585	A3– 546383_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 10 OF 43 SHEETS

ORIGINAL A3 SHEET 100mm 0



Scale Horizontal 1:1000 Vertical 1:500



Scale Horizontal 1:1000 Vertical 1:500

DATE	NO	REVISION	AUTHORISED
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14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

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115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
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CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD LONG SECTIONS**

SCALE: As SHOWN

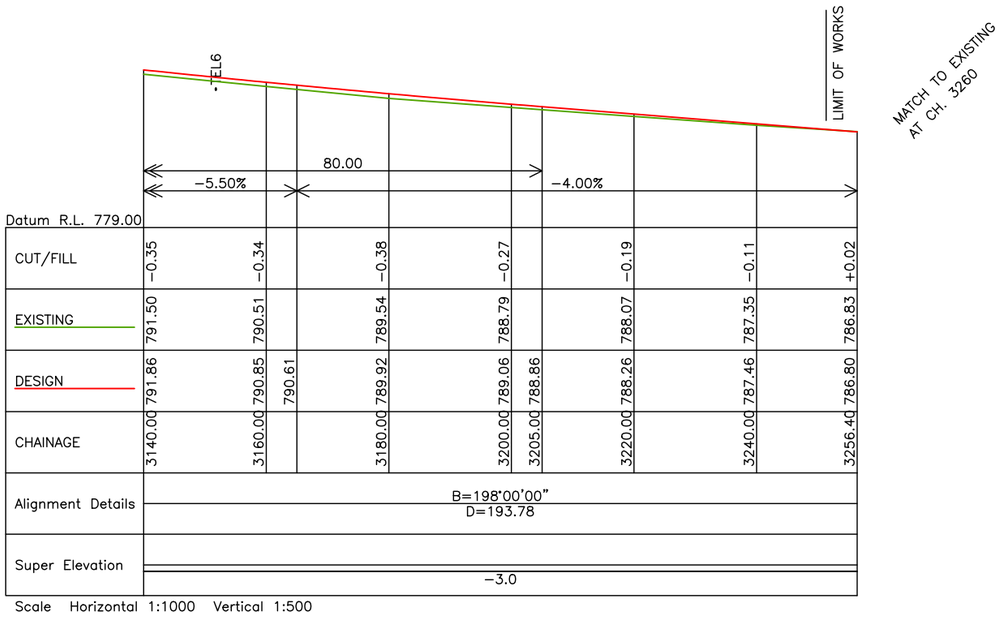
FILE: PN11585	A3– 546384_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

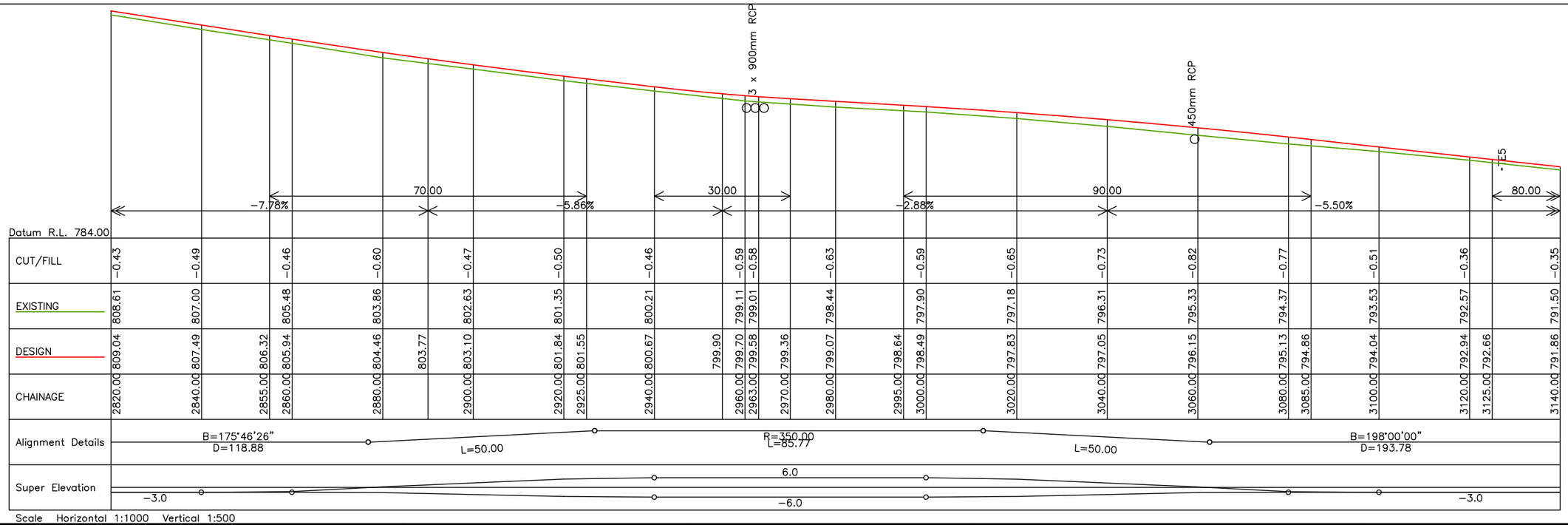
SHEET 11 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

0





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16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
LONG SECTIONS

SCALE: AS SHOWN

FILE: PN11585	A3– 546385_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

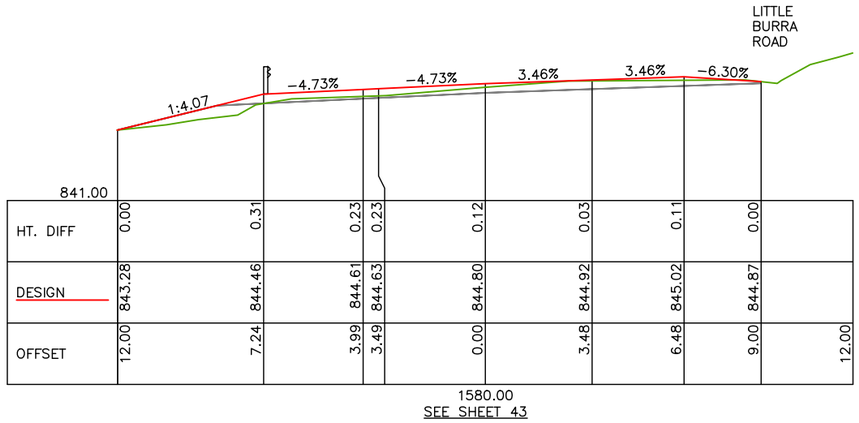
SHEET 12 OF 43 SHEETS

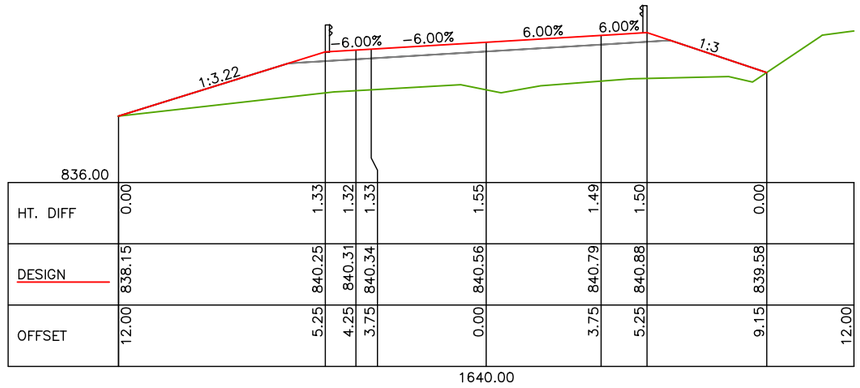
ORIGINAL A3 SHEET
100mm
0

ORIGINAL A3 SHEET

100mm

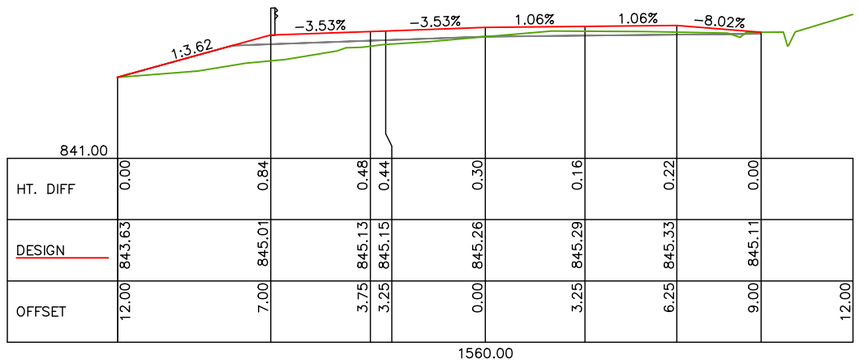
0

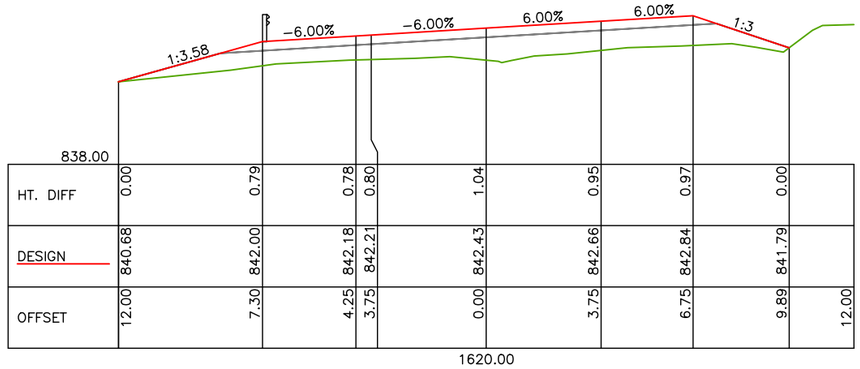


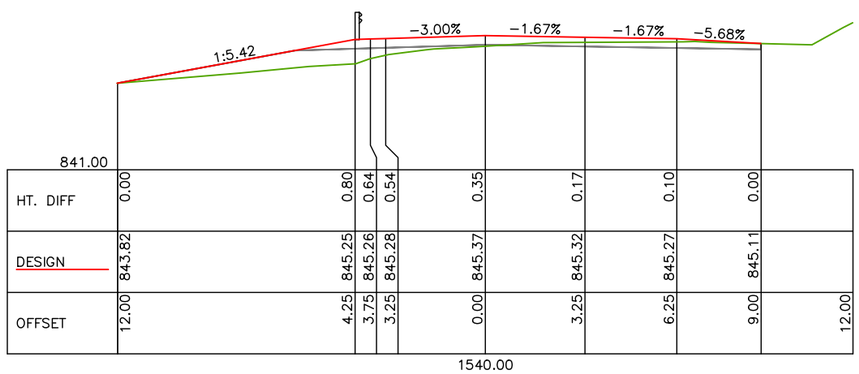


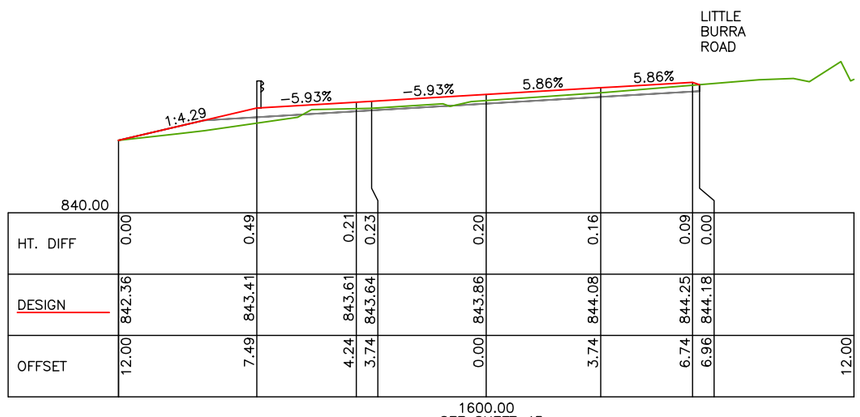
LEGEND

GUARD RAIL









DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

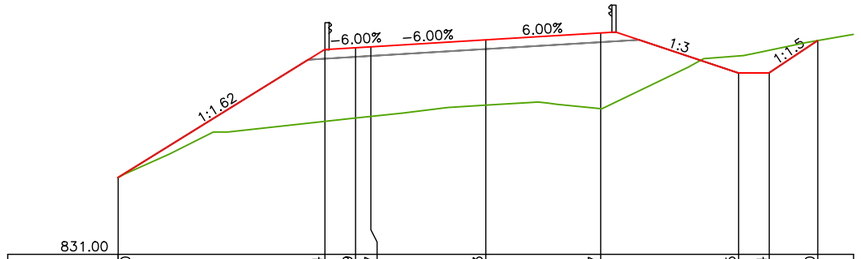
CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200

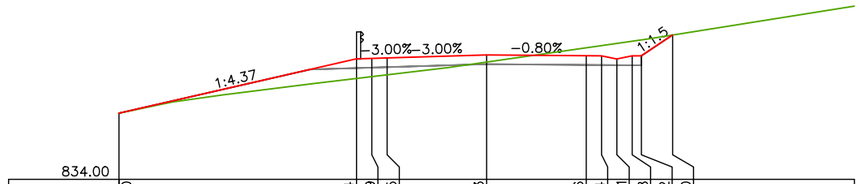
FILE: PN11585	A3– 546386_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 13 OF 43 SHEETS



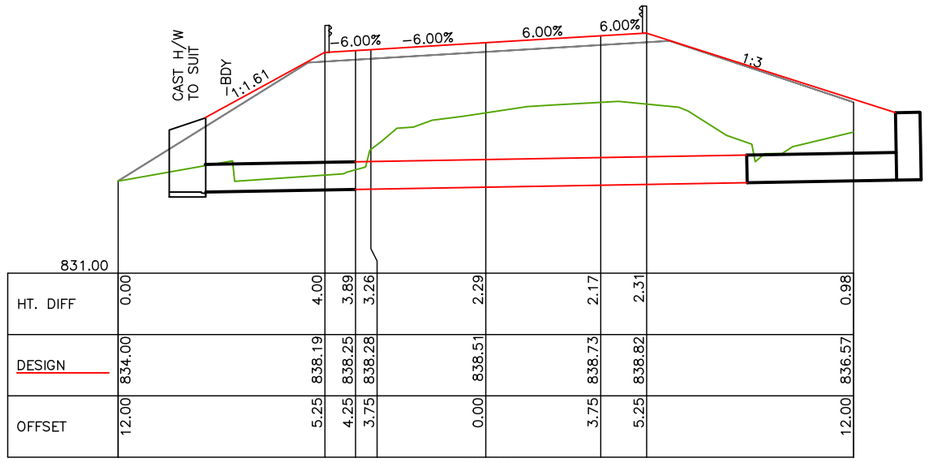
831.00												
HT. DIFF	0.00	2.34	2.29	2.27	2.13	2.47	−0.55	−0.74	0.00			
DESIGN	833.49	837.67	837.73	837.76	837.98	838.21	836.90	836.90	837.96			
OFFSET	12.00	5.25	4.25	3.75	0.00	3.75	8.25	9.25	10.83	12.00		

1680.00



834.00												
HT. DIFF	0.00	0.64	0.59	0.55	0.23	−0.26	−0.34	−0.51	−0.48	−0.52	0.00	
DESIGN	836.14	837.92	837.93	837.95	838.05	838.02	838.02	837.92	838.02	838.02	838.70	
OFFSET	12.00	4.25	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	6.07	12.00

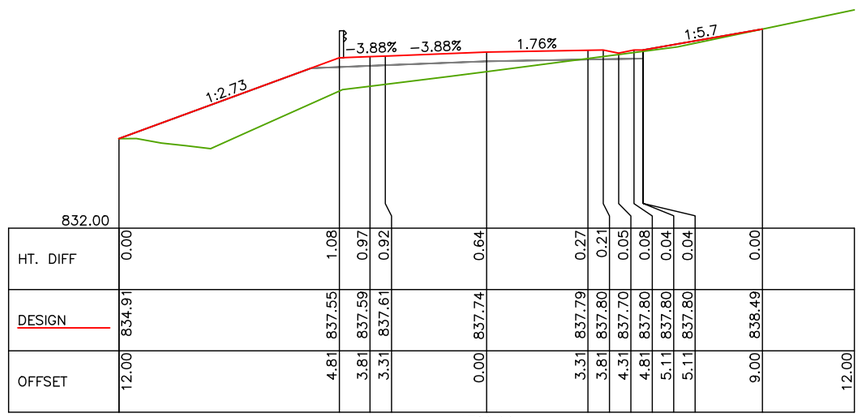
1740.00



831.00												
HT. DIFF	0.00	4.00	3.89	3.26	2.29	2.17	2.31	0.98				
DESIGN	834.00	838.19	838.25	838.28	838.51	838.73	838.82	836.57				
OFFSET	12.00	5.25	4.25	3.75	0.00	3.75	5.25	12.00				

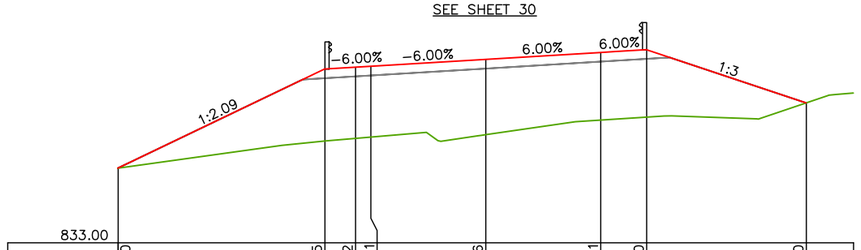
1668.00

SEE SHEET 30



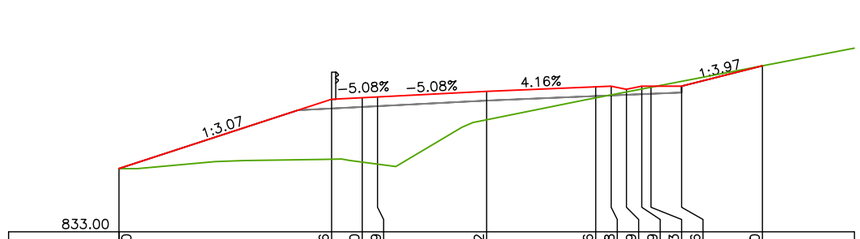
832.00												
HT. DIFF	0.00	1.08	0.97	0.92	0.64	0.27	0.21	0.05	0.08	0.04	0.04	0.00
DESIGN	834.91	837.55	837.59	837.61	837.74	837.79	837.80	837.70	837.80	837.80	837.80	838.49
OFFSET	12.00	4.81	3.81	3.31	0.00	3.31	3.81	4.31	4.81	5.11	5.11	9.00	12.00

1720.00



833.00												
HT. DIFF	0.00	2.35	2.32	2.31	2.46	2.21	2.20	0.00				
DESIGN	835.43	838.66	838.72	838.75	838.98	839.20	839.29	837.56				
OFFSET	12.00	5.25	4.25	3.75	0.00	3.75	5.25	10.46	12.00			

1660.00



833.00												
HT. DIFF	0.00	1.96	2.10	2.19	0.92	0.36	0.28	0.09	0.09	0.03	−0.16	0.00
DESIGN	835.06	837.32	837.37	837.39	837.57	837.72	837.74	837.64	837.74	837.74	837.74	838.41
OFFSET	12.00	5.06	4.06	3.56	0.00	3.56	4.06	4.56	5.06	5.36	6.36	9.00	12.00

1700.00

LEGEND

GUARD RAIL

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
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16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

FILE: PN11585	A3- 546387_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

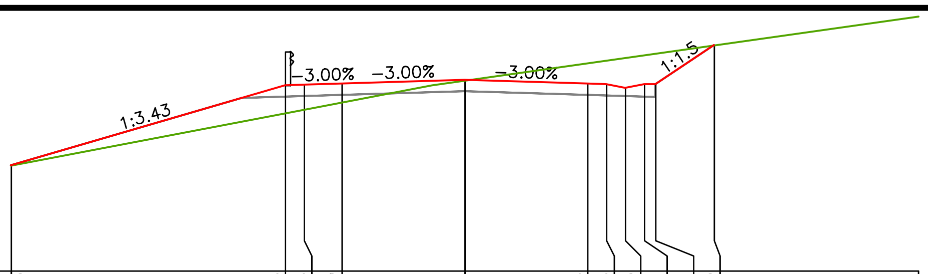
SHEET 14 OF 43 SHEETS

ORIGINAL A3 SHEET
100mm
0

ORIGINAL A3 SHEET

100mm

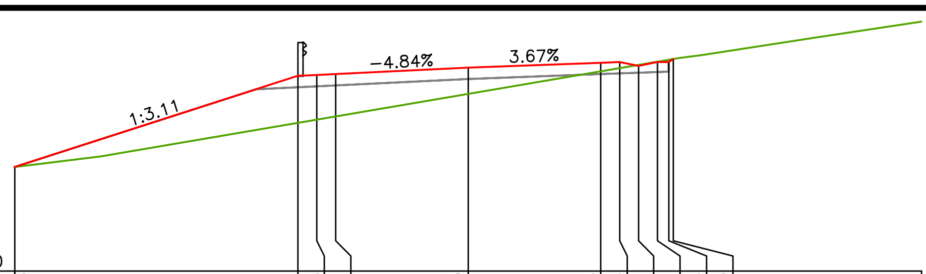
0



831.00

HT. DIFF	0.00	0.73	0.65	0.49	0.01	-0.55	-0.63	-0.80	-0.77	-0.81	0.00	
DESIGN	833.79	835.90	835.91	835.94	836.04	835.94	835.93	835.83	835.93	835.93	836.96	
OFFSET	12.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	6.60	12.00

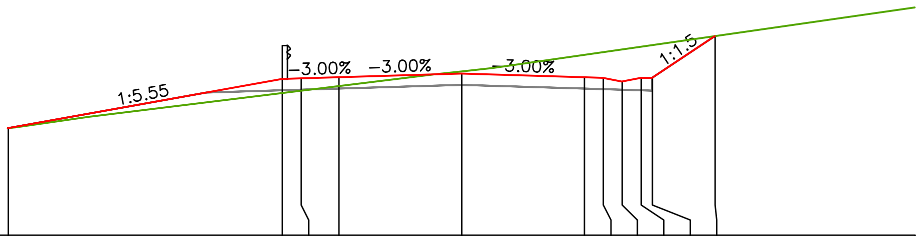
1800.00



824.00

HT. DIFF	0.00	1.24	1.18	1.12	0.69	0.23	0.16	-0.02	-0.01	-0.06	0.00	
DESIGN	826.74	829.15	829.17	829.19	829.36	829.49	829.51	829.41	829.51	829.51	829.59	
OFFSET	12.00	4.51	4.01	3.51	0.00	3.51	4.01	4.51	5.01	5.31	5.43	12.00

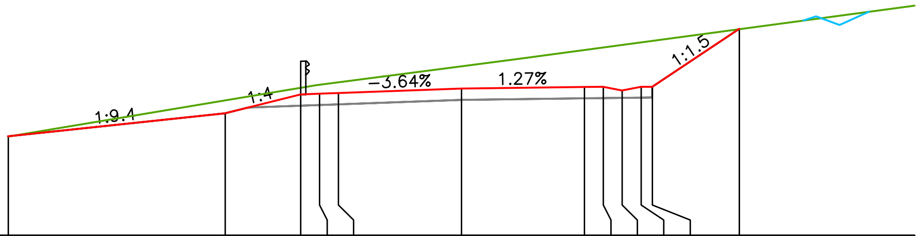
1860.00



833.00

HT. DIFF	0.00	0.38	0.33	0.24	-0.06	-0.59	-0.68	-0.85	-0.82	-0.87	0.00	
DESIGN	835.83	837.14	837.15	837.18	837.28	837.18	837.17	837.07	837.17	837.17	838.27	
OFFSET	12.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	6.71	12.00

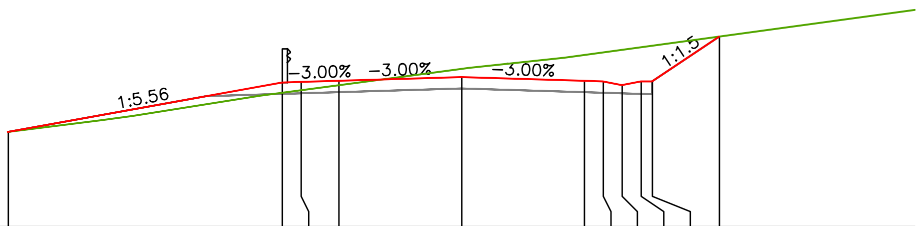
1780.00



828.00

HT. DIFF	0.00	-0.35	-0.18	-0.24	-0.29	-0.60	-0.99	-1.05	-1.22	-1.18	-1.23	0.00	
DESIGN	830.61	831.22	831.72	831.74	831.76	831.88	831.92	831.93	831.83	831.93	831.93	833.46	
OFFSET	12.00	6.26	4.26	3.76	3.26	0.00	3.26	3.76	4.26	4.76	5.06	7.36	12.00

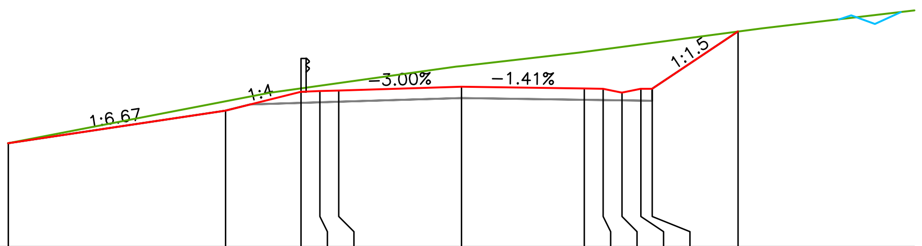
1840.00



834.00

HT. DIFF	0.00	0.27	0.22	0.12	-0.22	-0.68	-0.76	-0.93	-0.90	-0.94	0.00	
DESIGN	836.50	837.80	837.82	837.85	837.95	837.85	837.83	837.73	837.83	837.83	839.02	
OFFSET	12.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	6.82	12.00

1760.00



830.00

HT. DIFF	0.00	-0.25	-0.09	-0.14	-0.20	-0.55	-0.97	-1.04	-1.21	-1.18	-1.22	0.00	
DESIGN	832.74	833.60	834.10	834.12	834.14	834.24	834.19	834.18	834.08	834.18	834.18	835.70	
OFFSET	12.00	6.25	4.25	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	7.33	12.00

1820.00

LEGEND

GUARD RAIL

CATCH DRAIN

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors

115 Yambil Street, Griffith NSW

13 Gibraltar Street, Bungendore NSW

www.phlsurveyors.com.au

CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS

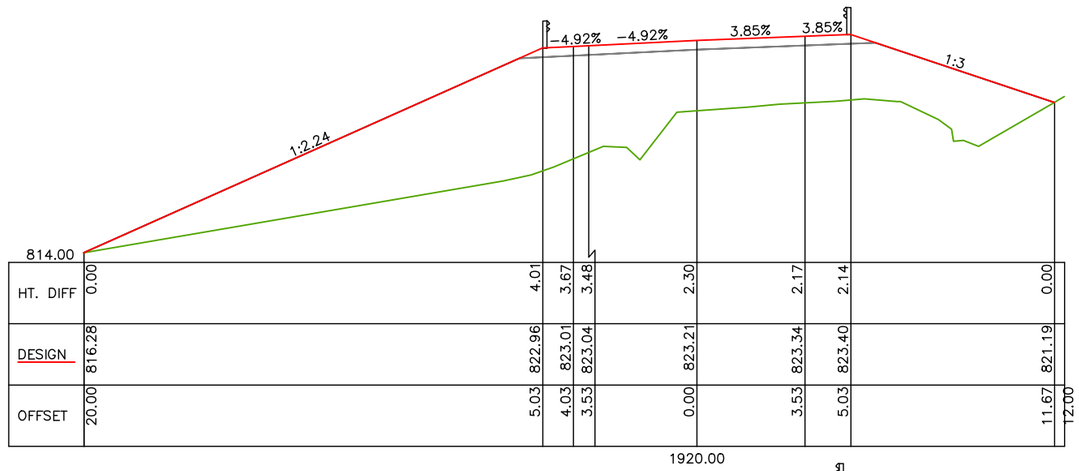
SCALE: 1:200

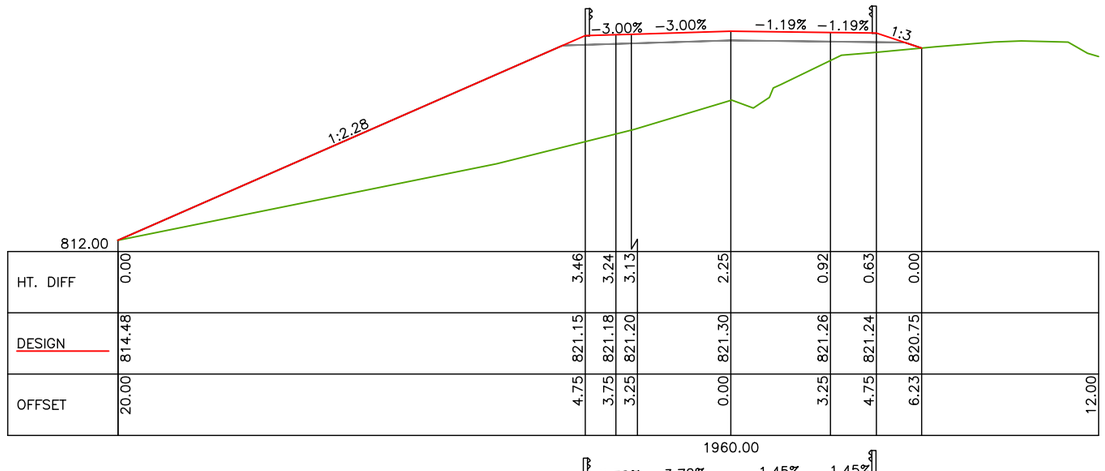
FILE: PN11585 | A3- 546388_4A

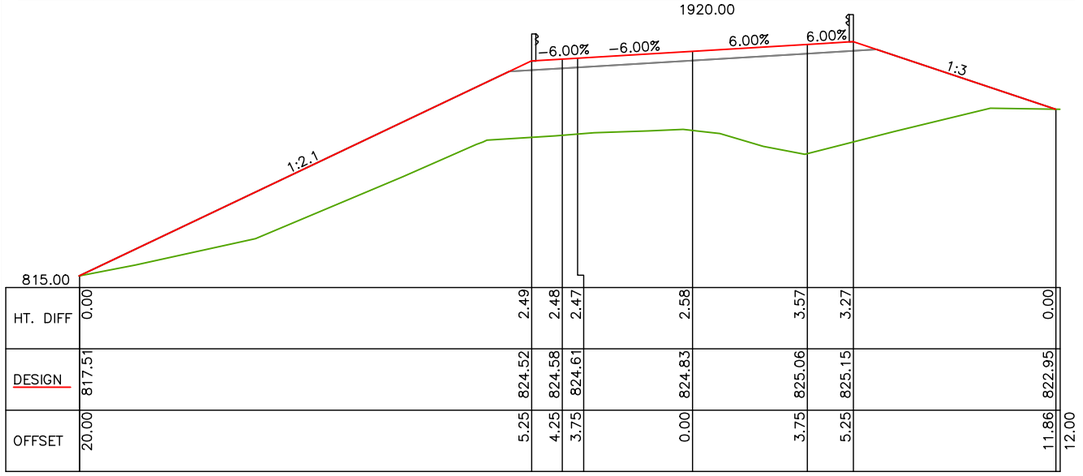
ACAD: 11585A19-1 | CCAD: 11585A19-2

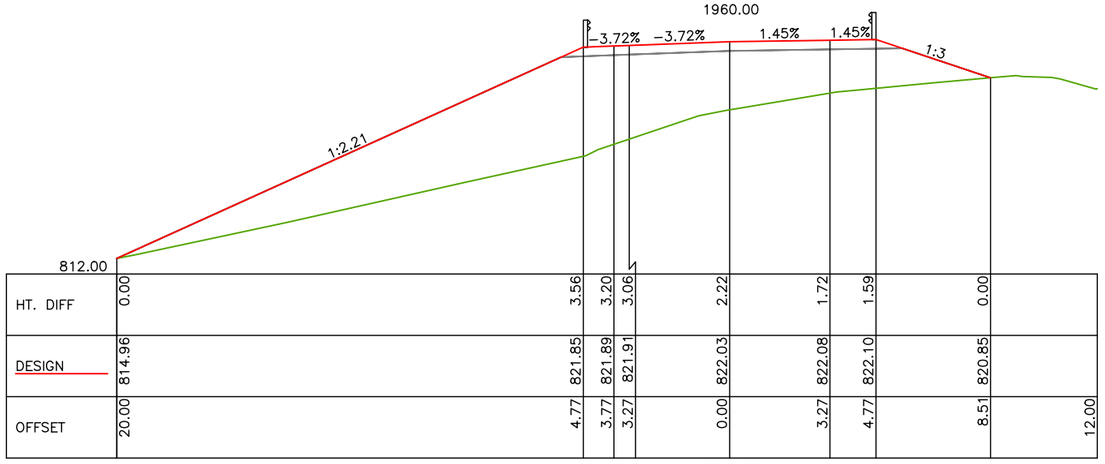
DRN: AL | CHK: AL

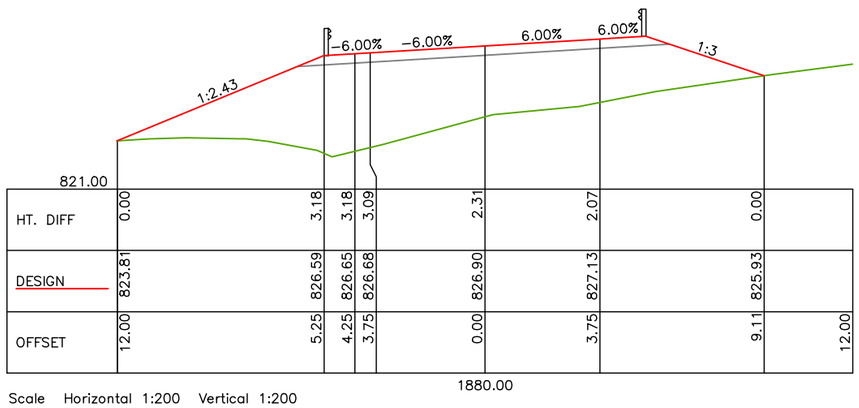
SHEET 15 OF 43 SHEETS



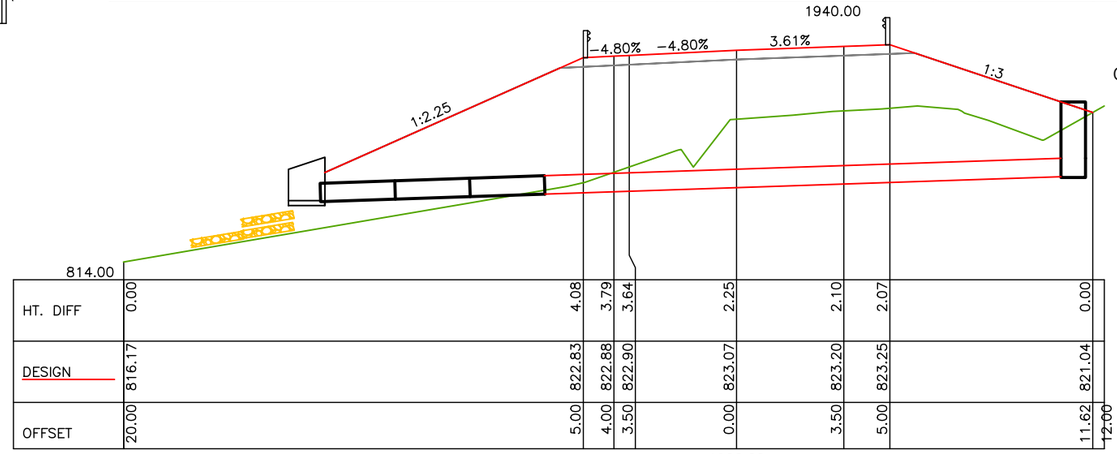








Scale Horizontal 1:200 Vertical 1:200



SEE SHEET 31

LEGEND

GUARD RAIL

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

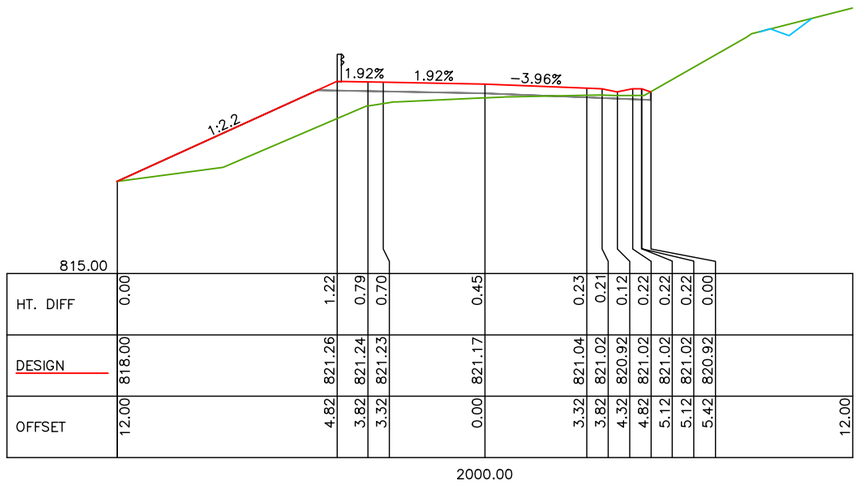
FILE: PN11585	A3– 546389_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

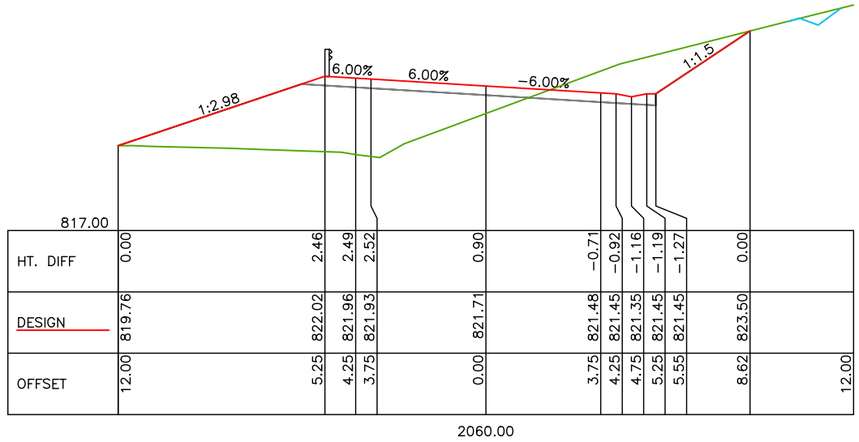
SHEET 16 OF 43 SHEETS

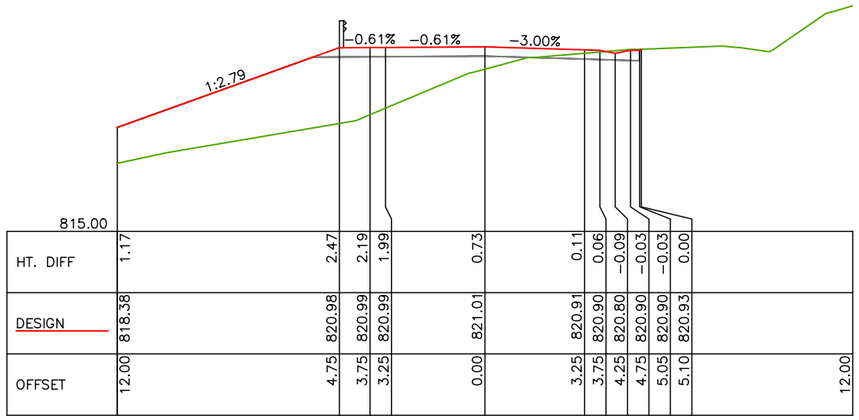
ORIGINAL A3 SHEET

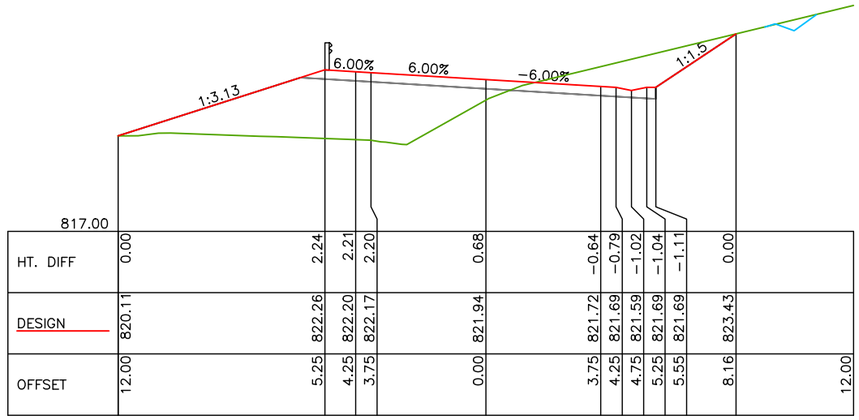
100mm

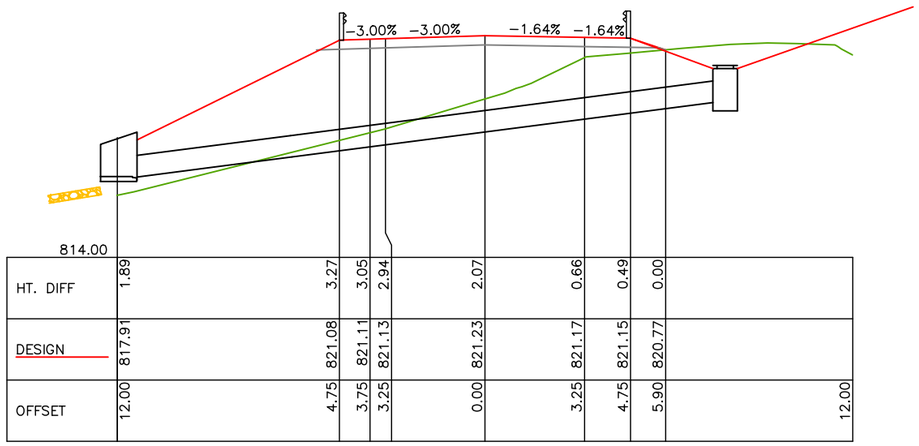
0

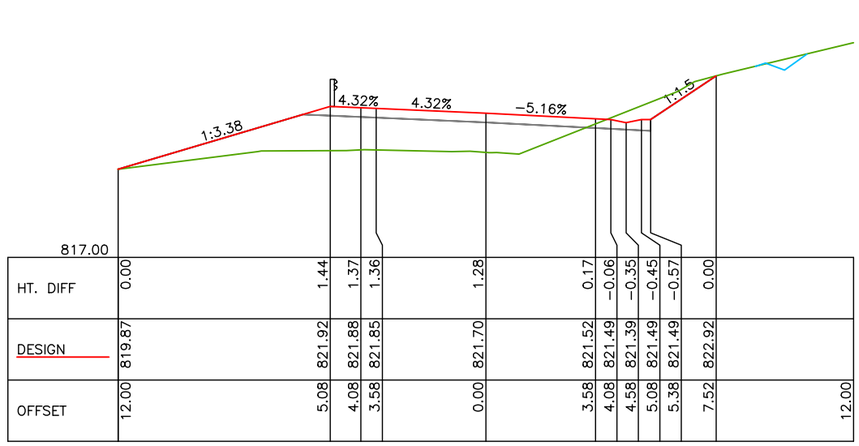












LEGEND

GUARD RAIL

CATCH DRAIN

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR CLIENT COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

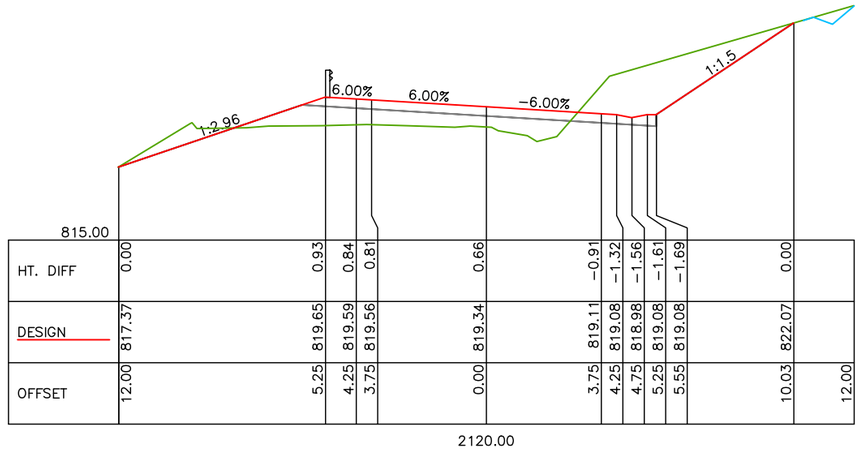
CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200

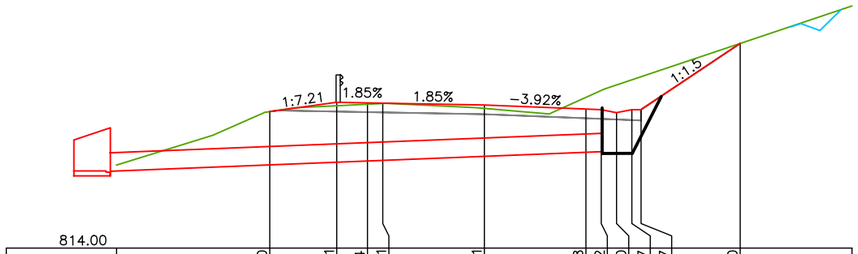
FILE: PN11585	A3– 546390_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 17 OF 43 SHEETS



815.00																							
HT. DIFF	0.00		0.93	0.84	0.81		0.66			-0.91	-1.32	-1.56	-1.61	-1.69		0.00							
DESIGN	817.37		819.65	819.59	819.56		819.34			819.11	819.08	818.98	819.08	819.08		822.07							
OFFSET	12.00		5.25	4.25	3.75		0.00			3.75	4.25	4.75	5.25	5.55		10.03		12.00					

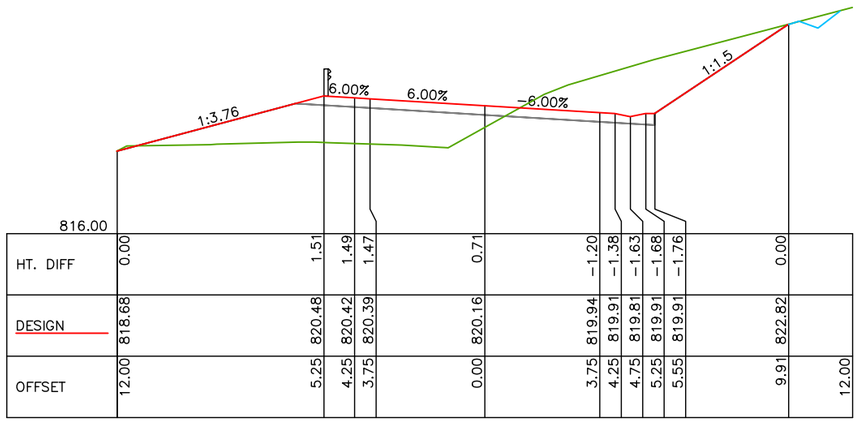
2120.00



814.00																							
HT. DIFF		0.00		0.11	0.04	0.01		0.11			-0.38	-0.62	-0.90	-0.97	-1.07		0.00						
DESIGN		818.44		818.75	818.73	818.72		818.66			818.53	818.51	818.41	818.51	818.51		820.66						
OFFSET	12.00		7.00		4.81	3.81	3.31		0.00		3.31	3.81	4.31	4.81	5.11		8.35		12.00				

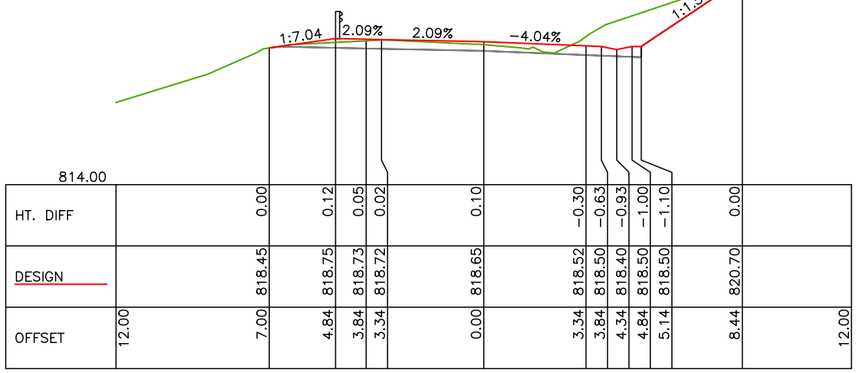
2160.00

SEE SHEET 33



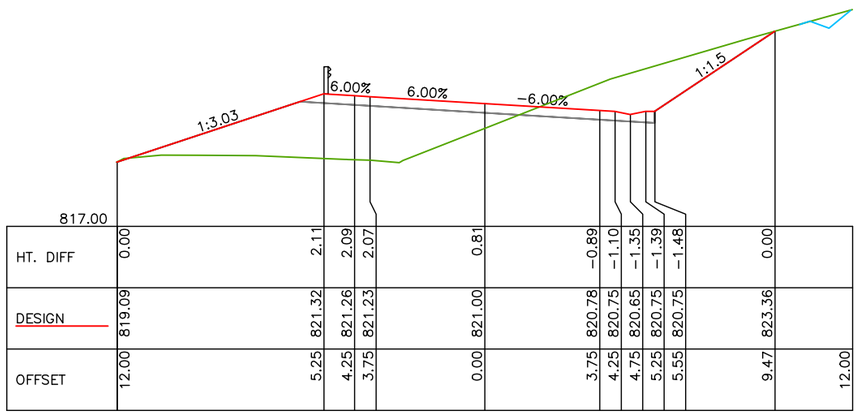
816.00																							
HT. DIFF	0.00		1.51	1.49	1.47		0.71			-1.20	-1.38	-1.63	-1.68	-1.76		0.00							
DESIGN	818.68		820.48	820.42	820.39		820.16			819.94	819.91	819.81	819.91	819.91		822.82							
OFFSET	12.00		5.25	4.25	3.75		0.00			3.75	4.25	4.75	5.25	5.55		9.91		12.00					

2100.00



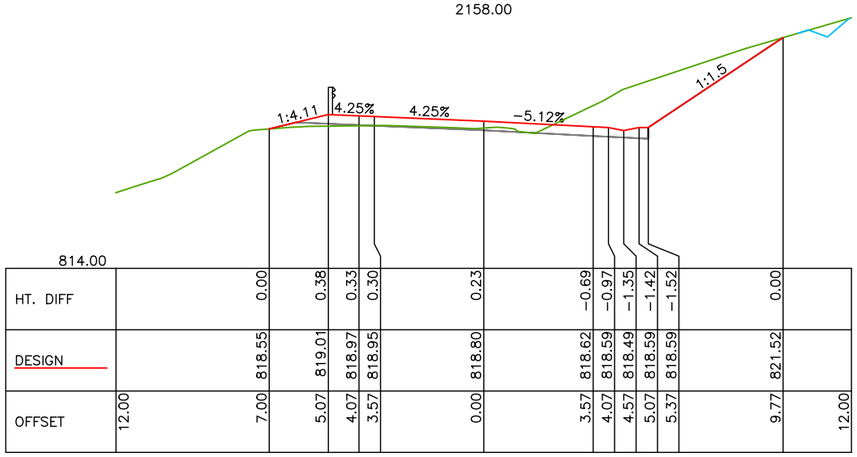
814.00																							
HT. DIFF		0.00		0.12	0.05	0.02		0.10			-0.30	-0.63	-0.93	-1.00	-1.10		0.00						
DESIGN		818.45		818.75	818.73	818.72		818.65			818.52	818.50	818.40	818.50	818.50		820.70						
OFFSET	12.00		7.00		4.84	3.84	3.34		0.00		3.34	3.84	4.34	4.84	5.14		8.44		12.00				

2158.00



817.00																							
HT. DIFF	0.00		2.11	2.09	2.07		0.81			-0.89	-1.10	-1.35	-1.39	-1.48		0.00							
DESIGN	819.09		821.32	821.26	821.23		821.00			820.78	820.75	820.65	820.75	820.75		823.36							
OFFSET	12.00		5.25	4.25	3.75		0.00			3.75	4.25	4.75	5.25	5.55		9.47		12.00					

2080.00



814.00																							
HT. DIFF		0.00		0.38	0.33	0.30		0.23			-0.69	-0.97	-1.35	-1.42	-1.52		0.00						
DESIGN		818.55		819.01	818.97	818.95		818.80			818.62	818.59	818.49	818.59	818.59		821.52						
OFFSET	12.00		7.00		5.07	4.07	3.57		0.00		3.57	4.07	4.57	5.07	5.37		9.77		12.00				

2140.00

LEGEND

GUARD RAIL

CATCH DRAIN

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200

FILE: PN11585	A3- 546391_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 18 OF 43 SHEETS

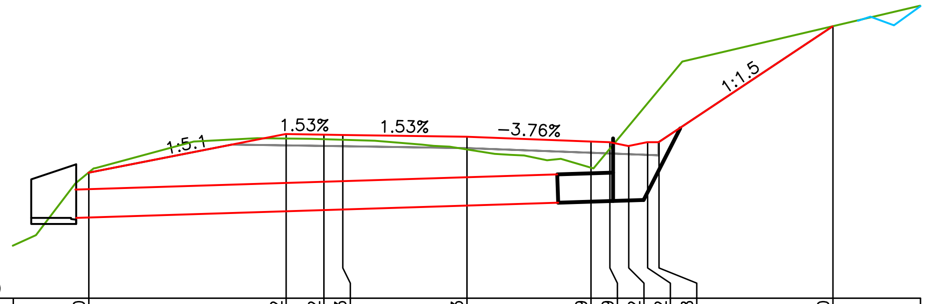
ORIGINAL A3 SHEET

100mm

0

ORIGINAL A3 SHEET

100mm

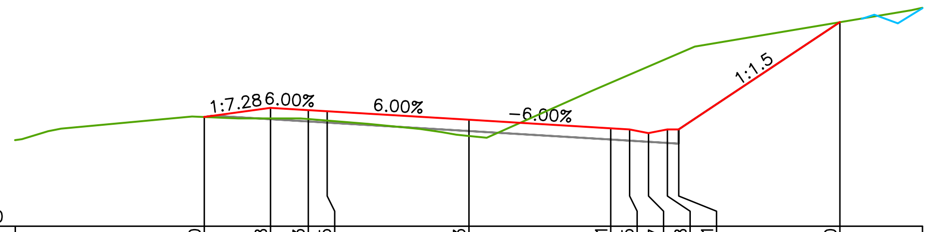


814.00

HT. DIFF		0.00	0.12	0.12	0.13	0.33	0.69	0.19	-0.52	-1.02	-1.38	0.00	
DESIGN		818.79	819.82	819.80	819.79	819.74	819.62	819.60	819.50	819.60	819.60	822.67	
OFFSET	12.00	10.00	4.78	3.78	3.28	0.00	3.28	3.78	4.28	4.78	5.08	9.68	12.00

2205.00

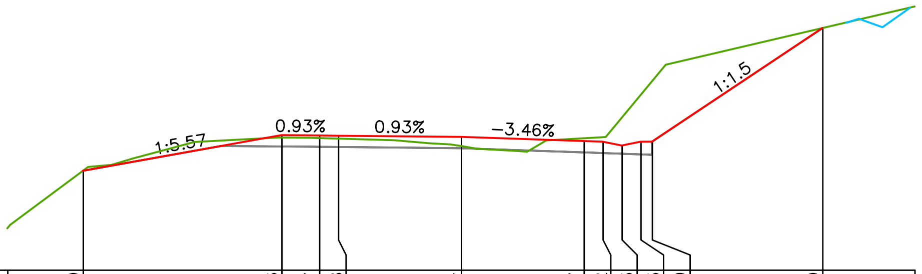
SEE SHEET 34



819.00

HT. DIFF		0.00	0.28	0.23	0.25	0.43	-1.21	-1.45	-1.77	-1.88	-2.01	0.00	
DESIGN		821.89	822.13	822.07	822.04	821.81	821.59	821.56	821.46	821.56	821.56	824.40	
OFFSET	12.00	7.00	5.25	4.25	3.75	0.00	3.75	4.25	4.75	5.25	5.55	9.81	12.00

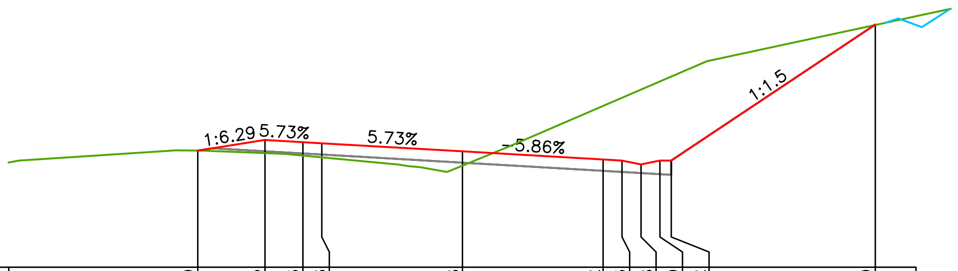
2260.00



815.00

HT. DIFF		0.00	0.06	0.07	0.08	0.24	-0.07	-0.12	-0.73	-1.23	-1.59	0.00	
DESIGN		818.66	819.60	819.59	819.58	819.55	819.44	819.42	819.32	819.42	819.42	822.43	
OFFSET	12.00	10.00	4.75	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	9.56	12.00

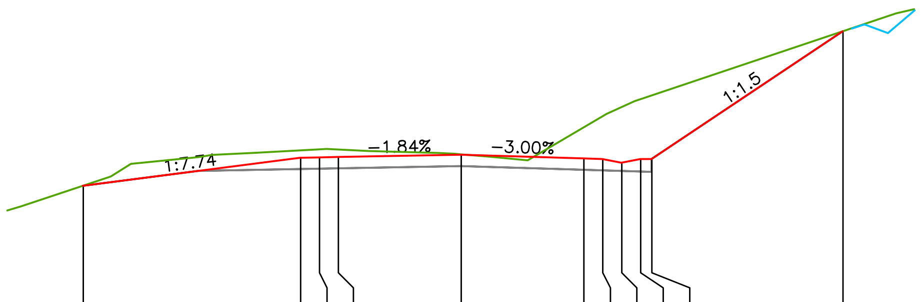
2200.00



818.00

HT. DIFF		0.00	0.35	0.36	0.38	0.38	-1.42	-1.66	-1.98	-2.10	-2.22	0.00	
DESIGN		821.08	821.36	821.30	821.27	821.06	820.84	820.81	820.71	820.81	820.81	824.41	
OFFSET	12.00	7.00	5.22	4.22	3.72	0.00	3.72	4.22	4.72	5.22	5.52	10.92	12.00

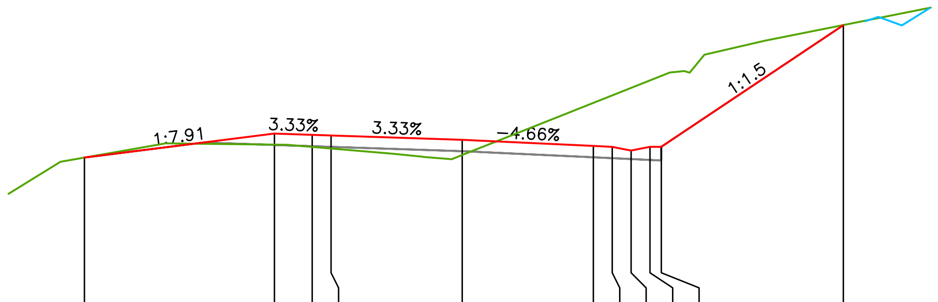
2240.00



815.00

HT. DIFF		0.00	-0.19	-0.21	-0.20	-0.01	-0.82	-1.13	-1.47	-1.58	-1.68	0.00	
DESIGN		818.09	818.83	818.84	818.85	818.91	818.82	818.80	818.70	818.80	818.80	822.17	
OFFSET	12.00	10.00	4.25	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	10.11	12.00

2180.00



816.00

HT. DIFF		0.00	0.29	0.32	0.34	0.40	-1.14	-1.36	-1.66	-1.75	-1.87	0.00	
DESIGN		819.84	820.47	820.44	820.42	820.31	820.15	820.12	820.02	820.12	820.12	823.33	
OFFSET	12.00	10.00	4.97	3.97	3.47	0.00	3.47	3.97	4.47	4.97	5.27	10.09	12.00

2220.00

LEGEND

GUARD RAIL

CATCH DRAIN

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

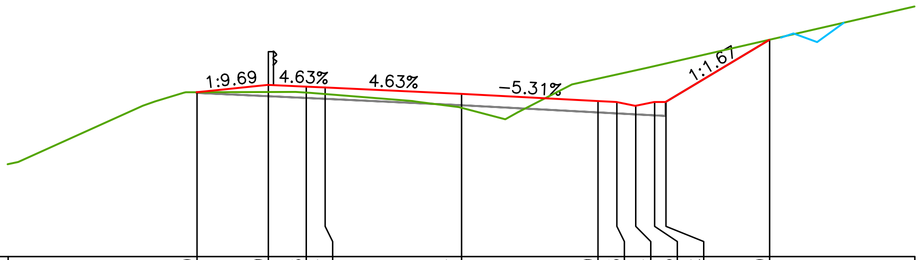
CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200
FILE: PN11585 | A3- 546392_3A
ACAD: 11585A19-1 | CCAD: 11585A19-2
DRN: AL | CHK: AL
SHEET 19 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

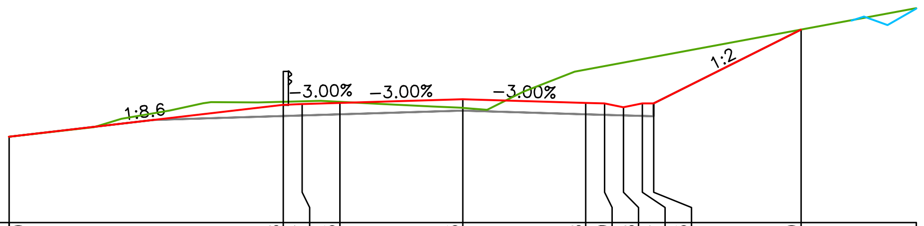
0



819.00

HT. DIFF		0.00	0.19	0.16	0.17	0.37	-0.59	-0.73	-0.94	-0.95	-1.02	0.00	
DESIGN		823.34	823.54	823.49	823.47	823.30	823.11	823.08	822.98	823.08	823.08	824.73	
OFFSET	12.00	7.00	5.11	4.11	3.61	0.00	3.61	4.11	4.61	5.11	5.41	8.15	12.00

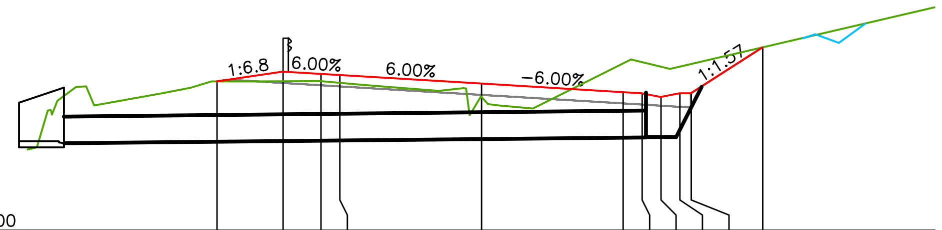
2300.00



822.00

HT. DIFF	0.00	-0.08	-0.07	-0.03	0.23	-0.88	-0.99	-1.18	-1.17	-1.23	0.00	
DESIGN	824.26	825.10	825.12	825.15	825.25	825.15	825.14	825.04	825.14	825.14	827.09	
OFFSET	12.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	8.95	12.00

2360.00

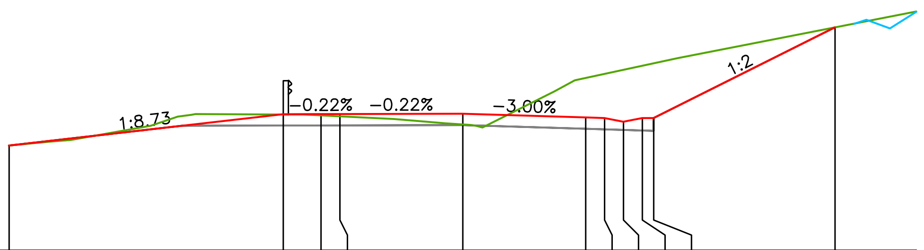


819.00

HT. DIFF		0.00	0.26	0.19	0.20	0.34	-0.75	-0.83	-0.80	-0.70	-0.77	0.00	
DESIGN		822.92	823.18	823.12	823.09	822.87	822.64	822.61	822.51	822.61	822.61	823.82	
OFFSET	12.00	7.00	5.25	4.25	3.75	0.00	3.75	4.25	4.75	5.25	5.55	7.44	12.00

2288.00

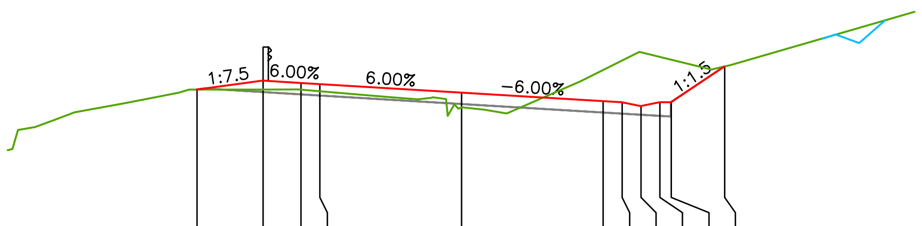
SEE SHEET 35



821.00

HT. DIFF	0.00	0.01	0.04	0.06	0.28	-1.04	-1.17	-1.37	-1.38	-1.45	0.00	
DESIGN	823.76	824.60	824.60	824.60	824.61	824.51	824.49	824.39	824.49	824.49	826.89	
OFFSET	12.00	4.75	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	9.85	12.00

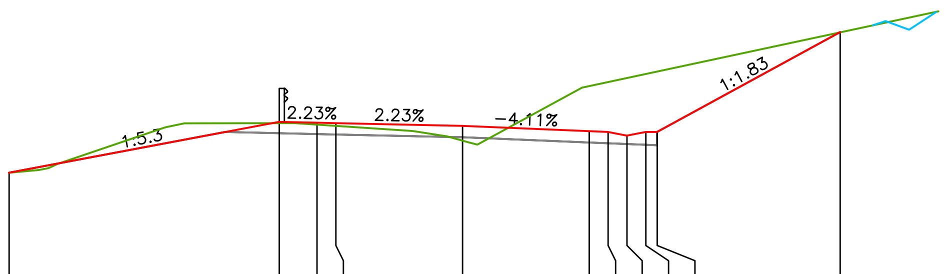
2340.00



819.00

HT. DIFF		0.00	0.24	0.18	0.19	0.40	-0.82	-1.10	-1.42	-1.20	-1.13	0.00	
DESIGN		822.65	822.88	822.82	822.79	822.57	822.34	822.31	822.21	822.31	822.31	823.26	
OFFSET	12.00	7.00	5.25	4.25	3.75	0.00	3.75	4.25	4.75	5.25	5.55	6.97	12.00

2280.00



820.00

HT. DIFF	0.00	0.04	0.05	0.07	0.39	-1.19	-1.32	-1.53	-1.53	-1.60	0.00	
DESIGN	822.72	824.07	824.05	824.04	823.96	823.83	823.80	823.70	823.80	823.80	826.45	
OFFSET	12.00	4.85	3.85	3.35	0.00	3.35	3.85	4.35	4.85	5.15	9.99	12.00

2320.00

LEGEND

GUARD RAIL

CATCH DRAIN

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors

115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

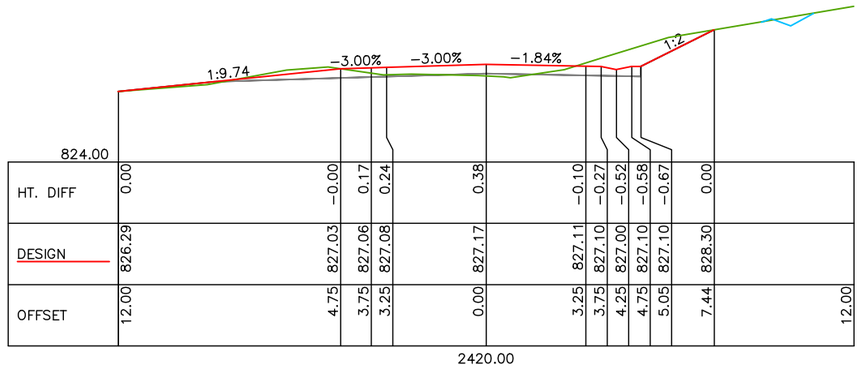
CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

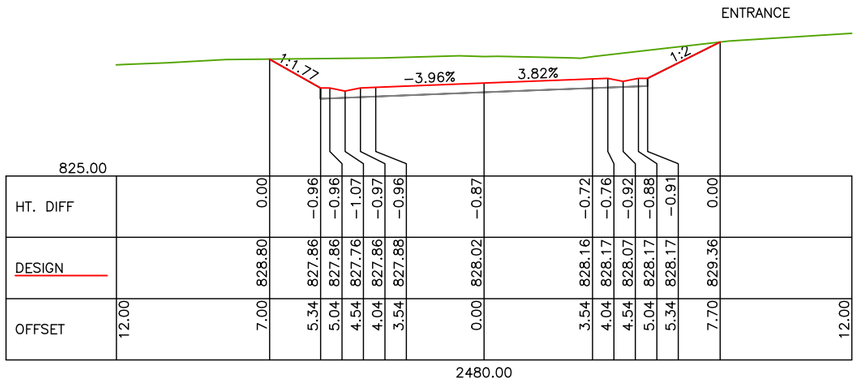
FILE: PN11585	A3- 546393_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 20 OF 43 SHEETS



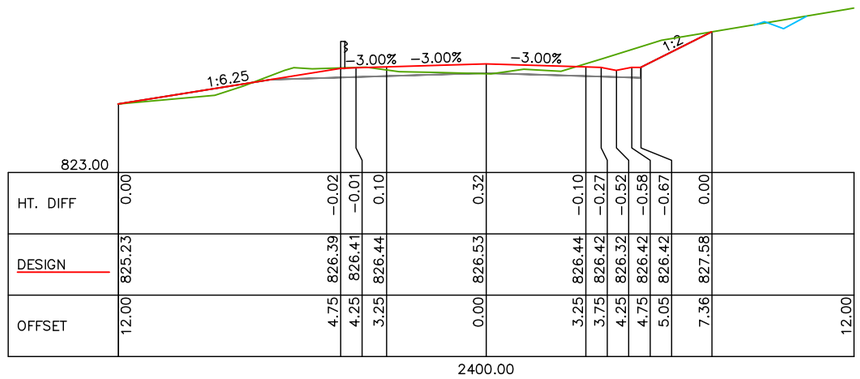
824.00																							
HT. DIFF	0.00		−0.00		0.17	0.24		0.38		−0.10	−0.27	−0.52	−0.58	−0.67	0.00								
DESIGN	826.29		827.03		827.06	827.08		827.17		827.11	827.10	827.00	827.10	827.10	828.30								
OFFSET	12.00		4.75		3.75	3.25		0.00		3.25	3.75	4.25	4.75	5.05	7.44		12.00						

2420.00



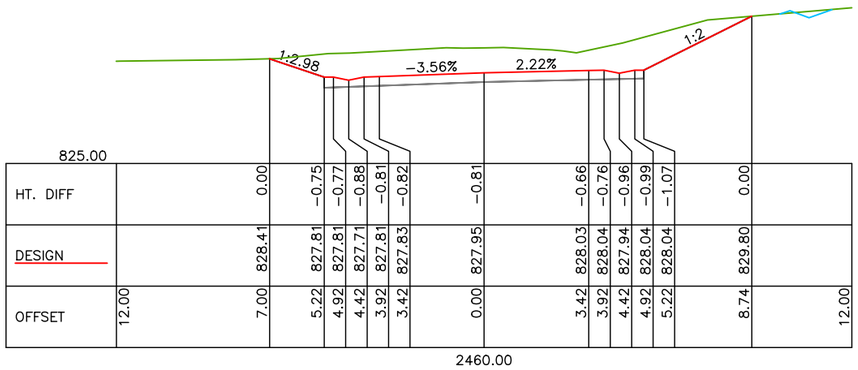
825.00																							
HT. DIFF	0.00		−0.96		−0.96	−1.07		−0.97		−0.96		−0.87		−0.72	−0.76	−0.92	−0.88	−0.91	0.00				
DESIGN	828.80		827.86		827.86	827.76		827.86		827.88		828.02		828.16	828.17	828.07	828.17	828.17	829.36				
OFFSET	12.00		7.00		5.34	5.04		4.54		4.04		3.54		0.00		3.54	4.04	4.54	5.04	5.34	7.70		12.00

2480.00



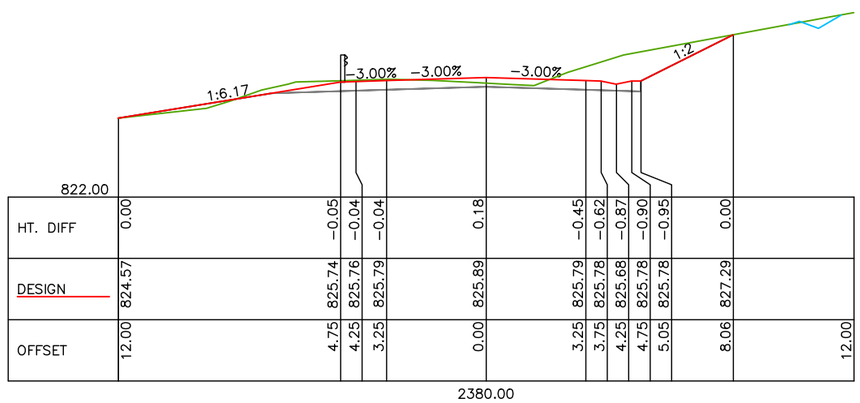
823.00																							
HT. DIFF	0.00		−0.02		−0.01	0.10		0.32		−0.10	−0.27	−0.52	−0.58	−0.67	0.00								
DESIGN	825.23		826.39		826.41	826.44		826.53		826.44	826.42	826.32	826.42	826.42	827.58								
OFFSET	12.00		4.75		4.25	3.25		0.00		3.25	3.75	4.25	4.75	5.05	7.36		12.00						

2400.00



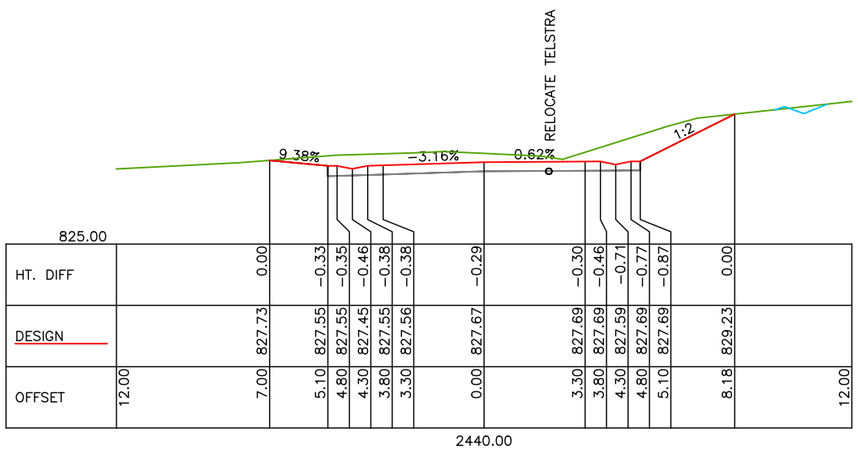
825.00																							
HT. DIFF	0.00		−0.75		−0.77	−0.88		−0.81		−0.82		−0.81		−0.66	−0.76	−0.96	−0.99	−1.07	0.00				
DESIGN	828.41		827.81		827.81	827.71		827.81		827.83		827.95		828.03	828.04	827.94	828.04	828.04	829.80				
OFFSET	12.00		7.00		5.22	4.92		4.42		3.92		3.42		0.00		3.42	3.92	4.42	4.92	5.22	8.74		12.00

2460.00



822.00																							
HT. DIFF	0.00		−0.05		−0.04	−0.04		0.18		−0.45	−0.62	−0.87	−0.90	−0.95	0.00								
DESIGN	824.57		825.74		825.76	825.79		825.89		825.79	825.78	825.68	825.78	825.78	827.29								
OFFSET	12.00		4.75		4.25	3.25		0.00		3.25	3.75	4.25	4.75	5.05	8.06		12.00						

2380.00



825.00																							
HT. DIFF	0.00		−0.33		−0.35	−0.46		−0.38		−0.38		−0.29		−0.30	−0.46	−0.71	−0.77	−0.87	0.00				
DESIGN	827.73		827.55		827.55	827.45		827.55		827.56		827.67		827.69	827.69	827.59	827.69	827.69	829.23				
OFFSET	12.00		7.00		5.10	4.80		4.30		3.80		3.30		0.00		3.30	3.80	4.30	4.80	5.10	8.18		12.00

2440.00

LEGEND

GUARD RAIL

CATCH DRAIN

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

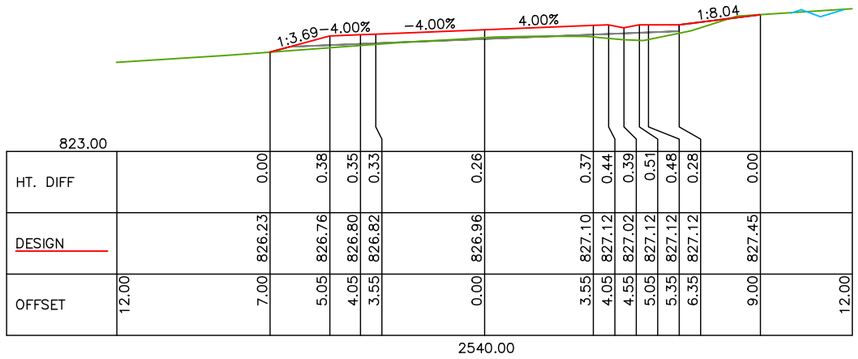
CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

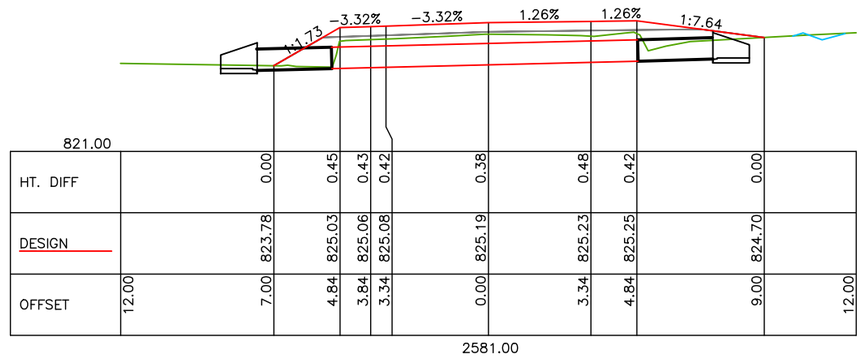
FILE: PN11585	A3– 546394_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 21 OF 43 SHEETS



823.00																							
HT. DIFF		0.00		0.38	0.35	0.33		0.26		0.37	0.44	0.39	0.51	0.48	0.28	0.00							
DESIGN		826.23		826.76	826.80	826.82		826.96		827.10	827.12	827.02	827.12	827.12	827.12	827.45							
OFFSET	12.00		7.00		5.05	4.05	3.55		0.00		3.55	4.05	4.55	5.05	5.35	6.35	9.00		12.00				

2540.00



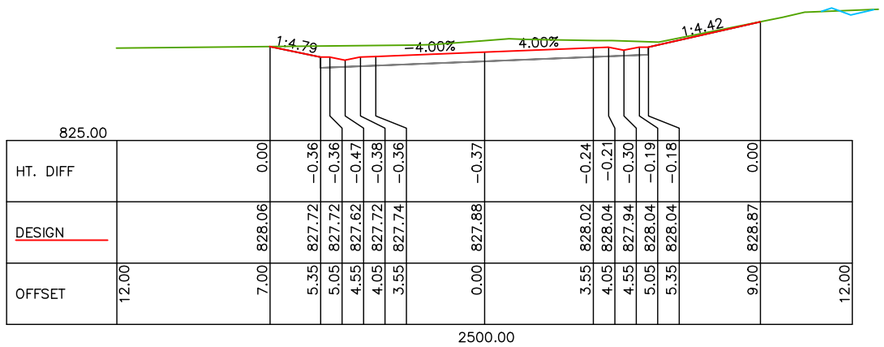
821.00																							
HT. DIFF		0.00		0.45	0.43	0.42		0.38		0.48	0.42					0.00							
DESIGN		823.78		825.03	825.06	825.08		825.19		825.23	825.25					824.70							
OFFSET	12.00		7.00		4.84	3.84	3.34		0.00		3.34	4.84				9.00			12.00				

2581.00

SEE SHEET 36

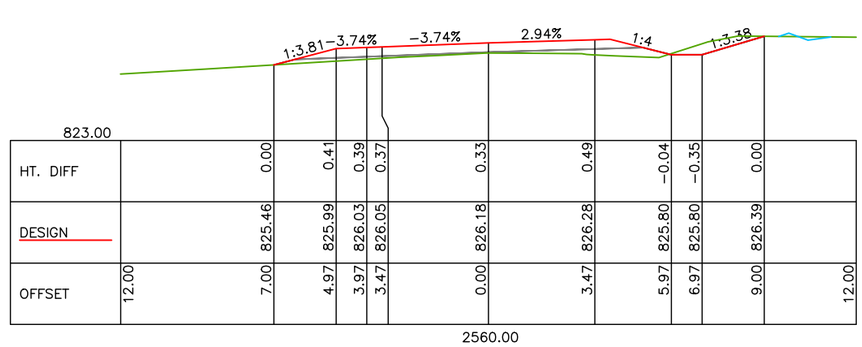
LEGEND

CATCH DRAIN



825.00																							
HT. DIFF		0.00		−0.36	−0.36	−0.47	−0.38	−0.36		−0.37		−0.24	−0.21	−0.30	−0.19	−0.18		0.00					
DESIGN		828.06		827.72	827.72	827.62	827.72	827.74		827.88		828.02	828.04	827.94	828.04	828.04		828.87					
OFFSET	12.00		7.00		5.35	5.05	4.55	4.05	3.55		0.00		3.55	4.05	4.55	5.05	5.35		9.00		12.00		

2500.00



823.00																							
HT. DIFF		0.00		0.41	0.39	0.37		0.33		0.49		−0.04		−0.35		0.00							
DESIGN		825.46		825.99	826.03	826.05		826.18		826.28		825.80		825.80		826.39							
OFFSET	12.00		7.00		4.97	3.97	3.47		0.00		3.47		5.97		6.97		9.00		12.00				

2560.00

10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR CLIENT COMMENTS	AL
DATE	NO	REVISION	AUTHORISED

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

FILE: PN11585	A3– 546395_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 22 OF 43 SHEETS

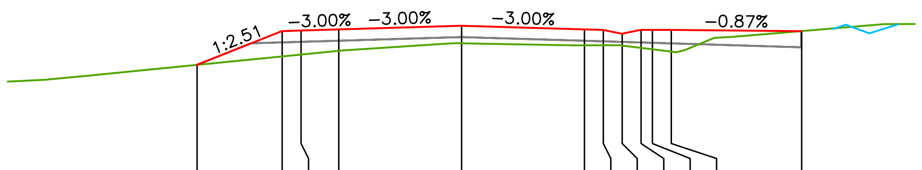
ORIGINAL A3 SHEET

100mm

0

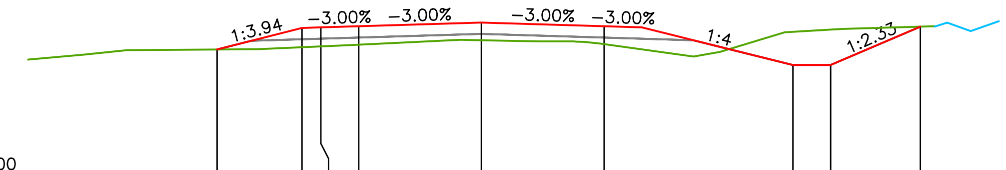
ORIGINAL A3 SHEET

100mm 0



HT. DIFF		0.00	0.67	0.64	0.57	0.47	0.42	0.41	0.31	0.47	0.51	0.57	0.00	
DESIGN		820.88	821.77	821.79	821.82	821.92	821.82	821.80	821.70	821.80	821.80	821.80	821.77	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	5.55	9.00	12.00

2640.00

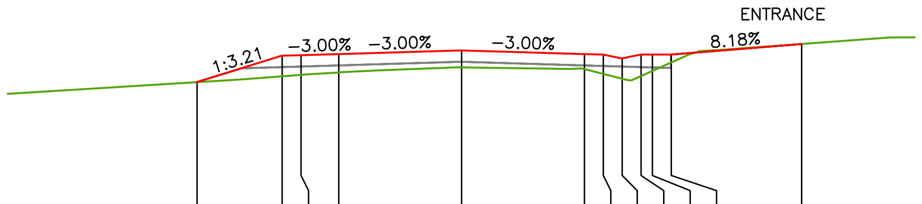


HT. DIFF		0.00	0.51	0.50	0.49	0.47	0.47	-0.88	-0.94	0.00	
DESIGN		817.29	817.86	817.87	817.90	818.00	817.90	816.87	816.87	817.89	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.62	12.00

2700.00

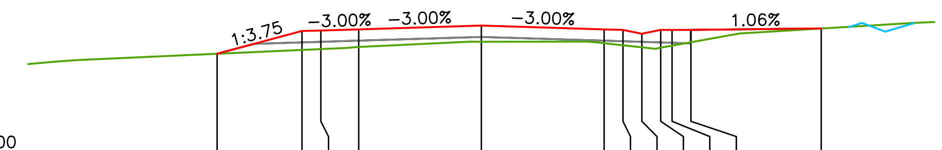
LEGEND

CATCH DRAIN



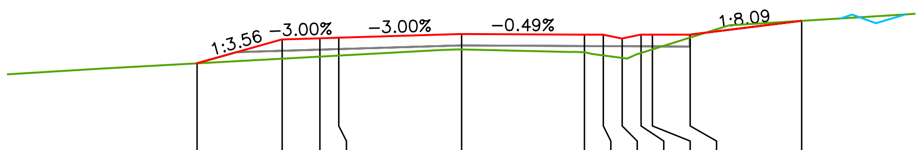
HT. DIFF		0.00	0.55	0.52	0.49	0.45	0.40	0.51	0.54	0.57	0.44	0.21	0.00	
DESIGN		822.27	822.97	822.99	823.02	823.11	823.02	823.00	822.90	823.00	823.00	823.00	823.28	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	5.55	9.00	12.00

2620.00



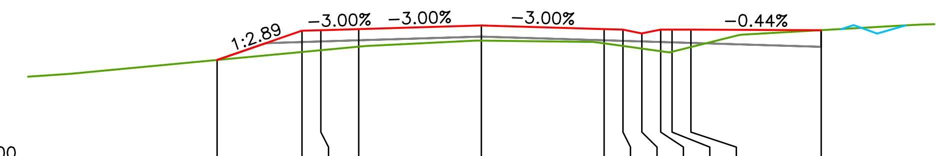
HT. DIFF		0.00	0.50	0.49	0.47	0.42	0.36	0.40	0.36	0.47	0.41	0.32	0.00	
DESIGN		818.58	819.18	819.19	819.22	819.32	819.22	819.21	819.11	819.21	819.21	819.21	819.24	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	5.55	9.00	12.00

2680.00



HT. DIFF		0.00	0.51	0.48	0.47	0.41	0.47	0.55	0.51	0.48	0.39	0.08	0.00	
DESIGN		823.45	824.08	824.11	824.12	824.22	824.20	824.20	824.10	824.20	824.20	824.20	824.57	
OFFSET	12.00	7.00	4.75	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	6.05	9.00	12.00

2600.00



HT. DIFF		0.00	0.57	0.53	0.47	0.40	0.38	0.43	0.40	0.57	0.59	0.46	0.00	
DESIGN		819.71	820.49	820.50	820.53	820.63	820.53	820.52	820.42	820.52	820.52	820.52	820.50	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	3.75	4.25	4.75	5.05	5.55	9.00	12.00

2660.00

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

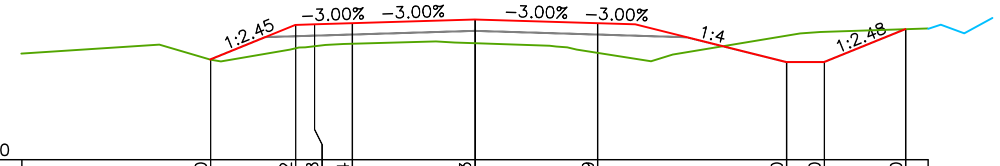
phl surveyors

115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

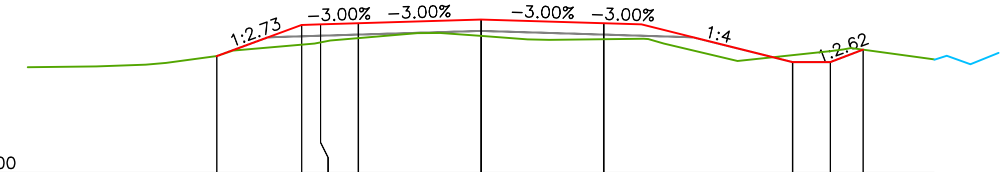
SCALE: 1:200	
FILE: PN11585	A3- 546396_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL
SHEET 23 OF 43 SHEETS	



810.00

HT. DIFF		0.00	0.62	0.58	0.54	0.63	0.79	-0.70	-0.80	0.00	
DESIGN		812.64	813.56	813.57	813.60	813.70	813.60	812.57	812.57	813.44	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.41	12.00

2760.00



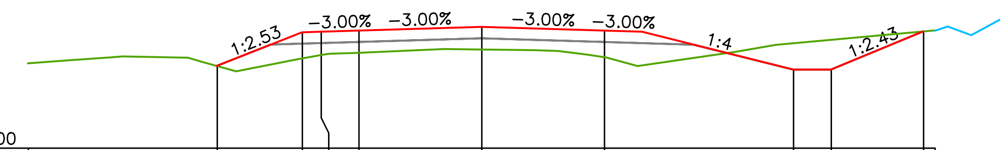
805.00

HT. DIFF		0.00	0.52	0.48	0.39	0.43	0.42	-0.19	-0.29	0.00	
DESIGN		808.07	808.90	808.91	808.94	809.04	808.94	807.91	807.91	808.25	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	10.12	12.00

2820.00

LEGEND

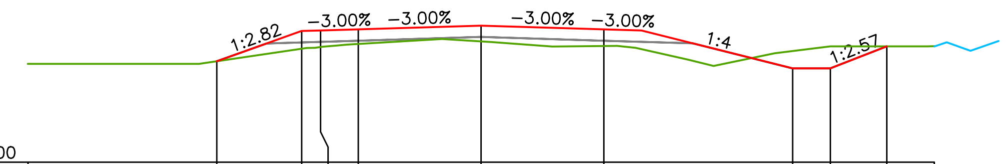
CATCH DRAIN



812.00

HT. DIFF		0.00	0.69	0.62	0.59	0.60	0.70	-0.69	-0.78	0.00	
DESIGN		814.16	815.05	815.07	815.10	815.19	815.10	814.07	814.07	815.07	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.69	12.00

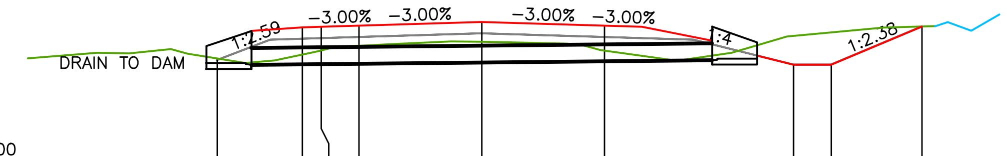
2740.00



807.00

HT. DIFF		0.00	0.47	0.44	0.39	0.42	0.44	-0.46	-0.58	0.00	
DESIGN		809.66	810.45	810.47	810.50	810.60	810.50	809.47	809.47	810.05	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	10.74	12.00

2800.00

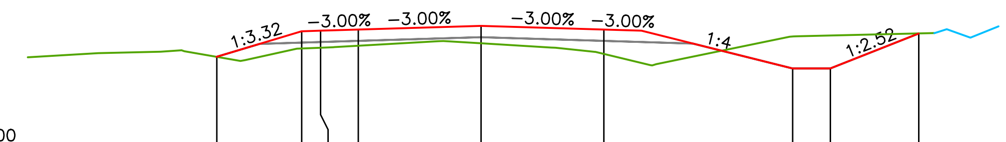


813.00

HT. DIFF		0.00	0.72	0.63	0.53	0.53	0.66	-0.76	-0.85	0.00	
DESIGN		815.62	816.48	816.50	816.53	816.63	816.53	815.50	815.50	816.51	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.65	12.00

2720.00

SEE SHEET 37



809.00

HT. DIFF		0.00	0.46	0.45	0.43	0.46	0.64	-0.85	-0.87	0.00	
DESIGN		811.33	812.01	812.02	812.05	812.15	812.05	811.02	811.02	811.95	
OFFSET	12.00	7.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.59	12.00

2780.00

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors

115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

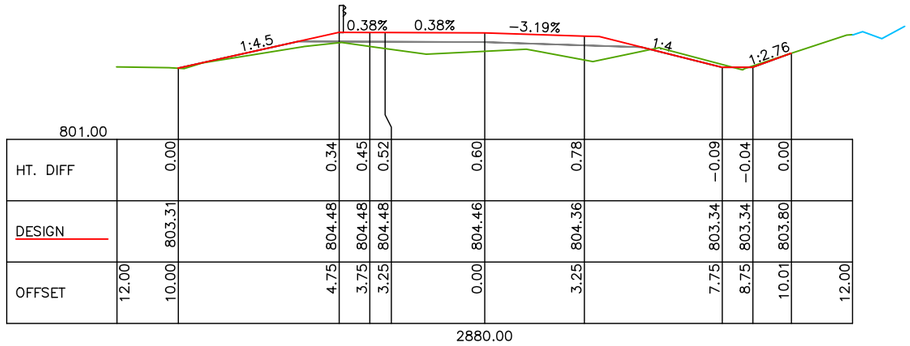
SCALE: 1:200

FILE: PN11585 | A3- 546800_4A

ACAD: 11585A19-1 | CCAD: 11585A19-2

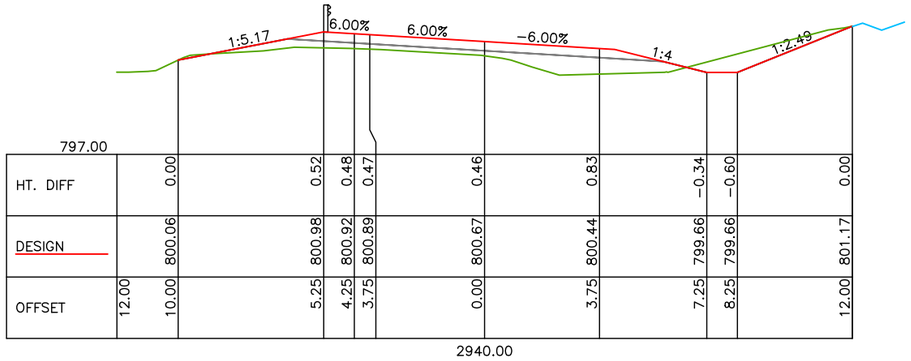
DRN: AL | CHK: AL

SHEET 24 OF 43 SHEETS



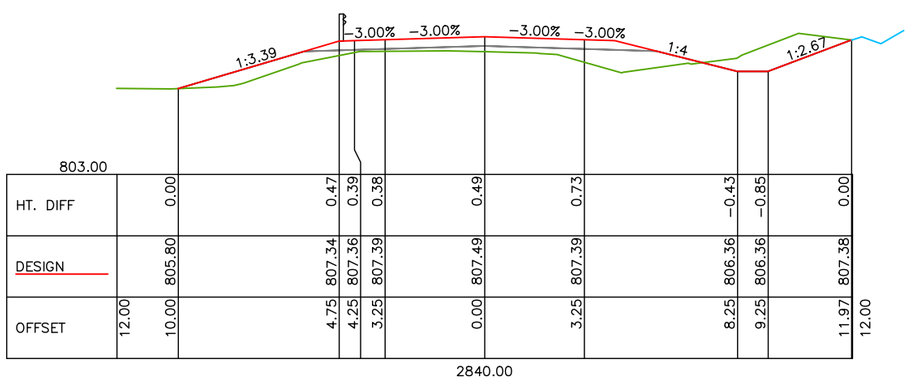
801.00														
HT. DIFF	0.00		0.34	0.45	0.52	0.60	0.78	−0.09	−0.04	0.00				
DESIGN		803.31	804.48	804.48	804.48	804.46	804.36	803.34	803.34	803.80				
OFFSET	12.00	10.00	4.75	3.75	3.25	0.00	3.25	7.75	8.75	10.01	12.00			

2880.00



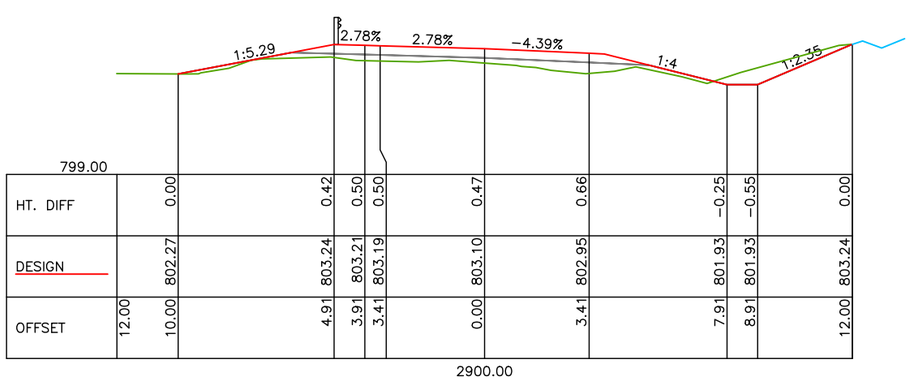
797.00														
HT. DIFF	0.00		0.52	0.48	0.47	0.46	0.83	−0.34	−0.60	0.00				
DESIGN		800.06	800.98	800.92	800.89	800.67	800.44	799.66	799.66	801.17				
OFFSET	12.00	10.00	5.25	4.25	3.75	0.00	3.75	7.25	8.25	12.00				

2940.00



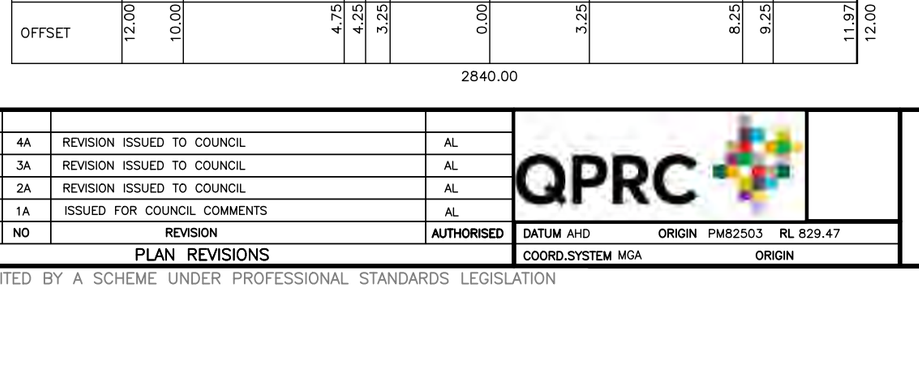
802.00														
HT. DIFF	0.00		0.38	0.34	0.34	0.46	0.80	0.00						
DESIGN		804.59	805.82	805.84	805.85	805.94	805.84	805.28						
OFFSET	12.00	10.00	4.75	3.75	3.25	0.00	3.25	5.91	12.00					

2860.00



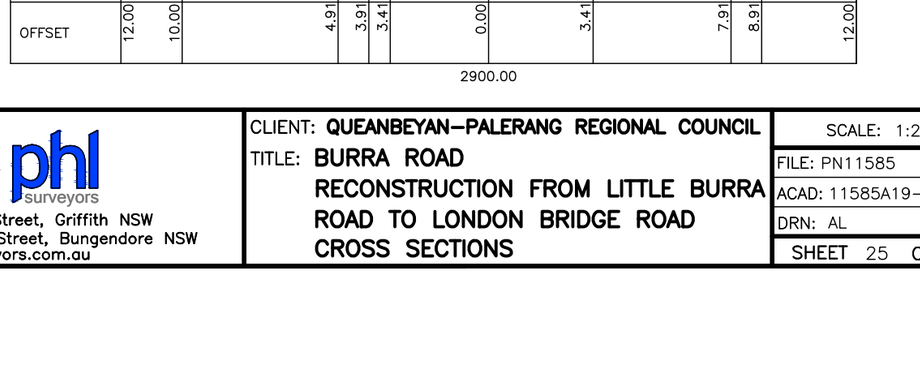
798.00														
HT. DIFF	0.00		0.52	0.49	0.48	0.50	0.49	−0.22	−0.49	0.00				
DESIGN		801.02	802.11	802.06	802.03	801.84	801.64	800.70	800.70	802.15				
OFFSET	12.00	10.00	5.17	4.17	3.67	0.00	3.67	7.17	8.17	12.00				

2920.00



803.00														
HT. DIFF	0.00		0.47	0.39	0.38	0.49	0.73	−0.43	−0.85	0.00				
DESIGN		805.80	807.34	807.36	807.39	807.49	807.39	806.36	806.36	807.38				
OFFSET	12.00	10.00	4.75	4.25	3.25	0.00	3.25	8.25	9.25	11.97	12.00			

2840.00



799.00														
HT. DIFF	0.00		0.42	0.50	0.50	0.47	0.66	−0.25	−0.55	0.00				
DESIGN		802.27	803.24	803.21	803.19	803.10	802.95	801.93	801.93	803.24				
OFFSET	12.00	10.00	4.91	3.91	3.41	0.00	3.41	7.91	8.91	12.00				

2900.00

LEGEND

GUARD RAIL

CATCH DRAIN

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

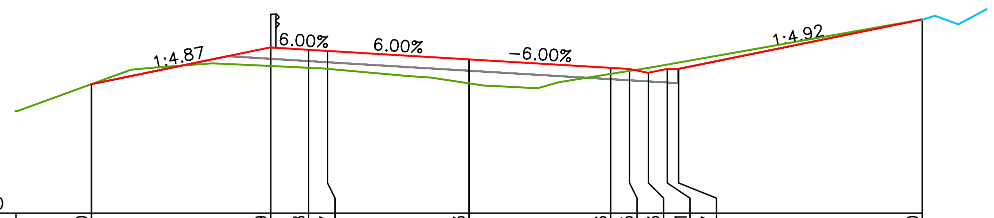
CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CROSS SECTIONS

SCALE: 1:200

FILE: PN11585	A3– 546801_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

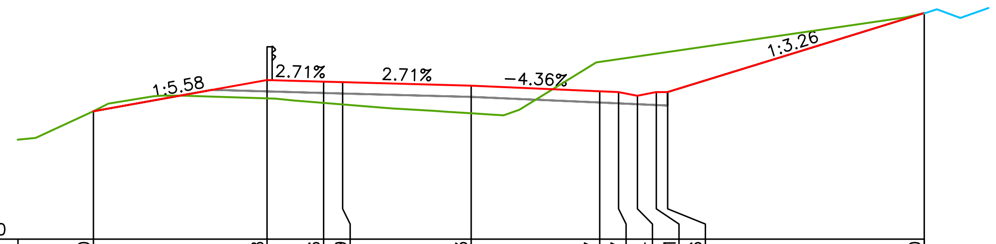
SHEET 25 OF 43 SHEETS



795.00

HT. DIFF		0.00	0.49	0.48	0.47	0.63	0.16	0.05	-0.13	-0.11	-0.17	0.00
DESIGN		798.41	799.38	799.32	799.29	799.07	798.84	798.81	798.71	798.81	798.81	800.13
OFFSET	12.00	10.00	5.25	4.25	3.75	0.00	3.75	4.25	4.75	5.25	5.55	12.00

2980.00



793.00

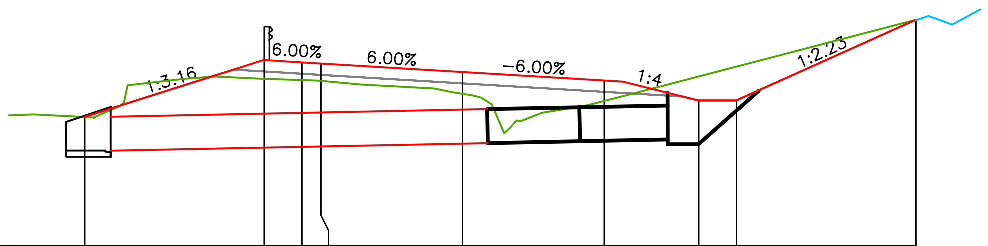
HT. DIFF		0.00	0.48	0.56	0.59	0.73	-0.77	-0.87	-1.04	-1.01	-1.06	0.00
DESIGN		796.37	797.19	797.15	797.14	797.05	796.90	796.87	796.77	796.87	796.87	798.96
OFFSET	12.00	10.00	5.40	3.90	3.40	0.00	3.40	3.90	4.40	4.90	5.20	12.00

3040.00

LEGEND

GUARD RAIL

CATCH DRAIN

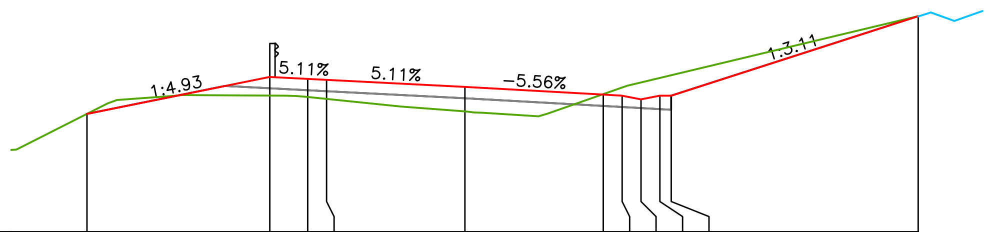


795.00

HT. DIFF		0.00	0.49	0.47	0.46	0.58	0.55	-0.63	-0.89	0.00
DESIGN		798.39	799.90	799.84	799.81	799.58	799.36	798.83	798.83	800.96
OFFSET	12.00	10.00	5.25	4.25	3.75	0.00	3.75	6.25	7.25	12.00

2963.00

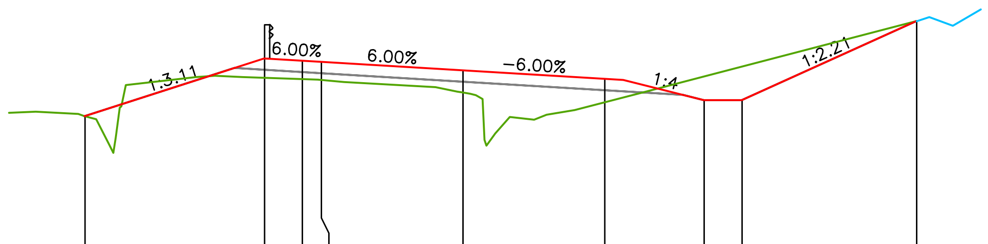
SEE SHEET 38



794.00

HT. DIFF		0.00	0.49	0.48	0.50	0.65	-0.01	-0.21	-0.45	-0.47	-0.54	0.00
DESIGN		797.11	798.09	798.04	798.01	797.83	797.62	797.59	797.49	797.59	797.59	799.69
OFFSET	12.00	10.00	5.16	4.16	3.66	0.00	3.66	4.16	4.66	5.16	5.46	12.00

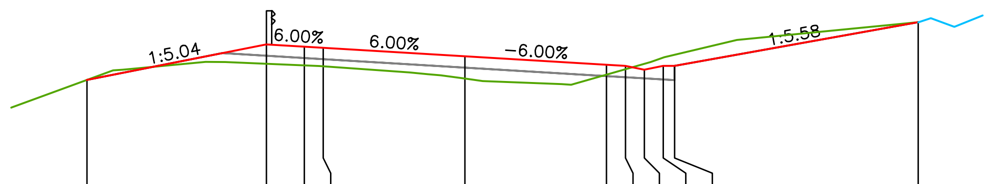
3020.00



795.00

HT. DIFF		0.00	0.51	0.49	0.48	0.59	0.62	-0.62	-0.88	0.00
DESIGN		798.48	800.01	799.95	799.92	799.70	799.47	798.91	798.91	801.00
OFFSET	12.00	10.00	5.25	4.25	3.75	0.00	3.75	6.38	7.38	12.00

2960.00



795.00

HT. DIFF		0.00	0.51	0.50	0.49	0.59	0.26	0.09	-0.15	-0.22	-0.29	0.00
DESIGN		797.86	798.80	798.74	798.71	798.49	798.26	798.23	798.13	798.23	798.23	799.39
OFFSET	12.00	10.00	5.25	4.25	3.75	0.00	3.75	4.25	4.75	5.25	5.55	12.00

3000.00

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

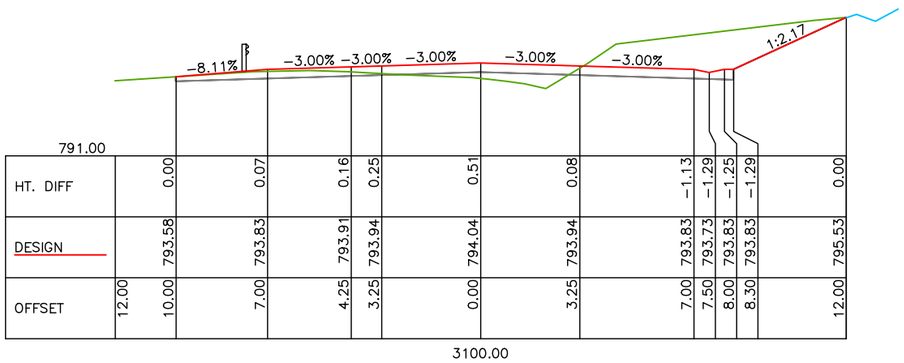
phl surveyors

115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

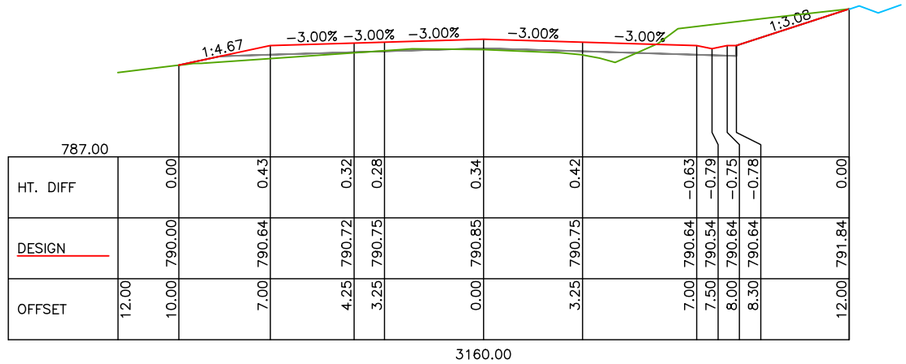
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200	
FILE: PN11585	A3– 546802_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL
SHEET 26 OF 43 SHEETS	



791.00												
HT. DIFF	0.00	0.07	0.16	0.25	0.51	0.08	-1.13	-1.29	-1.25	-1.29	0.00	
DESIGN	793.58	793.83	793.91	793.94	794.04	793.94	793.83	793.73	793.83	793.83	795.53	
OFFSET	12.00	10.00	7.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

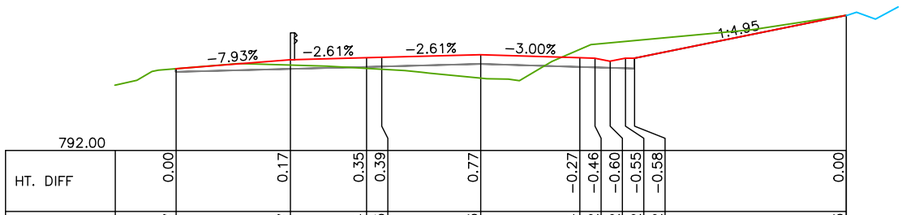
3100.00



787.00												
HT. DIFF	0.00	0.43	0.32	0.28	0.34	0.42	-0.63	-0.79	-0.75	-0.78	0.00	
DESIGN	790.00	790.64	790.72	790.75	790.85	790.75	790.64	790.54	790.64	790.64	791.84	
OFFSET	12.00	10.00	7.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

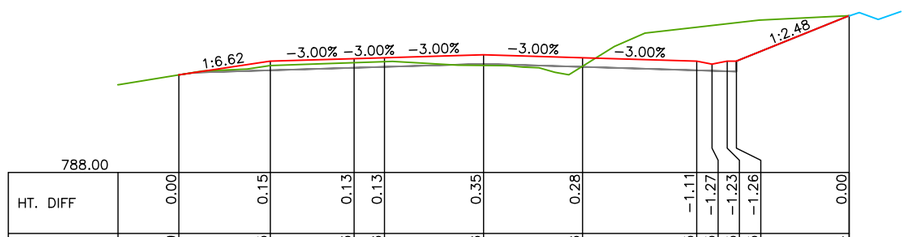
3160.00

SEE SHEETS 38-40



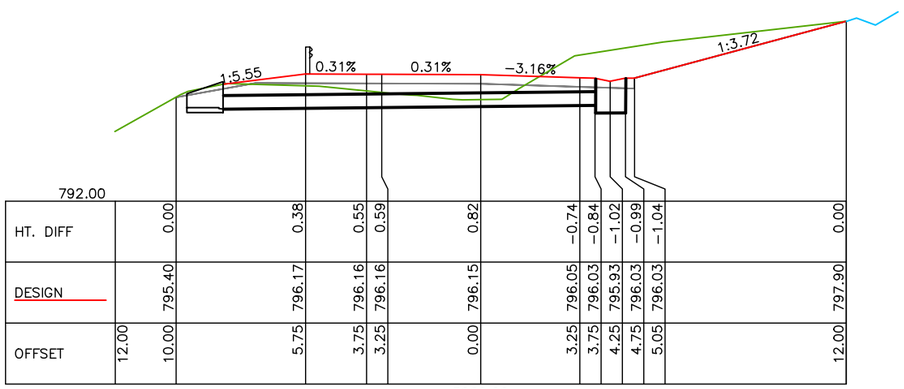
792.00												
HT. DIFF	0.00	0.17	0.35	0.39	0.77	-0.27	-0.46	-0.60	-0.55	-0.58	0.00	
DESIGN	794.67	794.97	795.04	795.05	795.13	795.04	795.02	794.92	795.02	795.02	796.43	
OFFSET	12.00	10.00	6.25	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	12.00

3080.00



788.00												
HT. DIFF	0.00	0.15	0.13	0.13	0.35	0.28	-1.11	-1.27	-1.23	-1.26	0.00	
DESIGN	791.19	791.65	791.73	791.76	791.86	791.76	791.65	791.55	791.65	791.65	793.14	
OFFSET	12.00	10.00	7.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

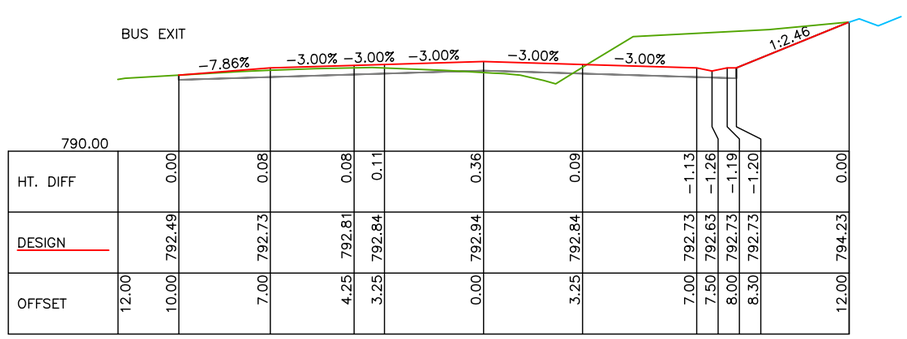
3140.00



792.00												
HT. DIFF	0.00	0.38	0.55	0.59	0.82	-0.74	-0.84	-1.02	-0.99	-1.04	0.00	
DESIGN	795.40	796.17	796.16	796.16	796.15	796.05	796.03	795.93	796.03	796.03	797.90	
OFFSET	12.00	10.00	5.75	3.75	3.25	0.00	3.25	3.75	4.25	4.75	5.05	12.00

3060.00

SEE SHEET 39



790.00												
HT. DIFF	0.00	0.08	0.08	0.11	0.36	0.09	-1.13	-1.26	-1.19	-1.20	0.00	
DESIGN	792.49	792.73	792.81	792.84	792.94	792.84	792.73	792.63	792.73	792.73	794.23	
OFFSET	12.00	10.00	7.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

3120.00

LEGEND

GUARD RAIL

CATCH DRAIN

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

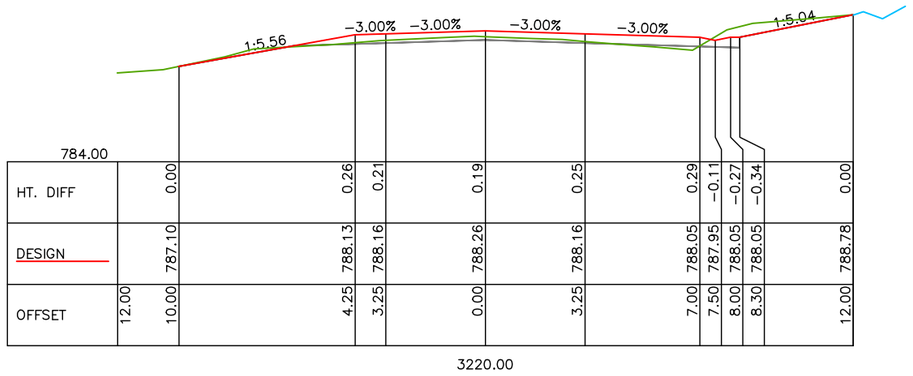
CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200

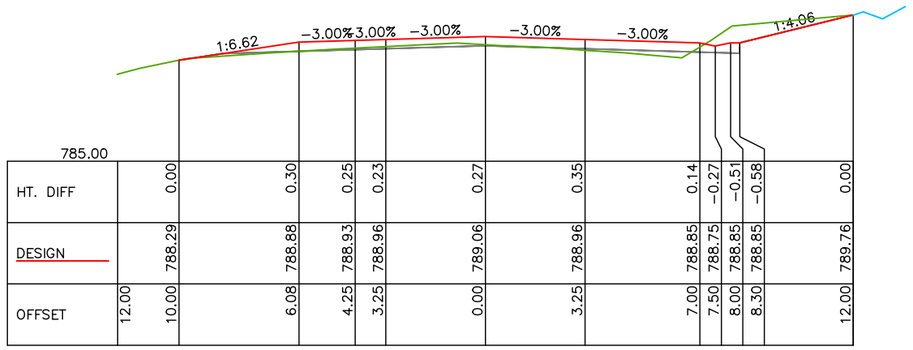
FILE: PN11585	A3- 546803_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 27 OF 43 SHEETS



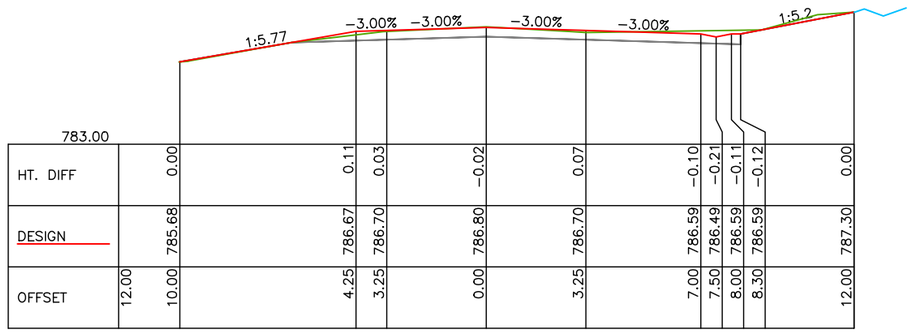
784.00									
HT. DIFF	0.00	0.26	0.21	0.19	0.25	0.29	−0.11	−0.27	−0.34	0.00
DESIGN	787.10	788.13	788.16	788.26	788.16	788.05	787.95	788.05	788.05	788.78
OFFSET	12.00	10.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

3220.00



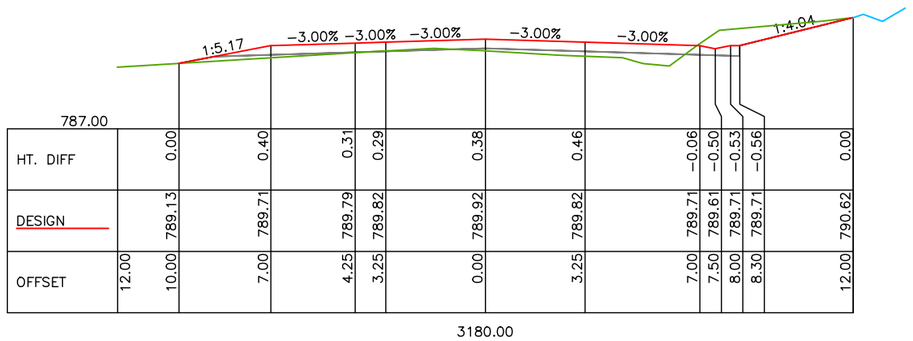
785.00									
HT. DIFF	0.00	0.30	0.25	0.23	0.27	0.35	0.14	−0.27	−0.51	−0.58	0.00
DESIGN	788.29	788.88	788.93	788.96	789.06	788.96	788.85	788.75	788.85	788.85	789.76
OFFSET	12.00	10.00	6.08	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

3200.00



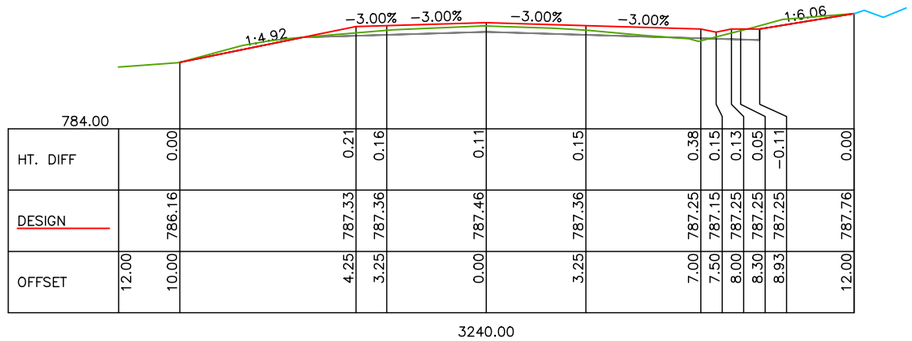
783.00									
HT. DIFF	0.00	0.11	0.03	−0.02	0.07	−0.10	−0.21	−0.11	−0.12	0.00
DESIGN	785.68	786.67	786.70	786.80	786.70	786.59	786.49	786.59	786.59	787.30
OFFSET	12.00	10.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

3256.40



787.00									
HT. DIFF	0.00	0.40	0.31	0.29	0.38	0.46	−0.06	−0.50	−0.53	−0.56	0.00
DESIGN	789.13	789.71	789.79	789.82	789.92	789.82	789.71	789.61	789.71	789.71	790.62
OFFSET	12.00	10.00	7.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	12.00

3180.00



784.00									
HT. DIFF	0.00	0.21	0.16	0.11	0.15	0.38	0.15	0.13	0.05	−0.11	0.00
DESIGN	786.16	787.33	787.36	787.46	787.36	787.25	787.15	787.25	787.25	787.25	787.76
OFFSET	12.00	10.00	4.25	3.25	0.00	3.25	7.00	7.50	8.00	8.30	8.93	12.00

3240.00

LEGEND

CATCH DRAIN

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CROSS SECTIONS**

SCALE: 1:200

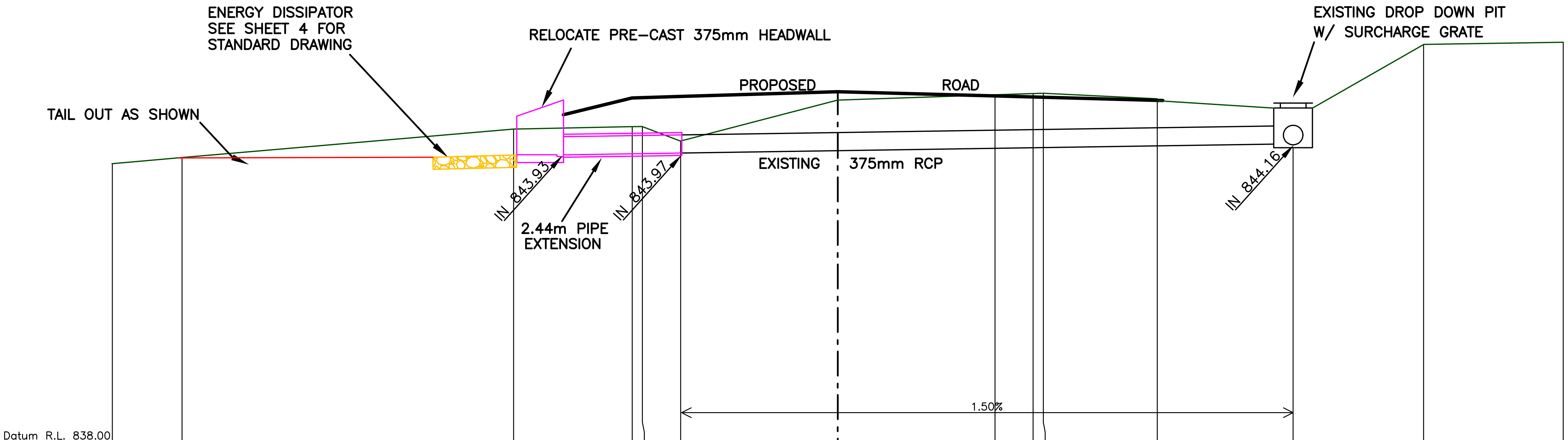
FILE: PN11585	A3– 546804_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 28 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

0



							-1.04	-1.10	-1.11	-1.12	-0.97	-0.05		
INVERT							844.02	844.07	844.08	844.08	844.12	844.16		
NATURAL	843.74	843.87	844.46	844.51	844.51	844.21	845.06	845.17	845.19	845.20	845.09	844.21	846.21	846.26
CHAINAGE	0.00	1.44	8.30	10.75	10.96	11.75	15.00	18.25	19.04	19.25	21.61	24.42	27.11	30.00

CH.1528

PIPE SCHEDULE		
DIA	CLASS	QTY
375mm	4	1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

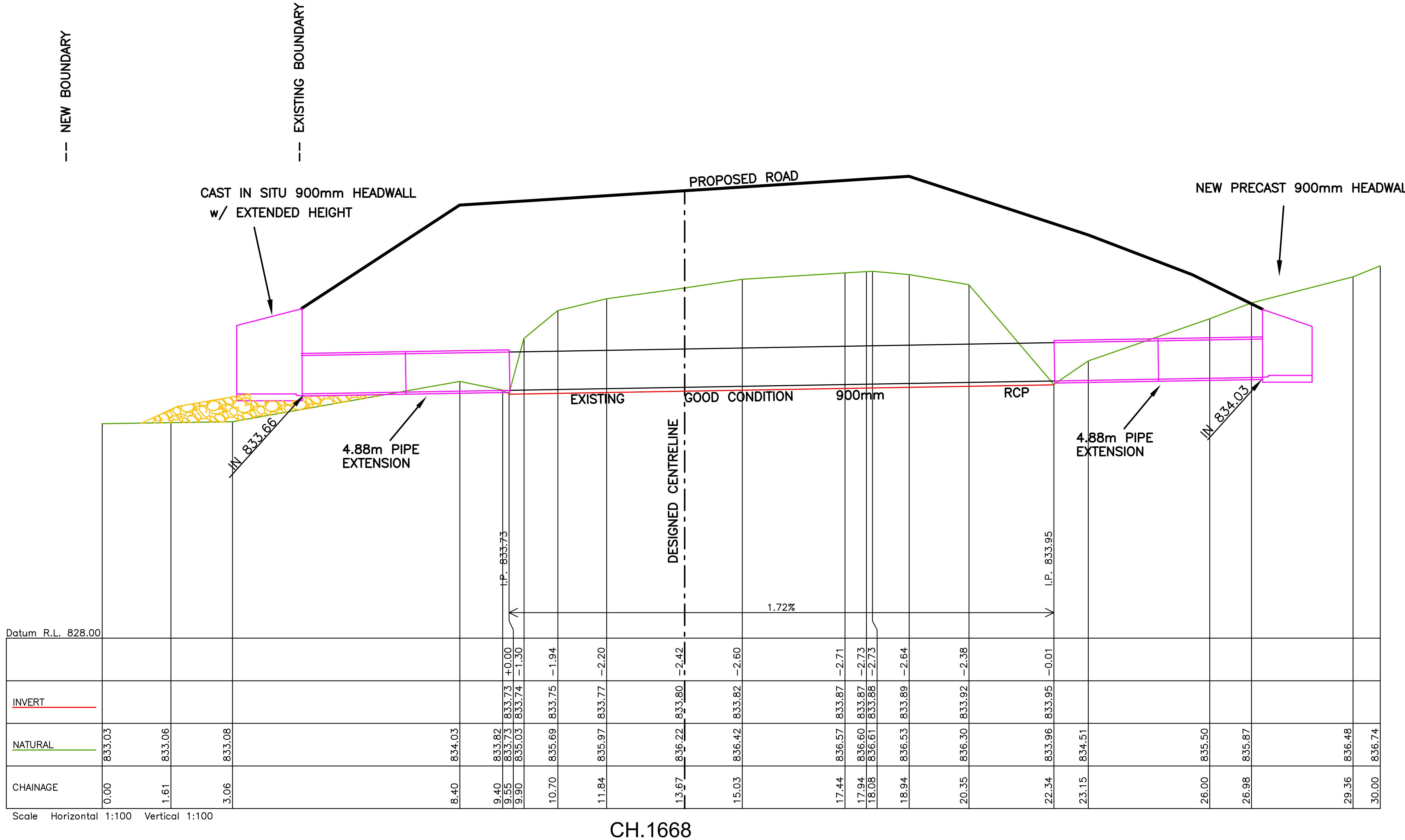
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100
FILE: PN11585 | A3- 546397_4A
ACAD: 11585A19-1 | CCAD: 11585A19-2
DRN: AL | CHK: AL
SHEET 29 OF 43 SHEETS



ORIGINAL A3 SHEET

100mm

0

CH.1668

PIPE SCHEDULE		
DIA	CLASS	QTY
900mm	4	4
CAST IN SITU H/W 900mmø		1
PRECAST H/W 900mm		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

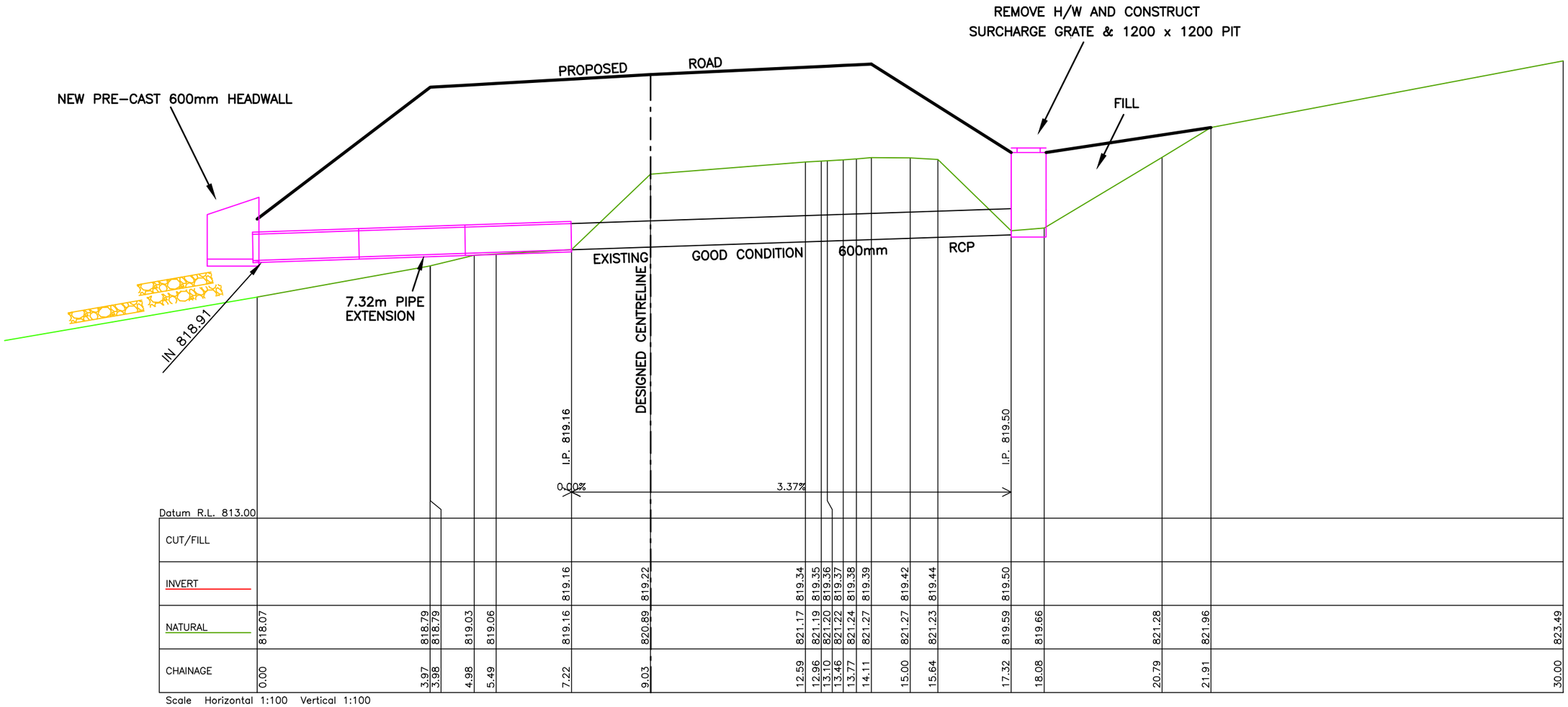
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100	
FILE: PN11585	A3- 546398_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL
SHEET 30 OF 43 SHEETS	



Scale Horizontal 1:100 Vertical 1:100

CH.1922

PIPE SCHEDULE		
DIA	CLASS	QTY
600mm	4	3
PRE-CAST H/W 600mmø		1
1200x1200 PIT w/ GRATE		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN-PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CULVERT DETAILS

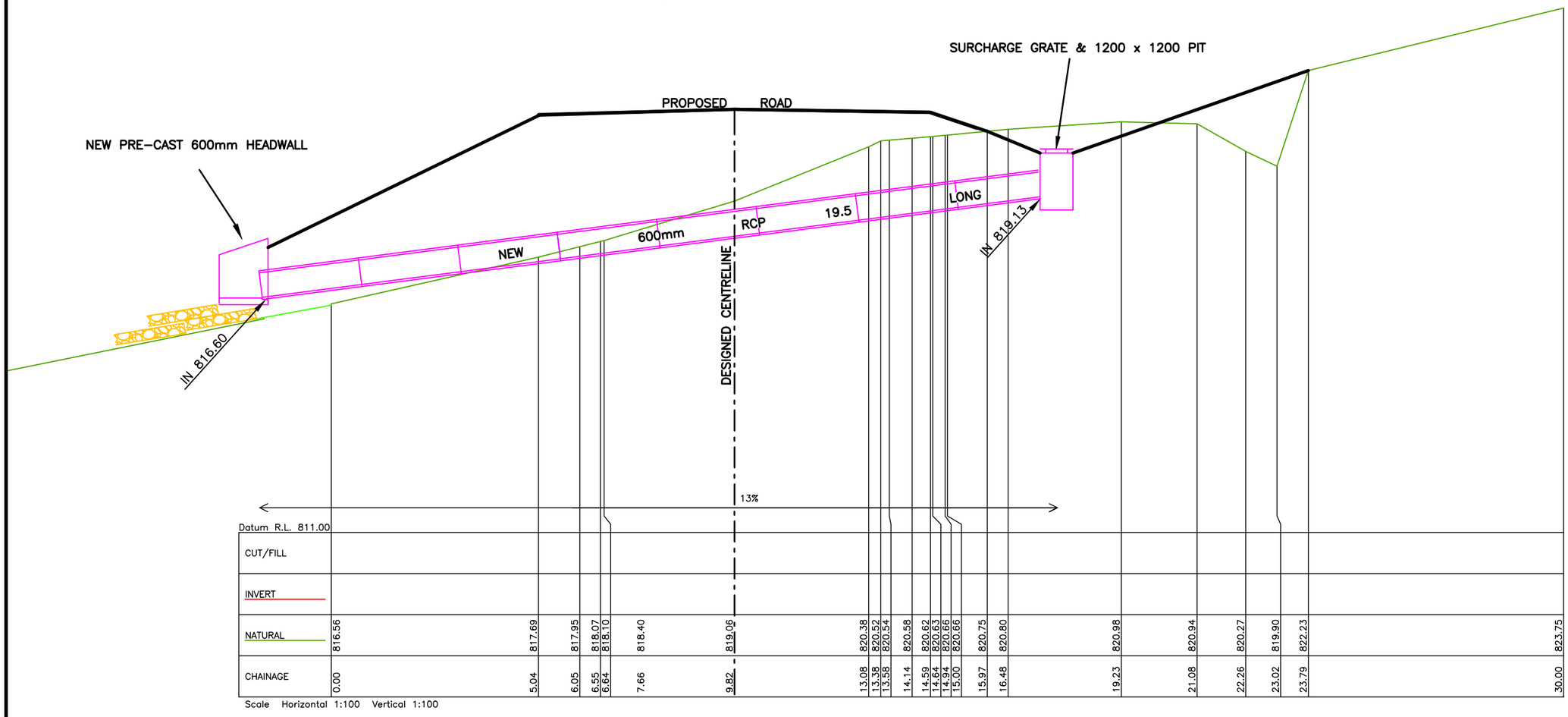
SCALE: 1:100

FILE: PN11585	A3- 546399_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 31 OF 43 SHEETS

ORIGINAL A3 SHEET
100mm
0

REMOVE EXISTING 375mm CULVERT
& REPLACE w/ NEW 600mm



Scale Horizontal 1:100 Vertical 1:100

CH.1963

PIPE SCHEDULE		
DIA	CLASS	QTY
600mm	4	8
PRECAST H/W 600mmø		1
1200x1200 PIT w/ GRATE		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

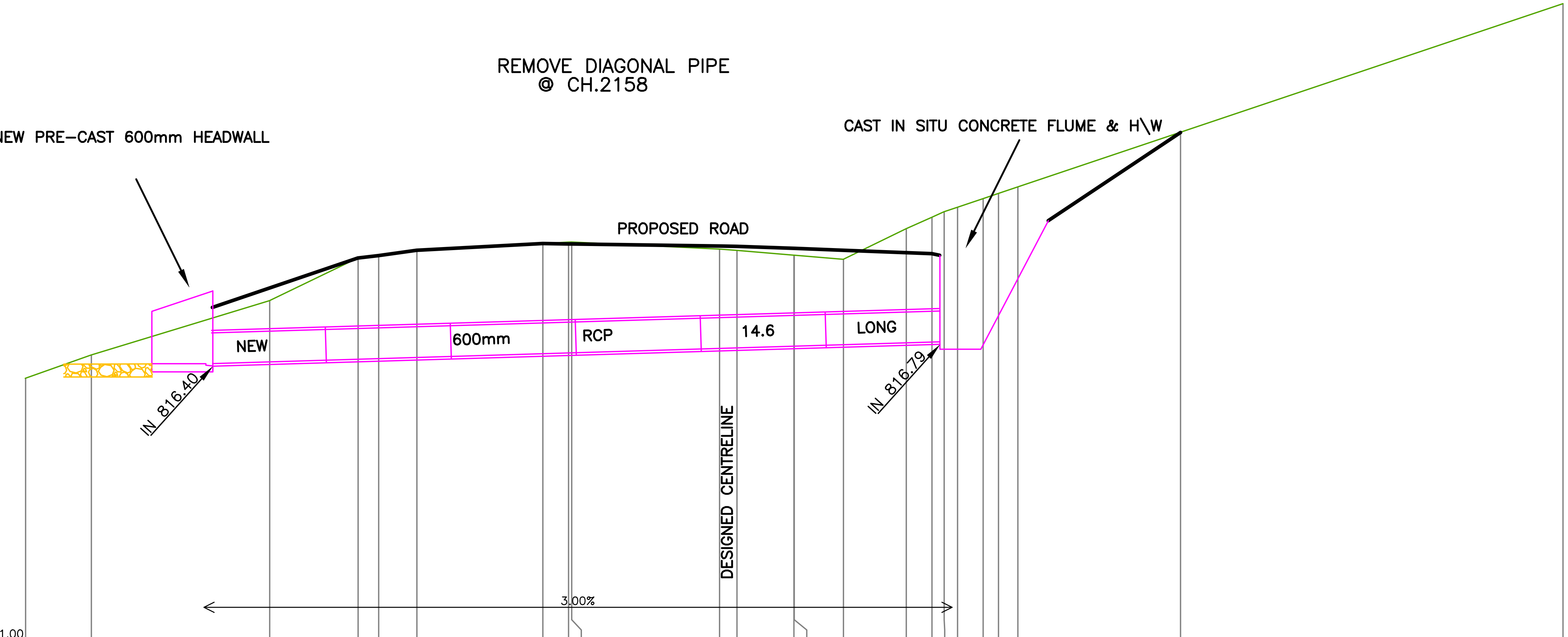
DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100
FILE: PN11585 A3- 546400_4A
ACAD: 11585A19-1 CCAD: 11585A19-2
DRN: AL CHK: AL
SHEET 32 OF 43 SHEETS

ORIGINAL A3 SHEET
100mm
0



Datum R.L. 811.00

CHAINAGE	NATURAL	INVERT	CUT/FILL
0.00	816.11		
1.28	816.56		
4.76	817.62	816.40	−1.22
6.49	818.45	816.45	−2.00
6.89	818.50	816.46	−2.04
7.64	818.62	816.49	−2.13
10.09	818.74	816.56	−2.18
10.59	818.76	816.57	−2.19
10.66	818.77	816.58	−2.19
13.54	818.63	816.66	−1.97
13.88	818.60	816.67	−1.93
14.99	818.51	816.71	−1.80
15.00	818.51	816.71	−1.80
15.96	818.43	816.74	−1.69
17.19	819.03	816.77	−2.25
17.69	819.25	816.79	−2.46
17.92	819.36	816.79	−2.56
18.19	819.45	816.80	−2.64
18.69	819.61	816.82	−2.80
18.99	819.71	816.83	−2.89
19.36	819.84	816.84	−3.00
22.54	820.91		
30.00	823.42		

Scale Horizontal 1:100 Vertical 1:100

CH.2162

PIPE SCHEDULE		
DIA	CLASS	QTY
600mm	4	6
PRECAST H/W 600mmø		1
CAST IN SITU PIT w/ FLUME & H\W		1

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

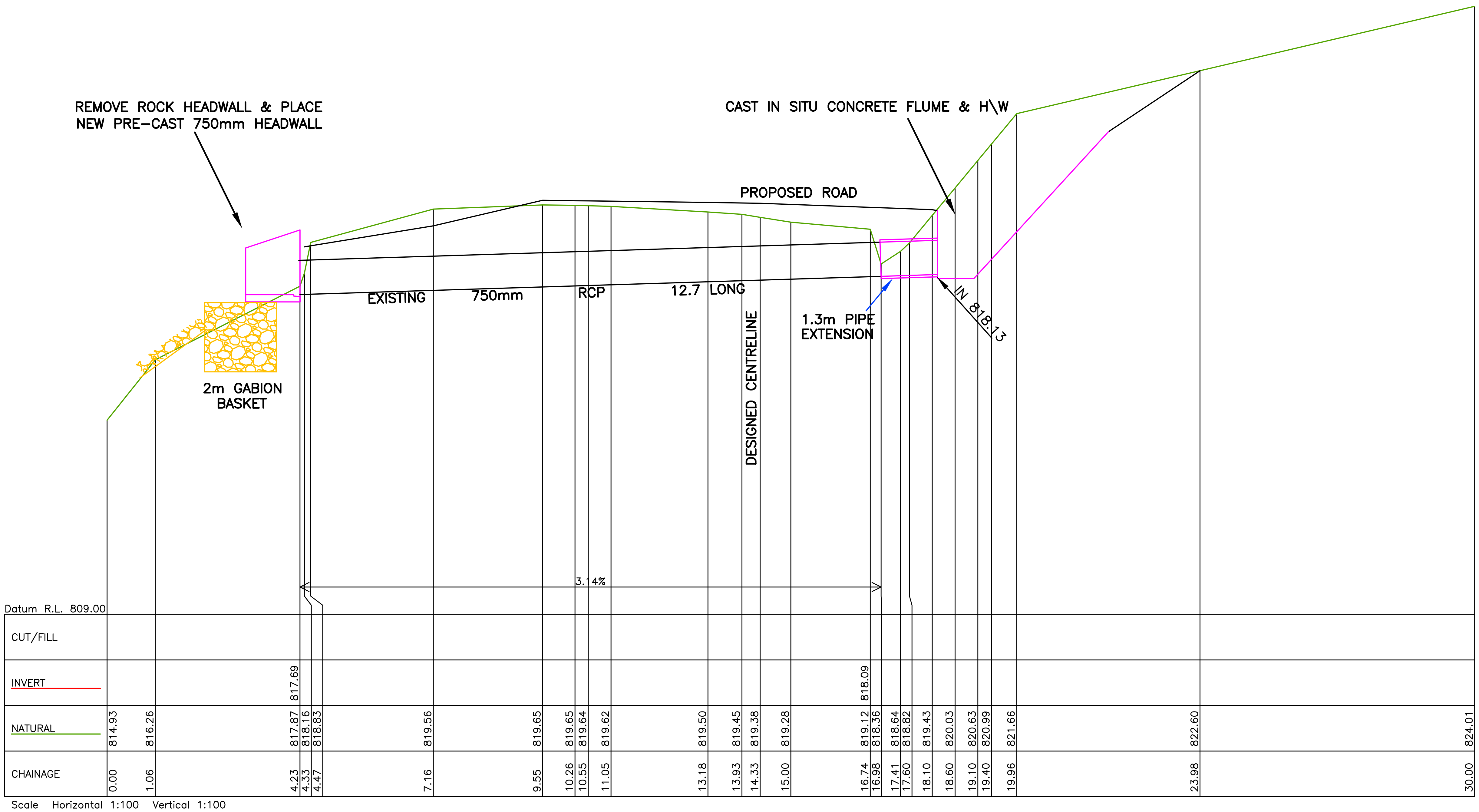
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:200
FILE: PN11585 | A3– 546401_4A
ACAD: 11585A19–1 | CCAD: 11585A19–2
DRN: AL | CHK: AL
SHEET 33 OF 43 SHEETS



ORIGINAL A3 SHEET

100mm 0

CH.2205

PIPE SCHEDULE		
DIA	CLASS	QTY
750mm	4	1
PRECAST H/W 750mmø		1
CAST IN SITU PIT w/ FLUME & H\W		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

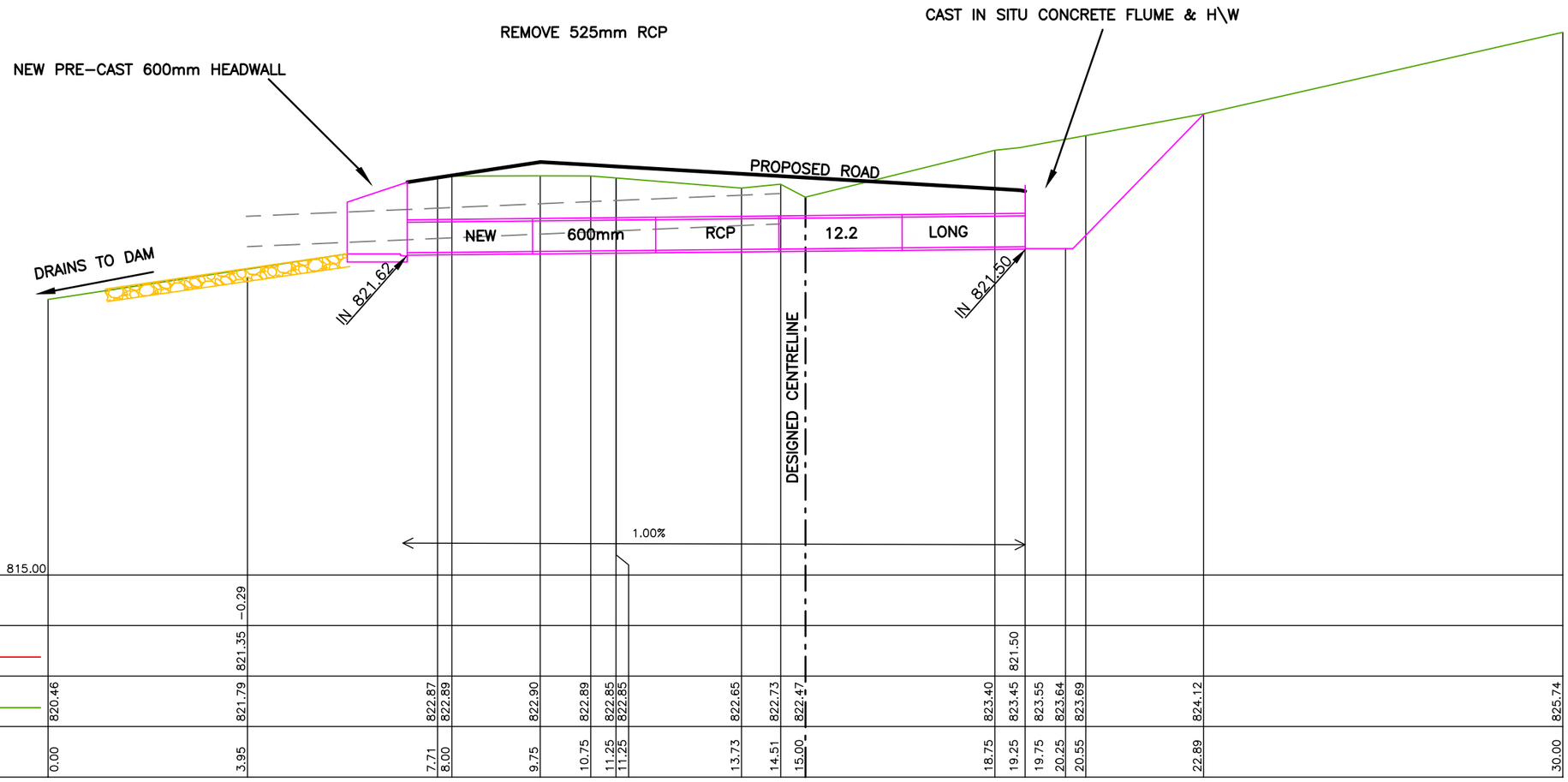
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100
FILE: PN11585 | A3– 546402_4A
ACAD: 11585A19–1 | CCAD: 11585A19–2
DRN: AL | CHK: AL
SHEET 34 OF 43 SHEETS



CH.2288

PIPE SCHEDULE		
DIA	CLASS	QTY
600mm	4	5
PRECAST H/W 600mmø		1
CAST IN SITU PIT w/ FLUME & H\W		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

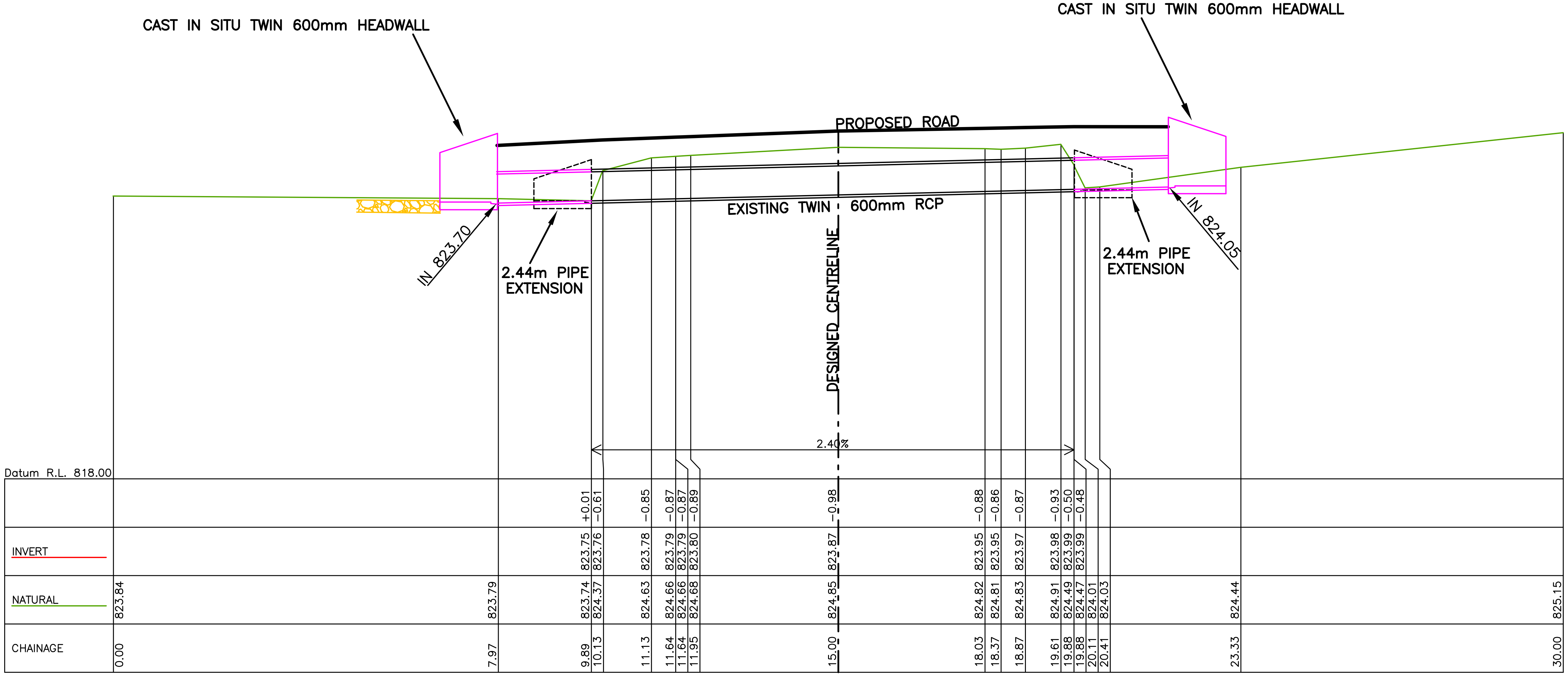
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100

FILE: PN11585	A3- 546403_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 35 OF 43 SHEETS

ORIGINAL A3 SHEET
100mm
0



CH.2581

PIPE SCHEDULE		
DIA	CLASS	QTY
600mm	4	4
CAST IN SITU TWIN 600mmø HEADWALL		2

ORIGINAL A3 SHEET
100mm
0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

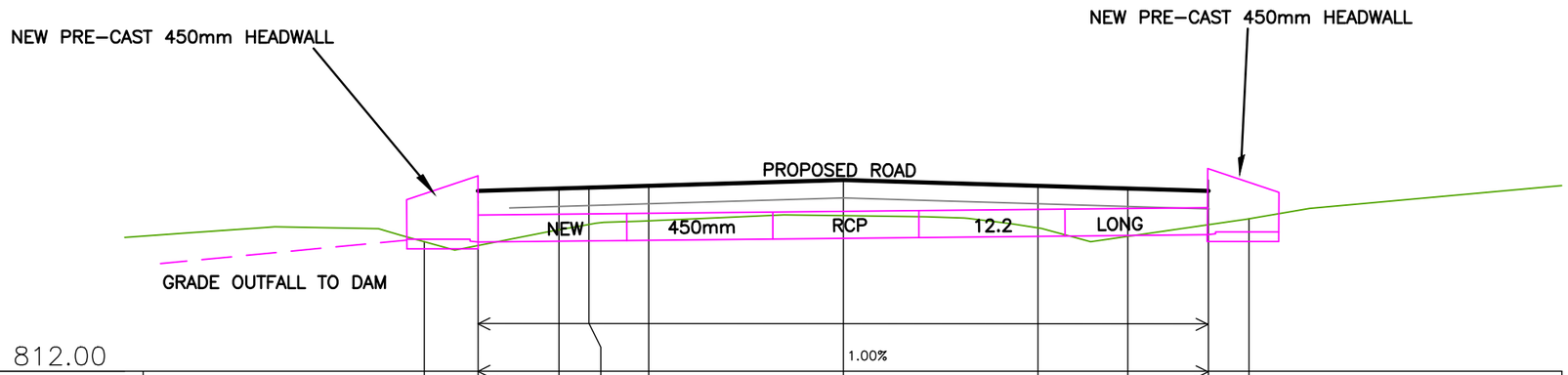
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**
TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100	
FILE: PN11585	A3– 546404_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL
SHEET 36 OF 43 SHEETS	



812.00														
DESIGN INVERT				814.06							814.18			
OFFSET	12.00	7.00	6.1	4.75	4.25	3.25	0.00	3.25	4.75	6.1	6.77	12.00		

CH 2720

PIPE SCHEDULE		
DIA	CLASS	QTY
450mm	4	5
PRECAST H/W 450mmø		2

ORIGINAL A3 SHEET

100mm

0

10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL
DATE	NO	REVISION	AUTHORISED
PLAN REVISIONS			

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

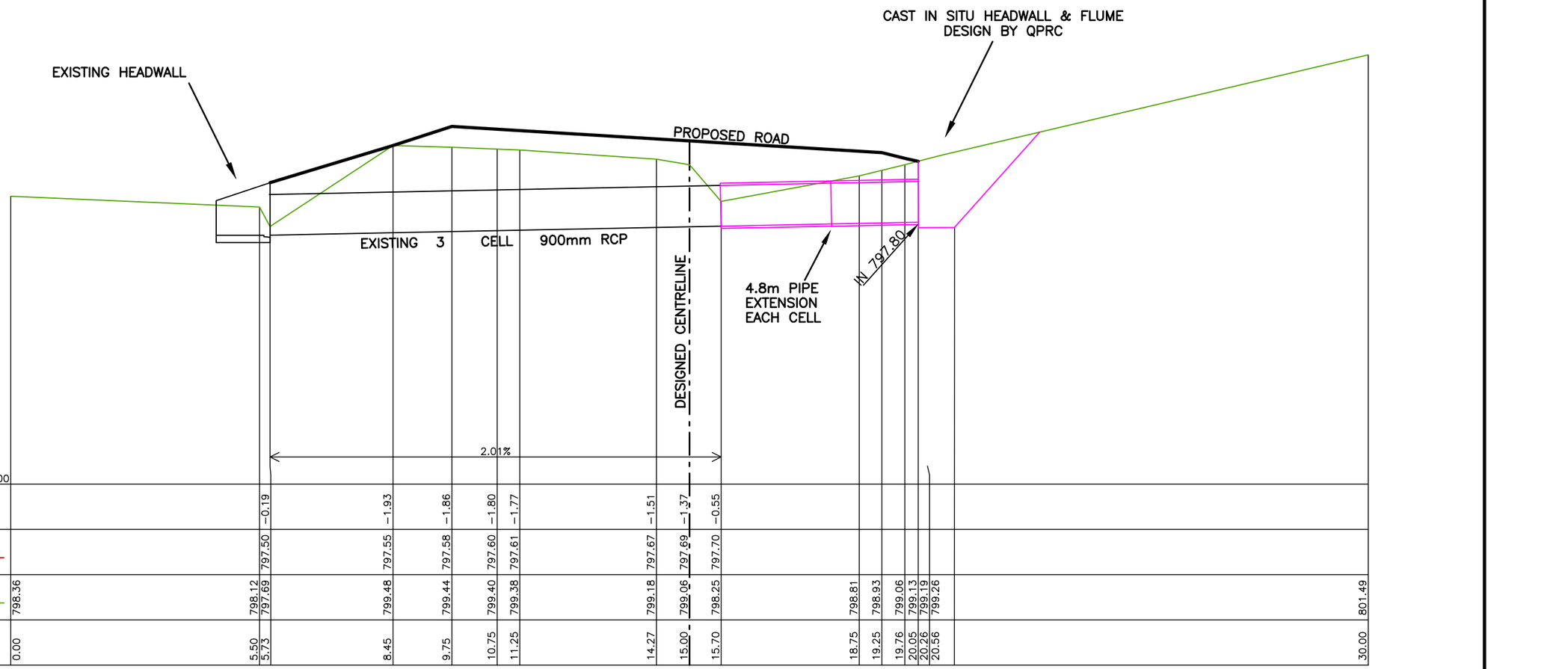
CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100

FILE: PN11585	A3- 546405_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

SHEET 37 OF 43 SHEETS



CH.2963

PIPE SCHEDULE		
DIA	CLASS	QTY
900mm	4	6
CAST IN SITU TRIPLE 900mmø HEADWALL		1

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

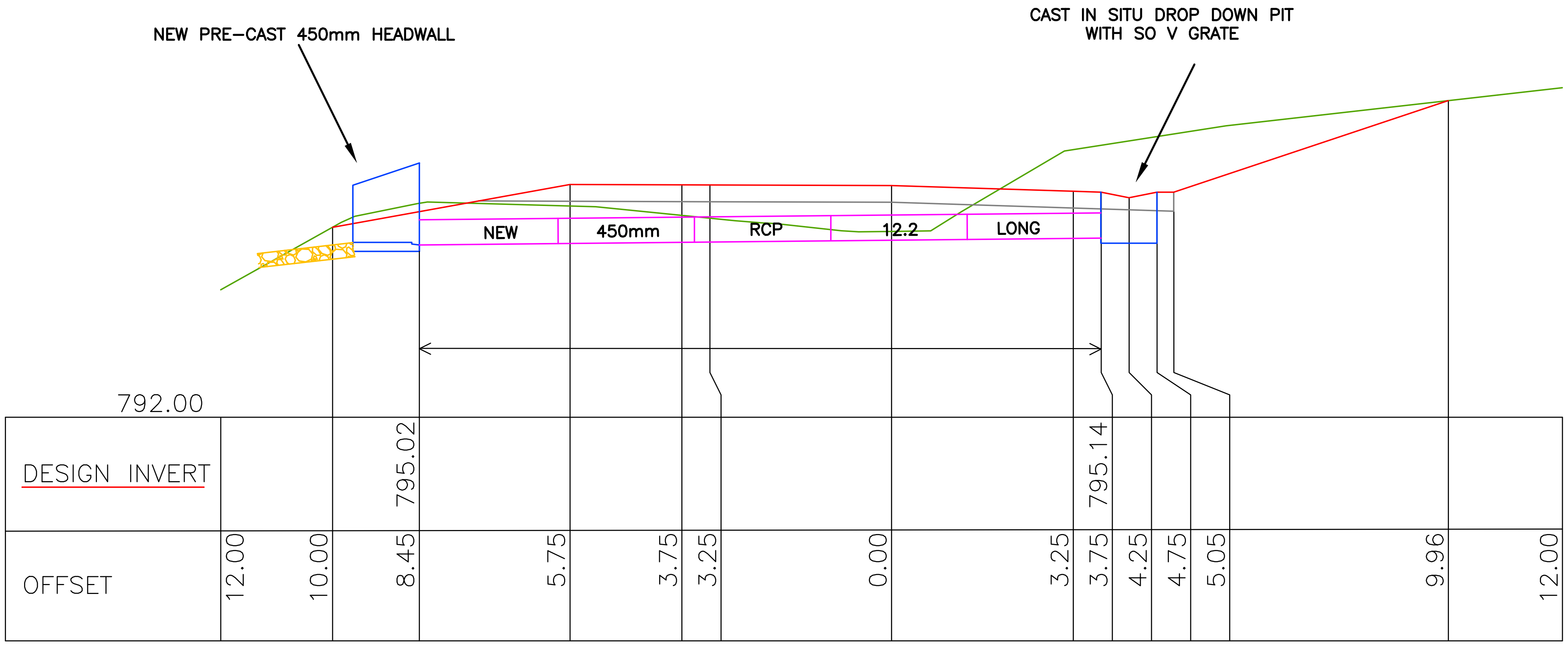
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
CULVERT DETAILS

SCALE: 1:100

FILE: PN11585	A3– 546406_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 38 OF 43 SHEETS

ORIGINAL A3 SHEET
100mm
0



CH 3060

PIPE SCHEDULE		
DIA	CLASS	QTY
450mm	4	5
PRECAST H/W 450mmø		2

ORIGINAL A3 SHEET

100mm

0

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN-PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD CULVERT DETAILS**

SCALE: 1:100

FILE: PN11585	A3- 546407_4A
ACAD: 11585A19-1	CCAD: 11585A19-2
DRN: AL	CHK: AL

PROTECT SURVEY MARK
PM 157973

MAINTAIN ACCESS TO
STOCK LOADING RAMP

19
DP 251090

CONSTRUCT NEW 375mm RCP 7.32 LONG
IN. UP 786.80
IN. DN 786.70

LONDON BRIDGE ROAD
(SEALED)

PROTECT EXISTING
RCP & H/W's

INV. 786.58
INV. 786.15
375mm RCP

LONG SECTION & GRADING PLAN
REFER SHEET 41
CROSS SECTIONS SHEET 42

BURRA ROAD

10.0
40.0
50.0
60.0
0.0

0.5
3.25 3.25 3.25 3.25 3.25 3.25 3.25 3.25 3.25

BUS
BUS
BUS

1
DP 245870

RELOCATE TELSTRA
BY OTHERS

SO DRAIN

RAD. 10
RAD. 10

1.0
3.0 3.0
1.0

MATCH TO EXISTING SEAL

8
DP 251090

1.0
3.25 2.15

GDA 94

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- HOLD LINE
- ℄ DOUBLE LINES
- DESIGNED SHOULDER
- NEW PIPES
- EXISTING FENCE
- BOUNDARY
- EXISTING ROAD
- NEW ROAD
- NEW CATCH DRAIN
- NEW TABLE DRAIN
- NEW SO KERB
- NEW CATCH DRAIN
- ELECTRIC OVERHEAD
- EXISTING TELSTRA
- STREET LIGHT

SIGNAGE REFER SHEET 9

DIAL BEFORE YOU DIG
www.1100.com.au

-3.00% 6.00 -7.00%

Datum R.L. 779.00													
DESIGN	790.16	789.95	789.83	789.65	789.16							787.90	787.76
EXISTING	789.75				788.87							787.84	787.76
CHAINAGE	0.00	7.00	9.00	13.00	20.00							38.06	40.00

Scale Horizontal 1:800 Vertical 1:400

LONDON BRIDGE ROAD – LONG SECTION

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA
ROAD TO LONDON BRIDGE ROAD
BUS STOP & INTERSECTION DETAIL

SCALE: 1:300

FILE: PN11585	A3– 546408_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 40 OF 43 SHEETS

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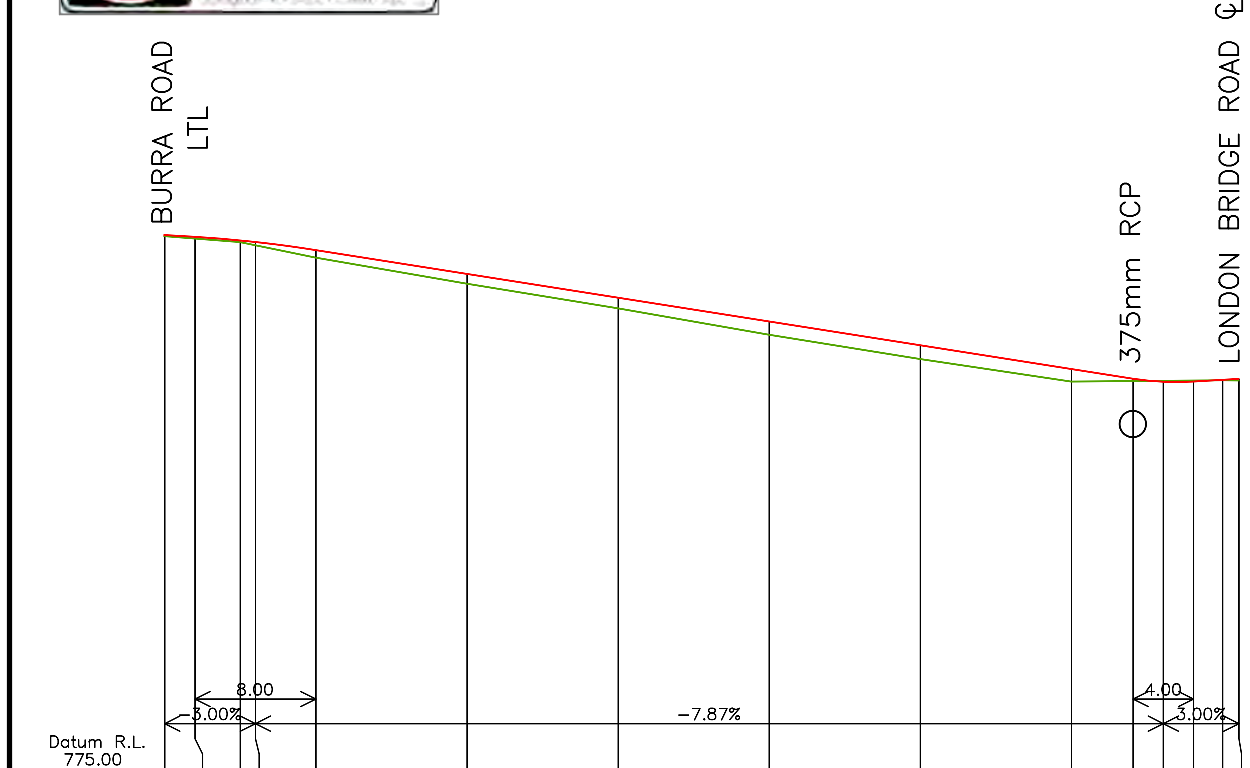

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	+0.325	791.37	791.05	20.00
	+0.355	790.58	790.23	30.00
	+0.443	789.80	789.35	40.00
	+0.460	789.01	788.55	50.00
	+0.419	788.22	787.81	60.00
		787.90 787.80		64.08
		787.81		68.08
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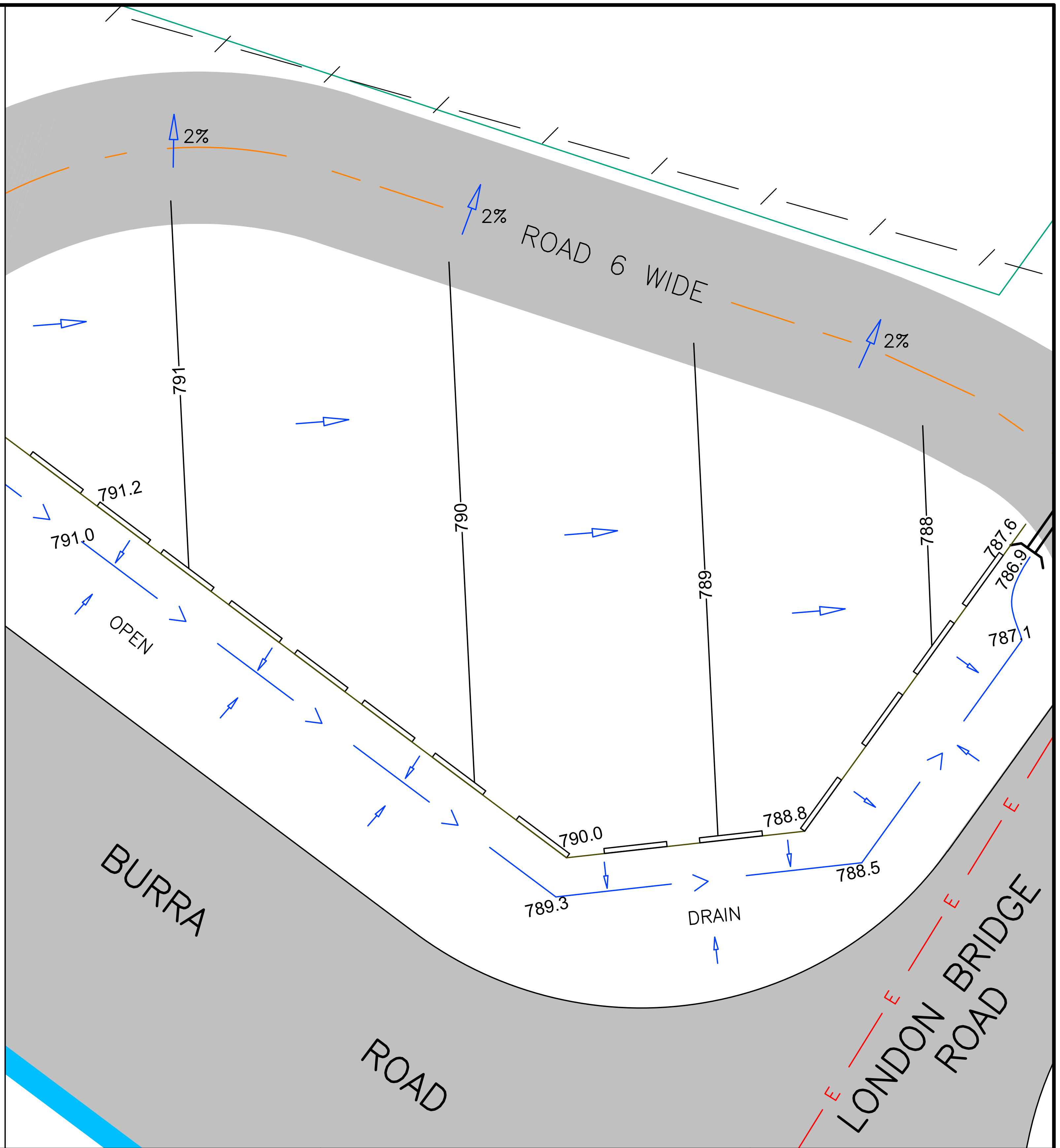

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15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

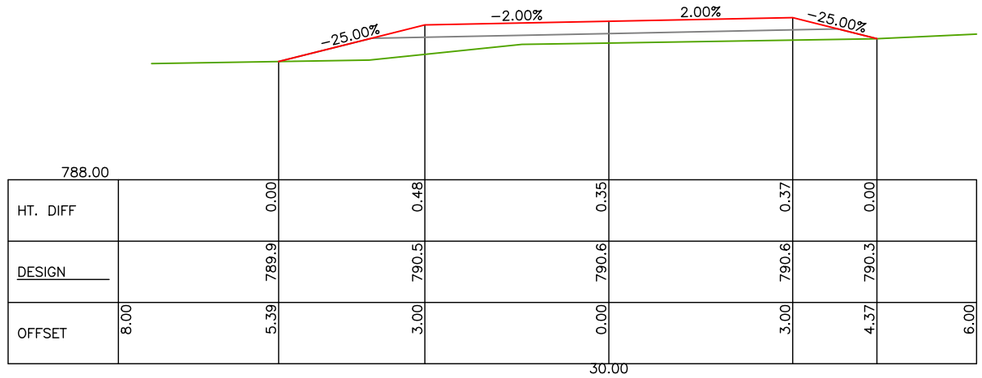
QPRC

DATUM AHD ORIGIN PM82503 RL 829.47
COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL
TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
BUS STOP GRADING PLAN & LONG SECTION

SCALE: 1:200
FILE: PN11585 | A3– 546805_4A
ACAD: 11585A19–1 | CCAD: 11585A19–2
DRN: AL | CHK: AL
SHEET 41 OF 43 SHEETS



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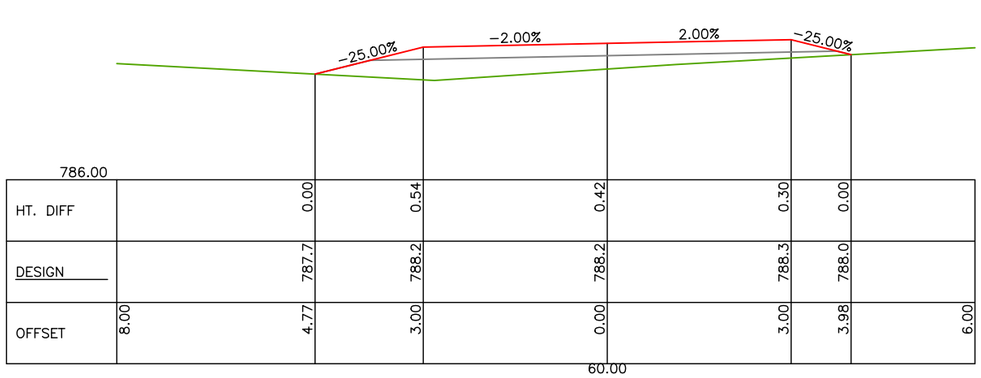
30.00



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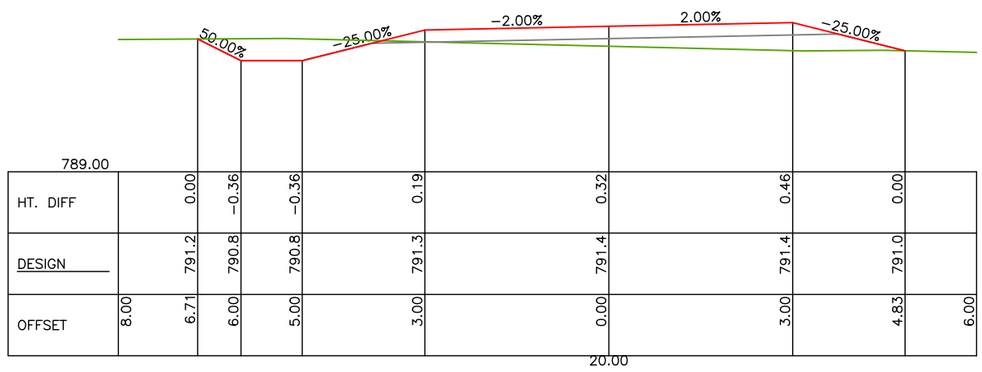
60.00



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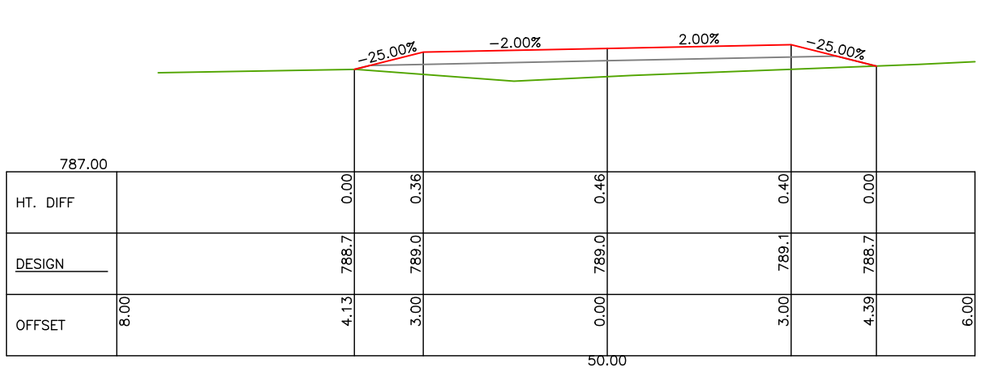
20.00



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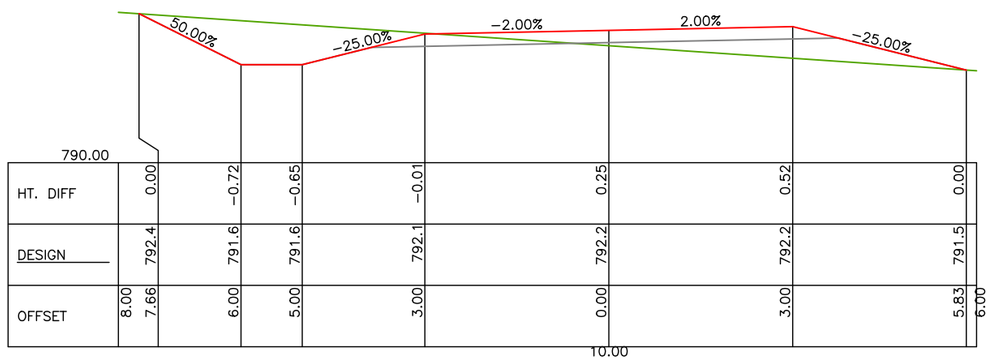

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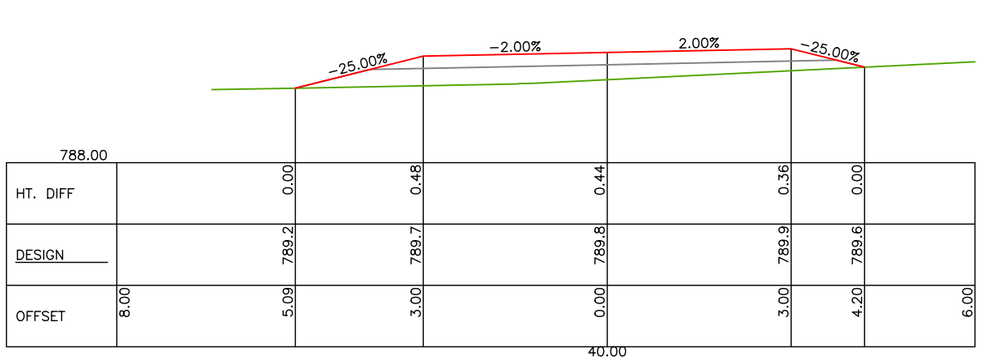

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40.00

Scale Horizontal 1:100 Vertical 1:100

ORIGINAL A3 SHEET

100mm

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DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
16/04/18	1A	ISSUED FOR COUNCIL COMMENTS	AL

PLAN REVISIONS

QPRC

DATUM AHD ORIGIN PM82503 RL 829.47

COORD.SYSTEM MGA ORIGIN

phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: **QUEANBEYAN–PALERANG REGIONAL COUNCIL**

TITLE: **BURRA ROAD RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD BUS STOP CROSS SECTIONS**

SCALE: 1:100

FILE: PN11585	A3– 546806_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 42 OF 43 SHEETS

ORIGINAL A3 SHEET

100mm

0

LIMIT OF WORKS

EXISTING 375mm RCP
EXTEND 2.44m EAST SIDE.
RELOCATE PRECAST H/W.
SEE DETAILS SHEET 29

INV. 844.27

BURRA

EXISTING

375mm

BOUNDARY

RCP

INV. 844.39

INVERT

PROTECT SURVEY MARK
PM 173896

PROPOSED

BOUNDARY & NEW FENCE

1540.00
1560.00
1580.00
1600.00
1620.00
1640.00

RAD. 12

DRAIN

LITTLE BURRA ROAD
(PRIVATE)

PROPOSED

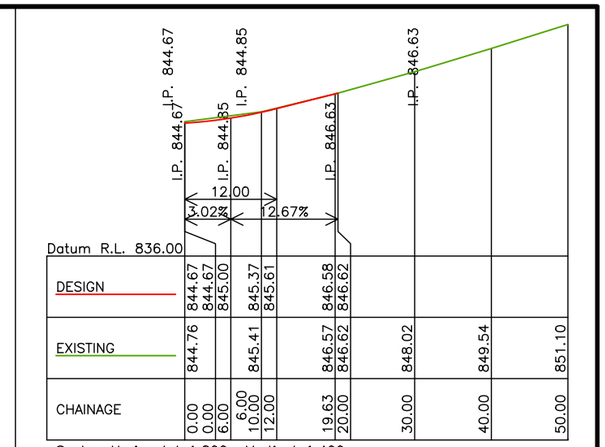
BOUNDARY

ROAD

LEGEND

- DEIGNED CENTRELINE
- DESIGNED TRAVEL LANE
- HOLD LINE
- ℄ DOUBLE LINES
- DESIGNED SHOULDER
- NEW PIPES
- EXISTING FENCE
- NEW BOUNDARY FENCE
- BOUNDARY
- NEW PROPOSED BOUNDARY
- EXISTING ROAD
- NEW ROAD
- NEW CATCH DRAIN
- NEW TABLE DRAIN
- EXISTING TELSTRA

SIGNAGE REFER SHEET 5



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LITTLE BURRA ROAD – LONG SECTION

DATE	NO	REVISION	AUTHORISED
10/09/2019	4A	REVISION ISSUED TO COUNCIL	AL
15/05/2019	3A	REVISION ISSUED TO COUNCIL	AL
14/11/2018	2A	REVISION ISSUED TO COUNCIL	AL
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phl surveyors
115 Yambil Street, Griffith NSW
13 Gibraltar Street, Bungendore NSW
www.phlsurveyors.com.au

CLIENT: QUEANBEYAN–PALERANG REGIONAL COUNCIL

TITLE: BURRA ROAD
RECONSTRUCTION FROM LITTLE BURRA ROAD TO LONDON BRIDGE ROAD
LITTLE BURRA ROAD INTERSECTION DETAIL

SCALE: 1:300

FILE: PN11585	A3– 546559_4A
ACAD: 11585A19–1	CCAD: 11585A19–2
DRN: AL	CHK: AL

SHEET 43 OF 43 SHEETS

Appendix B Consideration of clause 228(2) factors

Clause 228 (2) Checklist

The following factors, listed in clause 228(2) of the *Environmental Planning and Assessment Regulation 2000*, have also been considered to assess the likely impacts of the proposal on the natural and built environment.

Factor	Impact
a. Any environmental impact on a community? The proposed work would impact the local community during the construction phase through noise generation, potential night works and bridge closures. This impact, whilst manageable to some extent, would occur to some degree during the construction period.	Negative, short term during construction. Long term positive.
b. Any transformation of a locality? The proposal would not result in the transformation of a locality. Some clearing would result but would be in keeping with the existing patchiness of remnant vegetation. The transformation of the road from current alignment and width with gravel edges to widened and realigned road will be visually and environmentally positive.	Negative, some vegetation clearing Positive, sealing of the road
c. Any environmental impact on the ecosystems of the locality? The proposed work will result in the direct impact to 6.67 ha of native vegetation.	Minimal impact, some clearing of native vegetation but no significant impact found to be likely.
d. Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality? Temporary impacts to aesthetic values would be confined to construction and would be short term. No substantial long-term impacts to the environment are anticipated.	Negative, short term during construction. Long term, negligible.
e. Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations? The proposal will not impact on any Aboriginal or Non-Aboriginal Heritage.	No impact expected.
f. Any impact on the habitat of protected animals (within the meaning of the *Biodiversity Conservation Act 2016*)? *Threatened fauna species* were identified on site. A flock of *Callocephalon fimbriatum* (Gang-gang Cockatoos) listed as Endangered under the BC Act were observed during the field survey. Of the 37 hollow bearing trees identified within the site, 18 are considered potential Gang-gang Cockatoo breeding habitat and 14 are considered potential *Calyptorhynchus lathami* (Glossy Black-Cockatoo) breeding habitat. Removal of trees with breeding birds will likely be a significant impact and require a Species Impact Statement (SIS) or Biodiversity Development Assessment Report (BDAR) under the BC Act.	Potential for significant impact
g. Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? In addition to habitat loss, potential for injury to fauna has been identified as a risk of construction. Weed and pathogen introduction and spread has also been assessed. It is considered unlikely that the proposal will result in	Nil

Factor	Impact
significant impacts with the effective implementation of the management measures specified in this REF. No species of animal, plant or other form of life, whether living on land, in water or in the air would become endangered because of the proposed works.	
h. Any long-term effects on the environment? It is unlikely that the proposal would cause any no long-term effects on the environment.	Nil
i. Any degradation of the quality of the environment? The proposal would potentially degrade the quality of the environment in the short-term through biodiversity, soil and water, air quality and traffic and access impacts. These impacts would be minimised with the implementation of the safeguards.	Short term negative
j. Any risk to the safety of the environment? The proposal would pose minimal risk to the safety of the environment. There would be a long-term improvement to road safety.	Short term negative, but manageable. Long term positive.
k. Any reduction in the range of beneficial uses of the environment? There would be minor impact on the area of land available near the new alignment following acquisition of part of the adjacent Lots by Council.	Long term negligible
l. Any pollution of the environment? Earthworks have the potential to impact air quality through dust generation and to impact water quality through the release of sediment laden run-off. Noise pollution may also occur, impacting nearby rural residences. These impacts are short term and manageable and would not have an impact beyond the construction phase of the proposal. In the longer-term several environmental benefits would result from formalising drainage and treating weeds in the works area.	Short term negative, but manageable. Long term positive.
m. Any environmental problems associated with the disposal of waste? The proposal would generate waste associated with construction and vegetation clearing. Vegetative waste would be recycled on site (only if free of noxious weeds) or disposed of at a licence facility. The demolition of the existing road would generate waste. It is likely that some components can be recycled for use on other projects. Other waste components from the site would be disposed of at a licenced waste facility.	Short term, negative
n. Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? Fill would be imported to the site for the works. The proposal would require other materials for road construction. These materials are not likely to become in short supply.	Short term, minor negative.
o. Any cumulative environmental effect with other existing or likely future activities? There are no known proposed activities that have the potential to have cumulative environmental effects with the proposal. Should additional road works coincide with the proposed works, this may have cumulative effects. Long term cumulative impacts would be positive, in terms of safety.	Short term, minor negative. Long term positive.
p. Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? Not applicable	Nil

Appendix C NorBE Assessment

NorBE Assessment for proposed activities by public authorities that will be assessed under Part 5 of the EP&A Act as specified in Cl 12 of State Environmental Planning Policy (Sydney Drinking Water Catchment) 2011.

NorBE assessment – will there be a neutral or beneficial effect on water quality? **Project: Upgrade of Burra Road, between Little Burra Road and London Bridge Road** ***Assessed by Eco Logical Australia on behalf of Queanbeyan-Palerang Regional Council*** ***(Assessment must consider surface & ground waters and must consider construction & operational stages.)***	
Are there any identifiable potential impacts on **water quality**? What **pollutants** are likely? Major potential pollutants are **sediments** (fine & coarse), **nitrogen**, **phosphorus**, **pathogens** and **hazardous chemicals and contaminants** such as oil/fuel. During construction and/or post construction?	The proposal has the potential to impact water quality through generation and release into the surrounding environment of contaminated runoff during the construction phase. The major potential pollutants are: • Petrochemicals • Soil and sediments • Road base materials and binding agents • General solid waste. There is the potential for these pollutants to directly impact upon any of the watercourses that cross the study area, and for off-site/downstream impacts within the catchment. These potential impacts would be restricted to the construction phase. Following construction, it is likely that pollutants, particularly dust and sediment, would be reduced due to the sealing of the road, increased road safety and reduction of traffic (including spill) hazards, and the upgrade of waterway crossings and associated structures.
For each pollutant list the **safeguards** needed to prevent or mitigate potential impacts on water quality (*these may be SCA endorsed current recommended practices (CRPs) and/or equally effective other practices*)?	An extensive list of safeguards has been incorporated as mitigation measures into this REF to which this NorBE assessment is attached. These are summarised below. **General safeguards**: • A project specific CEMP, which will incorporate a sediment and erosion management plan, will be developed prior to construction commencing • Contaminated runoff generated will be captured and treated onsite before being discharged or otherwise disposed of • Overland flow will be diverted around stockpiles with the use of bunding **Petrochemicals, road-based materials and binding agents, and other chemicals**: • Hard stand work areas will be located at least 5 m from minor flow lines and 10 m from designated waterways • Any fuel, other petrochemicals or potentially polluting fluids must be stored in appropriate transportable storage containers, parked in suitable areas away (at least 40 m buffer) from watercourses, flowlines and low-lying drainage areas and remain on site for the minimum period necessary.

NorBE assessment – will there be a neutral or beneficial effect on water quality? Project: Upgrade of Burra Road, between Little Burra Road and London Bridge Road *Assessed by Eco Logical Australia on behalf of Queanbeyan-Palerang Regional Council* *(Assessment must consider surface & ground waters and must consider construction & operational stages.)*	
	• Ensure an appropriate spill kit is located on site and able to be deployed if required. All works personnel associated with the use or maintenance of mobile plants should be trained regarding the use and application of these kits. • All stored chemicals must be recorded on a register with their Material Safety Data Sheets (MSDS) • Vehicle wash-down and/or cement truck washout is to occur in a designated area or offsite **Soil and sediments:** • Temporary sediment and erosion control work, including sediment fencing upslope of all drainage lines/downslope of any drainage lines to be disturbed; sediment controls in and along watercourses; and downstream sedimentation barriers will be installed prior to construction commencing. • Coffer dams will be constructed on the upstream side of the culvert and bypass works to provide for the pumping of clean water around these work areas • Newly constructed batters shall be stabilised as soon as practically possible by topsoiling and sowing an appropriate cover crop (additional stabilisation materials such as geotextiles or mulching may be required for highly erodible soils) • Ground disturbance works will be scheduled for periods of dry weather as far as practical; no works involving soil disturbance shall take place during heavy rainfall periods, other than work necessary to stabilise the site • Disturbed soil areas should be rehabilitated/revegetated immediately following construction completion **Other waste**: • General solid waste is to be collected in appropriate bins and disposed of at Council Waste Transfer facilities • On site portable toilets are to be maintained and the waste from them is to be collected and properly disposed of by a licensed contractor
Will the safeguards be adequate for the time required? How will they need to be maintained?	The CEMP will address the requirement for safeguards prior to, during, and immediately following construction, and will include a timeline for their implementation and requirements for monitoring. All sedimentation and erosion safeguards will be installed and maintained according to manufacturer's specifications and with *Managing Urban Stormwater: Soils and Construction volume 1, Landcom 2004* ("The Blue Book"). These safeguards will be installed prior to any works commencing. The CEMP will include recommendations for regular maintenance intervals for these measures (at least once per week during construction) and the requirement to monitor and maintain these safeguards immediately after (within 24 hours of) any major rainfall or runoff events. Works will be avoided during such rainfall events to minimise additional impacts.

NorBE assessment – will there be a neutral or beneficial effect on water quality? Project: Upgrade of Burra Road, between Little Burra Road and London Bridge Road *Assessed by Eco Logical Australia on behalf of Queanbeyan-Palerang Regional Council* *(Assessment must consider surface & ground waters and must consider construction & operational stages.)*	
	Erosion and sediment control measures are not to be removed until the works are complete and the disturbed areas adequately stabilised and rehabilitated. Solid and chemical waste will be regularly disposed of in an appropriate manner as described above. Bunding and other safeguards will be monitored and maintained at least once per week during immediately after (within 24 hours of) any major rainfall or runoff events.
Will all **impacts** on water quality be effectively **contained on the site** by the identified **safeguards** (above) and not reach any watercourse, waterbody or drainage depression? Or will **impacts** on water quality be **transferred outside the site** for treatment? How? Why?	Erosion and sediment control measures (summarised above) and clean run-on diversion measures located both upstream and downstream of proposed disturbance areas will be effective at preventing these potential soil and sediment pollutants from reaching the surrounding waterways. General waste and petrochemicals will be appropriately stored onsite in designated bunded areas away from waterways and drainage lines, then transported off-site for appropriate disposal or treatment (e.g. in effluent/wastewater treatment areas, designated non-contaminated waste facilities etc.).
Is it likely that a **neutral or beneficial effect** on water quality will occur? Why?	It is likely that the proposal will have a beneficial effect on water quality within the locality. The mitigation measures outlined in this document and incorporated into the proposal, if appropriately implemented and maintained, are considered enough to mitigate any adverse impacts to water quality and/or to effectively contain any impacts to the site. The current drainage structures act as a source of sediment/contaminated runoff into the surrounding environment. By sealing the road shoulders, upgrading several waterway crossings, cleaning drains, and placing scour protection on creeklines, it is therefore likely that the proposal will have a beneficial effect on water quality once completed.

Appendix D Flora and Fauna Assessment

Burra Road upgrade, Burra – Terrestrial Biodiversity Report

Queanbeyan-Palerang Regional Council

ecological AUSTRALIA
A TETRA TECH COMPANY

1300 646 131
www.ecoaus.com.au

DOCUMENT TRACKING

Project Name	Burra Road Upgrade, Burra, Terrestrial Biodiversity Assessment Report
Project Number	12117
Project Manager	Skye O'Brien
Prepared by	Clare Duck
Reviewed by	Frank Lemckert
Approved by	Skye O'Brien
Status	Final
Version Number	V2
Last saved on	9 October 2019

This report should be cited as 'Eco Logical Australia 2019. *Burra Road Upgrade, Burra, Terrestrial Biodiversity Assessment Report*. Prepared for Queanbeyan-Palerang Regional Council.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd.

Template 2.8.1

Contents

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List of Tables

Abbreviations

Abbreviation	Description
ADD	Aboriginal Due Diligence
AHIMS	Aboriginal Heritage Information Management System
BC Act	NSW *Biodiversity Conservation Act 2016*
CEMP	Construction Environmental Management Plan
CEEC	Critically Endangered Ecological Community
CoP	Code of Practice
DNG	Derived Native Grassland
DoEE	Department of the Environment and Energy
DPI	Department of Primary Industries
EEC	Endangered Ecological Community
ELA	Eco Logical Australia
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
KFH	Key Fish Habitat
kph	Kilometres per hour
LEP	Local Environment Plan
NES	National Environmental Significance
NPW Act	*National Parks & Wildlife Act 1974*
OEH	Office of Environment and Heritage
OH&S	Occupational Health and Safety
PCT	Plant Community Type
REF	Review of Environmental Factors
RMS	NSW Roads and Maritime Services
SEPP	State Environmental Planning Policy
TEC	Threatened Ecological Community

1. Introduction

Eco Logical Australia Pty Ltd (ELA) was engaged by Queanbeyan-Palerang Regional Council to prepare a terrestrial biodiversity report for the proposed road upgrade works on Burra Road from Little Burra Road to London Bridge Road, Burra. This report forms part of a Review of Environmental Factors which would be assessed under Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

This terrestrial biodiversity report describes potential impacts of the proposed road upgrade on native vegetation, threatened species, populations and communities listed under the *Biodiversity Conservation Act 2016* (BC Act) and *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The impact assessment in this report is based on information gathered from data searches and field investigations. The report sets out the legislative context, methods used, impacts to the environment and recommendations to minimise these impacts.

1.1 Project description

The proponent is proposing to upgrade the 1.7 km of Burra Road, between Little Burra Road and London Bridge Road, Burra, largely within the existing alignment but with the possibility of realignment, as outlined in the project brief.

The project will involve the survey and upgrade of the existing alignment, with the possibility of realignment to meet road design standards, clearing and grubbing of the construction footprint, earthworks, drainage works, pavement building and bituminous sealing. Specifically, the project will involve:

- clearing and grubbing of the new construction footprint
- earthworks to shape batters and road formation
- construction of drainage requirements such as culverts to protect the road from flooding events
- construction of the road pavement
- sealing of the road surface for waterproofing
- installing road furniture for safety requirements.

This terrestrial biodiversity report has been submitted as part of a Review of Environmental Factors to Queanbeyan-Palerang Regional Council.

Note: The proposal forms part of a larger project of works, including upgrading the section of Burra Road south east of Old Cooma Road. These form part of separate proposals and have been subject to separate environmental assessments.

1.2 Subject site and study area

The subject site refers to the area directly affected by the proposal. It includes the footprint of the development and any ancillary works, facilities, accesses or hazard reduction zones that support the construction or operation of the development or activity (

Figure 1).

The study area refers to the subject site and any additional areas which are likely to be affected by the proposal, either directly or indirectly.

1.3 Site description

The study area is located within the Queanbeyan-Palerang Local Government Area (LGA) and is zoned as E4 – Environmental Living. The study area is located 5 km north of Burra and is approximately 820 m above sea level at its most elevated point.

Figure 1: Location of subject site

2. Legislative context

Table 1: Legislative context

Name	Relevance to the project
Commonwealth	
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Matters of National Environmental Significance (MNES) have been identified within the Project area. This report includes an assessment of any impacts to threatened species, populations or ecological communities, or their habitats, in accordance with the EPBC Act.
State	
Environmental Planning and Assessment Act 1979 (EP&A Act)	The Nerriga Road upgrade works are defined under the NSW State Environmental Planning Policy (SEPP) (Infrastructure) 2007 as development for a road or road infrastructure facilities; the project may be carried out by or on behalf of a public authority, without consent, on any land. As such, Council is considered the determining authority and the proponent under Part 5 of the EP&A Act and has a duty to consider the environmental impact under Section 111 of the Act. This report includes an assessment of any impacts to threatened species, populations or ecological communities, or their habitats in accordance with Section 5A of the EP&A Act.
Biodiversity Conservation Act 2016 (BC Act)	Assessments of significance for the impact to threatened species and endangered ecological communities in accordance with s7.3 of the Act have been undertaken for the proposed works.
Biosecurity Act 2015 (BS Act)	The BS Act provides a framework for the prevention, elimination and minimisation of biosecurity risks posed by biosecurity matter, dealing with biosecurity matter, carriers and potential carriers, and other activities that involve biosecurity matter, carriers or potential carriers. A list of priority weeds identified within the study area is included in this report.
Water Management Act 2000 (WM Act)	The project does not involve works on waterfront land. A Controlled Activity Approval under s91 of the WM Act is not required.
Planning Instruments	
Vegetation SEPP (non-rural areas 2017)	The aims of this Policy are to protect the biodiversity values of trees and other vegetation in non-rural areas of the State, and to preserve the amenity of non-rural areas of the State through the preservation of trees and other vegetation This SEPP does not apply to the land on which the development is proposed.
SEPP Coastal Management 2018	SEPP Coastal Management 2018 consolidated SEPP 14 Coastal Wetlands, SEPP 26 Littoral Rainforests and SEPP 71 Coastal Protection. The proposed development is not located on land subject to SEPP Coastal Management 2018.
SEPP 44 – Koala Habitat Protection	The policy applies only to the Queanbeyan-Palerang Regional Council area. SEPP 44 applies only to land undergoing development application and therefore does not apply to the proposed works as it is being assessed under Part 5 of the EP&A Act.

3. Methods

3.1 Literature and data review

The following databases were reviewed prior to conducting the field surveys:

- Atlas of NSW Wildlife Search (OEH, 2019a) covering an area from latitude -35.43 to -35.58 and longitude 149.15 to 149.30
- EPBC Act Protected Matters Search Tool (DoEEa, 2019a), using a radius of 15 km around the coordinates -35.50558, 149.23302
- NSW Threatened Species Profiles (OEH 2019b)
- The Australasian Virtual Herbarium database (AVH 2019).

Aerial photography of the study area and surrounds was also used to investigate the extent of native vegetation cover and landscape features.

The list of threatened species and ecological communities returned by the database searches was supplemented or amended based on local ecological knowledge of the area, including known species occurrences. A list of species (defined as 'yes', 'likely' or 'potential') was then used to inform the need for any targeted surveys (**Appendix B**).

3.2 Field survey

The initial field survey was conducted on 28 February and 5 March 2019 by ELA Ecologists David Allworth and Clare Duck.

This involved traversing the full extent of the subject site to assess:

- vegetation (including assessment of floristic structure and composition, and of vegetation communities against key listing criteria for relevant Threatened Ecological Communities (TECs))
- aquatic ecology (including Key Fish Habitat)
- the presence of, or potential habitat for, threatened flora and fauna (including hollow-bearing trees)
- opportunistic fauna sightings
- Koala habitat.

Vegetation community descriptions were based on multiple rapid survey assessments conducted within each vegetation community. Rapid assessments involved describing the vegetation structure (dominant species and cover within each vegetation stratum), as well as topographic position, soils and any other relevant abiotic factors. Two detailed floristic surveys were also undertaken using the Biodiversity Assessment Method (BAM) as per the BC Act. Following the initial field survey, the vegetation communities were assigned a Plant Community Type (PCT).

The following data was recorded, both upslope and downslope, of all drainage lines and areas identified as Key Fish Habitat: the type and condition of vegetation present within the drainage Line (including dominant canopy, midstorey and ground cover species and the presence/absence of priority weeds); the shape of the drainage line and substrate type; bank height/slope and the presence of erosion;

channel width; presence of fish; the size of pools; and culvert size. The results of the aquatic assessment have been incorporated directly into the REF.

3.2.1 Threatened flora and fauna habitat assessment

Assessments of the suitability of the available habitat for threatened flora and fauna species included locating any features of importance to threatened biodiversity and recording its location using a handheld GPS unit. Elements of specific interest included hollow-bearing trees, rock outcrops, stick nests, stands of winter-flowering trees and riparian areas. Based on the ELA ecologists' knowledge and understanding of potential threatened species and their associated habitat, as well as the results of database searches, targeted threatened species flora surveys were undertaken in areas of suitable habitat (**Table 2**).

Targeted flora surveys were undertaken by Clare Duck and Andrew Mitchell on 2 April 2019. Due to the narrow linear configuration of the subject site, the majority of the area was surveyed by parallel traverses. Targeted threatened flora surveys involved transects of suitable habitat and followed the NSW Guide to Surveying Threatened Plants (OEH 2016) (**Table 2**).

Table 2: Threatened flora species searched for in targeted survey

Scientific name	Common name	BC Act Status	EPBC Act Status	Survey period	Within survey period?
Dillwynia glaucula	Matted Bush-pea	E	-	Sept-Dec	No
Leucochrysum albicans var. *tricolor*	Hoary Sunray	-	E	Sept - April	Yes
Pomaderris cotoneaster	Cotoneaster Pomaderris	E	E	October - Nov	No
Pultenaea pedunculata	Michelago Parrot-pea	E	-	Sept - Nov	No

3.2.2 Survey limitations

Suitable habitat was limited to areas of potential habitat within the subject site; areas devoid of native vegetation (e.g. grazed paddocks) were excluded from targeted flora surveys.

Targeted field survey was undertaken outside the recommended survey period for three of the threatened flora species that were considered potential occurrences: *Pultenaea pedunculata* (Michelago Parrot-pea), *Pomaderris cotoneaster* (Cotoneaster Pomaderris) and *Dillwynia glaucula* (Matted Bush-pea) (OEH 2019).

Pultenaea pedunculata is a shrub that forms carpets >1 m wide, and *Dillwynia glaucula* and *Pomaderris cotoneaster* are shrubs that grow up to 2.5 m and 4 m tall, respectively. Although the targeted field survey was undertaken outside of the known flowering period for these two species, they are both conspicuous species and should still have been able to be located, if present. On that basis, it is considered unlikely that they occur within the subject site.

4. Existing environment

4.1 Literature and data review

4.1.1 Topography, geology and soils

The topography of the study area is characterised by undulating to rolling low hills and alluvial fans on Silurian volcanics, with most of the study area located at elevations of 650 – 900 m.

The study area is situated in the Canberra Lowlands, which falls within the South Eastern Highlands Bioregion. The soil and underlying geomorphology of the study area is characterised by the 'Burra' soil landscape profile (Jenkins 2000). Its geomorphology is comprised of the Colinton volcanics group and the Cappanana Formation, and includes various tuffs with minor siltstone, shale, sandstone, and limestone (Jenkins 2000:44). This soil landscape is classified as a transferral landscape, which has resulted from the accumulation of eroded parent materials washed downslope. Localised landscape limitations include strongly acidic soils with low available water-holding capacity, sheet erosion, and run-on (Jenkins 2000:44).

4.1.2 Disturbance

Much of the vegetation in the wider landscape has been cleared and exotic vegetation species associated with agricultural and pastoral cultivation have been introduced. Where remnant vegetation is extant, it is characterised by woodland species (Jenkins 2000:44).

4.1.3 Threatened ecological communities

Three threatened ecological communities (TECs) were identified as having the potential to occur within the study area and surrounds:

- White Box – Yellow Box – Blakely's Red Gum Derived Woodland and Derived Native Grassland
- Natural Temperate Grassland of the South Eastern Highlands
- Alpine Sphagnum Bogs and Associated Fens.

Following the field survey (see below), no TECs were found to occur.

4.1.4 Threatened flora species

The desktop review identified a total of 15 threatened flora species listed under the BC or EPBC Acts that have the potential to occur within a 15 km radius of the study area. Based on local ecological knowledge of the area and the AVH (2019) database, one additional threatened species was identified as potentially occurring.

An assessment of the likelihood of occurrence of threatened flora species within the study area is available in **Appendix B**.

4.1.5 Threatened fauna species

The desktop review identified a total of 49 threatened, migratory or marine fauna species listed under the BC and/or EPBC Acts that have the potential to occur within a 15 km radius of the study area. Based on local ecological knowledge of the area and the AVH (2019) database, six additional threatened

species were identified as potentially occurring. An assessment of the likelihood of occurrence of threatened fauna species within the impact assessment area is available in **Appendix B**.

4.2 Field survey

4.2.1 Vegetation validation

Field survey identified one Plant Community Type (PCT), which covered 6.67 ha of the study area:

- PCT 999 Ribbon Gum - Norton's Box - Broad-leaved Peppermint open forest on footslopes, central and southern South Eastern Highlands Bioregion.

0.62 ha of the site consisted of *Pinus* sp. (Pines), *Salix* sp. (Willows) or *Rubus fruticosus* sp. agg. (Blackberry). This area has been mapped as 'Planted / Exotic'. An additional 0.74 ha was comprised of treeless vegetation with exotic groundcover species.

Three declared priority weed species within the South East Local Land Services Region, *Rubus fruticosus* sp. agg. (Blackberry), *Hypericum perforatum* (St. John's Wort) and *Cytisus proliferous* (Scotch Broom), as well as several other exotic species, were identified within the subject site.

Figure 2: Vegetation communities within the subject site

PCT 999: Ribbon Gum - Norton's Box - Broad-leaved Peppermint open forest on footslopes, central and southern South Eastern Highlands Bioregion

The canopy of Norton's Box - Broad-leaved Peppermint open forest typically consists of *Eucalyptus nortonii* (Norton's Box), *Eucalyptus dives* (Narrow-leaved Peppermint) and *Callitris endlicheri* (Black Cypress Pine).

The midstorey may contain *Acacia echinula* (Hedgehog Wattle), *Acacia falciformis* (Broad-leaved Hickory), *Calytrix tetragona* (Common Fringe-myrtle), *Cassinia longifolia* and *Olearia tenuifolia* (Thin-leaf Daisy-bush). Typical groundcover species include *Austrostipa scabra* subsp. *falcata*, *Desmodium varians* (Slender Tick-trefoil), *Dianella revoluta* var. *revoluta* (Blueberry Lily), *Dichelachne micrantha* (Shorthair Plumegrass), *Anthosachne scabra* (Wheatgrass), *Geranium solanderi* var. *solanderi* (Native Geranium), *Rytidosperma pallidum* (Silvertop Wallaby Grass), *Poa sieberiana* var. *sieberiana*, *Stypandra glauca* (Nodding Blue Lilly) and *Themeda triandra* (Kangaroo grass).

The Norton's Box - Broad-leaved Peppermint open forest identified in the field had a canopy dominated by *Eucalyptus nortonii*, *E. mannifera* (Brittle Gum), *E. bridgesiana* (Apple Box) and *E. melliodora* (Candlebark). Midstorey species included *Acacia* spp. and *Cassinia longifolia*. The groundcover included species such as *Themeda triandra*, *Desmodium varians*, *Anthosachne scabra*, *Dichelachne micrantha*, *Geranium solanderi* var. *solanderi* and *Rytidosperma* spp.

Photo: PCT 999

4.2.2 Threatened flora and fauna habitat assessment

Key fauna habitat components within the study area included fallen timber and other large woody debris, hollow-bearing trees, native tree and shrub canopy, and ephemeral creeklines. The study area crosses three first order streams and one second order stream. Several wombat burrows were also recorded. The native vegetation in the subject site is likely to provide foraging habitat for forest birds, megachiropteran and microchiropteran bats, frogs and reptiles.

Field survey identified 37 hollow-bearing trees in the subject site. These provide potential denning, roosting and nesting habitat for a range of small to large birds, arboreal frogs and reptiles, arboreal mammals and microchiropteran bat species. These hollow-bearing trees contain hollows ranging from small hollows (<5 cm) that may be used by smaller birds and mammals (including microchiropteran bats), through to medium to large hollows (>10cm) which are potentially suitable for threatened species such as the large forest owls that require large hollows. Some hollow-roosting threatened microchiropteran bats and birds are known from the locality, including *Myotis macropus* (Southern Myotis), which was previously recorded north of the study area by (NGH 2016). The hollow-bearing trees within the subject site have the potential to support roosts (including maternity roosts) and nesting sites.

Gang-gang Cockatoos (*Callocephalon fimbriatum*) and Glossy Black-Cockatoos (*Calyptorhynchus lathami*) are both listed as endangered under the BC Act. A flock of Gang-gang cockatoos was observed within the subject site. Gang-gang Cockatoo breeding habitat is defined as *Eucalyptus* spp. with hollows greater than 9 cm diameter (OEH 2019c). Twenty-five trees satisfied these requirements. However, seven of these trees contained hollows less than 5 m from the ground. It is considered unlikely that Gang-gang Cockatoos would utilise these hollows for breeding habitat. Therefore, 18 trees within the subject site are considered potential Gang-gang Cockatoo breeding habitat (**Figure 3**). The survey area contained 14 trees with hollows greater than 15 cm diameter more than 5 m above ground, which indicates that they are potential Glossy Black-Cockatoo breeding habitat (OEH 2019c) (**Figure 4**).

The secondary Koala feed trees *E. Bridgesiana*, *E. mannifera*, *E. nortonii* and *E. melliodora* (OEH 2019c) were recorded within the subject site. The study area therefore constitutes potential Koala habitat (**Section 4.2.2.1**).

No threatened flora species were recorded in the study area.

Photo: A hollow-bearing *Eucalyptus rubida* within the subject site

Figure 3: Potential Gang-gang Cockatoo breeding habitat and location of Gang-gang Cockatoo flock recorded during survey

Figure 4: Potential Glossy Black-Cockatoo breeding habitat

4.2.2.1 EPBC Act Koala habitat assessment

The Study Area contains Koala habitat as defined by the Commonwealth Department of the Environment (2014). An assessment of the Koala habitat is therefore required. The assessment is in three stages:

1. Qualification as Critical Koala Habitat assessment.
2. Impacts on Critical Koala Habitat.
3. Assessment of other threats.

The habitat on site has been assessed using the Koala habitat assessment tool from the EPBC Act Referral Guidelines (DotE 2014) to determine if the site contains habitat critical to the survival of the Koala. To qualify as critical habitat, it must score 5 or more. The results of this assessment for the study area are presented in Table 3 below. As vegetation within the study area does not meet the definition of critical Koala habitat in accordance with the EPBC Act Referral Guidelines, there is no requirement for an impact assessment under the EPBC Act for this species.

Table 3: Koala habitat assessment tool

Attribute	Score	Reason
Koala occurrence	0	No Koala records within 2 km of the subject site within the last 10 years.
Vegetation structure and composition	2	Forest with emerging trees with four known koala food tree species.
Habitat connectivity	2	Site is part of a contiguous landscape >1000 ha.
Key existing threats	0	0 for Koala occurrence; significant vehicle threat present.
Recovery value	0	• Other, larger patches of native vegetation to the north and west are more likely to be important for the recovery of the koala • No Koala records within 15 km of the survey area • 'Refuges' (areas with reliable soil moisture and fertility) not present within study area and unlikely in contiguous vegetation
Total	4	**Site does not qualify as critical habitat**

5. Impact Assessment

5.1 Direct impacts

Direct impacts are those that directly affect the habitat of species and ecological communities and of individuals using the study area.

5.1.1 Flora and Vegetation communities

The proposed upgrade works will result in a direct impact of up to 6.67 ha of native vegetation, mapped within the study area.

Direct Impacts to native vegetation will include direct loss (clearing) of native vegetation associated with the widening of the road and batters. A summary of the area of each vegetation community to be affected by the proposed works is presented in **Table 4** below.

Table 4: Vegetation communities within the subject site

PCT #	PCT Name	Associated BC Act Community	Associated EPBC Act Community	Area (ha) within subject site
999	Ribbon Gum - Norton's Box - Broad-leaved Peppermint open forest on footslopes, central and southern South Eastern Highlands Bioregion – Intact Canopy	None	None	3.20
999	Ribbon Gum - Norton's Box - Broad-leaved Peppermint open forest on footslopes, central and southern South Eastern Highlands Bioregion – DNG	None	None	3.47

5.1.2 Fauna

A search of the BioNet database and the EPBC Act Protected Matters Search Tool identified a total of 49 threatened, migratory or marine fauna species listed under the BC and/or EPBC Acts that have the potential to occur within a 15 km radius of the study area. Based on local ecological knowledge of the area and the AVH (2019) database, six additional threatened species were identified as potentially occurring.

The proposed works may impact up to 37 hollow-bearing trees, mapped within the study area. These trees may provide roosting, denning or nesting habitat for a range of hollow-dependent fauna species such as microbat species. Eighteen of the hollow-bearing trees are considered potential Gang-gang Cockatoo breeding habitat, and fourteen are considered potential Glossy Black-Cockatoo habitat.

Given the narrow nature of the study area and the proposed habitat modifications, the proposal is unlikely to disrupt connectivity between fauna habitats. In addition, >1000 ha of remnant open forest and woodland vegetation is contained in the vegetation contiguous with the study area.

An Assessment of Significance under the NSW BC Act was undertaken for 12 threatened species (11 birds and one microbat) (**Appendix C**). This concluded that, if the mitigation measures in **Section 6** are followed, the proposal is unlikely to have significant impacts on any threatened fauna species under the BC Act and, therefore, neither an SIS nor a BDAR is required.

An impact assessment under the EPBC Act was undertaken for six migratory fauna species (**Appendix D**) and concluded that the proposal was unlikely to have a significant impact on these species. Therefore, a referral to the Commonwealth DoEE is not required.

5.2 Indirect Impacts

Indirect impacts occur when project-related activities affect species or ecological communities in a manner other than direct loss within the subject site.

Potential indirect impacts as a result of this proposal include dust settlement, invasion by exotic species in disturbed areas, and pollution by contaminated runoff. The proposal has the potential to result in increased wildlife deaths through vehicle collision resulting from increased road traffic once the upgrade is complete. A detailed assessment of the potential indirect impacts associated with this was beyond the scope of this report. Measures designed to mitigate indirect impacts have been outlined in **Section 6.1** and **6.2**.

6. Recommendations

6.1 Mitigation: Threatened flora and vegetation communities

The following mitigation measures are designed to limit the impact of the proposal on flora and vegetation communities:

- Avoid further clearing and modification of all native vegetation.
- The limits of the corridor of works (disturbance footprint) should be clearly marked (for example, using temporary fencing or bunting) to ensure site disturbance occurs only within the designated works areas and is not unnecessarily extended.
- Material stockpile and equipment storage areas should be restricted to existing disturbed areas.
- Vegetation clearing should be undertaken in a manner to avoid damage to adjacent vegetation.
- Fallen logs and felled tree trunks should be retained on site and used in rehabilitation works on or off site. The remaining portions of felled trees (e.g. upper branches and leaves) should be mulched/chipped and used in erosion mitigation and/or revegetation works.
- Vehicle movements should be confined to the disturbance footprint.
- Machinery coming from outside the works area should be thoroughly washed down prior to entering the site to reduce the risk of introducing weed species and pathogens.
- Priority weed species should be targeted in accordance with the NSW DPI WeedWise recommended control measures (DPI 2019).
- Any revegetation of disturbed areas should utilise a seed mix consisting of local provenance species that are typical of the vegetation in the study area.
- Council should develop an induction plan to inform workers of appropriate safeguards to limit impacts on vegetation to be retained and to limit impacts on vegetation beyond the disturbance footprint.

6.2 Mitigation: Threatened fauna

The following mitigation measures are designed to limit the impact on fauna resulting from the proposal:

- Modify the design where possible to retain hollow bearing trees.
- Undertake pre-clearing assessment immediately prior to felling of any hollow-bearing trees to identify any resident fauna. Should fauna roosts/nests be identified during this survey, a qualified ecologist should be consulted to determine the appropriate course of action prior to any disturbance.
- Felling of any hollow-bearing trees should be supervised by a qualified ecologist or fauna handler.
- Hollow-bearing trees should be removed in a way that minimises the risk of harm to fauna (e.g. by clearing surrounding, non-hollow-bearing trees at least one day prior to removing hollow-bearing trees; and by bumping the tree several times to initiate evacuation of any fauna prior to felling). Hollows should be inspected for fauna after felling.
- Retain, where possible, all felled hollow-bearing trees or hollow limbs on site or within adjacent vegetation to provide fauna habitat.

- Any occupied nests located or any fauna which are inadvertently injured should be reported to WIRES or a similar organisation and relocated from the works area by a suitably qualified fauna handler.

Gang-gang Cockatoo and Glossy Black-Cockatoos

Gang-gang Cockatoos breed from October to January and Glossy Black-Cockatoos breed from March to August (OEH 2019c). February is therefore the only month of the year when removing hollow-bearing trees that are suitable for nesting does not risk the possibility that Gang-gangs or Glossy Blacks are using the hollows at that time for breeding. The following mitigation measures are recommended so that a significant impact, as per the BC Act (**Appendix C**), can be avoided. These measures should be undertaken in conjunction with the more general fauna mitigation measures listed above:

- Modify the design where possible to retain hollow bearing trees.
- Targeted pre-dusk hollow-bearing tree watching surveys (1.5-person hours per tree) should be undertaken for the relevant cockatoo species, based on the time of year.
    - Gang gang Cockatoos breed between October and January
    - Glossy Black Cockatoos breed between March and August
- If there is no breeding pair present, the tree can be removed during the breeding season of the species surveyed for.
- If there is a breeding pair, the tree will be retained with a 20 m buffer around it until the breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair.
- Should works continue into the breeding season of the second species and clearing has not yet been undertaken, the tree must be checked for a breeding pair/s of the other species. If there is a breeding pair, the tree will be retained with a 20 m buffer around it until breeding is complete and chicks are fledged. Once breeding is complete and the hollow is vacant, the tree may be removed within the breeding season of the breeding pair.
- Any clearing of trees that contain hollows must follow procedures specified for threatened flora and vegetation communities and threatened fauna, above.

Alternatively, removal of trees with breeding birds may be considered a significant impact and require an SIS or a BDAR (**Appendix C**).

7. Conclusion:

This report has identified and assessed the potential impacts of the proposal to upgrade approximately 1.7 km of Burra Road, between Little Burra Road and London Bridge Road, Burra.

After consideration of the field investigation outcomes and analyses undertaken for this report, the identified impacts of the proposal are unlikely to have significant adverse impacts on any threatened flora or fauna species, provided that the mitigation measures outlined in **Section 6** are adopted.

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Appendix A Species List

Flora species recorded within the study area

Species Name	Common Name	Exotic (*)	Priority Weed for the South East
Acacia dealbata	Silver Wattle		
Acacia sp.			
Acaena novae-zelandiae	Bidgee-widgee		
Anthosachne scabra	Wheatgrass		
Aristida ramosa	Purple Wiregrass		
Austrostipa bigeniculata			
Austrostipa scabra	Speargrass		
Billardieri scandens	Hairy Apple Berry		
Bothriochloa macra	Red Grass		
Bursaria spinosa	Blackthorn		
Cassinia longifolia			
Cassinia sp.			
Centaurium tenuiflorum		*	
Chamaecytisus palmensis	Tagasaste	*	
Cheilanthes distans	Bristly Cloak Fern		
Cheilanthes sp.			
Chloris truncata	Windmill Grass		
Chrysocephalum apiculatum	Common Everlasting		
Convolvulus erubescens	Blushing Bindweed		
Cynoglossum australe			
Cytisus proliferous	Scotch Broom	*	*
Desmodium varians	Slender Tick-trefoil		
Dichelachne micrantha	Shorthair Plumegrass		
Dodonaea viscosa subsp. angustifolia	Sticky Hop-bush		
Echinopogon ovatus	Forest Hedgehog Grass		
Einadia hastata			
Eragrostis sp.	Berry Saltbush		
Eucalyptus bridgesiana	Apple Box		
Eucalyptus mannifera	Brittle Gum		
Eucalyptus nortonii	Norton's Box		
Eucalyptus melliodora	Yellow Box		
Fabaceae sp.			
Geranium solanderi	Native Geranium		

Geranium sp.			
Gonocarpus sp.			
Hibbertia obtusifolia	Hoary guinea flower		
Hypericum perforatum	St. John's Wort	*	*
Hypochaeris radicata	Catsear	*	
Indigofera australis	Australian Indigo		
Kunzea ericoides	Burgan		
Lactuca serriola	Prickly Lettuce	*	
Lomandra glauca	Pale Mat-rush		
Microlaena stipoides			
Oxalis perennans			
Oxalis sp.			
Panicum effusum			
Phalaris aquatica	Phalaris	*	
Phyllanthus sp.			
Phyllanthus gunnii	Scrubby Spurge		
Phyllanthus hirtellus	Thyme Spurge		
Plantago lanceolata	Lamb's Tongue	*	
Poa sieberiana			
Pomaderris aspera	Hazel Pomaderris		
Rosa rubiginosa	Sweet Briar	*	
Rubus fruticosus sp. agg.		*	*
Rytidosperma richardsonii	Straw Wallaby-grass		
Rytidosperma sp.			
Senecio sp.			
Themeda triandra	Kangaroo Grass		
Vittadinia cuneata	Fuzzweed		
Vittadinia hispidula			
Wahlenbergia gracilis	Sprawling Bluebell		
Wahlenbergia sp.			
Pomaderris aspera	Silver Wattle		

Appendix B Likelihood table

An assessment of likelihood of occurrence was made for threatened and migratory species identified from the database search. Five terms for the likelihood of occurrence of species are used in this report. This assessment was based on database or other records, presence or absence of suitable habitat, features of the proposal site, results of the site inspection and professional judgement. Some migratory, marine and aquatic species identified from the Commonwealth database search have been excluded from the assessment, due to lack of habitat. The terms for likelihood of occurrence are defined below:

- "yes" - the species was or has been observed on the site
- "likely" = a medium to high probability that a species uses the site
- "potential" = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely to occur, or unlikely to occur
- "unlikely" = a very low to low probability that a species uses the site
- "no" = habitat on site and in the vicinity is unsuitable for the species.

An assessment of significance was conducted for threatened species or ecological communities that were recorded within the site. An assessment of significance was also conducted for threatened species that had a high likelihood of occurring, were not recorded during the site visit and have the potential to be significantly impacted. It is noted that some threatened fauna species that are highly mobile, wide ranging and vagrant may use portions of the site intermittently for foraging. For these fauna species, the habitat present and likely to be impacted is not considered to be important to the threatened species, particularly in relation to the amount of similar habitat remaining in the surrounding landscape. As such, for these species, an assessment of significance in reference to State or Commonwealth legislation was not considered necessary.

The records column refers to the number of records occurring within 15 km of the subject site, as provided by the NSW Wildlife Atlas (BioNet) database search. Information provided in the habitat associations' column has primarily been extracted (and modified) from the Commonwealth Species Profile and Threats Database (DoEE 2018b), NSW Threatened Species Profiles (OEH 2018b) and BioNet (OEH 2019d).

- "CE" = critically endangered
- "E" = endangered
- "V" = Vulnerable
- "M" = Migratory

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
THREATENED FLORA					
Calotis glandulosa	Mauve Burr-daisy	Occurs in the Monaro and Kosciuszko regions, upper Shoalhaven catchment and near Oberon. Found in montane, subalpine and natural temperate grasslands.	V	V	Unlikely. No suitable habitat present.
Dillwynia glaucula	Michelago Parrot-pea	Recorded from four areas on the NSW Southern Tablelands: near Windellama, near Mongarlowe, north-east of Michelago and at Numeralla. It is found in exposed patches of clay or on rocky outcrops in eucalypt woodland often dominated by *Eucalyptus rossii* (Scribbly Gum), *E. pauciflora* (Snow Gum), *E. dives* (Broad-leafed Peppermint) and *E. macrorhyncha* (Red Stringybark).	E	-	Unlikely. One BioNet record within 15 km of the site. This conspicuous species was not observed within the subject site despite good survey coverage.
Dodonaea procumbens	Trailing Hop-bush	This species is found in dry areas of the Monaro, between Michelago and Dalgety; there is one population at Lake Bathurst. It occurs in Natural Temperate Grassland or fringing eucalypt woodland of *Eucalyptus pauciflora* (Snow Gum), on sandy-clay soils, usually on or near vertically-tilted shale outcrops.	V	V	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Eucalyptus aggregata	Black Gum	In NSW, this species is found in the Central and Southern Tablelands, in the South Eastern Highlands Bioregion and on the western fringe of the Sydney Basin Bioregion. It grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers and usually occurs in open woodland with a grassy groundlayer.	V	V	No. This conspicuous species was not observed during the field survey.
Lepidium hyssopifolium	Basalt Pepper-cress,	In NSW, this species occurs near Bathurst, Bungendore, and Crookwell and may also be extant near Armidale. It grows on alluvial soils, on cold, poorly-drained flats and hollows adjacent to creeks and small rivers and usually occurs in open woodland with a grassy groundlayer.	E	E	Unlikely. Targeted survey outside recommended survey period (November – February), but potential habitat (creeks/small rivers) very limited.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Leucochrysum albicans var. *tricolor*	Hoary Sunray, Grassland Paper-daisy	In NSW, the Hoary Sunray occurs on the Southern Tablelands and adjacent areas in an area roughly bounded by Albury, Bega and Goulburn. It is usually found in grassland, woodland and forest, generally on relatively heavy soils.	-	E	No. Eight BioNet records within 15 km of the site. Not observed during targeted field survey.
Pelargonium sp. *striatellum*	Omeo Stork's-bill	The Omeo Stork's-bill is known from only 3 locations in NSW: two on lake-beds on the basalt plains of the Monaro and one at Lake Bathurst. It grows on irregularly inundated or ephemeral lakes, in the transition zone between surrounding grasslands or pasture, and wetland or aquatic communities	E	E	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Pomaderris cotoneaster	Cotoneaster Pomaderris	*Cotoneaster Pomaderris* has a very disjunct distribution, being known from the Nungatta area, northern Kosciuszko National Park (near Tumut), the Tantawangalo area in South-East Forests National Park and adjoining freehold land, Badgery's Lookout near Tallong, Bungonia State Conservation Area, the Yerranderie area, Kanangra-Boyd National Park, the Canyonleigh area and Ettrema Gorge in Morton National Park. It has been recorded in a range of habitats in predominantly forested country. The habitats include forest with deep, friable soil, amongst rock beside a creek, on rocky forested slopes and in steep gullies between sandstone cliffs.	E	E	Unlikely. This conspicuous species was not observed during the field survey. No BioNet records within 15 km of the site.
Pomaderris pallida	Pale Pomaderris	In NSW, this species has been recorded from near Kydra Trig (north-west of Nimmitabel), Tinderry Nature Reserve, the Queanbeyan River (near Queanbeyan), the Shoalhaven River (between Bungonia and Warri), the Murrumbidgee River west of the ACT and the Byadbo area in Kosciuszko National Park. It grows in shrub communities surrounded by *Eucalyptus mannifera* (Brittle Gum) and *E. macrorhyncha* (Red Stringybark) or *Callitris* sp. woodland.	V	V	Unlikely. Suitable habitat limited. There are no BioNet records within 15 km of the site.
Prasophyllum petilum	Tarengo Leek Orchid	Natural populations are known from five sites in NSW: near Boorowa, Queanbeyan area, Ilford, Delegate and a newly recognised population approximately 10 km west of Muswellbrook. The species grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. It also grows in grassy woodland in association with *Poa labillardieri*, *Eucalyptus*	E	E	Unlikely. Suitable habitat limited. There are no BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
		aggregata and *Leptospermum* spp. near Queanbeyan and within the grassy groundlayer dominated by *Themeda triandra* (Kangaroo Grass) under Box-Gum Woodland at Ilford (and Hall, ACT).			
Pultenaea pedunculata	Matted Bush-pea	In NSW it is represented by just three disjunct populations: in the Cumberland Plains in Sydney, the coast between Tathra and Bermagui and the Windellama area south of Goulburn. It is found in woodland, sclerophyll forest, road batters and coastal cliffs.	E	-	Unlikely. This conspicuous species was not observed during the field survey.
Rutidosis leptorrhynchoides	Button Wrinklewort	In NSW, populations occur at Goulburn, the Canberra - Queanbeyan area and Michelago. It grows in Box-Gum Woodland, secondary derived grassland, or in Natural Temperate Grassland, and is usually found on shallow, stony red-brown clay loams.	E	E	Unlikely. No BioNet records within 15 km of the site. Suitable habitat (Box-Gum Woodland, secondary derived grassland or Natural Temperate Grassland) not present.
Swainsona recta	Small purple pea	*Swainsona recta* occurs throughout the Queanbeyan and Wellington-Mudgee areas. It is also known from the ACT and a single population of four plants near Chiltern in Victoria. Over 80% of the southern population grows on a railway easement. Its habitat includes grassland, woodland and open forest dominated Blakely's Red Gum (*Eucalyptus blakelyi*), Yellow Box (*E. melliodora*), Candlebark Gum (*E. rubida*) and Long-leaf Box (*E. goniocalyx*) (OEH 2018b).	E	E	Unlikely. Suitable habitat (Box-Gum Woodland) not present. Twenty-three BioNet records within 15 km of the site.
Swainsona sericea	Silky Swainson-pea	In NSW, this species has been recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is also an isolated record from the far north-west of NSW. It is found in Natural Temperate Grassland and *Eucalyptus pauciflora* (Snow Gum) Woodland on the Monaro, and Box-Gum Woodland in the Southern Tablelands and South West Slopes.	-	-	Unlikely. Box-Gum Woodland, Natural Temperate Grassland and Snow Gum Woodland not present Twenty-four BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Thesium australe	Austral Toadflax, Toadflax	In eastern NSW, this species is found in very small populations scattered along the coast, and from the Northern to Southern Tablelands. It grows in grassland on coastal headlands or grassland and grassy woodland away from the coast.	V	V	Unlikely. Suitable habitat limited. No BioNet records within 15 km of the site.
Xerochrysum palustre	Swamp Everlasting	In NSW, this species is found in Kosciuszko National Park and the eastern escarpment south of Badja. It is found in or on the margins of swamps and bogs that are often dominated by heaths.	-	V	No. Suitable swamp habitat not present.
THREATENED FAUNA					
Actitis hypoleucos	Common Sandpiper	Summer migrant. In NSW, this species is widespread along coastline and also occurs in many areas inland. It can be found in coastal wetlands and some inland wetlands, especially muddy margins or rocky shores. It also occurs near estuaries and deltas, lakes, pools, billabongs, reservoirs, dams and claypans, mangroves.	-	M	No. Suitable wetland habitat not present.
Anthochaera phrygia	Regent Honeyeater	Inhabits temperate woodlands and open forests of the inland slopes of south-east Australia, particularly Box-Ironbark woodland, and riparian forests of *Casuarina cunninghamiana* (River Sheoak). These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes. This species makes nomadic movements following winter flowering eucalypt species. Two of three known key breeding areas are in NSW: the Capertee Valley and the Bundarra-Barraba region. The other breeding area is in Chiltern, Victoria. They breed between July and January and usually nest in horizontal branches or forks in tall mature *Eucalyptus* spp. and *Casuarina/Allocasuarina* spp. (Sheoaks).	CE	CE	Unlikely. There are no NSW BioNet Atlas records within 15 km of the site. Suitable habitat not present.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Aprasia parapulchella	Pink-tailed Worm-lizard	This species inhabits sloping, open woodland areas with predominantly native grassy groundcover, particularly those dominated by Kangaroo Grass (*Themeda triandra*). This species is commonly found beneath small, partially-embedded rocks and appears to spend considerable time in burrows below these rocks.	V	V	Unlikely. Ten BioNet records within 15 km of the site. Suitable habitat (partially-embedded rocks) not present.
Apus pacificus	Fork-tailed Swift	This species has been recorded in all regions of NSW. It most commonly occupies riparian woodland, swamps, low scrub, heathland, saltmarsh, grassland, Spinifex sandplains, open farmland and coastal sand-dunes.	-	M	Potential. There are no BioNet records within 15 km of the site.
Ardea Ibis	Cattle Egret	Widespread and common across NSW. It can be found near grasslands, wooded lands and terrestrial wetlands.	-	M	Potential. Suitable habitat present. No records within 15 km of the site.
Artamus cyanopterus cyanopterus	Dusky Woodswallow	The species occurs throughout most of New South Wales, and primarily inhabits dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris (OEH 2018b).	V	-	Potential. Potential foraging habitat within and adjacent to the subject site. Three BioNet records >15 km from the site.
Bidyanus bidyanus	Silver Perch	Historically widespread throughout much of the Murray-Darling River System and introduced into the Lake Eyre Basin. The species inhabits freshwater rivers, lakes and reservoirs, particularly in areas of high water flow.	V	CE	Unlikely. There are no NSW BioNet Atlas records within 15 km of the site. Suitable habitat not present.
Botaurus poiciloptilus	Australasian Bittern	Found over most of NSW, this species' habitat consists of permanent freshwater wetlands, with tall, dense vegetation, particularly *Typha* spp. (Bulrushes) (OEH 2018b).	E	E	No. There is no suitable vegetated wetland habitat present. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Calidris acuminata	Sharp-tailed Sandpiper	Summer migrant. Widespread in most regions of NSW, especially in coastal areas, but sparse in the south-central Western Plain and east Lower Western Regions. It is found near shallow fresh or brackish wetlands with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	-	M	No. There is no suitable habitat present.
Calidris ferruginea	Curlew Sandpiper	The Curlew Sandpiper occupies littoral and estuarine habitats, including intertidal mudflats, non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	E	CE	No. There is no suitable habitat present. No BioNet records within 15 km of the site.
Calidris melanotos	Pectoral Sandpiper	This species is a summer migrant to Australia and is widespread but scattered in NSW. It is found near Shallow fresh to saline wetlands, including coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	-	M	No. There is no suitable habitat present. No BioNet records within 15 km of the site.
Callocephalon fimbriatum	Gang-gang Cockatoo	In spring and summer (during the breeding season), this species is generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter (non-breeding season), the species often moves to lower altitudes in drier more open eucalypt forests and woodlands, particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. The species requires *Eucalyptus* spp. trees with hollows greater than 9 cm diameter for breeding.	V	-	Yes. This species was recorded within the subject site. Potential foraging and breeding habitat present.
Calyptorhynchus lathami	Glossy Black-Cockatoo	In NSW, this species is widespread along coast and inland to the southern tablelands and central western plains, with a small population in the Riverina. It occupies open forest and woodlands of the coast and the Great Dividing Range. The species requires the presence of presence of *Allocasuarina* spp. or *Casuarina* spp. for foraging and living or dead tree with hollows greater than 15 cm diameter and greater than 5 m above ground for breeding.	V	-	Potential. One BioNet record >15 years old within 15 km of the site. Potential foraging and breeding habitat present.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Chalinolobus dwyeri	Large-eared Pied Bat, Large Pied Bat	This species has been recorded from Rockhampton in Qld south to Ulladulla in NSW. The largest concentrations of populations occur in the sandstone escarpments of the Sydney basin and the NSW north-west slopes. It occupies wet and dry sclerophyll forests, Cyprus Pine dominated forest, woodland, sub-alpine woodland, edges of rainforests and sandstone outcrop country.	V	E	No. No sandstone escarpments nearby. No BioNet records within 15 km of the site.
Chthonicola sagittata	Speckled Warbler	This species occurs from south-eastern Qld, the eastern half of NSW and into Victoria, as far west as the Grampians, mostly on hills and tablelands of the Great Dividing Range and rarely on coast. It can be found in Eucalyptus-dominated communities with a grassy understorey and sparse shrub layer, often on rocky ridges or in gullies.	V	-	Potential. Suitable habitat present. Six BioNet records within 15 km of the site.
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	This species is found from eastern through central NSW, west to Corowa, Wagga Wagga, Temora, Forbes, Dubbo and Inverell. It inhabits Eucalypt woodlands and dry open forest.	V	-	Potential. Suitable habitat present. No BioNet records within 15 km of the site.
Daphoenositta chrysoptera	Varied Sittella	The distribution of this species in NSW is nearly continuous from the coast to the far west. It inhabits Eucalypt forests and woodlands, mallee and Acacia woodland.	V	-	Potential. Suitable habitat present. No BioNet records within 15 km of the site.
Dasyurus maculatus maculatus	Spotted-tailed Quoll (SE mainland population)	The Spotted-tailed Quoll has been recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. It uses hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. It is mostly nocturnal, and spends most of the time on the ground, although is also an excellent climber and will hunt in tree hollows and prey on roosting birds.	V	E	Unlikely. Subject site provides marginal habitat at best. One BioNet record approximately 40 years old within 15 km of the site.
Delma impar	Striped Legless Lizard	This species occurs throughout temperate lowland grasslands in the Australian Capital Territory (ACT), the south-western slopes and southern tablelands of New South Wales (NSW), central and southern Victoria, and the south-eastern corner of South Australia (SA). This species is found in habitat where grassland is dominated by perennial, tussock-forming grasses such as *Themeda triandra*	V	V	Unlikely. Habitat not suitable. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
		(Kangaroo Grass), *Austrostipa* spp., *Poa* spp. and occasionally *Rytidosperma* spp.			
Gallinago hardwickii	Latham's Snipe	Migrant to east coast of Australia, extending inland west of the Great Dividing Range in NSW. Found near freshwater, saline or brackish wetlands up to 2000 m above sea-level; usually in freshwater swamps, flooded grasslands or heathlands.	-	M	No. There is no suitable habitat present. No BioNet records within 15 km of the site.
Grantiella picta	Painted Honeyeater	The Painted Honeyeater is a nomadic species that occurs predominantly on the inland slopes of the Great Dividing Range. It inhabits Boree/ Weeping Myall (*Acacia pendula*), Brigalow (*A. harpophylla*) and Box-Gum Woodlands and Box-Ironbark Forests. It is a specialist feeder on the fruits of mistletoes growing on woodland eucalypts and acacias, preferring mistletoes of the genus *Amyema*. Nesting occurs from spring to autumn in a small, delicate nest hanging within the outer canopy of drooping *Eucalyptus* spp., *Allocasuarina* and *Casuarina* spp. (Sheoaks), *Melaleuca* sp. (Paperbark) or Mistletoe branches.	V	V	Unlikely. No suitable habitat (abundant mistletoe) present at subject site. No BioNet records within 15 km of the site.
Haliaeetus leucogaster	White-bellied Sea-Eagle	This species is distributed along the coastline of mainland Australia and Tasmania, extending inland along some of the larger waterways, especially in eastern Australia. It can be found near freshwater swamps, rivers, lakes, reservoirs, billabongs, saltmarsh and sewage ponds and coastal waters. Terrestrial habitats include coastal dunes, tidal flats, grassland, heathland, woodland, forest and urban areas.	V	-	Unlikely except as vagrant/fly-over – no suitable habitat in subject site. One BioNet record (>20 years old) within 15 km of the site.
Heleioporus australiacus	Giant Burrowing Frog	The Giant Burrowing Frog is found in two distinct populations in south eastern NSW and Victoria: a northern population in the sandstone geology of the Sydney Basin as far south as Ulladulla, and a southern population occurring from north of Narooma through to Walhalla, Victoria. Habitat includes heath, woodland and open dry sclerophyll forest on a variety of soil types except those that are clay based. Breeds in ephemeral streams with permanent or semi-permanent pools.	V	V	Unlikely. One BioNet record (>20 years old) within 15 km of the site.
Hieraaetus morphnoides	Little Eagle	This species is found throughout the Australian mainland, with the exception of the most densely-forested parts of the Dividing Range escarpment. It inhabits	V	-	Potential. Suitable habitat present. No

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
		open eucalypt forest, woodland or open woodland, including Sheoak or Acacia woodlands and riparian woodlands of interior NSW.			BioNet records within 15 km of the site.
Hirundapus caudacutus	White-throated Needletail	The White-throated Needletail is recorded in all coastal regions of Qld and NSW, extending inland to the western slopes of the Great Divide and occasionally onto the adjacent inland plains. In Australia, the White-throated Needletail is almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. They are recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but are less commonly recorded flying above woodland. The species also occurs over heathland, but less often over treeless areas such as grassland or swamps. When flying above farmland, Needletails are more often recorded above partly cleared pasture, plantations or remnant vegetation at the edge of paddocks.	-	M	Potential (fly-over only).
Lathamus discolor	Swift Parrot	This species breeds in Tasmania during Spring and Summer and migrates to the Australian south-east mainland between March and October. On the mainland they occur where Eucalypts are flowering profusely, or where there are abundant lerp infestations. Favoured feed trees include winter flowering species such as *Eucalyptus robusta* (Swamp Mahogany), *Corymbia Maculata* (Spotted Gum), *C. gummifera* (Red Bloodwood), *E. sideroxylon* (Mugga Ironbark), and *E. albens* (White Box).	E	CE	Unlikely. No BioNet records within 15 km of the site. Preferred feed trees do not occur at the subject site.
Litoria aurea	Green and Golden Bell Frog	Since 1990, recorded from approximately 50 scattered sites within its former range in NSW, from the north coast near Brunswick Heads, south along the coast to Victoria. Records exist west to Bathurst, Tumut and the ACT region, but the only remaining extant inland population is an old gold mine at Captains Flat. All other records within 10 km of coastal waters where the effects of the chytrid fungus are ameliorated.	E	V	Unlikely. No suitable habitat present and not within 10 km of the coast. No BioNet records within 15 km of the site.
Litoria castanea	Yellow-spotted Tree Frog	A single known population occurs on the Southern Tablelands of NSW. Large permanent ponds or slow-flowing streams with plenty of emergent vegetation such as bulrushes.	E	E	Unlikely. Species considered extinct outside of single known population.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
					No suitable vegetated wetland habitat present. No BioNet records within 15 km of the site.
Litoria raniformis	Growling Grass Frog	In NSW, only known to exist in isolated populations in the Coleambally Irrigation Area, the Lowbidgee floodplain and around Lake Victoria. A few recent unconfirmed records have also been made in the Murray Irrigation Area. It inhabits permanent or ephemeral *Eucalyptus largiflorens* (Black Box)/*Duma florulenta* (Lignum)/*Chenopodium nitrariaceum* (Nitre Goosefoot) swamps, *D. florulenta*/*Typha* spp. swamps and *Eucalyptus camaldulensis* (*River* Red Gum) swamps or billabongs along floodplains and river valleys. It is also found in irrigated rice crops.	E	V	Unlikely. Species occurs only west of divide. Local records probably mistaken *Litoria castanea*. No suitable habitat present. No BioNet records within 15 km of the site.
Maccullochella macquariensis	Trout Cod	The single naturally occurring population is restricted to a small (approximately 120 km) stretch of the Murray River from below Yarrawonga Weir to Strathmerton. The species occupies stream positions characterised by a high abundance of large woody debris (or 'snags') in water that is comparatively deep and close to riverbanks. However, midstream snags are also an important habitat component.	E	E	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Maccullochella peelii	Murray Cod	Found throughout most of the Murray Darling Basin with the exception of some localised extinctions. Some translocated populations exist outside the species' natural distribution in impoundments and waterways (Cataract Dam and the Nepean River). It inhabits clear rocky streams to slow flowing, turbid rivers and billabongs. Frequently found in the main river channel and larger tributaries; it is also found in floodplain channels when they contain water.	E	V	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Macquaria australasica	Macquarie Perch	The Macquarie Perch is found in the Murray-Darling Basin, particularly in the upstream reaches of the Lachlan, Murrumbidgee and Murray rivers, and in parts of south-eastern coastal NSW, including the Hawkesbury and Shoalhaven catchments. It inhabits river and lake habitats, especially the upper reaches of rivers and their tributaries.	E	E	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Melanodryas cucullata cucullata	Hooded Robin (south-eastern form)	This species is found throughout much of inland NSW, with the exception of the extreme north-west, where it is replaced by the subspecies *picata*. It inhabits open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas.	V	-	Potential. Potential foraging habitat within and adjacent to the site. Three BioNet records >15 years old within 15 km of the site.
Merops ornatus	Rainbow Bee-eater	This species is distributed across much of mainland Australia, including NSW. It inhabits open forests and woodlands, shrublands, farmland, areas of human habitation, inland and coastal sand dune systems, heathland, sedgeland, vine forest and vine thicket.	-	M	Potential (on migration). No BioNet records within 15 km of the site
Miniopterus schreibersii oceanensis	Eastern Bentwing-bat	In NSW it occurs on both sides of the Great Dividing Range, from the coast inland to Moree, Dubbo and Wagga Wagga. It inhabits rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland. In breeding season females and older males congregate in large well documented maternity roosts. Outside of breeding seasons smaller groups roost in caves, rock overhangs culverts and buildings.	V	-	Potential. No BioNet records within 15 km of the site.
Monarcha melanopsis	Black-faced Monarch	In NSW and the ACT, the species occurs around the eastern slopes and tablelands of the Great Divide, inland to Coutts Crossing, Armidale, Widden Valley, Wollemi National Park, Wombeyan Caves and Canberra. It is rarely recorded farther inland. It occurs mainly in rainforest ecosystems, including semi-deciduous vine-thickets, complex notophyll vine-forest, tropical (mesophyll) rainforest, subtropical (notophyll) rainforest, mesophyll (broadleaf) thicket/shrubland, warm temperate rainforest, dry (monsoon) rainforest and (occasionally) cool temperate rainforest.	-	M	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Motacilla flava	Yellow Wagtail	This species is a regular summer migrant to mostly coastal Australia. In NSW, it has been recorded from Sydney to Newcastle, the Hawkesbury and inland in the Bogan LGA. It inhabits swamp margins, sewage ponds, saltmarshes, playing fields, airfields, ploughed land and lawns.	-	M	Unlikely. No suitable habitat. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Myiagra cyanoleuca	Satin Flycatcher	Satin Flycatchers inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and, on migration, occur in coastal forests, woodlands, mangroves and drier woodlands and open forests.	-	M	Potential (on migration). No BioNet records within 15 km of the site.
Neophema pulchella	Turquoise Parrot	The Turquoise Parrot's range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range. It lives on the edges of Eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland.	V	-	Unlikely, except as an occasional visitor. Suitable habitat limited. One BioNet record >30 years old within 15 km of the site.
Numenius madagascariensis	Eastern Curlew, Far Eastern curlew	In NSW, the Eastern Curlew has a primarily coastal distribution. It generally occupies coastal lakes, inlets, bays and estuarine habitats, and is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts. They occur in both fresh and brackish waters and occasionally are recorded around floodwaters.	-	CE	Unlikely. No suitable habitat. No BioNet records within 15 km of the site.
Pandion haliaetus	Osprey	Common around the northern NSW coast, and uncommon to rare from coast further south. Some records from inland areas. It can be found near rocky shorelines, islands, reefs, mouths of large rivers, lagoons and lakes.	V	M	No. No suitable habitat. No BioNet records within 15 km of the site.
Petauroides volans	Greater Glider	The Greater Glider occurs in Eucalypt forests along the ranges and coastal plains of eastern Australia, feeding almost exclusively on the young leaves and flower buds of select Eucalypt species. It shelters in tree hollows, with a particular preference for large hollows in large, old trees. Individuals occupy relatively small home ranges (1-3 ha).	-	V	Unlikely. Habitat (large, old trees) limited. No BioNet records within 15 km of the site.
Petrogale penicillata	Brush-tailed Rock-wallaby	In NSW, the Brush-tailed Rock-wallaby occurs from the Qld border in the north to the Shoalhaven in the south, with the population in the Warrumbungle Ranges being the western limit. It inhabits rocky escarpments, outcrops and cliffs, with a preference for complex structures with fissures, caves and ledges.	E	V	Unlikely. Suitable rocky habitat not present. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Petroica boodang	Scarlet Robin	In NSW, this species occurs from the coast to the inland slopes. It is often found in dry eucalypt forests and woodlands, and occasionally in mallee, wet forest, wetlands and tea-tree swamps.	V	-	Potential. Potential foraging habitat within and adjacent to the site. Eight BioNet records within 15 km of the site.
Petroica phoenicea	Flame Robin	In NSW, the Flame Robin breeds in upland areas, and in winter many birds move to the inland slopes and plains, or occasionally to coastal areas. It breeds in upland tall moist eucalypt forests and woodlands. In winter it uses dry forests, open woodlands, heathlands, pastures and native grasslands. It can occasionally be found in temperate rainforest, herbfields, heathlands, shrublands and sedgelands.	V	-	Potential. Potential foraging habitat within and adjacent to the site. Six BioNet records within 15 km of the site.
Phascolarctos cinereus	Koala	In NSW, it mainly occurs on the central and north coasts, with some populations in the west of the Great Dividing Range. There are sparse and possibly disjunct populations in the Bega District and at several sites on the southern tablelands. It inhabits eucalypt woodlands and forests.	V	V	Unlikely. No primary food trees present. No BioNet records within 15 km of the site. Habitat does not qualify as critical habitat under the EPBC Act referral guidelines.
Polytelis swainsonii	Superb Parrot	Found throughout eastern inland NSW in Box-gum woodland, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. It nests in small colonies, often with more than one nest in a single tree. They nest in the hollows of large trees (dead or alive), mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes, nest trees can be in open Box-Gum Woodland or isolated paddock trees. The species known to be used are *Eucalyptus blakelyi* (Blakely's Red Gum), *E. melliodora* (Yellow Box), *E. bridgesiana* (Apple Box) and *E. polyanthemos* (Red Box). It feeds in trees and understorey shrubs and on the ground, and their diet consists mainly of grass seeds and herbaceous plants.	V	V	Unlikely. Box-Gum woodland not present. No BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Pseudomys fumeus	Smoky Mouse	In south-east NSW, the Smoky Mouse occurs at a small number of sites in Kosciuszko NP, Bondo SF and Ingbyra SF, and around Mt Poole, Nullica SF and South East Forests NP. It can be found in sclerophyll forest, heathland and open-forest, mainly on ridgetops but sometimes in ferny gullies.	E	E	Unlikely. No BioNet records within 15 km of the site.
Pteropus poliocephalus	Grey-headed Flying-fox	The Grey-headed Flying Fox inhabits subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps, as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20-50 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. They feed on the nectar and pollen of *Eucalyptus* spp., *Melaleuca* spp. and *Banksia* spp., and fruits of rainforest trees and vines.	V	V	Unlikely. No camps present. No important patches of feed trees present. No BioNet records within 15 km of the site.
Rhipidura rufifrons	Rufous Fantail	The Rufous Fantail inhabits the coastal and near coastal districts of northern and eastern Australia, including on and east of the Great Divide in NSW. It is often found in sclerophyll forests and subtropical and temperate rainforest. It sometimes inhabits drier sclerophyll forests and woodlands.	-	M	Potential (on migration only). No BioNet records within 15 km of the site.
Rostratula australis	Australian Painted Snipe	In NSW, records of the Painted Snipe are from the Murray-Darling Basin, including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp, and swamps near Balldale and Wanganella. Other important locations with recent records include wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. It prefers the fringes of swamps, dams and nearby marshy areas, where there is a cover of grasses, Lignum, low scrub or open timber. It nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	E	E	Unlikely. No suitable habitat present. No BioNet records within 15 km of the site.
Stagonopleura guttata	Diamond Firetail	The Diamond Firetail is distributed in NSW, and has mainly been recorded in the Northern, Central and Southern Tablelands, the Northern, Central and South Western Slopes and the North West Plains and Riverina, and less commonly in coastal areas and further inland. It prefers gassy Eucalypt woodlands, open forest, mallee, Natural Temperate Grassland, secondary derived grassland, riparian areas, and lightly wooded farmland.	V	--	Potential. Potential foraging habitat within and adjacent to the site. Eight BioNet records within 15 km of the site.

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Synemon plana	Golden Sun Moth	The Golden Sun Moth's NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. The species' historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, central and western Victoria, to Bordertown in eastern South Australia. It occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which the groundlayer is dominated by *Austrodanthonia* spp.	E	CE	Unlikely. No suitable grassland habitat. No BioNet records within 15 km of the site.
Tympanocryptis pinguicolla	Grassland Earless Dragon	The only populations now known are in the ACT and adjacent NSW at Queanbeyan, and on the Monaro Basalt Plains between Cooma and south-west of Nimmitabel. Restricted to a small number of Natural Temperate Grassland sites dominated by wallaby grasses (*Nothodanthonia* spp.), spear grasses (*Austrostipa* spp.), Poa Tussock (*Poa sieberiana*), Red Grass (*Bothriochloa macra*), and occasionally Kangaroo Grass (*Themeda triandra*).	E	E	Unlikely. No suitable grassland habitat. No BioNet records within 15 km of the site.
Varanus rosenbergi	Rosenberg's Goanna	In NSW, this species is found on the Sydney Sandstone in Wollemi National Park, in the Goulburn and ACT regions, and near Cooma in the south. It has also recorded from the South West Slopes near Khancoban and Tooma River. It can be found in heath, open forest and woodland. The species is known from Morton National Park and the Queanbeyan area and is found in heath, open forest and woodland. It nests in terrestrial termite mounds.	V	-	Unlikely. No suitable breeding habitat (termite mounds). One BioNet record (approximately 20 years old) within 15 km of the site.
THREATENED ECOLOGICAL COMMUNITIES					
Natural Temperate Grassland of the South Eastern Highlands (EPBC Act)		Natural temperate grassland is dominated by moderately tall (25–50 cm) to tall (50–100 cm), dense to open tussock grasses in the genera *Austrodanthonia* spp., *Austrostipa* spp., *Bothriochloa* spp., *Poa* spp. and *Themeda* spp.. It occurs on Ridges, crests, hillsides, undulating plains, valleys and lower slopes, creeks, drainage lines and river flats. It generally corresponds with the Monaro, Murrumbateman, Bungonia and Crookwell subregions of the South Eastern Highlands bioregion.	-	CE	No

Scientific name	Common name	Habitat associations	Conservation status		Likelihood of occurrence
			BC Act	EPBC Act	
Alpine Sphagnum Bog and Associated Fens		The community can usually be defined by the presence or absence of *Sphagnum* spp., the most common of which is *Sphagnum cristatum*. However, there are some sites in the community that are dominated by shrubs or *Restionaceae* spp., where *Sphagnum* spp. are only a minor component, and others where Sphagnum has been depleted or lost due to disturbance. In these cases, the site may still be considered to be part of this ecological community if other key species are present. It is found in permanently wet areas, such as along streams, valley edges and valley floors. They are also situated on slopes where soils are waterlogged. In NSW, it occurs in the Australian Alps bioregion and the Bondo subregion of the South Eastern Highlands bioregion.	E	CE	No
White Box-Yellow Box-Blakely's Red Gum Woodland (BC Act) White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (EPBC Act)	Box-Gum Woodland	This TEC is characterised by the presence or prior occurrence of *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and/or *E. blakelyi* (Blakely's Red Gum). Trees may occur as pure stands, mixtures of the three species, or in mixtures with other trees, including wattles. The understorey in intact sites is characterised by native grasses and a high diversity of herbs; the most commonly encountered include *Themeda triandra* (Kangaroo Grass), *Poa sieberiana* (Snowgrass), *Rytidosperma* spp., *Austrostipa* spp., *Chrysocephalum apiculatum* (Common Everlasting), *Goodenia pinnatifida, Hypericum gramineum* (Small St. John's Wort), *Vittadinia muelleri* and *Wahlenbergia* spp. Shrubs are generally sparse or absent, though they may be locally common. Remnants generally occur on fertile lower parts of the landscape where resources such as water and nutrients are abundant.	E -	- CE	No No

Appendix C Assessment of Significance for BC Act listed species

Threatened species impact assessment is an integral part of environmental impact assessment. The objective of Section 5A of the Environmental Planning and Assessment Act 1979 (EP&A Act) is to improve the standard of consideration afforded to threatened species, populations and ecological communities, and their habitats, through the planning and assessment process, and to ensure that the consideration is transparent.

Assessments of significance were undertaken for the following species and communities:

- *Artamus cyanopterus cyanopterus* (Dusky Woodswallow)
- *Callocephalon fimbriatum* (Gang-gang Cockatoo)
- *Calyptorhynchus lathami* (Glossy Black-Cockatoo)
- *Chthonicola sagittata* (Speckled Warbler)
- *Climacteris picumnus victoriae* (Brown Treecreeper (eastern subspecies))
- *Daphoenositta chrysoptera* (Varied Sittella)
- *Hieraaetus morphnoides* (Little Eagle)
- *Melanodryas cucullata cucullata* (Hooded Robin (south-eastern form))
- *Miniopterus schreibersii oceanensis* (Eastern Bentwing-Bat)
- *Petroica boodang* (Scarlet Robin)
- *Petroica phoenicea* (Flame Robin)
- *Stagonopleura guttata* (Diamond Firetail)

***Callocephalon fimbriatum* (Gang-gang Cockatoo)**

The Gang-gang Cockatoo is distributed from southern Victoria through south and central-east NSW. In summer it occupies tall montane forests and woodlands, although it may also occur in sub-alpine *Eucalyptus pauciflora* (Snow Gum) woodland and occasionally temperate rainforests. In winter, the species occurs at lower altitudes in drier, more open eucalypt forests, particularly box-ironbark assemblages.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A key stage in the life cycle of this species is its breeding period, which usually occurs between October and January. The species requires hollows in large trees to breed and prefers to breed in tall mature sclerophyll forests with a dense understorey.

The action proposed will result in the removal of up to 37 hollow-bearing trees, 18 of which are considered suitable Gang-gang Cockatoo breeding habitat (hollows greater than 9 cm diameter and more than 5 m from the ground). This has the potential to disrupt this key life cycle stage.

The proposed development is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species will be placed at risk of extinction if breeding trees are removed.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Up to approximately 6.67 ha of foraging habitat (all native vegetation within the subject site) and 18 potential breeding trees may be removed as a result of this proposed action.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As the areas to be removed are located at the edges of patches of the open forest and woodland communities which are already located adjacent to the existing road alignment, the proposed action will not result in increased fragmentation of habitat for this species. This, combined with the highly

mobile characteristic of the Gang-gang Cockatoo, means that the foraging habitat to be impacted is unlikely to be important to the long-term survival of the species in the locality.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat to be removed and modified has been historically disturbed through clearing, ongoing road maintenance activities, and weed encroachment. This area is neither the tall mountain forest/wet sclerophyll forest, lowland box-gum nor the box-ironbark forest preferred by this species. In addition, similar or higher quality woodland habitat is widespread in the vicinity, including >1000 ha of contiguous suitable foraging habitat. The 6.67 ha of foraging habitat in the study area is therefore not considered important for the long-term survival of this species in the locality. However, any breeding trees within the study area are considered important to the long-term survival of the species.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation”, “removal of dead wood and dead trees” and “loss of hollow-bearing trees”.

Conclusion

If the mitigation actions outlined in **Section 6.2** are followed, the proposal is unlikely to have a significant impact on the Gang-gang Cockatoo.

***Calyptorhynchus lathami* (Glossy Black-Cockatoo)**

The Glossy Black-Cockatoo is uncommon although widespread throughout suitable forest and woodland habitats from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW. It inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of *Casuarina* and *Allocasuarina* spp. (Sheoak) occur. It feeds almost exclusively on the seeds of several species of *Casuarina* and *Allocasuarina* spp. and requires hollows >9 cm diameter and >5 m from the ground for breeding.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

A key stage in the life cycle of this species is its breeding period, which usually occurs between March and August. The species requires hollows >9 cm diameter and >5 m from the ground for breeding.

The action proposed will result in the removal of up to 37 hollow-bearing trees, 14 of which are considered suitable Glossy Black-Cockatoo breeding habitat. This has the potential to disrupt this key life cycle stage.

The proposed development is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species will be placed at risk of extinction if breeding trees are removed.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Up to approximately 6.67 ha of foraging habitat (native vegetation within the subject site) and 14 potential breeding trees will be removed as a result of this proposed action.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As the areas to be removed are located at the edges of patches of the open forest and woodland communities which are already located adjacent to the existing road alignment, the proposed action will not result in increased fragmentation of habitat for this species. This, combined with the highly

mobile characteristic of the Glossy-black Cockatoo, means that the foraging habitat that will be impacted is unlikely to be important to the long-term survival of the species in the locality.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat to be removed and modified has been historically disturbed through clearing, ongoing road maintenance activities, and weed encroachment; similar or higher quality woodland habitat is widespread in the vicinity, including >1000 ha of contiguous suitable foraging habitat. The area does not contain the *Allocasuarina* and *Casuarina* spp. preferred by this species. The 6.67 ha of foraging habitat to be removed is therefore not considered important for the long-term survival of this species in the locality. However, any potential breeding trees within the survey area are considered important to the long-term survival of the species.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation”, “removal of dead wood and dead trees” and “loss of hollow-bearing trees”.

Conclusion

If the mitigation actions outlined in **Section 6.2** are followed, proposal is unlikely to have a significant impact on the Glossy Black-Cockatoo.

Threatened Woodland Birds - Dusky Woodswallow, Speckled Warbler, Varied Sittella, Hooded Robin, Scarlet Robin, Flame Robin and Diamond Firetail

These birds are assessed together because they have broadly similar habitat requirements (they live in woodland and forest, feed mostly on invertebrates, and do not require hollows for nesting) and the proposal is likely to impact on them in similar ways.

Artamus cyanopterus cyanopterus **(Dusky Woodswallow)**

This species is widespread from the coast to inland NSW, including the western slopes of the Great Dividing Range. It prefers woodlands and dry open sclerophyll eucalypt forests, generally with a sparse shrub understorey and a ground cover consisting of grasses, sedges or open ground with woody debris. It also occurs in farm land or roadside remnants. It feeds primarily on invertebrates, and occasionally on nectar, fruit and seeds (OEH 2019b).

Chthonicola sagittata **(Speckled Warbler)**

The Speckled Warbler inhabits a wide range of eucalypt dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area. The Speckled Warbler builds a grass dome nest in a dense grass tussock or shrub (OEH 2019b).

The diet of the Speckled Warbler consists of seeds and insects, with most foraging taking place on the ground around tussocks and under bushes and trees. Speckled Warblers often join mixed species feeding flocks in winter, travelling in company with other species such as Yellow-rumped, Buff-rumped, Brown and Striated Thornbills (OEH 2019b).

Daphoenositta chrysoptera **(Varied Sittella)**

The distribution of the Varied Sittella includes most of mainland Australia except deserts and open grasslands. It prefers eucalypt forests and woodlands with rough-barked species, or mature smooth-barked gums with dead branches, mallee and *Acacia* spp. woodland and feeds on arthropods from bark, dead branches, or small branches and twigs. It nests in a small cup built onto a branch or peeling bark crevice of a rough-barked tree (OEH 2019b).

Melanodryas cucullata cucullata **(Hooded Robin – south-eastern form)**

This bird is associated with a wide range of eucalypt woodlands, shrubland and open forests. In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover. Hooded Robin home ranges are relatively large, averaging 18 ha for birds from the New England Tableland (OEH 2019b).

Petroica phoenicea **(Flame Robin)**

The Flame Robin breeds in upland tall moist eucalypt forests and woodlands, often on ridges and slopes, nesting mostly near edges or areas with an open understorey and grassy ground layer. It often occurs in recently burnt areas, and abundant fallen timber is an important component of its habitat. In winter

many birds move to the inland slopes and plains, or to drier more open habitats in the lowlands (OEH 2019b).

***Petroica boodang* (Scarlet Robin)**

The Scarlet Robin inhabits dry eucalypt forests and woodlands with an open grassy understorey and a few scattered shrubs. It breeds in summer in higher country; some birds migrate to lower altitudes in autumn. Abundant logs and fallen timber are important components of its habitat (OEH 2019b).

Stagonopleura guttata (Diamond Firetail)

The Diamond Firetail can be found in grassy eucalypt woodlands, including Box-Gum Woodlands. This species can also be found in open forest, mallee, riparian vegetation, and grasslands, and is often seen in flocks of between five to forty birds. The Diamond Firetail is a ground feeder, feeding on ripe and partly-ripe grass, herb seeds, green leaves, and on insects. It nests in dense shrubs or in tree canopy (OEH 2019b).

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

6.67 ha of vegetation within the study area provides potential foraging habitat for these species (all native vegetation). The trees, shrubs and tussock grasses provide potential breeding habitat for the Dusky Woodswallow, Hooded Robin, Diamond Firetail, Speckled Warbler, Varied Sittella and Scarlet Robin. The Flame Robin does not breed in the drier inland areas that it commonly occupies during winter.

Similar or better quality (less disturbed) foraging and breeding habitat is available in the broader landscape, including >1000 ha of contiguous native vegetation. As such, the proposed activity is unlikely to affect the life cycle of these species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

An area of up to approximately 6.67 ha of open forest and woodland would be removed to facilitate road widening. This constitutes approximately 2.5% of the mapped extent of similar woodland and open forest habitat within 1 km of the study area (265 ha) and 0.08% within 10 km (8349 ha). The area to be removed is also contiguous with >1000 ha of open forest and woodland that would provide similar habitat for these species.

Given the large extent of similar habitats in the locality (immediately adjoining the study area), and the highly mobile nature of these species, the proposal is not considered likely to affect habitat important for the long-term survival of the species in the locality.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As the areas of vegetation to be removed are located at the edges of patches of this community, which are already located adjacent to the existing road alignment, the proposed action will not result in increased fragmentation of habitat for this species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The local populations of these species are likely to extend well beyond the study area; similar or higher quality woodland habitat is widespread in the vicinity. The habitat to be removed is therefore likely to be of low importance to the long-term survival of these species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation” and “removal of dead wood and dead trees”. The limited extent of native vegetation clearance, relative to the native vegetation in the wider locality, means that in this context these key threatening processes are not considered to constitute a significant impact.

Conclusion

The proposal is unlikely to have a significant impact on the Dusky Woodswallow, Speckled Warbler, Varied Sittella, Hooded Robin, Scarlet Robin, Flame Robin or Diamond Firetail.

***Climacteris picumnus victoriae* (Brown Treecreeper)**

This species inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, open ground and fallen timber. It nests in hollows in standing dead or live trees and tree stumps. Fallen timber constitutes important foraging habitat for the Brown Treecreeper. The species is sedentary, although some birds may disperse locally after breeding. Populations consist of pairs or groups of three to six (OEH 2019b). No Brown Treecreepers were recorded during the field survey.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The availability of similar or higher quality foraging and breeding habitat in the broader landscape (including >1000 ha of contiguous potential habitat) means that the proposed activity is unlikely to result in a local population of any of these species being placed at risk of extinction.

As such, the proposed activity is unlikely to affect breeding, or the life cycle, of these species such that a viable local population is likely to be placed at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

NA

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Up to approximately 6.67 ha of open forest and woodland and 37 hollow-bearing trees would be removed to facilitate road widening. This constitutes approximately 2.5% of the mapped extent of similar woodland and open forest habitat within 1 km of the study area (265 ha) and 0.08% within 10 km (8349 ha).

Given the large extent of similar habitats in the locality (>1000 ha contiguous with the study area), and the highly mobile nature of the Brown Treecreeper, the proposal is not considered likely to affect habitat important for the long-term survival of the species in the locality.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As the areas of vegetation to be removed are located at the edges of patches of this community that are already located adjacent to the existing road alignment, the proposed action will not result in increased fragmentation of habitat for this species. This, combined with the highly mobile characteristic of the Brown Treecreeper, means that this habitat is unlikely to be important to the long-term survival of the species in the locality.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

Similar or higher quality vegetation exists in adjacent land. As such, the habitat to be removed is not considered important to the long-term survival of these species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation”, “removal of dead wood and dead trees” and “loss of hollow-bearing trees”.

Conclusion

The proposal is unlikely to have a significant impact on the Brown Treecreeper.

***Hieraaetus morphnoides* (Little Eagle)**

The Little Eagle is found throughout mainland Australia, with the exception of the most densely forested parts of the Great Dividing Range and escarpment. It occupies open Eucalypt forest and woodland, nesting in tall living trees within a remnant patch where it builds a large stick nest in winter. No Little Eagles have been recorded in the study area; however, the species has large home ranges and is likely to occasionally hunt over the study area.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposal has the potential to affect foraging through the removal of up to 6.67 ha of potential habitat for the species (all native vegetation) but is unlikely to impact on breeding: there are no large raptor nests in the site. Given that similar or better quality (less disturbed) habitat is widespread in the vicinity, the proposal is unlikely to place the local population at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

Up to 6.67 ha of woodland or open forest will be removed.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

Although the proposal will result in the widening of Burra Road, this species is easily capable of crossing such a gap, and the proposal will not result in any fragmentation or isolation of habitat.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The proposal will impact on up to 6.67 ha of potential habitat for the species, comprising 2.5% of the potential habitat (all native woodland or open forest) within 1 km of the study area. The local population of the species would extend well beyond the study area: similar or better quality (less disturbed) woodland habitat is widespread in the vicinity. The habitat to be removed is therefore unlikely to be important for the long-term survival of the species in the locality.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation”.

Conclusion

On consideration of the factors above, the proposal is unlikely to have a significant impact on the Little Eagle.

***Miniopterus schreibersii oceanensis* (Eastern Bentwing-Bat)**

The Eastern Bentwing-bat roosts primarily in culverts, caves, pipes and other similar structures, and breeds only in substantial caves; however, it has also been recorded roosting in tree hollows. It forages in open forest and woodland. The study area constitutes potential foraging and roosting (but not breeding) habitat for this species. It should be noted that targeted searches for microchiropteran bats have not been undertaken at this site.

(a) in the case of a threatened species, whether the proposed development or activity is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction,

The proposal will not affect any breeding habitat for this species. Up to 37 hollow-bearing trees and 6.67 ha of potential foraging and roosting habitat will be removed, which represents 2.5% of the mapped extent of similar woodland and open forest habitat within 1 km of the study area (265 ha) and 0.08% within 10 km (8349 ha).

However, the habitat within the study area is considered marginal and does not contain the preferred habitat for this species (caves). It also does not include and is not near a maternity roost. If present, it is likely that the local population would extend well beyond the study area. Therefore, the proposal would be unlikely to place a local population at risk of extinction.

(b) in the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

(i) is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction, or

(ii) is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction,

NA

(c) in relation to the habitat of a threatened species or ecological community:

(i) the extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

As noted above, up to approximately 6.67 ha of foraging or roosting habitat and 37 hollow-bearing trees will be removed for the proposed action. This represents 2.5% of the potential habitat for the species in the vicinity, although it does not represent primary habitat.

(ii) whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

As the areas of habitat to be removed are located at the edges of patches of this community, which are already located adjacent to the existing road alignment, and the Eastern Bentwing-Bat is highly mobile, the proposed action will not result in increased fragmentation of habitat for this species.

(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality,

The habitat to be removed is located immediately adjacent to much larger patches of native vegetation, and the species are highly mobile and able to traverse both the road and these larger areas of habitat. As such, the proposed action is unlikely to further fragment this habitat or to result in the removal of important foraging habitat.

(d) whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly),

The proposal is unlikely to have an adverse effect on any declared area of outstanding biodiversity value.

(e) whether the proposed development or activity is or is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the key threatening processes “clearing of native vegetation”, “removal of dead wood and dead trees” and “loss of hollow-bearing trees”.

Conclusion

The proposal is unlikely to have a significant impact on the Eastern Bentwing-bat. However, the mitigation measures outlined in **Section 6** have been recommended to further reduce the potential impacts of the proposal on the species.

Appendix D EPBC Act Assessment of Significance

EPBC Significant impact criteria and assessment

This section provides an assessment of the potential significance of impacts from the proposed activity on Matters of National Environmental Significance (MNES). The EPBC Act Administrative Guidelines on Significance set out 'Significant Impact Criteria' that are to be used to assist in determining whether a proposed action is likely to have a significant impact on MNES. A 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts. MNES listed under the EPBC Act include:

- listed threatened species and ecological communities
- listed migratory species
- Wetlands of International Importance
- The Commonwealth marine environment
- World Heritage properties
- National Heritage places
- nuclear actions
- Great Barrier Reef
- a water resource, in relation to coal seam gas development and large coal mining development.

An action will require federal approval if the action has, will have, or is likely to have a significant impact on a species or community listed in any of the following categories:

- extinct in the wild
- critically endangered
- endangered
- vulnerable

Impact assessments were undertaken for six Migratory species:

- *Apus pacificus* (Fork-tailed Swift) (Migratory)
- *Ardea ibis* (Cattle Egret) (Migratory)
- *Hirundapus caudacutus* (White-throated Needletail) (Migratory)
- *Merops ornatus* (Rainbow Bee-eater) (Migratory)
- *Myiagra cyanoleuca* (Satin Flycatcher) (Migratory)
- *Rhipidura rufifrons* (Rufous Fantail) (Migratory)

Matters to be addressed	Impact (Commonwealth legislation)
(a) any environmental impact on a World Heritage Property;	NA: the proposed action does not impact on a World Heritage Property.
(b) any environmental impact on Wetlands of International Importance;	NA: The proposed action will not affect any part of a Ramsar Wetland.
(c) any impact on Commonwealth Listed Endangered Species or Communities	NA: the proposed action will not impact any Commonwealth Listed Endangered Species or Communities
(d) any impact on Commonwealth Listed Vulnerable Species;	NA: the proposed action will not impact any Commonwealth Listed Vulnerable Species.
(e) any environmental impact on Commonwealth Listed Migratory Species;	The Study Area provides potential foraging habitat for six migratory species: *Apus pacificus* (Fork-tailed Swift), *Ardea ibis* (Cattle Egret), *Hirundapus caudacutus* (White-throated Needletail), *Merops ornatus* (Rainbow Bee-eater), *Myiagra cyanoleuca* (Satin Flycatcher) and *Rhipidura rufifrons* (Rufous Fantail). The vegetation present is unlikely to provide breeding habitat for any of these species. The significant impact criteria in terms of migratory species are discussed below: **(a) substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species** The proposed action will remove or modify up to 6.67 ha of potential foraging habitat for these species. Due to the highly mobile nature of these species, the removal of this vegetation is unlikely to increase fragmentation or isolation. **(b) result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species, or** The proposed action is unlikely to introduce any invasive species. **(c) seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.** The proposed action does not impact breeding habitat, and the foraging habitat that will be impacted would form only a small fraction of the range for these species. The proposed action would affect substantially less than an ecologically significant proportion of the populations of these species, so is unlikely to result in a significant impact. Conclusion: Referral not required.
(f) does any part of the Proposal involve a Nuclear Action;	NA: the proposal does not involve a Nuclear Action.
(g) any environmental impact on a Commonwealth Marine Area;	NA: the proposed action will not impact on a Commonwealth Marine Area.
(h) In addition, any direct or indirect impact on Commonwealth lands	NA: the proposed action will not directly or indirectly impact on Commonwealth land.

Appendix E Aboriginal Due Diligence Assessment

Aboriginal Due Diligence Assessment of the Burra Road Upgrade: Little Burra Road to London Bridge Road

Queanbeyan-Palerang Regional Council

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Abbreviations

Abbreviation	Definition
ACHA	Aboriginal Cultural Heritage Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BP	Before Present
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DECCW	Department of Environment, Climate Change, and Water
ELA	Eco Logical Australia Pty Ltd.
EP&A	Environmental Planning and Assessment Act 1979
LEP	Local Environmental Plan
LGA	Local Government Area
NPW	National Parks and Wildlife Act 1974 (New South Wales)
OEH	Office of Environment and Heritage (New South Wales)
PAD	Potential archaeological deposit
Study area	The Burra Road corridor, inclusive of the area between approximately 600 metres north of the intersection between Burra Road / Little Burra Road to approximately 700 metres south of the intersection between Burra Road / London Bridge Road, Burra, New South Wales

1. Introduction

1.1 Project background

The Queanbeyan-Palerang Regional Council has engaged Eco Logical Australia Pty Ltd. (ELA) to undertake an Aboriginal Due Diligence Assessment of the Burra Road Upgrade: Little Burra Road to London Bridge Road (**Figure 1**). The principle aim of this assessment is to identify the likelihood of Aboriginal cultural heritage sites and/or objects being present within the area of the proposed work and, if so, whether the proposed works have the potential to harm those sites and/or objects.

This assessment outlines the findings of the Aboriginal Due Diligence Assessment of the study area in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* (Department of Environment, Climate Change, and Water 2010b).

1.2 Assessment process

Aboriginal cultural heritage sites and objects in New South Wales are afforded protection under the *National Parks and Wildlife Act 1974* (NPW), irrespective of whether they are registered on the Aboriginal Heritage Information Management System (AHIMS). As defined by the NPW, Aboriginal cultural heritage sites and objects are:

- Any lands dedicated as an Aboriginal area under the Act; and
- Any deposit, object, or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.

Strict penalties apply for engaging in activities that inflict harm to an Aboriginal cultural heritage site or object without consent for activities under the NPW. Under Part 6 of the NPW Act, consent or authorisation for harmful activities may be given under an Aboriginal Heritage Impact Permit (AHIP).

To assess the requirement of an AHIP, the Office of Environment and Heritage (OEH) necessitates that an Aboriginal Cultural Heritage Assessment (ACHA) is prepared in accordance with the *Guide to Investigating, Assessing, and Reporting on Aboriginal Cultural Heritage in NSW* (Department of Environment, Climate Change, and Water 2010a; DECCW) and the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010b). These two guides establish a set of guidelines to aid land users in being aware of how their activities could damage Aboriginal cultural heritage sites and archaeologists in the requirements that must be followed during the investigation of Aboriginal cultural heritage sites. If an AHIP is required, the OEH necessitates that it is further supported by a copy of the approval for the development or infrastructure issued under Part 4 or Part 5 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

An archaeologically sensitive landscape is an area that has the potential for archaeological material to be present within it. According to the *Due Diligence Code of Practice* (DECCW 2010b), archaeologically sensitive landscapes can include, but are not limited to, areas:

Within 200m of waters;

- Located within a sand dune system;
- Located on a ridge top, ridge line, headland;

- Located within 200m below or above a cliff face;
- Within 20m of or in a cave, rock shelter, or a cave mouth; or
- Is on land that is not disturbed land.[1]

The aims of this Due Diligence Assessment are to:

- Assess the geological and topographical characteristics of the study area;
- Undertake a search of the Aboriginal Heritage Information Management System (AHIMS) register maintained by the OEH to establish if there are any previously recorded Aboriginal sites or objects within the study area;
- Undertake a search of the NSW State Heritage Inventory, the Australian Heritage Database the Queanbeyan Local Environmental Plan (LEP) (2012) Schedule 5 (Environmental Heritage), and the Palerang LEP (2014) Schedule 5 to establish if there are any previously recorded Aboriginal cultural heritage sites or objects within the study area;
- Undertake a desktop review of relevant previous archaeological assessments to understand the local archaeological context and assist in predicting the likely occurrence of unrecorded Aboriginal sites or objects;
- Undertake a surface survey of the study area to identify any Aboriginal sites and areas of sensitive landforms; and
- Prepare an archaeological due diligence assessment determining if known objects or additional unrecorded objects are present within the study area, as well indicate whether further assessment and/or an AHIP is required.

[1] *Disturbed land* is defined as any area that has been the subject of anthropogenic activity that has changed the land's surface and remains clear and observable (DECCW 2010b:18). Examples of land disturbance activities include: ploughing; construction of rural infrastructure (such as dams and fences); clearance of vegetation; construction of buildings or other structures; construction or installation of utilities and other similar services (such as above or below ground electrical infrastructure, water or sewerage pipelines, stormwater drainage, and other similar infrastructure); and earthworks.

In Australian archaeology, *disturbed land* does not encompass the land modification conducted by Aboriginal groups (such as ecosystem management through fire-stick farming), as these activities are representative of cultural beliefs and behaviours.

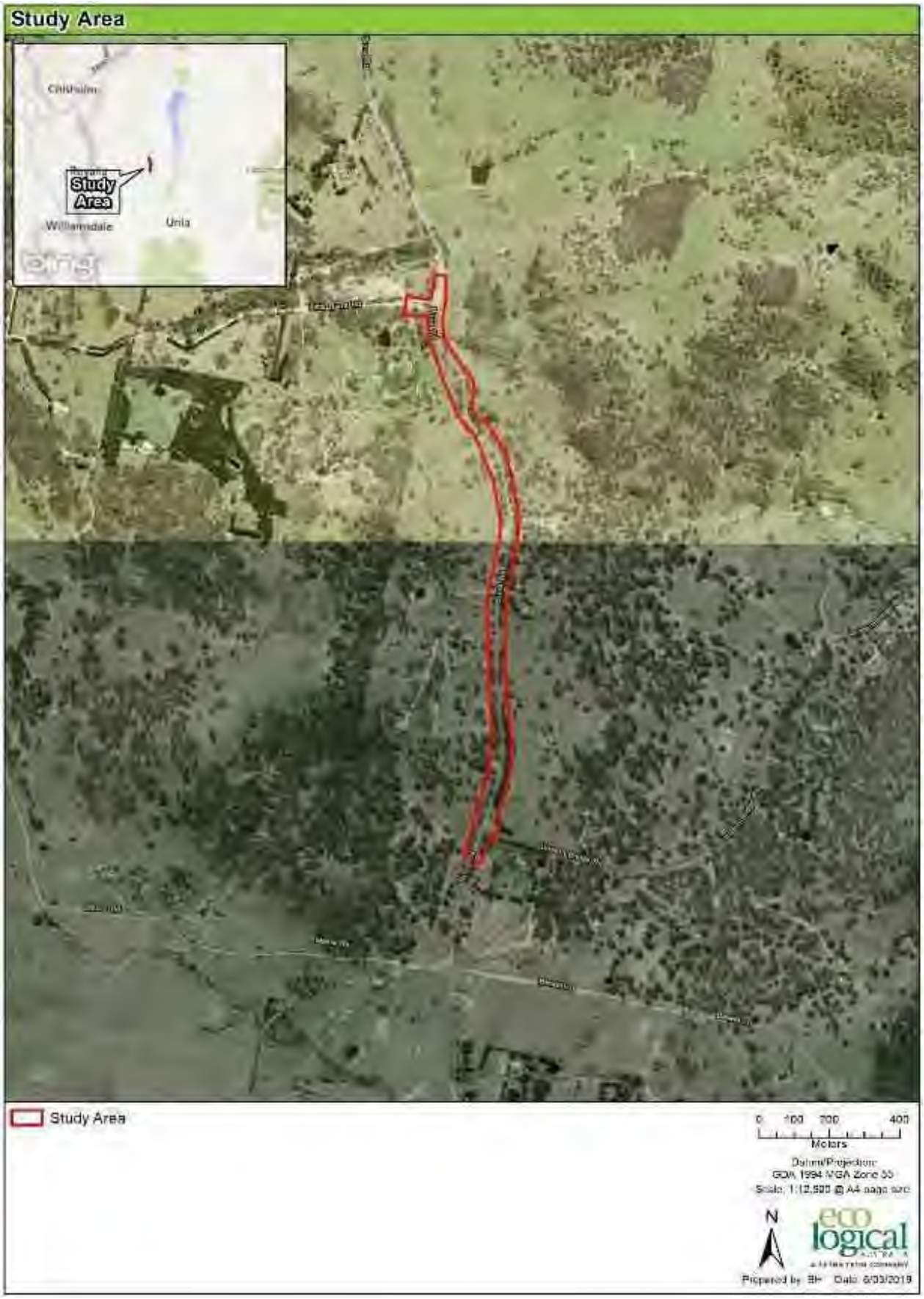

Figure 1: Location of study area along Burra Road, approximately 600 metres north of the intersection between Burra Road / Little Burra Road to approximately 700 metres south of the intersection between Burra Road / London Bridge Road, Burra.

1.3 Executive summary

This Aboriginal Due Diligence Assessment comprised of an extensive desktop review and site survey of the study area.

The desktop review indicated that several archaeological investigations have been undertaken in the Burra area, culminating in the recording of 86 Aboriginal cultural heritage sites in proximity to the present study area (Section 5.1.1). These sites largely comprise of artefact scatters and isolated artefacts, although several Potential Archaeological Deposits (PADs) and culturally modified trees have also been recorded. Moreover, whilst there are no standalone Aboriginal cultural heritage sites recorded on the Australian Heritage Database, the State Heritage Register, the Queanbeyan LEP (2012), or the Palerang LEP (2014), there are several sites associated with the heritage-listed London Bridge Arch and the Googong Foreshores and Geodiversity Heritage Area (Section 5.1.2).

The land comprised in the Burra Road corridor, inclusive of the area between approximately 600 metres north of the intersection between Burra Road / Little Burra Road to approximately 700 metres south of the intersection between Burra Road / London Bridge Road, Burra, contains landform elements that are typically regarded as archaeologically sensitive (such as well-drained lower slopes and slope terminations). It is very likely that this landscape was once utilised by Aboriginal communities. However, the site assessment of the study area did not identify any Aboriginal cultural heritage material. The land comprised within the study area has been extensively disturbed through historical vegetation clearance, installation of erosion and sediment controls, levelling of the road surface, and the construction of road pavement. As a result, it is unlikely that either *in situ* surface or subsurface archaeological materials remain within the current road corridor.

Consequently, ELA has made one recommendation for the management of the study area:

1. **Recommendation 1: General measures.**

All Aboriginal cultural heritage sites, whether recorded or not, are protected under the NPW. It is an offence to disturb or damage these sites without first having obtained an AHIP (Aboriginal Heritage Impact Permit). Works or activities that could potentially disturb the ground surface include earthworks, building construction, services installation, repetitive vehicular movement, and landscaping. These works have the potential to disturb surface and *in situ* subsurface Aboriginal sites.

If suspected Aboriginal objects (such as stone artefacts or midden materials like faunal remains or shell) are encountered during development, all activities must cease in the affected area and an archaeologist contacted to assess the finds. If the finds are found to be Aboriginal objects, the Office of Environment and Heritage (OEH) must be notified under Section 89A of the NPW. Appropriate management and avoidance or approval under a Section 90 AHIP should be sought if the Aboriginal objects are to be moved or harmed. In the extremely unlikely event that human remains are found, all activities should immediately cease and the New South Wales Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.

2. Basis for cultural heritage management

Places of cultural significance enrich people's lives, often providing a deep and inspirational sense of connection to community and landscape, to the past, and to lived experiences … they are irreplaceable and precious.

(Australia ICOMOS Burra Charter 2013:1)

Traditionally, heritage and archaeological assessments have focused on the significance of the tangible elements of cultural heritage (Brown 2008). Items such as structures and archaeological artefacts have been considered predominantly in terms of their (New South Wales Heritage Office 2015:20-24):

- Scientific or research potential ("an item has potential to yield information that will contribute to an understanding of New South Wales' cultural or natural history"); and
- Representativeness ("an item possesses uncommon, rare, or endangered aspects of New South Wales' cultural or natural significance").

By focusing on the scientific qualities of heritage, many of the intangible qualities of heritage were not considered. This is especially crucial when participating in the management and protection of Aboriginal cultural heritage. By nature, Aboriginal cultural heritage is multi-faceted: it consists not only of tangible structures and objects of value for scientific investigations, but also of a deeply complex array of intangible expressions, such as stories, memories, and traditions. Many of the rights and interests of Aboriginal communities in their own heritage is formed on the basis of this intangibility. It stems from their spirituality, customary law, original ownership, and continuing custodianship (Australian Heritage Commission 2002:5).

These intangible expressions often share a strong link with the landscape. Byrne *et al.* (2003:3) describe this connection in the form of a map, where individuals:

> *Carry around in [their] heads a map of the landscape which has all these places and their meanings detailed on it. When we walk through our landscapes the sight of a place will often trigger the memories and the feelings [that] go with them … it is the landscape talking to us.*

Crucially, those who are not connected to the landscape in question will not be able to discern these intangible meanings embedded in the landscape; they can only come to recognise the significance by consulting with local knowledge holders (Byrne *et al.* 2003:3). And, even so, they may vary between individuals, reflecting unique experiences.

By recognising the rights and interests of Aboriginal knowledge holders and community members in their cultural heritage, all parties involved in the identification, conservation, and management of this cultural heritage must acknowledge that Aboriginal people (Australian Heritage Commission 2002:6):

- Are the primary source of information on the value of their heritage and how this is best conserved;
- Must have an active role in any heritage planning processes;
- Must have input into primary decision-making in relation to their heritage so that they can continue to fulfil their obligations towards this heritage; and
- Must control the intellectual property and other information relating specifically to their heritage, as this may be an integral aspect of its heritage value.

As such, cultural heritage sites and objects are fundamental elements of Aboriginal peoples' identities, connections, and belonging to their communities. The careful protection and management of this heritage is essential for the preservation of connection between past, present, and future.

3. Detection and identification of archaeological material

The detection and identification of archaeological material is dependent upon several, interacting factors, including: the degree of preservation of archaeological material; the depositional nature of archaeological material; the accessibility of the study area, especially to where archaeological material may be located; and the visibility conditions of the study area. The interaction of these factors can be visualised in Figure 2. It is crucial to understand the nature of archaeological data and how its identification during an archaeological assessment can influence the interpretations, significance assessments, and management recommendations drawn from it.

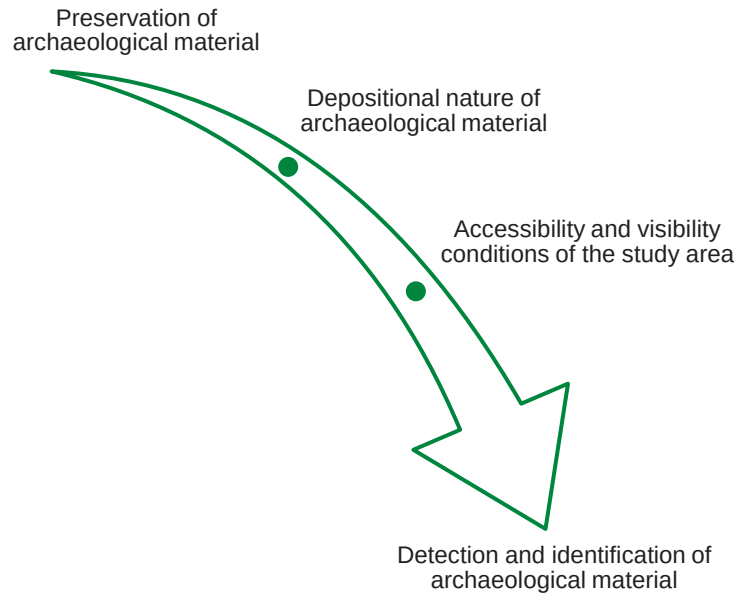

Figure 2: Interpretive visualisation of the interactions between the preservation, depositional nature, and accessibility and visibility of archaeological materials, and the influence of these factors on the detection and identification of archaeological material.

3.1 Preservation of archaeological material

Preservation refers to the degree of completeness or condition of archaeological remains. Although preservation has been regarded as a binary process, where an artefact is either preserved intact or it has become completely degraded, preservation is highly dependent upon the characteristics of the archaeological material and its interactions with the immediate environment in which it resides (Schiffer 1987:150). When environmental conditions are altered the rate of preservation (or deterioration) also changes, and it will affect different archaeological materials variably.

The environmental modes of deterioration have traditionally been grouped via their form of action upon materials: either chemical, physical, or biological. Chemical weathering is the degradation of archaeological materials through chemical reactions, which act to alter the mineral composition of

matter through forming or destroying minerals. Physical weathering does not change the chemical composition of archaeological material, rather, it disintegrates materials through environmental factors, such as water, temperature, and wind. Similarly, biological weathering utilises environmental elements, however, it occurs through the activities of faunal, floral, and microbial organisms.

Stone, particularly in the form of lithic artefacts, is one of the most prolific archaeological materials in Aboriginal archaeological assemblages. Although it may be regarded as a durable, hard-wearing material, rock[2] is still prone to the above weathering processes. Chemical weathering is the most common deteriorating process for stone and stone artefacts. The reaction between water and any one of the numerous atmospheric gases has the propensity to result in dilute acids. In the case of rock shelters, this may result in the advanced weathering of the stone overhang or rock carvings and/or art on the external side of the drip line. Lithics, on the other hand, may be subjected to the polishing of stone surfaces, particularly if they are submerged in water (Kamminga 1979:149-151). Physical weathering typically presents in freeze-thaw cycles and thermal shock. Freeze-thaw cycles occur when the pores in a stony surface are infiltrated by moisture from the ground and atmosphere that, upon freezing, expands and exerts pressure on the stone surface (Schiffer 1987:154). This can result in cracking and fragmentation. Thermal shock can exacerbate the freeze-thaw cycle by creating deep cracks to be saturated by moisture (Schiffer 1987:154). In subsurface contexts, the movement of soil particles around lithics can cause friction against the artefact's surface, resulting in striations and chipping (Keeley 1980:31; Burroni *et al.* 2002). Moreover, cryoturbation (disturbance processes that displace artefacts beneath the ground surface) can influence the contact and pressure between artefacts, resulting in the subsurface weathering of stone artefacts against one another (Laville *et al.* 1980). Degradation through biological weathering is not as common. In some circumstances, microbes may produce acid, resulting in erosion of rock surfaces (Schiffer 1987:157). This may affect rock shelters and associated carvings and/or art. Faunal and floral organisms can also impact rock surfaces and stone artefacts: excessive rubbing against rock by animals can carve out depressions; compression through trampling may fracture stone artefacts; and invasive root growth by plants can serve to fracture larger rock surfaces.

Artefacts composed from organic matter (such as wood, bone, shell, and fibrous matter) are less common in Aboriginal archaeological assemblages. Unlike stone, which is typically preserved unless weathering processes are enacted upon it, organic materials are (by nature) designed to break down. In archaeological contexts, organic matter will only survive under certain conditions. In Aboriginal archaeological contexts, charring is a common preserving factor. Charring will preserve organic matter by transforming it into a carbon-based material, which is an inorganic compound. In this form, organic matter is largely resistant to external deterioration processes. Although, due to its porous and brittle nature, it can be highly susceptible to physical weathering (Schiffer 1987:164). Less commonly, anaerobic environments can preserve organic matter to an extremely high quality. Anaerobic conditions occur when oxygen is limited or absent from an environment. The range of bacteria that would normally break down organic matter is restricted, as many are unable to survive in absent- or low oxygenated environments (Holden *et al.* 2006). In permanently waterlogged or extremely arid instances, the stable

[2] The terms *rock* and *stone* are not used interchangeably. In archaeological contexts, *rock* denotes the raw, geological material, as unaltered by anthropogenic interference. *Stone*, on the other hand, has been subjected to anthropogenic alteration, particularly in the creation of portable artefacts. An exception exists for rock shelters and rock carvings/art: despite being anthropogenically utilised or formed, they are described as the natural, geological material from which they have been derived.

environmental conditions and low oxygen levels allow the chemical composition of organic materials to remain stable and protected from a variety of weathering processes (Holden *et al.* 2006).

It must also be stressed that the type of interaction, either preserving or deteriorating, and the rate of weathering between the environment and archaeological material are not able to be generalised. The preservation of a specific artefact is highly reliant upon its individual chemical composition and the nature of its immediate environment (i.e. not the geographic environment, but its immediate position beneath the soil or in a rock shelter; Schiffer 1987:146). Microenvironments with unique conditions can occur in larger environmental zones and can account for the unexpected preservation or deterioration of archaeological materials.

3.2 Depositional nature of archaeological material

The preservation of archaeological material does not guarantee its detection and identification during an archaeological assessment; the depositional nature of archaeological material can influence the ability of the surveyor to detect it. The deposition of artefacts is generally divided into two classifications: cultural or noncultural. Cultural deposition occurs when artefacts are placed or discarded through anthropogenic activities. Archaeological material deposited in this manner can be used to infer past occupational and spiritual activities, and much scholarly research has been dedicated to the interpretation of 'activity areas' through the clustering of certain occupational material (e.g. Binford 1978; Section 5.4.1). Noncultural deposition, on the other hand, occurs when archaeological material is moved via environmental influences. Weathering processes, particularly those associated with aeolian and alluvial effects, are common noncultural deposition forces. Biological deposition (*bioturbation*) stemming from the subsurface and/or surface activity of insects or mammals can result in the mixing of subsurface stratigraphic layers or surface locations of archaeological materials (see Hewitt and Allen 2010, for an extensive discussion of this issue in Australian archaeological contexts). However, a single deposit of archaeological material may be the result of several different depositional processes, often through both cultural and noncultural influences. Moreover, disturbances associated with modern anthropogenic activities must also be considered: the construction of modern amenities – particularly those that involve ground disturbance – and agricultural activities are common influencers of artificial deposition.

These depositional forces result in three key elements that may influence the detectability of archaeological material (after Schiffer *et al.* 1978:6; Dancey 1981): the abundance and frequency of archaeological material; the clustering of archaeological material; and the obtrusiveness of archaeological material. The abundance and frequency of archaeological material may be correlated with the past occupational use or cultural significance of an area, which potentially derives from local topographic and environmental conditions and resource availability. Essentially, stone artefacts may be found in abundance where there is ample raw rock suitable for knapping nearby, or, evidence of continuous occupation may be associated with abundant food and water resources. Material that is found in abundance may be indicative of past cultural and occupational activities (Section 5.4.1). Similarly, the clustering of archaeological material may also be considered the result of these anthropogenic selective influences. However, it should also be considered that subsequent disturbances or erosion of the area may influence how artefacts are clustered. For example, the severe erosion of a stratigraphic sequence with sparse archaeological material could result in the grouping of all archaeological material in a single, apparently 'dense' assemblage. Finally, the obtrusiveness of archaeological material influences the probability that it can be detected through a particular assessment method. Size, composition, and surface morphology can influence the obviousness of an

archaeological material in the environment. Its detection may also be affected by the assessment method selected. Archaeological material may not be detectable on the soil surface: it may exist as part of a subsurface deposit, which potentially has no indication of its presence on the surface. In this instance, archaeological sensitivity predictive models (Section 5.2.1) can be devised to aid in the detection of landforms that may contain subsurface archaeological deposits.

An important note must be made with regards to a *lack* of archaeological material. Usually, the absence of archaeological evidence would be considered an indication of minor or no past occupational activities. However, some activities result in less impact on the environment, such as integral spiritual customs or purposeful 'cleaning' of an occupational site. Moreover, noncultural deposition and/or other disturbances may further exacerbate this impression through removing archaeological material from an area. Consequently, sites with little or no archaeological material should be considered as carefully as their counterparts.

3.3 Accessibility and visibility conditions of archaeological material

The identification of archaeological material requires the surveyor to be able to access the particular location in which it resides and detect it in its environment. The accessibility of an archaeological site or archaeologically sensitive area may be influenced by a number of external factors. Weather conditions resulting in restricted or difficult access, the local biotic environment, terrain, and road access or land ownership and/or use may impede the ability of the surveyor to examine particular areas. Once the surveyor has reached the area of archaeological potential, they must also be able to *see* the archaeological material: the term 'archaeological visibility' is used to describe the extent to which the surveyor can detect the presence of archaeological materials. Visibility may be increased by intensive grazing, land clearance, road or facility eases, or erosion of creek banks; conversely, it may be reduced by excessive foliage growth, leaf litter, or sediment deposition.

A common paradoxical dilemma encountered in archaeological assessments is: in prioritising areas of high archaeological visibility over areas of low archaeological visibility, the surveyor is targeting places in which archaeological material is more likely to be seen, however, these are also the areas in which material is more likely to have been subjected to noncultural deposition or modern disturbances. Thereby, the archaeological integrity and scientific significance of an assemblage or site may be drawn into question. To avoid this, archaeological interpretations should extensively consider the potential impacts of any weathering, depositional, and disturbance effects on the assemblage and archaeological sequence in question.

4. Landscape context of the study area

4.1 Site location

The study area comprises the Burra Road corridor, inclusive of the area between approximately 600 metres north of the intersection between Burra Road / Little Burra Road to approximately 700 metres south of the intersection between Burra Road / London Bridge Road (Figure 1). The study area is approximately 845 metres above sea level at its most elevated point.

4.2 Environmental conditions

The study area is situated in the undulating Canberra Lowlands, which falls within the South Eastern Highlands Bioregion. Its climate is a temperate one, characterised by warm summers and no dry season, with a mean annual rainfall between 460 millimetres and 1883 millimetres.

The soil and underlying geomorphology of the study area is characterised by the 'Burra' soil landscape profile, as described by Jenkins (2000). Its geomorphology is comprised of the Colinton volcanics group and the Cappanana Formation, and includes various tuffs with minor siltstone, shale, sandstone, and limestone (Jenkins 2000:44). The overlying soil stratigraphy consists of: shallow, well-drained Rudosols (Lithosols) and Tenosols (Lithosols / Earthy Sands) on crests and upper slopes; moderately deep, moderately well-drained Red Kurosols (Red Podzolic Soils) and Red Kandosols (Red Earths) on midslopes and most lower slopes; and moderately deep, slowly to moderately well-drained Brown Chromosols (Yellow Podzolic Soils) and Brown Kandosols (Yellow Earths) along minor drainage lines and on some lower slopes (Jenkins 2000:44). A soil auger sampled from within the Burra landscape and directly south of the present study area indicates that the soil is mostly neutral, with a pH of 6.0 (Jenkins 1991; Appendix B). Topographically, the Burra profile occurs with a local relief of less than 90 metres (Jenkins 2000:44).

Much of the vegetation in the wider landscape have been cleared and exotic vegetation species associated with agricultural and pastoral cultivation have been introduced. Where remnant vegetation is extant, it is characterised by woodland (savanna) species (Table 1).

Table 1: Species found in the Burra soil landscape, after Jenkins (2000:44).

Botanical name	Common name
Tree species	
Eucalyptus bridgesiana	Apple Box
Eucalyptus meliodora	Yellow Box
Eucalyptus pauciflora	Snow Gum
Shrub species	
Acacia mearnsii	Black Wattle
Acacia dealbata	Silver Wattle
Groundcover species	
Poa spp.	Snow Grass *various*
Stipa spp.	Spear Grass *various*
Themeda triandra	Kangaroo Grass

5. Cultural heritage registers

5.1 Aboriginal Heritage Information Management System

The Aboriginal Heritage Information Management System (AHIMS) is a database that retains information and records pertaining to the identified and recorded Aboriginal cultural heritage sites, objects, and declared places throughout New South Wales. It is maintained and regulated by OEH under Section 90Q of the NPW Act.

A search of the AHIMS database was conducted on 20 February, 2019, in order to determine if any registered Aboriginal sites are present within or in proximity to the study area (Appendix A). The AHIMS database search was conducted utilising the following parameters:

Table 2: AHIMS search parameters.

AHIMS search parameters	
GDA	Zone 55
Lat, Long from	-35.5427, 149.1793
Lat, Long to	-35.4706, 149.2936
Buffer	200 m

The AHIMS search result showed:

Table 3: AHIMS search result.

86	Aboriginal sites and/or objects are recorded within the search parameters
0	Aboriginal places have been declared within the search parameters

The distribution of recorded Aboriginal sites in proximity to the study area is shown in Figure 3. The frequencies of site types and contexts recorded within the AHIMS database search area are listed below:

Table 4: Frequencies of site types.

Site Features	Number	%
Artefact scatter	40	46.5
Artefact scatter and PAD	2	2.3
Artefact scatter and culturally modified tree	1	1.2
Isolated artefact	27	31.4
PAD	11	12.8
Culturally modified tree	3	3.5
Organic material, PAD, and artefact scatter	1	1.2
Hearth, organic material, PAD, and artefact scatter	1	1.2
Total	86	100

No Aboriginal sites are recorded within the study area on the AHIMS database.

5.2 Local, state, and national heritage registers

Searches of the Australian Heritage Database, the State Heritage Register (SHR), the Queanbeyan LEP (2012) Schedule 5, and the Palerang LEP (2014) Schedule 5 were conducted on 20 February, 2019, in order to determine if any places of Aboriginal archaeological significance are located within or in proximity to the study area. The search terms utilised included “Burra” and “London Bridge”.

No standalone Aboriginal cultural heritage sites are recorded on these databases within or in proximity to the study area. There are, however, Aboriginal cultural heritage sites associated with other heritage listed items: the London Bridge Arch, accessed via London Bridge Road, is approximately 3 kilometres east of the present study area, as is the southern extent of the Googong Foreshores and Geodiversity Heritage Area, which is parallel to the eastern perimeter of the study area. Both items are registered on the Commonwealth Heritage List.

The London Bridge Arch is listed as a Natural heritage place (Commonwealth of Australia Heritage Place ID 106093). It is a natural arch that has been carved out of the rock through the dissolution of soluble limestone. It is highly valued for its aesthetic value and its setting in the wider landscape, which likely had strong spiritual significance for the local Aboriginal community. Moreover, the associated karstic cave system contains evidence of past Aboriginal cultural activities, such as occupation floors (Section 6.2). There is the potential for burials to have occurred in this area, although the historical records of this have not been corroborated (Section 6.2).

The Googong Foreshores and Geodiversity Heritage Area is listed as a Historical heritage place (Commonwealth of Australia Heritage Place ID 106072). Whilst its value is largely placed in historical European associations with the area, it is valued for similar reasons as the London Bridge Arch: numerous archaeological investigations of the Googong area and accounts from Aboriginal knowledge holders have indicated that the area was (and continues to be) an area of significant Aboriginal cultural heritage value.

Figure 3: AHIMS registered sites within the vicinity of the study area.

6. Aboriginal cultural heritage context

6.1 Previous archaeological studies of the wider region

Lampert's (1971) excavation of the Burrill Lake, South Coast, rock shelter has provided some of the earliest evidence for the occupation of south-eastern coastal New South Wales. Radiocarbon dates derived from wood charcoal present in the lowest occupation layers of the rock shelter yielded dates of 20,820 ± 810 and 20,760 ± 800 years Before Present (Lampert 1971:9; B.P.).[3] The faunal remains from the site indicate that the local population were subsisting on a mixed coastal-bushland diet: whilst marine shell was present in not inconsiderable quantities, there was a heavy emphasis on the faunal species available in the immediate vicinity of the shelter (Lampert 1971:12).

Subsequent archaeological investigations of the South Coast resulted in an exponentially increasing number of archaeological sites being recorded. A majority of these sites were identified within close proximity to the coastline, with only a small number being recorded in the wetlands and riverine plains set back from the shoreline. This prompted several researchers to suggest that, due to the apparently high population density along the coastline, the predominant subsistence strategy utilised the rich marine resources. Poiner (1976:201) and Bowdler (1977:233) argued that population movement operated on a seasonal regime: communities would gather on the coast during summer, when the marine resources were at their most bountiful, and either retreat to further inland or to other coastal areas during the harsher winter months. Should groups shift further inland for permanent habitation, Bowdler (1977:233) reasoned that they likely moved along major river systems so as to continue an aquatic subsistence strategy. Sites such as Burrill Lake, with its predominance of bushland faunal remains, were considered to be an oddity amongst the largely littoral assemblages.

Contemporaneous research into the Southern Highlands region appeared to corroborate this model. It was believed that highland areas provided a much harsher climatic niche to adapt to, being near inaccessible during winter and providing only relatively poor resources (Bowdler 1981). Whilst extensive archaeological investigations conducted by Flood (1973) identified evidence of occupational sites at 900 metres to 1500 metres above sea level, these were considered to be transient: Flood (1973) argued that the prolific quantity of Bogong moths (*Agrotis infusa*) available in the summer months would have been the main, if not the only, motivation for groups to venture away from the coast and into the high country. Bowdler (1981) countered this hypothesis, to an extent, suggesting that the occupation of the Southern Highlands could not have been supported by the seasonal abundance of a single resource: the *mirr-n'yong* (*Microseris lanceolata*, or, Daisy Yam) is frequently mentioned as a staple food source in early ethnographic accounts and is available year-round. This hypothesis of continuing coastal habitation with limited forays into the highlands was supported by the radiocarbon dates obtained by rock shelters in the Canberra region. In the late twentieth century, some of the oldest radiocarbon-dated sites were Caddigat Shelter, Adaminaby, at 1,600 ± 600 B.P., and Bogong Shelter, Namadgi, at 1,000 ± 60 B.P. (Bowdler 1981).

Vallance (1983), however, argued that a range of subsistence strategies would have been practiced, reflecting changes in available resources between seasons and years. This was corroborated by Byrne's (1983, 1984) research, which involved the recording of a considerable number of archaeological material

[3] January 1, 1950, is the commencement date for the *Before Present* dating scale. This date is regarded as the origin of practical radiocarbon dating methods, one of the primary absolute scientific dating methods used for archaeological research.

in the hinterland. The majority of these sites were located 13 to 18 kilometres from the coast, with a paucity of archaeological material in within 3 to 10 kilometres from the coast (Byrne 1983). Walkington (1987) suggested that this likely represented a 'days' walking distance' between campsites on the coast and those in the hinterland. Moreover, Hallam (1987) argued that the rich resources available in the wetlands makes a purely coastal subsistence strategy seem incomprehensible.

Similarly, in the Southern Highlands, Argue (1995) noted that if the mirr-n'yong was available as a dependable, consistent resource, then year-round occupation of the Southern Highlands was possible. Argue (1995) identified three distinct environmental zones within the wider Highlands bioregion: alpine, sub-alpine, and montane. Each zone is characterised by different altitude and corresponding vegetation. The alpine zone lies above 1,850 metres above sea level and supports herb fields, sod tussock grasslands and heath, although it is too cold for tree growth (Argue 1995). The sub-alpine zone is situated below the treeline to 1,450 metres above sea level, where the vegetation comprises of woodland and an associated shrub understorey (Argue 1995). Where cold air drainage restricts tree growth, such as on valley floors, grasslands similar to those of the alpine zone are found (Argue 1995). Finally, the montane zone is placed between 1,450 metres and 900 metres above sea level, where dense woodland forests and thick understoreys are supported by a warmer climate (Argue 1995). Argue (1995) notes that much of the sub-alpine zone would likely have been climatically mild in comparison to the higher alpine zone: resource availability, rather than seasonal fluctuations in climate, would have likely influenced the use of lower altitude areas. A comprehensive study conducted by Argue (1991) indicated that a wide variety of floral and faunal resources would have been available and sustained occupation throughout the course of the year.

Continued research, including both academic and surveys conducted through consultancy work, is demonstrating that many of the above strict coastal subsistence theories are not supported by the available evidence. Not only are an increasing number of wetland and hinterland sites being recorded, demonstrating the use of a wide variety of resource zones, but radiocarbon evidence from the Southern Highlands indicates that inland sites were occupied much earlier than originally theorised: the radiocarbon analysis of Birrigai rock shelter, Tharwa, yielded a date of 21,000 ± 220 B.P. (Argue 1995) and further research by Theden-Ringl (2016) has indicated that the Southern Highlands were likely occupied permanently from at least 8,000 B.P.

6.2 Previous archaeological investigations of the immediate and surrounding area

86 Aboriginal cultural heritage sites have been previously recorded on AHIMS and predominantly comprise of artefact scatters / isolated artefacts (Section 5.1.1). The majority of these sites were recorded as part of relatively small-scale assessments driven by proposed developments.

In 1989, Boot and Cooke conducted an investigation of the London Bridge Arch and associated karstic cave system, located approximately 3 kilometres east of the study area (Section 5.1.2). Their study examined approximately 100 hectares of landform features, including alluvial flats, creek banks, two major ridgelines running parallel to Burra Creek, and limestone caves (Boot and Cooke 1989). Five isolated artefacts (AHIMS 57-2-0165 to 57-2-0169) and one artefact scatter (AHIMS 57-2-0172) were recorded across the study area. The excavation of two karstic caves, Douglas Cave and Burra Shelter, identified further occupational material. A rich faunal assemblage and seven lithics were located in Douglas Cave. Faunal remains were identified to a lesser extent in Burra Shelter, however, five lithics and two hearths were uncovered. Radiocarbon dating of charred skeletal material from the hearths indicated they likely date between 700 to 900 B.P. No human remains were found during the

excavations. Boot and Cooke (1989) suggested that the limited occupational material from within the two caves likely indicates a period of sparse occupation during the last one thousand years. It should be noted, however, that only two caves from the extensive karstic network were excavated by Boot and Cooke (1989); there is the distinct possibility that other caves were utilised more heavily and/or frequently than Douglas Cave and Burra Shelter.

Several other archaeological investigations have taken place to the west of the present study area. During the assessment of the 'Little Burra' rural residential subdivision, twenty Aboriginal cultural heritage sites were recorded. These comprised of: eleven artefact scatters, eight isolated finds, and a culturally modified tree (Saunders 1999). Several areas of high archaeological potential identified during this survey (Saunders 1999) were later salvaged (Saunders 2002). As part of this salvaging program, sixty-one artefacts were recovered from low rises on low-gradient basal slopes and low-gradient basal slopes within 60 metres of major tributaries for Jerrabomberra Creek (Saunders 2002). The artefactual assemblage comprised largely of quartz, with lesser quantities of silcrete, metamorphosed sedimentary, metamorphosed tuff, chert, and volcanic stones. A brown bottle glass flake was also recorded, which clearly demonstrates that Aboriginal cultural activities were taking place in the area at the time of and/or after contact with Europeans.

To the northeast of the study area, archaeological examinations of the 'Royalla Estate' rural residential subdivision obtained similar results. Saunders (2005) recorded eleven Aboriginal cultural heritage sites and two PADs across 199 hectares of the 244-hectare property. These eleven sites comprised of a total of fifty-eight artefacts, predominantly made from quartz and chert. The majority of sites were identified on low spurline crests and slopes and very low-gradient basal slopes within the gently undulating valley of Jerrabomberra Creek. However, due to the high levels of anthropogenic disturbances stemming from European agricultural and land management practices, it is unlikely that these sites are representative of past Aboriginal cultural activities within the landscape. The substantial loss of topsoil has likely lead to the displacement and loss of Aboriginal cultural heritage sites (Saunders 2005).

6.3 Social and ethnographic considerations

> *Landscapes are not simply inert backdrops or containers for the arrangement of human artefacts; [they] are a product of a complex interaction between a symbolically and historically constituted human social world and a material environment.*
>
> (Godwin and Weiner 2006:124)

Although immensely informative in understanding how Aboriginal communities lived within and used the landscape, the above archaeological investigations are largely constructed through a cultural ecological perspective; that is, they focus on the subsistence and movement of groups as determined by environmental pressures. This approach has faced a considerable amount of critique (see David *et al.* 2006: Chapter 1), primarily because it marginalises the most crucial determinative factor in human life: that of the individual. The choice about where a community lives or what they eat may have varied based on environmental conditions and resource availability, but it also would have been largely determined by the social practices in play at the time.

Due to the impact of European colonisation and the limitations of ethnographic records, however, many of these social practices can only be theorised. Early ethnographers were primarily interested in documenting unusual events, with a focus on religious and social life, especially that of men (Boot

2002:58). As a result, the documentation of every day events, such as those related to decisions made about food collection, and the (religious, social, and routine) activities engaged in by women and children largely did not occur. Moreover, ethnographic sources only record the events that were observed at the time of recording and those of the recent past (Boot 2002:58). Therefore, they should not be used to extrapolate or infer predictive models for earlier periods. It is unreasonable to assume that practices of Aboriginal life as recorded in the nineteenth century were the same as those that occurred prior to contact with Europeans.

Tindale's (1974:198) mapping of the territorial boundaries of Aboriginal groups across Australia places the Burra area within the Ngarigo region. The Ngarigo people, according to Tindale (1974:198) ranged north from Monaro Tablelands to Queanbeyan and west towards the Australian Alps. The evidence available regarding language distribution suggests that there were two main language groups: *Ngarigo*, to the south of the Canberra-Queanbeyan region, and *Ngunawal-Gundungura* to the north (Saunders 2003).However, it is important that Tindale's (1974) boundaries are considered with caution: discrepancies between and within Tindale's (1974) study and other ethnographic records, and the issue that many of these boundaries were devised by European scholars drawing on old anthropological accounts, means that their reliability is questionable. The division between the Ngarigo peoples and the neighbouring Ngunawal and Walgalu groups may have functioned in a way not explored by Tindale (1974). We should be careful not to consider languages and regional boundaries as static elements; both can experience alterations over time as the result of changing social conditions (Besold 2013:1). The proximity of the Ngarigo and the neighbouring Ngunawal and Walgalu peoples likely resulted in contact between the groups; there may have been shared words or expressions between the dialects and individuals may have been fluent in multiple languages.

Taking into consideration the shortcomings of the cultural ecological perspective and a need to see Aboriginal subsistence as socially determined, only certain inferences stemming from the local resource availability can be made. Argue's (1991) ecological survey of the Brindabella Valley can generally suggest the likely resources that would have been available to Aboriginal groups living around the Burra area:

- Freshwater fish, such as *Maccullochella macquariensis* (Trout Cod) and other *Hypseleotris* spp. (Carp Gudgeons);
- Other aquatic fauna, such as *Ornithorhynchus anatinus* (Platypus), *Chelodina longicollis* (Snake-necked Turtle), and *Cherax destructor* (Yabby);
- Terrestrial fauna and faunal products, such as *Phalangeriformes* spp. (Possums), *Macropodidae* spp. (Kangaroos), *Vombatus ursinus* (Common Wombat), Birds, *Varanus* spp. (Goanna), *Phascolarctos cinereus* (Koala), *Zaglossus bartoni* (Echidna), grubs, and honey; and
- Terrestrial flora, such as fruits from *Acrotriche* spp. (Currants) and *Leucopogon hookeri* (Mountain Beard Heath), the young fronds and rhizomes of *Pteridium esculentum* (Bracken Fern), the tubers of *Phragmites* spp. (Grasses), *Triglochin* spp. (Water Plantain), and *Microseris lanceolata* (Daisy Yam), and *Acacia* spp. (Wattle) seeds.

In combination with the resources available for consumption, a wide variety of materials were employed for medicinal purposes, social conventions, the manufacture of tools, and ceremonial events. These materials were usually sourced locally, but rarer items were also traded between groups across vast distances. Such items made by the Ngarigo may have included (Flood 1996:24-25; Boot 2002:75; Saunders 2003:10):

- Tools made from organic materials, such as bark canoes, paddles, spears, waddies, spear throwers, digging sticks, boomerangs, fish hooks, bags, Coolamon, and bone awls and scrapers;
- Tools made from stone, such as hafted edge-ground hatchets, fish traps, stone heat retainers, hammerstones, grindstones, spears, and a variety of flakes;
- Personal decorative items, such as Kangaroo bone and teeth adornments, pierced nose adornments, necklaces made from fibres and decorated with beads and feathers, and Possum and Koala skin cloaks and belts;
- Other items made from organic materials, such as hammocks, nets, ropes, wraps for infants, torches, and string bags; and
- Shelters, made from bark and tree boughs.

The key theoretical critique leveraged at the cultural ecological perspective was the need for archaeologists to approach "the Aboriginal past as socially dynamic, Aboriginal environments as socially constructed, Aboriginal landscapes as socially inscribed, and Aboriginal history as social agency" (Lourandos in David *et al.* 2006:8). Their way of life was not dictated by the environment in which they lived. Rather, it both shaped and was shaped by the social customs that Aboriginal people engaged in.

6.4 Predictive models

A commonly utilised tool in the planning and management of Aboriginal cultural heritage are predictive models. These models aim to identify specific landforms and places within the landscape which may contain archaeological material. They usually begin as geographically broad models, constructed through extensive reviews of the available literature to determine basic patterns of site distribution, before being refined according to the specific landform and environmental characteristics of the study area.

Predictive models are almost solely based upon a cultural ecological perspective of the landscape: landforms and environmental characteristics provided a distinct set of subsistence constraints, meaning the landscape could only be occupied in particular ways in order to minimise distance to potable water, maximise biodiversity, and provide shelter from the elements. Accordingly, there is an expectation that land use patterns vary between separate environmental zones due to differing constraints and that this will manifest in alternate spatial distributions of archaeological material. As discussed in Section 6.3, there are numerous limitations to this approach. Moreover, while some social factors may have influenced communities to venture through certain landscapes, other social factors may have resulted in the avoidance of areas, regardless of environmental conditions. Due to this, to understand the cultural context of a certain landscape consultation with local Aboriginal knowledge holders and community members is essential.

6.4.1 Site types

There are several common Aboriginal cultural heritage site types that may be found in Burra area.

- **Open camp sites / stone artefact scatters / isolated finds**

  Open campsites represent past Aboriginal subsistence and stone knapping activities, and may include archaeological remains such as stone artefacts and hearths. This site type usually appears as surface artefact scatters in areas where vegetation is limited and ground surface visibility is high. They are also often exposed by erosion, agricultural events (such as ploughing), and the creation of informal, unsealed vehicle access tracks and walking paths. Open campsites

are often located on dry, relatively flat land along or adjacent to rivers and creeks. Sites that contain surface or subsurface deposits resulting from repeated or continuous occupation are more likely to occur on elevated ground near permanent, reliable water sources. Flat, open areas associated with creeks and their resource-rich environments would have offered ideal camping areas to the Aboriginal inhabitants of the local area.

Isolated artefacts may represent a single item discard event or the result of limited stone knapping activity. The identification of isolated artefacts may indicate the presence of a more extensive, subsurface in situ archaeological deposit, or a larger deposit obscured by low ground visibility. Isolated artefacts are likely to be located on landforms associated with a range of activities, such as ridge lines that would have provided ease of movement through the area and level areas with access to a water source. Artefact scatters and isolated artefacts are the most common site types found in association with fresh water and/or food resource gathering areas.

- **Potential Archaeological Deposit (PAD)**

  PADs are areas where there is no surface expression of stone artefacts, but, due to a landscape feature or isolated artefact, there is a strong likelihood that the area will contain subsurface *in situ* archaeological deposits. Landscape features that may indicate a PAD include proximity to reliable water sources, particularly terraces and flats, ridge lines and ridge tops, and sand dune systems.

- **Culturally modified trees**

  Culturally modified trees exhibit evidence of the deliberate removal of the *periderm* (outer bark), *phloem* (inner bark), and, in some cases, the sapwood. These materials can be used to manufacture a variety of items, including shields, Coolamon (bowls or trays), water craft, containers, and a range of wooden tools and implements. Trees may also have been scarred in order to gain access to food resources (such as cutting toe-holds so as to climb the tree and catch possums or birds) or to mark locations (such as tribal territories). In some instances, Aboriginal people marked important features or locations (such as ceremonial grounds) by carving patterns or motifs into the sapwood of established trees or bending and grafting the branches of saplings to create rings.

- **Grinding grooves**

  Grinding grooves are the physical evidence of tool making or food processing activities undertaken by Aboriginal people. The manual rubbing of stones against other stones creates grooves in the rock; these are usually found on flat areas of abrasive rock such as sandstone in close proximity to water courses.

- **Bora grounds / ceremonial sites**

  Ceremonial sites are locations that have spiritual or ceremonial values to Aboriginal people. Such sites may comprise natural or altered landforms and, in some cases, will also contain archaeological material. For example, bora grounds are a ceremonial site type usually consisting of a cleared area around one or more raised earth circles connected by a pathway. Bora grounds are often accompanied by ground drawings or mouldings of people, animals or deities, or geometrically carved designs on the surrounding trees.

- **Burials**

  Mortuary practices often took place in proximity to camp sites, as most people tended to die in or close to camp and it is difficult to move a body over a long distance. Soft, sandy soils on or close to rivers and creeks allowed for easier removal of earth for burial. Similarly, rock shelters or middens also provided accessible burial places. Burial sites may be marked by stone cairns, modified trees, or a natural landmark. They may also be identified through historic records or oral histories.

- **Contact / historical sites**

  Artefacts located at such sites may involve the use of introduced materials such as glass or ceramics or may have social significance regarding the interaction between Aboriginal people and European settlers.

6.4.2 Site occurrence

Based on the results produced from the landscape assessment, searches of the AHIMS and state heritage registers, and examination of the regional and local Aboriginal archaeological context, the below predictive model (Table 5) has been designed for the study area.

Table 5: Predictive model for the occurrence of archaeological site types in the study area

Site Type	Description
Open camp sites / stone artefact scatters / isolated finds	Artefact scatters and isolated artefacts are the most common site types found in association with fresh water, and/or food resource gathering areas. Artefact scatters and isolated finds are reported to be the most common archaeological site type in the area, with quartz and chert the dominant raw material types. These site types would be highly likely to be present in the study area.
Potential Archaeological Deposits	The study area has a range of landforms that could be considered to be potentially archaeologically sensitive including: lower slopes and slope terminations. As a result, this site type would be considered moderately likely to be present in the study area.
Culturally modified trees	Culturally modified trees may be present wherever tree specimens of an appropriate age are present. Due to the widespread land clearing that has been undertaken within the area, this site type is only moderately likely to be present.
Axe grinding grooves	As the underlying geomorphology of the study area is not suitable for axe grinding and the study area is not in proximity to a higher order river, this site type is unlikely to occur.
Bora grounds / ceremonial sites	There is a low reported incidence of ceremonial sites in proximity to the study area. Hence, there is a low likelihood that this site type may be present.
Burials	There is a low reported incidence of burial sites in proximity to the study area. Therefore, this site type would be considered not likely to be present in the study area.
Contact / historical sites	Contact sites may occur in any area where Aboriginal people encountered early European settlers. The brown bottle glass flake identified by Saunders (2002) (Section 6.2) indicates that this was taking place in the area.

6.4.3 Archaeological assemblages

Kuskie (2009:81-82) describes an interpretive model for examining the archaeological assemblages that are expected to result from varying cultural, behavioural, and subsistence activities associated with the

above site types (Table 6). Whilst this model is useful for making inferences concerning the activities that were likely occurring in a specific study area, the effects of taphonomic and depositional processes (Section 3) on a given assemblage must be considered. It is likely that Aboriginal people primarily worked with organic materials (such as wood, bark, resin, leaves, reeds, shell, and bone; Holdaway and Stern 2008:1-2). Resultingly, due to the durability of stone and the rare preservation of organic materials, the archaeological record of Aboriginal culture is incomplete.

Due to the likely mild neutrality and dry nature of the study area, it is unlikely that subsurface archaeological deposits of organic material remain (Section 4.2).

Table 6: Interpretive model for examining archaeological assemblages, after Kuskie (2009:81-82).

Activity	Likely associated archaeological assemblage
Ceremonial activities	• Presence of ochre in sites; and • Evidence of ceremonial sites (such as bora grounds, stone arrangements, carved trees, or rock engravings).
Spiritual, social, and other activities	• Presence of ochre in sites; • Evidence of ceremonial sites (such as bora grounds, stone arrangements, carved trees, or rock engravings); and • Rock art and engravings.
Food procurement	• Stone artefacts (such as eloueras); • Wooden implements (such as digging sticks), where preserved; and • Food refuse (such as shell or bone).
Food processing and consumption	• Tools with specific use-wear/residues on cutting/chopping/pounding edges; • Specific tools that are related to processing certain foods (such as eloueras or seed grinding slabs); • Evidence associated with hearths or ovens; and • Food refuse (such as shell or bone).
Production and maintenance of wooden implements	• Stone and shell tools with design and/or use-wear/residues consistent with working wood; and • Presence of wooden implements, where preserved.
Procurement of stone	• Presence of stone sources; and • Evidence for procurement activities.
Production of stone tools	• Hammerstones and anvils; • Debitage (such as cores, flakes, flake portions, or microblades); and • Finished tools.
Production of backed artefacts	• Microliths (unused); • Bondi point preforms; • Backing flakes; • Hammerstones; and • High quantities of debitage, including a high frequency of microblades.
Maintenance of stone tools	• Cutting-edge rejuvenation flakes; • Portable whetstones; and • Axe-grinding grooves.

7. Survey of the study area

7.1 Survey methods and study area conditions

A visual inspection of the study area was undertaken by Alistair Grinbergs (Principal Heritage Consultant) and Elise Jakeman (Graduate Archaeologist) on 28 February, 2019. The survey aimed to identify whether Aboriginal sites or objects are present and assess the archaeological potential of the study area.

The survey assessed a study area of approximately 8.95 hectares. It comprises of the Burra Road corridor, inclusive of the area between from approximately 600 metres north of the intersection between Burra Road / Little Burra Road to approximately 700 metres south of the intersection between Burra Road / London Bridge Road, Burra. The survey involved a thorough inspection of the ground surface for the visible presence of Aboriginal archaeological artefacts, the inspection of mature remnant trees for evidence of cultural modification, and the landscape for areas of potential archaeological sensitivity.

Overall, the ground surface within the road corridor is highly disturbed. The construction of Burra Road and subsequent maintenance activities required the lower slope landform to be cut and benched, resulting in severe ground displacement. Drainage lines have been cut in order to prevent erosion and assist in the removal of excess water (Figure 4), however, there is still evidence of substantial soil movement (Figure 5). The road batters have been affected similarly (Figure 6). The eastern verge of Burra Road is heavily grassed and vegetated by a dense mixture of native and introduced exotic species, serving as screening for the adjacent properties (Figure 7). The western verge comprises more native vegetation. The remains of several remnant eucalyptus trees are extant on the western verge that may be of an appropriate age to bear cultural modification scars. However, many of the trees are in very poor condition; several have died and subsequently fallen, whilst others demonstrate the effects of environmental and disease scarring.

Figure 5: Drainage line cut into ground surface. Western verge of Burra Road, Burra. Facing north.

Figure 4: Erosion of the ground surface, likely resulting from the formation of a natural drainage line. Western verge of Burra Road, Burra. Facing west.

Figure 6: Disturbed soil stratigraphic matrix visible in batter affected by erosion. Western verge of Burra Road, Burra. Facing west.

Figure 7: The eastern verge of Burra Road, Burra, is densely vegetated by exotic species. Intersection between Burra Road / London Bridge Road. Facing north.

7.2 Effective survey coverage

As a result of the vegetation cover and anthropogenic disturbances associated with the construction and maintenance of Burra Road, Burra, archaeological visibility was generally low across the entire study area. In areas where visibility was high, such as instances affected by erosion, considerable disturbance was evident. The *effective survey coverage*, therefore, was low. To calculate the effective survey coverage, this assessment utilises the approach defined by Ellender and Weaver (1994). It is comprised of two components: the actual survey area and a visibility rating (Table 7). The effective survey coverage of the assessment was 0.18 hectares.[4]

$$\text{Effective survey coverage (\%)} = \frac{\text{Actual survey area (ha)}}{100} \times \text{Visibility rating (\%)}$$

Table 7: Visibility rating for effective survey coverage, after Ellender and Weaver (1994). Note that the ratings do not account for grass length (visibility may be higher in areas with short cropped grass or different grass species).

Visibility rating (%)	Description
0-5	Unable to see soil
5-10	Occasional glimpse of soil
10-20	Occasional patch of bare ground
20-50	Frequent patches of bare ground
50-70	About half bare ground
75-100	More than half bare ground; or, ploughed

7.3 Implications of survey

The study area contains landform elements that are typically regarded as archaeologically sensitive, such as well-drained lower slopes and slope terminations. Moreover, the review of previous archaeological investigations that have been undertaken within the Burra area strongly indicate that this region has been of considerable importance to the local Aboriginal community for several thousand years. It is very likely that this landscape was once utilised by Aboriginal communities.

No Aboriginal archaeological material or likely areas of archaeological sensitivity were identified during the course of the survey. The extensive anthropogenic modification to the land through the construction of ancillary driveways, batters, easements, and erosion controls has likely disturbed most surface archaeological material. Moreover, the cutting and benching of the lower slope landform on the eastern side of Burra Road, Burra, has likely disturbed any *in situ* subsurface archaeological deposits. For this reason, it is unlikely that *in situ* surface or subsurface archaeological deposits remain in the majority of the study area.

[4] The detection of archaeological material may differ between surveys due to variations in weather conditions (such as recent rainfall and resulting vegetation growth, soil erosion and movement, or restricted access), change in land ownership and/or use, or alternate methodological procedures. Consequently, archaeological assessments are unlikely to capture the full range or potential for archaeological material. An assessment can, however, strongly indicate the likelihood of archaeological material being present within a study area.

8. Due Diligence Assessment

In the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010b:18), due diligence is defined as "taking reasonable and practical steps to determine whether a person's actions will harm an Aboriginal [heritage site] and, if so, what measures can be taken to avoid that harm". The following section relates to the generic due diligence process as applied to the study area.

- **Step 1. Will the activity disturb the ground surface or any culturally modified trees?**

The upgrade of Burra Road will result in ground disturbance. Likely activities involved in the upgrading of the road may include: vegetation clearance, installation of erosion and sediment controls, cut and fill of ground surface to level road, and construction of road pavement.

No culturally modified trees have been identified in the study area.

- **Step 2. Are there any: a) relevant confirmed site records or other associated landscape feature information on AHIMS, b) any other sources of information of which a person is already aware, or c) landscape features that are likely to indicate presence of Aboriginal objects?**

No Aboriginal cultural heritage sites have been previously registered on AHIMS within the study area. No Aboriginal cultural heritage places have been declared on AHIMS within the study area. No other heritage registers contain information regarding identified Aboriginal cultural heritage sites or places within the study area.

The land comprised within the study area contains landform elements that are typically regarded as archaeologically sensitive. Due to the historical vegetation clearance, installation of erosion and sediment controls, levelling of the road surface, and the construction of road pavement, it is likely that archaeological traces of past activities have been disturbed.

- **Step 3. Can you avoid harm to the object or disturbance of the landscape feature?**

No Aboriginal cultural heritage sites have been previously registered on AHIMS within the study area. No Aboriginal cultural heritage places have been declared on AHIMS within the study area. No other heritage registers contain information regarding identified Aboriginal cultural heritage sites or places within the study area.

- **Step 4. Does a desktop survey and visual inspection confirm that there are Aboriginal objects or that they are likely?**

The land comprised within the study area contains landform elements that are typically regarded as archaeologically sensitive. Due to the historical vegetation clearance, installation of erosion and sediment controls, levelling of the road surface, and the construction of road pavement, it is likely that archaeological traces of past activities have been disturbed.

9. Statutory requirements

Aboriginal objects and places in NSW are afforded protection under the NPW irrespective of whether they are registered on AHIMS. Strict penalties apply for engaging in activities that inflict harm to an Aboriginal cultural heritage site or object without consent for activities under the NPW. Under Part 6 of the NPW, consent or authorisation for harmful activities may be given under an AHIP. Should harm be inflicted upon an Aboriginal site or object, there are five defences:

- The harm was authorised under an AHIP;
- The proponent exercised due diligence prior to causing the harm and is able to demonstrate this;
- The harm was caused during activities that complied with a code of practice as described in Part 6A of the *National Parks and Wildlife Regulation 2009* (New South Wales). For example, undertaking archaeological test excavations in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (Department of Environment, Climate Change, and Water 2010a);
- The harm was caused as part of a low-impact activity or omission under the regulation, and the proponent was not aware of the presence of Aboriginal cultural material; or
- The harm caused during activities that are exempted under Section 87A of the NPW. For example, emergency fire-fighting or bushfire hazard reduction work, as defined by the *Rural Fires Act 1997* (New South Wales).

To assess the requirement of an AHIP, the OEH necessitates that an ACHA is prepared in accordance with the *Guide to Investigating, Assessing, and Reporting on Aboriginal Cultural Heritage in New South Wales* (DECCW 2010a) and the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010b). These two guides establish a set of guidelines to aid land users in being aware of how their activities could damage Aboriginal cultural heritage sites and archaeologists in the requirements that must be followed during the investigation of Aboriginal cultural heritage sites. If an AHIP is required, the OEH necessitates that it is further supported by a copy of the approval for the development or infrastructure issued under Part 4 or Part 5 of the EP&A.

10. Conclusions and recommendations

This Aboriginal Due Diligence Assessment aimed to identify whether further assessment of a study area is required. This includes whether approval under Part 6 of the NPW will be required for the proposed activity to proceed.

An extensive search of the relevant heritage registers and review of the available archaeological literature has enabled the development of a predictive model for the study area, aiding the identification of archaeologically sensitive areas and the most common site types which could be expected to be present (Table 5). The predictive model is based on evidence from the surrounding region, including adjacent properties.

The land comprised within the Burra Road corridor study area has been extensively disturbed by the construction and maintenance of the road corridor. As a result, it is unlikely that either *in situ* surface or subsurface archaeological materials remain within the current road corridor. Based on the findings of

this Due Diligence Assessment and the requirements of the NPW, the following actions are recommended:

- **Recommendation 1: General measures.**

All Aboriginal cultural heritage sites, whether recorded or not, are protected under the NPW. It is an offence to disturb or damage these sites without first having obtained an AHIP (Aboriginal Heritage Impact Permit). Works or activities that could potentially disturb the ground surface include earthworks, building construction, services installation, repetitive vehicular movement, and landscaping. These works have the potential to disturb surface and *in situ* subsurface Aboriginal sites.

If suspected Aboriginal objects (such as stone artefacts or midden materials like faunal remains or shell) are encountered during development, all activities must cease in the affected area and an archaeologist contacted to assess the finds. If the finds are found to be Aboriginal objects, the Office of Environment and Heritage (OEH) must be notified under Section 89A of the NPW. Appropriate management and avoidance or approval under a Section 90 AHIP should be sought if the Aboriginal objects are to be moved or harmed. In the extremely unlikely event that human remains are found, all activities should immediately cease and the New South Wales Police should be contacted. If the remains are suspected to be Aboriginal, the OEH may also be contacted to assist in determining appropriate management.

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Appendix A AHIMS search results

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 18COR_12117

Client Service ID : 400682

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
57-5-0098	B1 [illegible]	AGD	55	697850	6067430	Open site	Valid	Artefact : -	Open Camp Site	98145,98147
	Contact	Recorders	T Saunders					Permits	1287,1145,1346,1147,1481,1482,1483	
57-2-0165	LBS 1;Googong Foreshores Reserve	AGD	55	705850	6067250	Open site	Valid	Artefact : -	Isolated Find	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0166	LBS 2;Googong Foreshores Reserve	AGD	55	705050	6067230	Open site	Valid	Artefact	Isolated Find	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0167	LBS 3;Googong Foreshores Reserve	AGD	55	705200	6067050	Open site	Valid	Artefact : -	Isolated Find	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0168	LBS 5;Googong Foreshores Reserve	AGD	55	705250	6066750	Open site	Valid	Artefact : -	Isolated Find	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0169	CD P8;Googong Foreshores Reserve	AGD	55	705200	6067500	Open site	Valid	Artefact : -	Isolated Find	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0170	Douglas Cave 1;Googong Foreshores Reserve	AGD	55	705070	6067210	Closed site	Valid	Non-Human Bone and Organic Material : -, Potential Archaeological Deposit (PAD) : -, Artefact : 6	Open Camp Site	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0171	[illegible] Shelter 1;Googong Foreshores Reserve	AGD	55	704950	6067110	Closed site	Valid	Hearth : 1, Non-Human Bone and Organic Material : -, Potential Archaeological Deposit (PAD) : -, Artefact : -	Open Camp Site	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0172	LBS 4;Googong Foreshores Reserve	AGD	55	705360	6067050	Open site	Valid	Artefact : -	Open Camp Site	96516,102775
	Contact	Recorders	Philip Boot,H [illegible]					Permits		
57-2-0240	LBA [illegible]	AGD	55	699360	6072550	Open site	Valid	Artefact : 15		[illegible]
	Contact	Recorders	Archaeological Heritage Surveys					Permits	1616	
57-2-0249	LBA 21	AGD	55	699240	6071520	Open site	Valid	Artefact : 19		97593
	Contact	Recorders	Archaeological Heritage Surveys					Permits	1527,1528,1529,1616	
57-2-02[illegible]	[illegible]	AGD	55	[illegible]	[illegible]	Open site	Valid	Artefact : -		
	Contact	Recorders	Archaeological Heritage Surveys					Permits		

Report generated by AHIMS Web Service on 20/02/2019 for Elise Jakeman for the following area at Lat, Long From : -35.5427, 149.1793 - Lat, Long To : -35.4706, 149.2936 with a Buffer of 200 meters. Additional Info : Aboriginal due diligence assessment for QPRC road upgrades on Burra Road. Number of Aboriginal sites and Aboriginal objects found is 96

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : ...8COR_12117
Client Service ID : ...88682

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
57-2-0217	Little Burra A7	AGD	55	699830	6073160	Open site	Valid	Modified Tree (Carved or Scarred) :		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0213	Little Burra A6	AGD	55	699800	6073060	Open site	Valid	Artefact :		
	Contact	Recorders	Archaeological Heritage Surveys					Permits		
57-2-0214	Little Burra A4	AGD	55	699910	6072910	Open site	Valid	Artefact :		
	Contact	Recorders	Tom Knight					Permits	1617,1618,1619	
57-2-0215	Little Burra A5	AGD	55	699950	6072810	Open site	Valid	Artefact :		
	Contact	Recorders	Tom Knight					Permits	1617,1618,1619	
57-2-0216	Little Burra A6	AGD	55	699850	6072250	Open site	Valid	Artefact :		
	Contact	Recorders	Ms Trish Saunders					Permits	1617,1618,1619	
57-2-0217	Little Burra A7	AGD	55	699830	6073060	Open site	Valid	Artefact :		
	Contact	Recorders	Unkown					Permits	1617,1618,1619	
57-2-0218	Little Burra A8	AGD	55	700040	6071300	Open site	Valid	Artefact		
	Contact	Recorders	Tom Knight					Permits		
57-2-0219	Little Burra A9	AGD	55	699490	6071940	Open site	Valid	Artefact :		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0281	OCB3 - A1	AGD	55	698690	6072090	Open site	Valid	Artefact : 5, Modified Tree (Carved or Scarred) : 2		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0282	OCB3 - A2	AGD	55	698170	6072750	Open site	Valid	Artefact : 9		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0283	OCB3 - A3	AGD	55	697885	6072060	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0284	OCB3 - A4	AGD	55	697965	6071960	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0285	OCB3 - A5	AGD	55	698054	6072580	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0286	OCB3 - A6	AGD	55	697860	6072237	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0191	034	AGD	55	697550	6069670	Open site	Valid	Artefact : 67		9760, 17843

Report generated by AHIMS Web Service on 28/02/2019 for Elise Jaleman for the following area at Lat, Long From : -35.5427, 149.1793 - Lat, Long To : -35.4704, 149.2936 with a Buffer of 200 meters. Additional Info : Aboriginal due diligence assessment for QPRC road upgrades on Burra Road. Number of Aboriginal sites and Aboriginal objects found is 96

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : ISCOR_12117

Client Service ID : 408682

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Ms Trish Saunders					Permits	1735,1348	
57-5-0223	Open [1]	AGD	55	697110	6068640	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0210	024	AGD	55	697270	6068220	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0205	023	AGD	55	697360	6067970	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0206	R20	AGD	55	697890	6067960	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0218	06	AGD	55	697530	6068040	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0219	R5	AGD	55	697520	6067980	Open site	Valid	Artefact : 2		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0220	08	AGD	55	697580	6067940	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0221	07	AGD	55	697740	6067820	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0222	09	AGD	55	697620	6067920	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0223	05	AGD	55	697530	6067820	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0224	R10	AGD	55	697520	6067850	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0225	R12	AGD	55	698250	6067840	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Trish Saunders					Permits		
57-5-0226	013	AGD	55	698200	6067370	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0227	R14	AGD	55	698370	6067030	Open site	Valid	Artefact : 2		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0228	R15	AGD	55	698450	6067480	Open site	Valid	Artefact : 1		97340
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0229	R16	AGD	55	698360	6067100	Open site	Valid	Artefact : 1		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0230	R17	AGD	55	698660	6066800	Open site	Valid	Artefact : 1		97340

Report generated by AHIMS Web Service on 20/02/2019 for Elise Jaleman for the following area at Lat, Long From : -35.5827, 149.1793 - Lat, Long To : -35.4704, 149.2936 with a Buffer of 200 meters. Additional Info : Aboriginal due diligence assessment for QPRC road upgrades on Burra Road. Number of Aboriginal sites and Aboriginal objects found is 86

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 18COR_12117

Client Service ID : 408682

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0231	R10	AGD	55	698470	6066040	Open site	Valid	Artefact : 1		97860
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0232	[illegible]	AGD	55	[illegible]	[illegible]	Open site	Valid	Artefact : 1		97860
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0274	Little Burra A15	AGD	55	693270	6071560	Closed site	Valid	Artefact : 1		
	Contact	Recorders	Archaeological Heritage Surveys					Permits		
57-2-0271	Little Burra A12	AGD	55	697920	[illegible]	Open site	Valid	Artefact : 2		
	Contact	Recorders	J Klavin					Permits		
57-2-0270	Little Burra A11	AGD	55	698580	6071210	Open site	Valid	Artefact : 3		
	Contact	Recorders	Archaeological Heritage Surveys					Permits		
57-2-0277	Little Burra A10	AGD	55	699470	[illegible]	Open site	Valid	Artefact : 5		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0269	Little Burra A10	AGD	55	699790	6071910	Open site	Valid	Artefact : 6		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0272	Little Burra A13	AGD	55	699260	6072010	Open site	Valid	Artefact : 2		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0273	Little Burra A14	AGD	55	699200	6072100	Open site	Valid	Artefact : 1		
	Contact	Recorders	J Klavin					Permits		
57-2-0275	Little Burra A16	AGD	55	699590	6072060	Open site	Valid	Artefact : 1		
	Contact	Recorders	Tom Knight					Permits		
57-2-0276	Little Burra A17	AGD	55	699250	6072390	Open site	Valid	Artefact : 1		
	Contact	Recorders	Tom Knight					Permits		
57-5-0397	Bus 1	AGD	55	700459	[illegible]	Open site	Valid	Artefact : 1		
	Contact	Recorders	[illegible]					Permits		
57-5-0700	R11 - (Burra 10) [duplicate refer to 57-5-0098]	AGD	55	697500	6067500	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms Trish Saunders					Permits		
57-2-0433	RS-A1	AGD	55	[illegible]	[illegible]	Open site	Valid	Artefact : 3		[illegible]
	Contact Searle	Recorders	[illegible] Archaeological and Cultural Heritage Consultants					Permits		
57-2-0434	RS-A2	AGD	55	[illegible]	6070495	Open site	Valid	Artefact : 1		99586,101614
	Contact Searle	Recorders	[illegible] Archaeological and Cultural Heritage Consultants					Permits	3617	
57-2-0435	RS-A3	AGD	55	[illegible]	[illegible]	Open site	Valid	Artefact : 1		99586,101614
	Contact Searle	Recorders	Ms Trish Saunders					Permits	3617	
57-2-0436	RS-A4	AGD	55	697676	6070204	Open site	Valid	Artefact : 17		99586,101614

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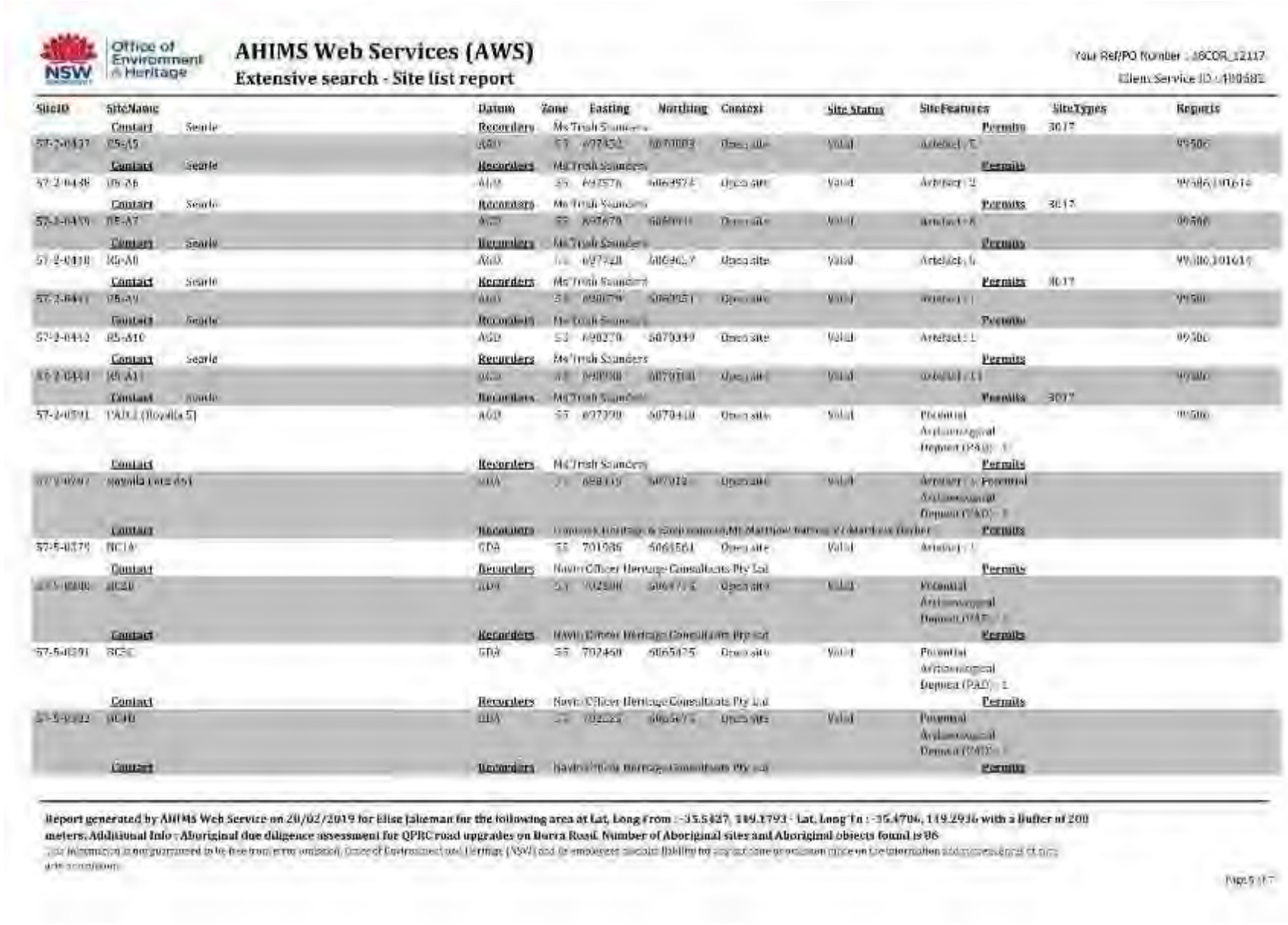

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : JBCOR_12117

Client Service ID : 400582

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
	Contact Searle	Recorders	Ms Trish Saunders					Permits	3017	
57-2-0437	05-A5	AGD	55	697452	6070003	Open site	Valid	Artefact : 2		99506
	Contact Searle	Recorders	Ms Trish Saunders					Permits		
57-2-0438	05-A6	AGD	55	697578	6069974	Open site	Valid	Artefact : 2		99506,101614
	Contact Searle	Recorders	Ms Trish Saunders					Permits	3017	
57-2-0439	05-A7	AGD	55	697679	6069911	Open site	Valid	Artefact : 8		99506
	Contact Searle	Recorders	Ms Trish Saunders					Permits		
57-2-0440	05-A8	AGD	55	697728	6069857	Open site	Valid	Artefact : 6		99506,101614
	Contact Searle	Recorders	Ms Trish Saunders					Permits	3017	
57-2-0441	05-A9	AGD	55	698079	6069851	Open site	Valid	Artefact : 1		99506
	Contact Searle	Recorders	Ms Trish Saunders					Permits		
57-2-0442	05-A10	AGD	55	698278	6070349	Open site	Valid	Artefact : 1		99506
	Contact Searle	Recorders	Ms Trish Saunders					Permits		
57-2-0443	05-A11	AGD	55	698598	6070148	Open site	Valid	Artefact : 11		99506
	Contact Searle	Recorders	Ms Trish Saunders					Permits	3017	
57-2-0591	PAD 1 (Bowalla 5)	AGD	55	697399	6070418	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		99506
	Contact	Recorders	Ms Trish Saunders					Permits		
57-5-0097	Bowalla Lane 4&5	AGD	55	698119	6070112	Open site	Valid	Artefact : 6, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Umwelt (Australia) Pty Ltd on behalf of Heritage & Conservation Register, Mr Matthew Barrett & Mr Matthew Barber					Permits		
57-5-0379	BC1A	GDA	55	701686	6065561	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0380	BC2A	GDA	55	702306	6064716	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0381	BC3C	GDA	55	702468	6065475	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0382	BC4D	GDA	55	702622	6065474	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		

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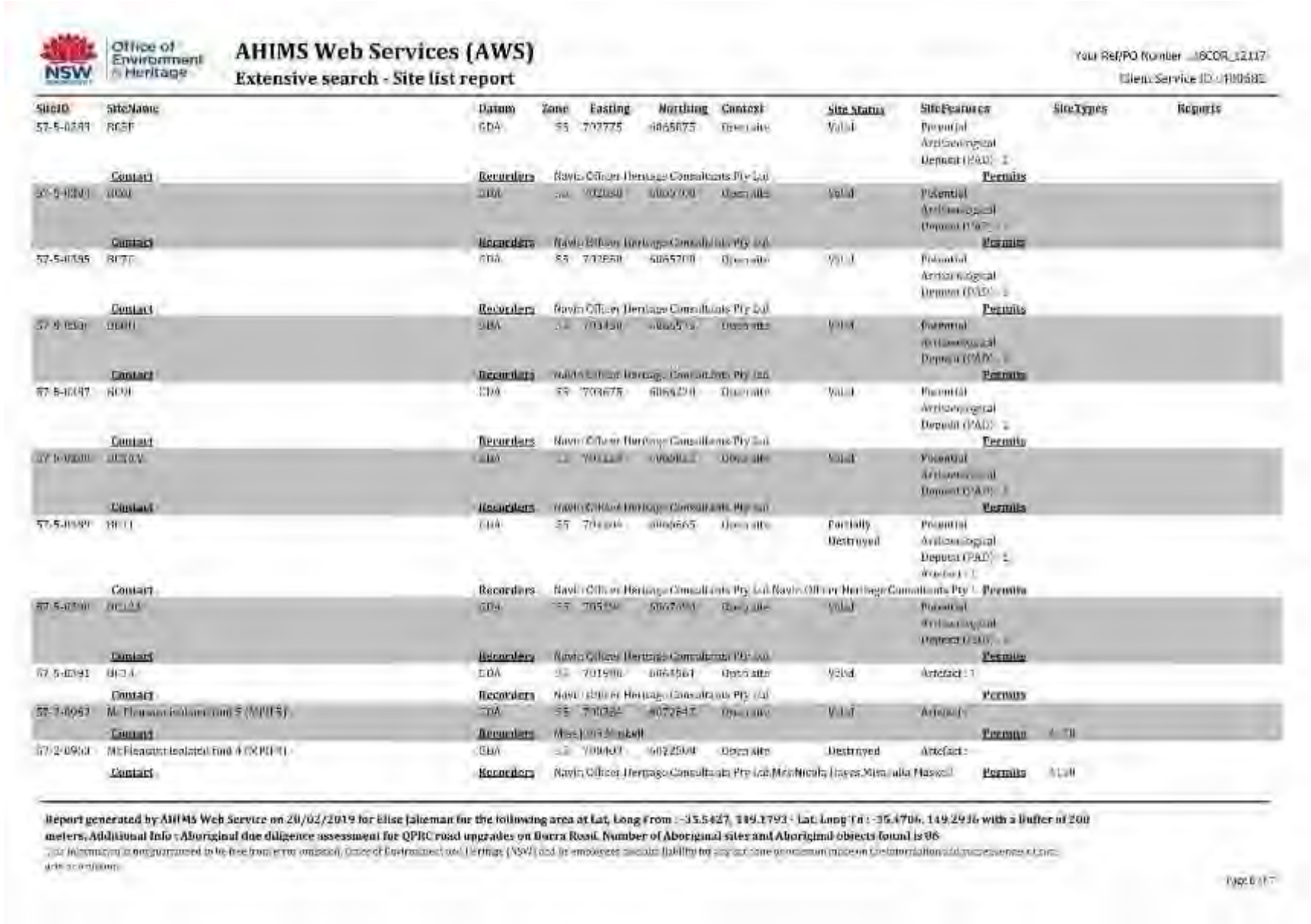

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : JBCOR_12117

Client Service ID : 198582

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
57-5-0591	RCSF	GDA	55	707775	6865875	Open site	Valid	Potential Archaeological Deposit (PAD): 2		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0592	[illegible]	GDA	[illegible]	[illegible]	[illegible]	Open site	Valid	Potential Archaeological Deposit (PAD): [illegible]		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0595	RCF	GDA	55	707858	6865709	Open site	Valid	Potential Archaeological Deposit (PAD): 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0596	[illegible]	GDA	[illegible]	707450	[illegible]	Open site	Valid	Potential Archaeological Deposit (PAD): 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0597	RCF	GDA	55	707675	6866250	Open site	Valid	Potential Archaeological Deposit (PAD): 2		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0598	RCF V	GDA	[illegible]	[illegible]	[illegible]	Open site	Valid	Potential Archaeological Deposit (PAD): 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0599	RCF	GDA	55	707694	6866665	Open site	Partially Destroyed	Potential Archaeological Deposit (PAD): 1 Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd Navin Officer Heritage Consultants Pty L					Permits		
57-5-0590	RCF 3	GDA	55	707550	6867093	Open site	Valid	Potential Archaeological Deposit (PAD): 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0591	RCF 4	GDA	55	707598	6864561	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
57-5-0593	Mt Pleasant Isolated find 5 (MPIF5)	GDA	55	710324	6872847	Open site	Valid	Artefact : 1		
	Contact	Recorders	[illegible]					Permits	[illegible]	
57-5-0603	Mt Pleasant Isolated find 4 (MPIF4)	GDA	[illegible]	709407	6872508	Open site	Destroyed	Artefact :		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd Mrs Nicola Hayes,Miss Julia Maxwell					Permits	[illegible]	

Report generated by AHIMS Web Service on 28/02/2019 for Elise Jaleman for the following area at Lat, Long From : -35.5427, 149.1793 - Lat, Long To : -35.4704, 149.2936 with a Buffer of 200 meters. Additional Info : Aboriginal due diligence assessment for QPRC road upgrades on Burra Road. Number of Aboriginal sites and Aboriginal objects found is 96

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 18COR_12117

Client Service ID : 480682

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
57-7-0952	Mt Pleasant Artefact scatter 6 (MPA56)	GDA	55	700343	6072530	Open site	Destroyed	Artefact		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd & Mrs Nicola Hayes-Mawhinney				Permits			

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Appendix B 'Burra' soil landscape, Soil Profile Report

NSW SOIL AND LAND INFORMATION SYSTEM

Soil Profile Report

SITE DETAILS

Site Location:	WILLIAMSDALE-BURRA RD
Profile Details:	Soil landscapes of the Michelago 1:100 000 Sheet Survey (1000215), Profile 135, collected from a barrer by Mr Brian Jenkins on 16 January, 1981
Map Reference:	MGA Grid Reference: Zone 55, 701863E, 6063634N, 8726 MICHELAGO (1:100000) map sheet.
Physiography:	hillslope in hills on tuff lithology and used for volun./native pasture. Slope 15.0% (measured), local relief high (30-300 m), elevation 750.0 m, aspect north west. Surface condition is firm, profile is well drained, erosion hazard is high, and no salting evident
Vegetation/Land Use:	extensive clearing at the site, used for volun./native pasture, with volun./native pasture in the general area
Surface Condition:	firm when described, expected to be hard set when dry, ground cover is 100%.
Erosion/Land Degradation:	high, erosion at site: is none
Soil Hydrology:	profile is moderately permeable and well drained, no free water, run on is moderate and runoff is moderate
Soil Type:	Earthy Sand (GSG), Uc4.11 (PPF)
Base of observation:	
Profile Field Notes:	

SOIL DESCRIPTION

Layer 0

0.00 - 0.00 m

Layer 1

0.00 - 0.22 m	Texture:	fine sandy loam
	Colour:	dark brown (10YR 3/3) [moist] with no recorded mottles
	Structure:	massive (fabric is earthy)
	Coarse Fragments:	not evident
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	moderately moist; non plastic, non-sticky, disruptive test result was moderately weak force, shearing test result was brittle
	Erodibility Tests:	Crumb (EAT) test showed no change

	Field chemical tests:	Field pH is 6.5 (Raupach).
	Sample taken:	none
	Lower Boundary:	smooth abrupt (5-20 mm) boundary to....
Layer 2		
0.22 - 0.30 m	Texture:	fine sandy loam
	Colour:	brown (dull yellowish brown) (10YR 5/3) [moist] with no recorded mottles
	Structure:	massive (fabric is earthy)
	Coarse Fragments:	not evident
	Soil fauna:	Activity is nil
	Cracks/Macropores:	Cracks are nil, macropores are nil
	Moisture/Consistence:	moderately moist, non plastic, non-sticky, disruptive test result was moderately weak force, shearing test result was brittle
	Erodibility Tests:	Crumb (EAT) test showed no change.
	Field chemical tests:	Field pH is 6.5 (Raupach).
	Sample taken:	none

LABORATORY TESTS

None available

For information on laboratory test data and units of measure, please see: Soil survey standard test methods

Report generated on 06/03/2019 at 11:3 I AM

To contact us, email: soils@environment.nsw.gov.au

Soil Profile Report 3036

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