

Rushes Creek Poultry Production Farm

SSD 7704

ENVIRONMENTAL IMPACT STATEMENT

Volume 3
APPENDICES G - N

Prepared for:
ProTen Tamworth Pty Limited

AUGUST 2018



Prepared by:

List of Appendices

- Appendix G Biodiversity Assessment Report
(SLR Consulting Australia 2018b)
- Appendix H Aboriginal Cultural Heritage Assessment Report
(OzArk Environmental and Heritage Management 2018)
- Appendix I Noise Impact Assessment (Global Acoustics 2018)
- Appendix J SEPP 33 - Preliminary Risk Screening and Hazard Assessment
(SLR Consulting Australia 2018c)
- Appendix K Preliminary Civil Engineering Design Drawings
(Lance Ryan Consulting Engineers)
- Appendix L Preliminary Infrastructure Design Drawings/Plans/Specifications
- Appendix M Water Access Licences
- Appendix N Landowners' Consents



Appendix G

Biodiversity Assessment Report
(SLR Consulting Australia 2018b)



PROPOSED POULTRY FACILITY, RUSHES CREEK, NSW

**State Significant Development (SSD 7704)
Biodiversity Assessment Report**

Prepared for: ProTen Tamworth

SLR Ref: 610.16117.00100
Version No: -v1.3
July 2018



PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ProTen Tamworth. Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.16117.00100-R01-v1.3	26 July 2018	Jeremy Pepper, A Carty, M Doherty, M Consterdine	E Bath	E. Bath
610.16117.00100-R01-v1.2	22 July 2018	Jeremy Pepper, A Carty, M Doherty, M Consterdine	E Bath	
610.16117.00100-R01-v1.1	22 February 2018	Jeremy Pepper, A Carty, M Doherty, M Consterdine	A Williams, E Bath	

EXECUTIVE SUMMARY

ProTen Tamworth Pty Limited (ProTen) is seeking development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for development of an intensive poultry broiler production farm, known as the Rushes Creek Poultry Production Farm (the Development). The Development Site is located within an area known as Rushes Creek, approximately 43 kilometres northwest of Tamworth and 33 kilometres northeast of Gunnedah, in the Nandewar bioregion of New South Wales and within the Tamworth local government area.

The Development Site has been, and continues to be, used for grazing and cropping. Native vegetation recorded within the Study Area for this Biodiversity Assessment Report (BAR) is limited to discreet patches of woodland of various sizes, with the vast majority of the Study Area comprising either exotic grassland or derived native grassland. The following native plant community types have been identified within the Study Area based on the results of the field survey:

- White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 1383);
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion (PCT 589);
- Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (PCT 101); and
- River Red Gum riparian tall woodland open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 78).

Seven threatened species were recorded, including two bird species and five microchiropteran bat species: Little Eagle, Grey-crowned Babbler, Eastern False Pipistrelle, Eastern Freetail-bat, Eastern Bentwing-bat, Eastern Cave Bat and Greater Broad-nosed Bat. These species all generate ecosystem credits. The Eastern Bentwing-bat and Eastern Cave Bat also generate species credits for specific breeding habitats (i.e. caves), however such habitat is not present within the Development Site. No threatened species that generate 'species credits' were recorded within the Study Area.

The avoidance of trees and native woodland patches was an important factor during the Development design and optimisation process. As a consequence, the layout of the Development successfully avoids all of the woodland patches recorded and mapped within the Study Area, with the exception of a small number of paddock trees.

The Development will have a disturbance footprint of approximately 87.78 hectares, comprising:

- Four Poultry Production Units (PPUs), including the poultry sheds, ancillary infrastructure, solar panels, perimeter road and surface water management system (including upstream diversions), totalling approximately 73.43 hectares combined;
- Eight new residential dwellings for the farm managers, totalling approximately 0.36 hectares;
- Internal access roads and driveways, totalling approximately 7.99 hectares;
- Internal water and electricity supply infrastructure (including water pump adjacent to the Namoi River), totalling approximately 5.87 hectares; and
- A bedding materials shed and two dead bird freezers, totalling approximately 0.13 hectares.

EXECUTIVE SUMMARY

The areas of native vegetation to be cleared have been carefully considered and high value vegetation and habitats have been avoided as far as possible. However, minor residual impacts on native vegetation are unavoidable to allow construction of the Development; accordingly will result in the removal of approximately 1.17 hectares of highly disturbed Derived Native Grassland, which is a treeless form of White Box grassy woodland and represents the Box-Gum Woodland threatened ecological community, in addition to the removal of some isolated paddock trees that cannot be avoided.

The assessment has determined that a biodiversity offset is required in accordance with the *Framework for Biodiversity Assessment* (Office of Environment and Heritage [OEH] 2014a) and the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b). The impact has been quantified in terms of biodiversity credits, with the proposed clearing equating to 29 ecosystem credits of the type White Box grassy woodland (PCT 1383). No species credits are required as part of the offset.

Actions to fulfil the offset requirement for the Development have been identified and include uploading an expression of interest (EOI) for the required ecosystem credits on the BioBanking Credit Register, monitor the availability of matching ecosystem credits and consultation with the OEH BioBanking Team.

One matter of national environmental significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* was identified during the assessment, being the threatened ecology community White Box Yellow Box Blakely's Red Gum Grassy Woodland and Derived Native Grassland was recorded within the Study Area. Impacts on this community will be limited to removal of highly degraded derived grassland within the disturbance footprint. Additionally, a selection of listed threatened species and terrestrial migratory species, including birds and bats, could be expected to utilise the woodland habitats within the Study Area. However, the Development will not involve the removal of woodland habitats, with the exception of a small number of isolated paddock trees. Accordingly, the Development will not involve the imposition of a 'significant impact' on any matters of national environmental significance and referral to the Department of the Environment and Energy is not considered necessary.

Table of Contents

1	INTRODUCTION.....	1
1.1	Background	1
1.2	Proposed Development Site	1
1.3	Proposed Development	2
1.4	Scope and Aims of Report.....	6
1.5	Information Sources.....	7
1.6	Methods Summary.....	7
1.7	Definitions	8
2	LANDSCAPE FEATURES	10
2.1	IBRA Bioregions and Subregions	10
2.2	Mitchell Landscapes.....	10
2.3	Native Vegetation Extent.....	11
2.4	Topography, Geology and Soils.....	17
2.4.1	Topography	17
2.4.2	Geology	17
2.4.3	Soils	17
2.5	Waterbodies.....	18
2.5.1	Rivers and Creeks	18
2.5.2	Wetlands	18
2.5.3	Aquatic Habitat	18
2.6	Biodiversity Corridors.....	21
2.7	Landscape Value	22
2.7.1	Native Vegetation Extent	22
2.7.2	Connectivity	22
2.7.3	Patch Size	22
2.7.4	Landscape Value Score	23
3	NATIVE VEGETATION.....	24
3.1	Study Area Characteristics	24
3.2	Regional (Broad-scale) Vegetation Mapping	24
3.3	Vegetation Classes	25
3.3.1	Western Slopes Grassy Woodlands	25

Table of Contents

3.3.2	Inland Riverine Forests	26
3.4	Site Specific Mapping - Plant Community Types (PCTs).....	28
3.4.1	Overview of Vegetation recorded within the Development Site	28
3.4.2	White Box Grassy Woodland	31
3.4.3	White Box - White Cypress Pine - Silver-leaved Ironbark Grassy Woodland	32
3.4.4	Poplar Box - Yellow Box - Western Grey Box Grassy Woodland	33
3.4.5	River Red Gum Riparian Tall Woodland / Open Forest Wetland	34
3.4.6	White Box Woodland - Derived Native Grassland	35
3.4.7	Non-native Groundcover	37
3.5	Site-Specific Vegetation Mapping – Differences to Regional Mapping	38
3.6	Vegetation Zones	38
3.7	Threatened Ecological Communities	40
4	THREATENED SPECIES.....	44
4.1	Overview	44
4.2	Ecosystem Credit Species.....	47
4.2.1	Predicted Threatened Species (by Credit Calculator)	47
4.2.2	Additional Threatened Species - Atlas of NSW Wildlife Database	50
4.2.3	Candidate Ecosystem Credit Species	51
4.3	Species Credit Species.....	57
4.3.1	Generated by Credit Calculator	57
4.3.2	Species Credit Species Generated by Atlas of NSW Wildlife (10 km search)	59
4.3.3	Matters for Further Consideration	60
4.3.4	Candidate Species Credit Species	60
5	IMPACT AVOIDANCE AND MINIMISATION	62
5.1	Impact Avoidance Measures.....	62
5.1.1	Site Selection	62
5.1.2	Development Optimisation	62
5.2	Final Development Footprint	63
5.3	Direct Impacts	64
5.3.1	Overview	64
5.3.2	Impacts on Vegetation Zones	64
5.4	Indirect Impacts	65

Table of Contents

5.5	On-Site Mitigation Measures	67
6	IMPACT SUMMARY	69
6.1	Areas Not Requiring Further Assessment	69
6.2	Entities Not Requiring Offsets.....	69
6.3	Impacts Requiring Offsetting	69
6.3.1	PCTs Requiring Offset	70
6.3.2	Species Polygons Requiring Offset	70
6.4	Impacts Requiring Further Consideration.....	70
6.5	Biodiversity Credit Requirement.....	71
6.5.1	Ecosystem Credits	71
6.5.2	Landscape Value Score	71
6.5.3	Species credits	71
6.6	Biodiversity Credit Report	72
7	BIODIVERSITY OFFSET STRATEGY	73
7.1	Overview	73
7.2	Overview of Offset Options	73
7.3	Like-For-Like Offsets (Option 1)	75
7.3.1	Purchase Like-For-Like Credits (Option 1a)	75
7.3.2	Generate Credits by Creating a BioBanking Agreement (Option 1b)	75
7.4	Apply Variation Rules (Option 2).....	75
7.5	Supplementary Measures (Option 3).....	76
7.6	Payment to Fund (Option 4)	77
7.7	Offset Strategy Actions	77
8	EPBC ACT MATTERS.....	79
8.1	Predicted Matters of NES.....	79
8.2	Relevant Matters of NES	79
8.2.1	Listed Threatened Species	79
8.2.2	Listed Threatened Communities	81
8.2.3	Wetlands of National Significance	82
8.2.4	Migratory Species	82
8.3	Impacts on Relevant Matters of NES	83

Table of Contents

8.3.1	Listed Threatened Species	83
8.3.2	Threatened Ecological Communities	84
8.3.3	Migratory Species	84
9	STATE ENVIRONMENTAL PLANNING POLICIES (SEPPS).....	85
10	REFERENCES.....	86

DOCUMENT REFERENCES

TABLES

Table 1	Schedule of Land Titles	1
Table 2	SEARs Relating to Biodiversity	6
Table 3	Definitions in the BAR	8
Table 4	Native vegetation extent in the outer (2000 ha) landscape circle	11
Table 5	Native vegetation extent (within landscape circles before and after development).....	12
Table 6	Plant community types (PCTs) mapped by OEH (2015) within the Study Area.....	24
Table 7	Plant community types (PCTs) recorded by SLR within the Study Area	29
Table 8	White Box grassy woodland	31
Table 9	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland.....	32
Table 10	Poplar Box - Yellow Box - Western Grey Box grassy woodland	33
Table 11	River Red Gum riparian tall woodland / open forest wetland	34
Table 12	Derived Native Grassland (White Box Grassy Woodland)	35
Table 13	Non-native Groundcover	37
Table 14	Vegetation zones mapped within the Study Area	39
Table 15	Vegetation zones within the Development Footprint (Impact Areas) – with plots	40
Table 16	Threatened ecological communities mapped within the study area	41
Table 17	Threatened species recorded within the Study Area	45
Table 18	Ecosystem credit species generated by credit calculator.....	47
Table 19	Additional ecosystem credit species generated by Atlas of NSW Wildlife.....	50
Table 20	Ecosystem credit threatened species recorded within the Study Area	53
Table 21	Other candidate (ecosystem credit) threatened species	56
Table 22	Species credit species – Credit Calculator output	57
Table 23	Species credit species - Atlas of NSW Wildlife.....	59
Table 24	Development Footprint Areas	63
Table 25	Vegetation impacts (clearing areas for vegetation zones)	64
Table 26	Mitigation measures to be implemented before, during and after construction.....	67
Table 27	Vegetation zones requiring offset and credits required.....	70
Table 28	Ecosystem credits required for offset and matching credit types.....	72
Table 29	Ecosystem credits required for offset and matching credit types.....	74
Table 30	PMST results – listed threatened species	79

Table of Contents

FIGURES

Figure 1	Regional Locality	4
Figure 2	Development Layout.....	5
Figure 3A	Site Map (Native Vegetation Extent)	13
Figure 4A	Location Map (Native Vegetation Extent)	15
Figure 5	Regional scale vegetation mapping	27
Figure 6	Plant Community Types (PCTs) recorded within the site	30
Figure 7	Vegetation zones and plot locations	42
Figure 8	Threatened ecological communities.....	43
Figure 9	Previous records of threatened species within the locality	46
Figure 10	Threatened species and hollow-bearing trees recorded in the Study Area.....	52
Figure 11	Potential Impacts	66

APPENDICES

Appendix A	Site Photographs
Appendix B	SEARs (Biodiversity)
Appendix C	Methods Statement
Appendix D	FBA Plot Data Summary
Appendix E	Likelihood of occurrence for threatened biota
Appendix F	EPBC Act Protected Matters Search Tool Results
Appendix G	BioBanking Credit Reports
Appendix H	Completed field data sheets

Table of Contents

GLOSSARY

Assessment circles	Two circles (the inner and outer assessment circle) in which the percent native vegetation cover in the landscape is assessed, taking into account both cover and condition of vegetation.
Biobank site	Land that is designated by a BioBanking agreement to be a biobank site.
Benchmarks	The quantitative measures of the range of variability in vegetation condition in vegetation with relatively little evidence of modification by humans since European (post 1750) settlement. Benchmarks are defined for specified variables for each PCT. Vegetation with relatively little evidence of modification generally has minimal timber harvesting (few stumps, coppicing, cut logs), minimal firewood collection, minimal exotic weed cover, minimal grazing and trampling by introduced or overabundant native herbivores, minimal soil disturbance, minimal canopy dieback, no evidence of recent fire or flood, is not subject to high frequency burning, and has evidence of recruitment of native species.
BioBanking agreement	An agreement entered into between the landowner and the Minister under Part 7A of the TSC Act for establishing a biobank site.
BioBanking statement	A statement issued and in force under TSC Act detailing biodiversity credit information for securing a biobank site.
Biodiversity Assessment Report (BAR)	The report that must be prepared in accordance with the BBAM.
Biodiversity credit report	The report produced by the Credit Calculator that sets out the number and type of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or sets out the number and type of biodiversity credits that are created at a biobank site.
Biodiversity credits	Ecosystem credits or species credits.
Biodiversity values	Biodiversity values includes the composition, structure and function of ecosystems, and includes (but is not limited to) threatened species, populations and ecological communities, and their habitats.
Biometric Vegetation Type (BVT)	Provides the occurrence of the PCT within a specific catchment management area. A BVT may be assigned catchment specific attributes such as benchmark data, percent cleared in the catchment area value and associations with threatened species, populations and communities. A PCT may be distributed across one or more major catchment areas and is assigned a BVT with each major catchment area occurrence. BVTs are managed in the VIS Classification Database.
Broad condition state	Areas of the same PCT that are in relatively homogenous condition. Broad condition is used for stratifying areas of the same PCT into a vegetation zone for the purpose of determining the site value score.
Catchment area	The area of operation of a former catchment management authority.
Change in site value score for a biobank site	The difference (gain) between the current site value score for a biobank site and the predicted future site value score for a biobank site calculated in accordance with Equation 7 of the BBAM.
Change in landscape value score for a biobank	The difference (gain) between current landscape value score for a biobank site and predicted landscape value score for a biobank site calculated in accordance with Equation 9 in the BBAM.

Table of Contents

site

Connectivity	The measure of the degree to which an area(s) of native vegetation is linked with other areas of vegetation.
BioBanking Credit Calculator (BBCC)	The computer program that provides decision support to assessors and proponents by applying the BBAM, and which calculates the number and type of biodiversity credits required to offset the impacts of a development or created at a biobank site.
Derived vegetation	PCTs that have changed to an alternative stable state as a consequence of land management practices since European settlement. Derived communities can have one or more structural components of the vegetation entirely removed or severely reduced (e.g. over-storey of grassy woodland), or have developed new structural components where they were previously absent (e.g. shrubby mid-storey in an open woodland system).
Ecosystem credits	A measurement of the value of EECs, CEECs and threatened species habitat for species that can be reliably predicted to occur with a PCT. Ecosystem credits measure the loss in biodiversity values at a development site and the gain in biodiversity values at a biobank site.
Exotic plant cover	Exotic plants are vascular plants not native to Australia. Exotic plant cover is measured as total percent foliage cover of all exotics in all strata.
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component.
Habitat surrogates	Measures of habitat that predict the occurrence of threatened species, populations and communities: IBRA subregion, PCT, percent vegetation cover and vegetation condition.
Hollow bearing tree	A living or dead tree that has at least one hollow. A tree is considered to contain a hollow if: (a) the entrance can be seen; (b) the minimum entrance width is at least 5 cm across; (c) the hollow appears to have depth (i.e. you cannot see solid wood beyond the entrance); (d) the hollow is at least 1 m above the ground. Trees must be examined from all angles.
IBRA region	A bioregion identified under the Interim Biogeographic Regionalisation for Australia (IBRA) system 2, which divides Australia into bioregions on the basis of their dominant landscape-scale attributes.
IBRA subregion	A subregion of a bioregion identified under the IBRA system and based on major catchment areas as shown in Appendix 8 of BBAM.
Landscape attributes	In relation to a biobank site, native vegetation cover, vegetation connectivity, patch size and the strategic location of a biobank site.
Local population	The population that occurs in the study area. In cases where multiple populations occur in the study area or a population occupies part of the study area, impacts on each subpopulation must be assessed separately.
Mitchell landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000.
Native ground cover	All native vegetation below 1 m in height, including all such species native to NSW (i.e. not confined to species indigenous to the area).
Native ground cover (grasses)	Native ground cover contains all native vegetation below 1 m in height and includes all species native to NSW (i.e. it is not confined to species indigenous to the area). Native ground cover (grasses) refers specifically to native grasses.
Native ground	Native ground cover contains all native vegetation below 1 m in height and includes all

Table of Contents

cover (other)	species native to NSW (i.e. it is not confined to species indigenous to the area). Native ground cover (other) refers to non-woody native vegetation (vascular plants only) <1 m that is not grass (e.g. herbs, ferns).
Native ground cover (shrubs)	Native ground cover contains all native vegetation below 1 m in height and includes all species native to NSW (i.e. it is not confined to species indigenous to the area). Native ground cover (shrubs) refers to native woody vegetation <1 m.
Native mid-storey cover	Native mid-storey contains all vegetation between the over-storey stratum and a height of 1 m (typically tall shrubs, under-storey trees and tree regeneration) and including all species native to NSW (i.e. native species not local to the area can contribute to mid-storey structure).
Native over-storey cover:	Native over-storey is the tallest woody stratum present (including emergent) above 1 m and including all species native to NSW (i.e. native species not local to the area can contribute to over-storey structure). In a woodland community the over-storey stratum is the tree layer, and in a shrubland community the over-storey stratum is the tallest shrub layer. Some vegetation types (e.g. grasslands) may not have an over-storey stratum.
Native plant species richness	The number of different native vascular plant species that are characteristic of a PCT.
Native vegetation	Native vegetation means any of the following types of indigenous vegetation: (a) trees (including any sapling or shrub, or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland .
Patch size	An area of native vegetation that: a) occurs on the development site or biobank site, and b) is in moderate to good condition, and c) includes native vegetation that has a gap of less than 100 m from the next area of moderate to good condition native vegetation (or ≤ 30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biobank site.
PCT classification system	The system of classifying native vegetation approved by the NSW Plant Community Type Control Panel and described in the VIS Classification Database.
Percent cleared value	The percentage of a vegetation type that has been cleared within a major catchment area as a proportion of its pre-1750 extent, as identified in the VIS Classification Database. The percent cleared value is assigned to the BVT equivalent.
Percent foliage cover:	The percentage of ground that would be covered by a vertical projection of the foliage and branches and trunk of a plant or plants.
Percent native vegetation cover	The percent of native vegetation cover in the inner and outer assessment circle, or the development footprint buffer area. Cover estimates are based on the cover of native woody and non-woody vegetation relative to the approximate benchmarks for the PCT, taking into account vegetation condition and extent. Native over-storey vegetation is used to determine the percent cover in woody vegetation types, and native ground cover is used to assess cover in non-woody vegetation types.
Plant community type (PCT)	A NSW plant community type identified using the PCT classification system.

Table of Contents

Plot	An area within a vegetation zone in which site attributes are assessed.
Reference sites	The relatively unmodified sites that are assessed to obtain local benchmark information when benchmarks in the Vegetation Benchmarks Database are too broad or otherwise incorrect for the PCT and/or local situation. Benchmarks can also be obtained from published sources.
Regeneration	The proportion of over-storey species characteristic of the PCT that are naturally regenerating and have a diameter at breast height <5 cm within a vegetation zone.
Regionally significant biodiversity link	A biodiversity corridor that is identified in a plan approved by the Chief Executive of OEH.
Retirement of credits	The purchase and retirement of biodiversity credits from an already-established biobank site.
Riparian buffer	Distance of riparian land on both sides of various waterbodies (rivers, estuary, streams and wetlands). Can determine connectivity value class on a biobank site.
SEPP 44	State Environmental Planning Policy Number 44 Koala Habitat Protection
Site attributes	The matters assessed to determine site value. They include: native plant species richness, native over-storey cover, native mid-storey cover, native ground cover (grasses), native ground cover (shrubs), native ground cover (other), exotic plant cover (as a percentage of total ground and mid-storey cover), number of trees with hollows, proportion of over-storey species occurring as regeneration, and total length of fallen logs.
Site value	The condition of native vegetation assessed against the benchmark for the PCT.
Site value score	The quantitative measure of vegetation condition calculated in accordance with Equation 1 in BBAM.
Species credit species	The class of biodiversity credits created on a threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates and are identified in the following: (a) the species is identified as a species credit species in the Threatened Species Profile Database, and (b) the geographic distribution of the species is known or predicted to include the IBRA subregion in which the biobank site is located, and (c) the biobank site contains habitat features or components associated with the species, as identified in the Threatened Species Profile Database, OR (d) past surveys undertaken at the biobank site indicate that the species is present at the biobank site.
Strategic location of a biobank site	A biobank site that includes land that is: part of a state significant biodiversity link and in a plan approved by the Chief Executive OEH; a regionally significant biodiversity link and in a plan approved by the Chief Executive OEH; or in the riparian buffer area of a 4th order stream or higher, an important wetland or an estuarine area.
TG value	the ability of a species to respond to improvement in site value or other habitat improvement at a biobank site with management actions. TG is based on an assessment of effectiveness of management actions, life history characteristics, naturally very rare species, and very poorly known species.
Threatened	Critically endangered, endangered or vulnerable threatened species or populations as

Table of Contents

species	defined in section 4(1) of the TSC Act, or any additional threatened species listed under Part 13 of the EPBC Act as critically endangered, endangered or vulnerable.
Threatened species survey	A targeted survey for threatened species undertaken in accordance with Section 6.6 of BBAM.
Total length of fallen logs	The total length of logs present in a vegetation zone that are at least 10 cm in diameter and at least 0.5 m long.
Transect	A line or narrow belt along which environmental data is collected.
Vegetation Benchmarks Database	A database of benchmarks for vegetation classes and some PCTs. The Vegetation Benchmarks Database is maintained by OEH and is part of the VIS Classification Database. It is available at www.environment.nsw.gov.au/research/Visclassification.htm .
Vegetation class	A level of classification of vegetation communities defined in Keith (2004). There are 99 vegetation classes in NSW.
Vegetation formation	A broad level of vegetation classification as defined in Keith (2004). There are 12 vegetation formations in NSW.
Vegetation in low condition, or low condition	<p>a) woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either:</p> <ul style="list-style-type: none"> – less than 50% of ground cover vegetation is indigenous species, or – greater than 90% of ground cover vegetation is cleared <p>OR</p> <p>b) native grassland, wetland or herbfield where either:</p> <ul style="list-style-type: none"> – less than 50% of ground cover vegetation is indigenous species, or – more than 90% of ground cover vegetation is cleared. <p>Native vegetation that is not in low condition is in moderate to good condition.</p>
Vegetation in moderate to good condition	Native vegetation that is not vegetation in low condition.
Vegetation zone	A relatively homogenous area of native vegetation on a biobank site that is the same PCT and broad condition state.
VIS Classification Database (NSW Vegetation Information System Classification Database)	The master vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The VIS Classification Database is maintained by OEH and available at www.environment.nsw.gov.au/research/Visclassification.htm .
Viability	The capacity of a species to successfully complete each stage of its life cycle under normal conditions so as to retain long-term population densities.
Wetland	An area of land that is wet by surface water or ground water, or both, for long enough periods that the plants and animals in it are adapted to, and depend on, moist conditions for at least part of their life cycle. Wetlands may exhibit wet and dry phases and may be wet permanently, cyclically or intermittently with fresh, brackish or saline water.
Woody native vegetation	Native vegetation that contains an over-storey and/or mid-storey that predominantly consists of trees and/or shrubs.

1 Introduction

1.1 Background

ProTen Tamworth Pty Limited (ProTen) is seeking development consent under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) for an intensive poultry broiler production farm, known as the Rushes Creek Poultry Production Farm (the Development).

This Biodiversity Assessment Report (BAR) has been prepared by SLR Consulting Australia (SLR) to satisfy the Secretary's Environmental Assessment Requirements (SEARs) issued by the Department of Planning and Environment (DPE) for the Development and to inform the Environmental Impact Statement (EIS) required accompanying the development application to the DPE. It has been undertaken in accordance with the *Framework for Biodiversity Assessment* (Office of Environment and Heritage [OEH] 2014a) (FBA) and the *NSW Biodiversity Offsets Policy for Major Projects* (OEH 2014b) (Offsets Policy).

1.2 Proposed Development Site

The Development Site is located within an area known as Rushes Creek approximately 43 kilometres (km) northwest of Tamworth and 33 km northeast of Gunnedah in the New England North West region of New South Wales (NSW) (see **Figure 1**) and the Tamworth local government area (LGA). The long-standing and existing use of the Development Site is traditional agricultural production, including both livestock grazing and cropping.

The Development Site comprises approximately 1,016 hectares (ha) of land, including cleared grassland with paddock trees and areas of woodland. **Table 1** lists the lots within the Development Site.

Table 1 Schedule of Land Titles

Lot	Deposited Plan (DP)	Tenure
Lot 1	DP 44215	Freehold – ProTen Tamworth Pty Limited
Part Lot 1	DP 1108119	
Lot 1	DP 1132298	
Lots 26, 85, 86, 101, 118, 165, 166 and 171	DP 752169	
Part Lot 143	DP 752189	
Lot 1	DP 1132078	
Lot 1	DP 1141148	
Untitled parcel of land traversing through Lot 171 DP 752169		Council public road (unformed)

Rushes Creek Road, which is a sealed two-lane rural road, forms the Site's eastern boundary. Ski Gardens Road and the Namoi River are located to the north and west of the Development Site, and Lake Keepit is located to the southwest. Similar cleared agricultural lands occur around the Development Site in all directions. The topography of the Development Site ranges between around 325 and 410 metres Australian Height Datum (m AHD). The visual amenity is that of a rural property that has been significantly modified by historic land clearing and long-term agricultural production activities.

The long-standing and existing use of the Development Site is traditional agricultural production, including both livestock grazing and cropping. A selection of photographs taken across the site during the ecological field survey is provided in **Appendix A**.

1.3 Proposed Development

The Development will comprise four individual farms or poultry production units (PPUs), each including between 10 and 18 tunnel-ventilated fully-enclosed climate-controlled poultry sheds (54 shed in total), along with associated support infrastructure and staff amenities. The Development will have the capacity to house a total population of 3.05 million birds. The proposed numbers of sheds for each PPU are as follows:

- Farm 1 – 10 sheds;
- Farm 2 – 18 sheds;
- Farm 3 – 10 sheds; and
- Farm 4 – 16 sheds.

The Development is classified as State significant development (SSD) under the provisions of Part 4 of the EP&A Act in accordance with *State Environmental Planning Policy (State and Regional Development) 2011* (SRD SEPP). It will require development consent from the Minister (or delegate), along with an environment protection licence (EPL) from the Environment Protection Authority (EPA) and a section 138 approval (*Roads Act 1993*) from Tamworth Regional Council (Council).

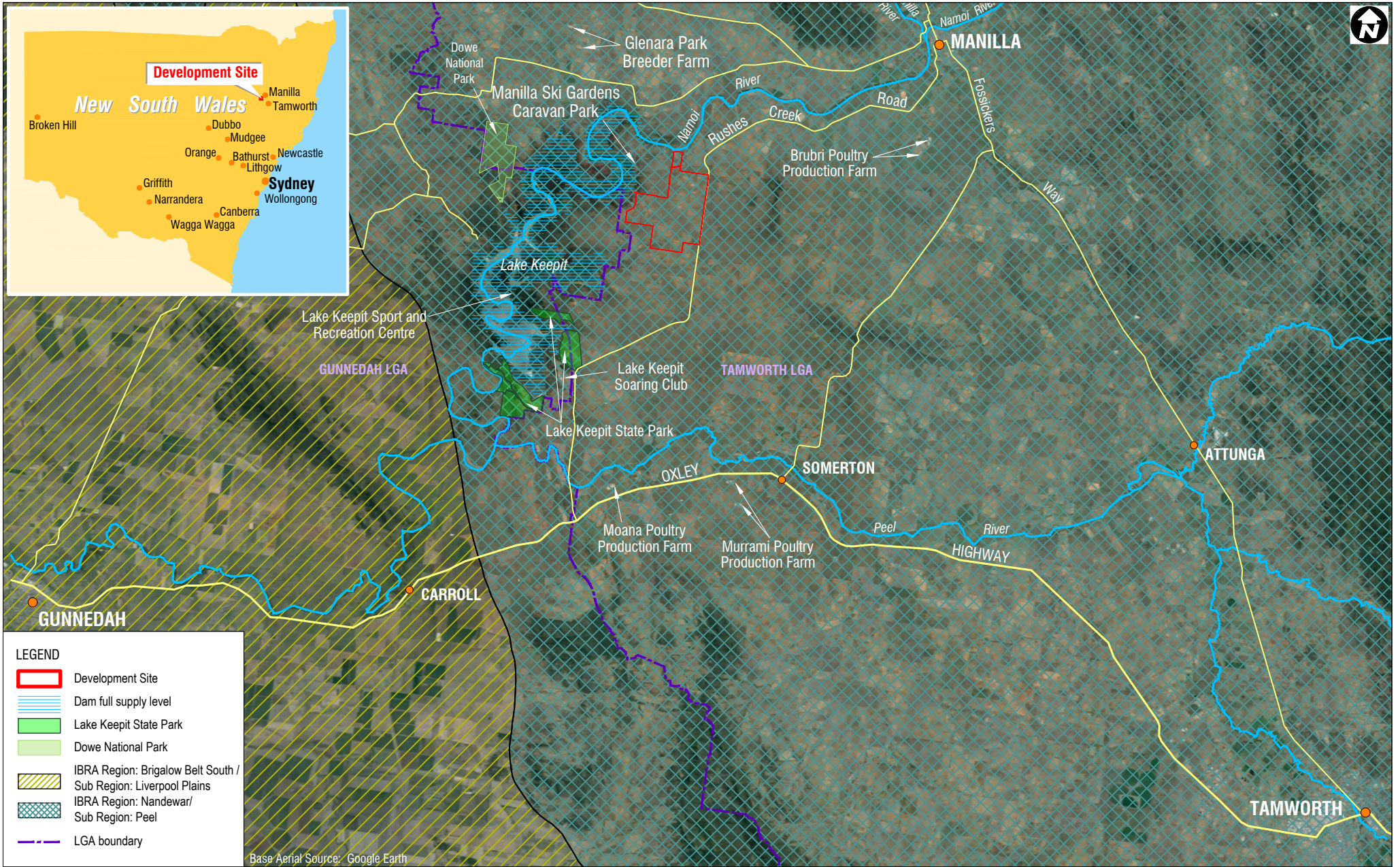
The proposed layout of the Development is shown in **Figure 2**. In addition to the poultry shedding, the Development will comprise various support/servicing infrastructure, including:

- Eight new residences to house the farm managers;
- Water supply infrastructure to extract, transfer, treat and store water from the Namoi River;
- Electricity supply infrastructure and solar panels at each farm;
- Two new access driveways from Rushes Creek Road and internal access roads;
- A staff amenities and workshop facility at each farm (office space, toilets, change rooms, workshop, chemical store and pump room);
- Two dead bird freezers adjacent to the internal access roads near Rushes Creek Road;
- One poultry bedding material storage shed;
- Bulk liquid petroleum gas (LPG) tanks at each farm;
- Generators and generator enclosures/sheds at each farm (emergency use only);
- Vehicle wheel wash facilities;

- Feed silos at each farm;
- Water storage tanks at each farm; and
- Surface water management system at each farm (swale drains, table drains, detention dam and upstream diversions).

The total disturbance footprint will be relatively small at approximately 87.78 ha (see **Section 5.2**) and the commercial activities associated with the poultry operation will be largely confined to the individual farm sites and access roads. It is intended to continue using the land outside of the disturbance footprint within the Development Site for continued agricultural production purposes under some form of lease or share farming arrangement.

H:\Projects-SLR\610-SivSYD\610-SYD\610-16117 Prof.en - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOGYSLR61016117_F01_LocalityPlan_V3.dwg



LEGEND

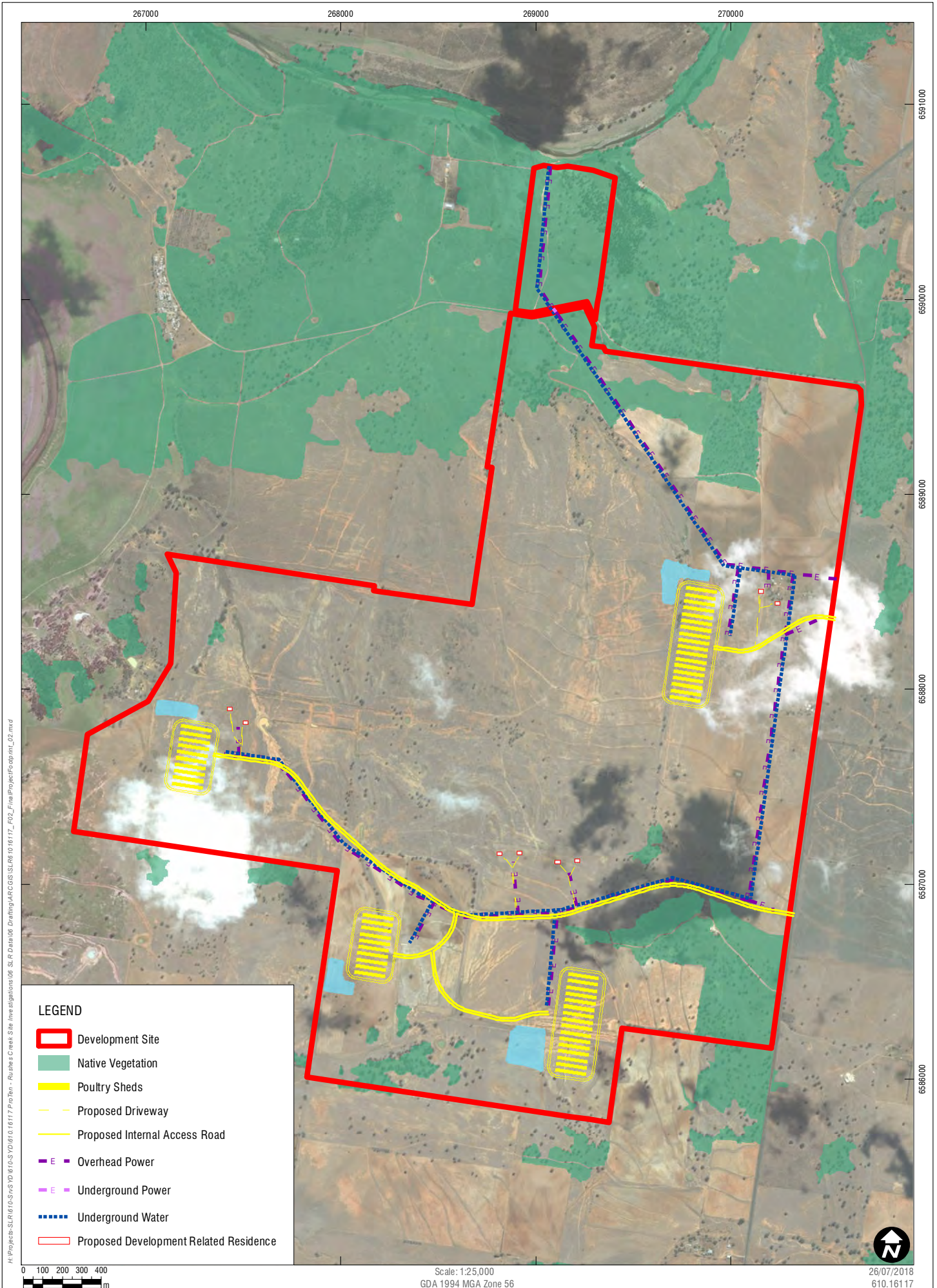
- Development Site
- Dam full supply level
- Lake Keepit State Park
- Dowe National Park
- IBRA Region: Brigalow Belt South / Sub Region: Liverpool Plains
- IBRA Region: Nandewar / Sub Region: Peel
- LGA boundary

0.0 5.0 10.0
KM

Base Aerial Source: Google Earth

Scale: 1:250000
(GDA94) MGA Zone 56

23.07.2018
610.16117



H:\Projects-SLR\610.16117\610.16117\610.16117_Prop\610.16117_Prop\610.16117_FinalProjectFootprint_C2.mxd

1.4 Scope and Aims of Report

This BAR has been prepared by SLR to satisfy the SEARs (SSD 7704) issued by the DPE for the Development and to inform the EIS required to accompany the development application to the DPE. Biodiversity is identified as an issue in the SEARs and **Table 2** lists the specific assessment requirements. Additional requirements for biodiversity assessment were also provided by the OEH as an attachment to the SEARs, and these requirements are also listed in **Table 2**. An excerpt of the OEH letter attached to the SEARs is provided in **Appendix B**. OEH has also identified matters “which require further consideration”, as listed in **Table 2**.

Table 2 SEARs Relating to Biodiversity

SEARs	Location in BAR
Key Issue – biodiversity to include:	
Assessment of the biodiversity impacts in accordance with the <i>Framework for Biodiversity Assessment</i> (OEH 2014) and the <i>NSW Biodiversity Offsets Policy for Major Projects</i> (OEH 2014); and	Sections 5 and 6
Accurate predictions of any vegetation clearing on or off the site, including buildings, access roads and servicing and support infrastructure.	Sections 5 and 6
OEH requirements (SEARs letter dated 30 June 2016)	
Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the <i>Threatened Species Conservation Act 1995</i> .	Sections 5 and 6
Species/Populations/Ecological Communities which require further consideration (and provision of the information specified in s9.2 of the Framework for Biodiversity Assessment): <ul style="list-style-type: none"> • Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions • <i>Anthochaera phrygia</i>- Regent Honeyeater • <i>Hakea pulvinifera</i>- Lake Keepit Hakea Critically endangered entities specifically excluded from requiring further consideration: <ul style="list-style-type: none"> • White Box Yellow Box Blakely's Red Gum Woodland CEEC • <i>Lathamus discolor</i>- Swift Parrot 	Sections 4 to 6

Under the Offsets Policy (OEH 2014b), the SEARs require a proponent to apply the FBA to assess impacts on biodiversity. The FBA is also applied to identify reasonable measures and strategies that can be taken to avoid and minimise impacts on biodiversity. A BAR is required to describe the biodiversity values present on a development site and the impact of the proposed project on these values. A Biodiversity Offset Strategy (BOS) is required to outline how the proponent intends to offset the impacts of the proposal.

In terms of the NSW *Biodiversity Conservation Act* 2016, it is noted that the transitional arrangements apply to the current SSD project application (SSD 7704) and hence the biodiversity assessment can be prepared according to the FBA. Accordingly, a 'biodiversity development assessment report' is not required, pursuant to the *Biodiversity Conservation Act*.

Consideration of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is also provided in this BAR (see **Section 8**). Matters of national environmental significance are protected under the EPBC Act and the FBA requires proponents to identify and assess the impacts on all nationally listed threatened species and threatened ecological communities (TECs) that may be on the Development Site.

1.5 Information Sources

The key information sources utilised in the assessment include:

- *OEH Atlas of NSW Wildlife* for previous records of threatened species from the locality;
- Protected Matters Search Tool, located on the website of the Department of the Environment and Energy (DoEE 2014b) for matters of national environment significance (as listed under the EPBC Act) predicted to occur within the locality;
- *Threatened Species Profile Database*, for detailed information on threatened species of relevance to the Development Site and the locality;
- GIS data on Interim Biogeographic Regionalisation for Australia (IBRA) regions and Mitchell Landscapes;
- BioBanking Credit Calculator, for lists of predicted ecosystem credit species and species credit species and for the Development's credit requirements;
- Mapping of the vegetation of the Namoi catchment management area (CMA), including GIS data that was utilised to prepare base vegetation maps and design field surveys;
- Data collected during field surveys; and
- Officers of the OEH's NSW Offsets Policy Team who provided assistance on particular matters relating to the FBA and the Credit Calculator.

1.6 Methods Summary

This BAR was prepared according to the steps and processes detailed in the FBA, with the key steps being:

- Desktop review – database searches to identify listed threatened biota (species, populations and communities) of potential relevance to the Study Area, initial GIS mapping and survey design;
- Field survey of the Study Area (see **Appendix C** for details);
- GIS mapping and data compilation;
- 'Landscape assessment' using GIS, available geographic and vegetation data and field survey results;
- Identification of vegetation zones and use of BioBanking plot/transect data and GIS mapping to assess 'site value';

- Identification of threatened species of relevance to the Development Site, including both ecosystem credit species and species credit species;
- Assessing the proposed Development footprint in GIS to calculate vegetation removal;
- Application of the Credit Calculator and impact credit calculations; and
- Preparation of the BAR, including a BOS.

A field survey ‘methods statement’ is provided in **Appendix C**, which includes details of survey timing, techniques employed, survey effort and weather conditions. The Study Area was surveyed during October 2016 and October 2017 by senior staff of SLR’s ecology discipline. The purpose of the field surveys was to inspect the Development Site and collect the necessary floristic and habitat details for completion of the FBA assessment (including plot and transect data for site value score and targeted threatened species surveys). Plot and transect data was collected according to the FBA and data is provided in **Appendix D** and copies of BioBanking field sheets are provided in **Appendix E**.

Application of the Credit Calculator was completed by SLR accredited assessors Jeremy Pepper (#0107), Principal Ecologist and Andrew Carty (#087), Associate Ecologist.

1.7 Definitions

Definitions used in this report are listed in **Table 3**.

Table 3 Definitions in the BAR

Term	Definition
Credit Calculator	BioBanking Credit Calculator, v4.0 (Proposal ID 0107/2016/3991MP).
CEEC	Critically endangered ecological community listed under TSC Act and/or EPBC Act
Development Site	The Development Site is as shown in Figures 1 and 2 and described in the EIS. It encompasses the various lots listed in Table 1 , which together comprise approximately 1,016 ha
EEC	Endangered ecological community listed under TSC Act and/or EPBC Act
EPBC Act	Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999</i>
Locality	All land within 10 km of the Study Area
Study Area	The area within and adjoining (see below note) the Development Site which was subject to field surveys (including threatened species surveys). The boundary of the Study Area comprises the Development Site and the Namoi River riparian zone, as shown in Figure 2
TEC	Threatened ecological community listed under TSC Act and/or EPBC Act
TSC Act	NSW <i>Threatened Species Conservation Act 1995</i>

Note: the field surveys and vegetation mapping were completed for a wider Study Area, which includes the Namoi River riparian zone adjoining the northern boundary of the Development Site (see **Figure 2**). This area was surveyed to assess potential impacts from the proposed water extraction infrastructure which will avoid riparian vegetation. These riparian habitats assessed do not form part of the Development Site and will not be affected by construction or operation of the Development. Accordingly, these parts of the Study Area have been excluded from the impact assessment and credit calculations in this BAR.

2 Landscape Features

This section describes the landscape features of the Study Area and surrounds in accordance with Section 4 of the FBA. The landscape features within and surrounding the Development Site are displayed in **Figure 3** and **Figure 4**.

2.1 IBRA Bioregions and Subregions

The Study Area occurs within the eastern margins of the Nandewar Bioregion¹, with the NSW Brigalow Belt South Bioregion located around 15 km to the west of the Study Area. The Nandewar Bioregion lies in northern NSW and extends across the Queensland border covering an area of approximately 2,700,313 ha of which 76.6 percent (%) falls within NSW, occupying around 2.6% of the State. The Nandewar Bioregion includes part of the MacIntyre, Gwydir and Namoi catchments and the Peel, Macdonald, McIntyre, Namoi, Severn and Gwydir Rivers traverse the Bioregion. Within its boundaries lie the towns of Inverell and Tamworth and the smaller towns of Quirindi, Bingara, Barraba, Manilla and Bendemeer (OEH 2016a).

The Study Area lies within the Peel IBRA subregion, which is characterised by landforms of low peaked hills with a north-westerly alignment, basalt caps of dissected flows, moderate slopes and flat river valleys with alluvium. Soil types include shallow stony soils on ridges, texture contrast soils on slopes, black earths on basalt, pedal clays on limestone, serpentinites with shallow stony profiles and alluvial loams/clays with moderate to high fertility. Vegetation includes White Box (*Eucalyptus albens*) grassy woodlands with Yellow Box (*Eucalyptus melliodora*) and Blakely's Red Gum (*Eucalyptus blakelyi*) on lower slopes, Rough-barked Apple (*Angophora floribunda*) and Yellow Box on flats, River Oak (*Casuarina cunninghamiana*) and some River Red Gum (*Eucalyptus camaldulensis*) along major streams, Red Stringybark (*Eucalyptus macrorhyncha*) and Red Ironbark (*Eucalyptus fibrosa*) on steeper slopes in the east, Silver-leaved Ironbark (*Eucalyptus melanophloia*) on basalt caps, and White Cypress Pine (*Callitris glaucophylla*) and Kurrajong (*Brachychiton populneus*) on stony areas in the west and north (OEH 2016a). Stands of some of these main vegetation types are present within the Study Area.

2.2 Mitchell Landscapes

The Study Area occurs within the Tamworth – Keepit Slopes and Plains Mitchell Landscape unit. This landscape is characterised by extensive areas of undulating to rolling slopes and plains with low hills and low ranges forming the western fall of the New England plateau with a general elevation of 500 to 800 metres (m) with a local relief of 250 m with some peaks reaching 1,100 m. This landscape unit has a complex geology of folded and faulted sedimentary and metamorphic rocks with minor interbedded volcanics. Soils and vegetation in the Tamworth – Keepit Slopes and Plains Mitchell Landscape unit are as described for the Peel IBRA subregion (DECCW 2002).

¹ Bioregions and subregions are defined as per the Interim Biogeographic Regionalisation of Australia.

2.3 Native Vegetation Extent

In accordance with Section 4.2.2 and Appendix 4 of the FBA, the extent of native vegetation within the development site and within a defined landscape context must be estimated both before and after the development with GIS software using available aerial imagery and/or vegetation mapping data. Native vegetation extent is estimated within two landscape circles, an inner and an outer assessment circle, and the size of the circles must fall within one of the size classes listed in Appendix 4 of the FBA.

In terms of the native vegetation within the outer assessment circle, the extent of native vegetation within the Study Area was estimated using vegetation mapping polygons development by SLR as part of the current investigation and outside of the Study Area using broad scale vegetation mapping data from the *Border Rivers / Gwydir / Namoi Regional Vegetation Mapping* (OEH 2015). To cover the Development Site a 2,000 ha outer circle was drawn in GIS using available aerial imagery as a base. Using a 1:10 ratio, a 200 ha inner assessment circle was also drawn over the area of greatest impact on native vegetation (as a result of the development).

A breakdown of the native vegetation types mapped within the outer (2000 ha) assessment circle is listed in **Table 4**. Around 26 % (518 ha) of the outer assessment circle comprises native vegetation, with the remaining 74 % (1482 ha) comprising cleared land (or non-native vegetation).

Table 4 Native vegetation extent in the outer (2000 ha) landscape circle

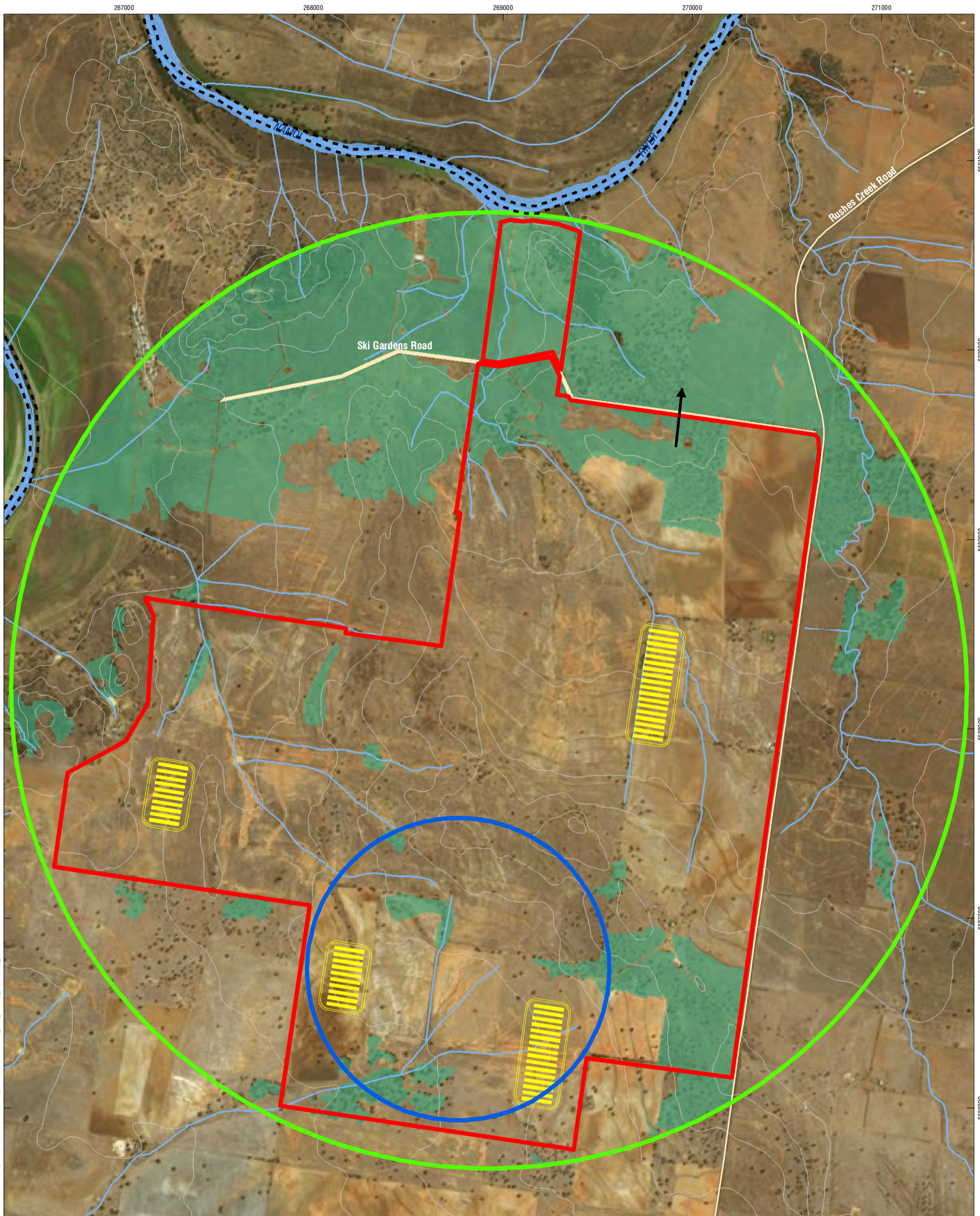
Vegetation	Area (ha)
Candidate Native Grasslands	312.74
Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion	58.43
White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion	116.21
White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion	19.98
Poplar Box - Yellow Box - Western Grey Box grassy woodland	10.95
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0.01
Grand Total (ha):	518.32

The total native vegetation extent within both landscape circles is displayed in the Site Map (**Figure 3**) and Location Map (**Figure 4**). A summary of the total native vegetation extent within the landscape circles, before and after development, is provided in **Table 5**. These areas are converted into percentages and entered into the Credit Calculator. Due to the fact that the development will only clear a small area of derived native grassland (and no woody canopy cover), the values for native vegetation extent before and after development remain the same.

Table 5 Native vegetation extent (within landscape circles before and after development)

Landscape Circle#	Current Area of Native Vegetation (ha)	Future (Post-development) Area (ha)
Inner (200 ha)	17 (9 %)	17 (9 %)
Outer (2000 ha)	518 (26 %)	518 (26 %)

See **Figure 4a** for native vegetation extent in the outer assessment circle.



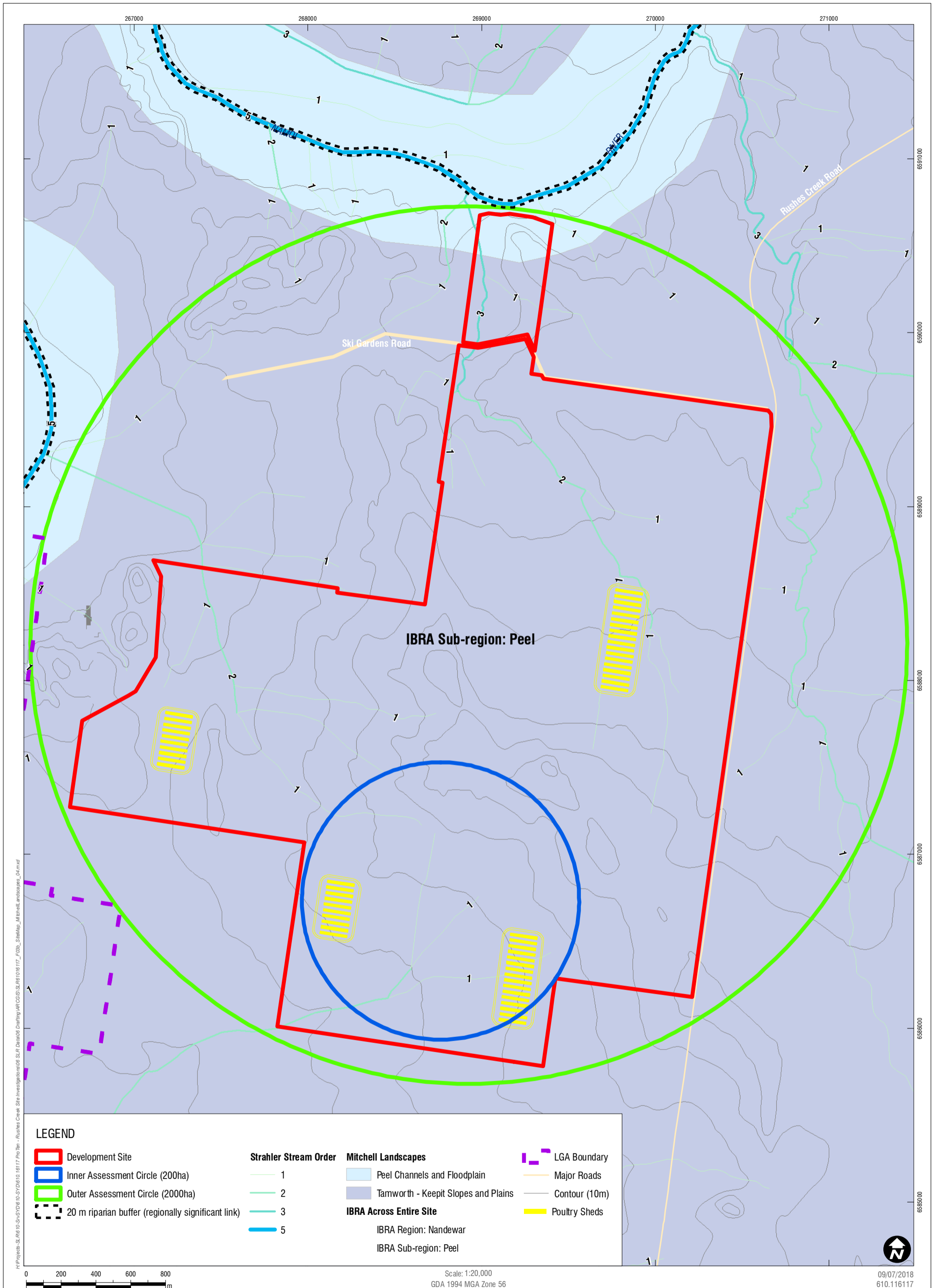
- LEGEND**
- Development Site
 - Inner Assessment Circle (200ha)
 - Outer Assessment Circle (2000ha)
 - 20 m riparian buffer (regionally significant link)
 - Native Vegetation Extent
 - Connecting Link
 - Major Roads
 - Contour (10m)
 - Watercourse
 - Poultry Sheds



Scale: 1:20,000
GDA 1994 MGA Zone 56

23/07/2018
610.116117

*Source: OEH (2015) BRG - Namoi Regional Native Vegetation Mapping



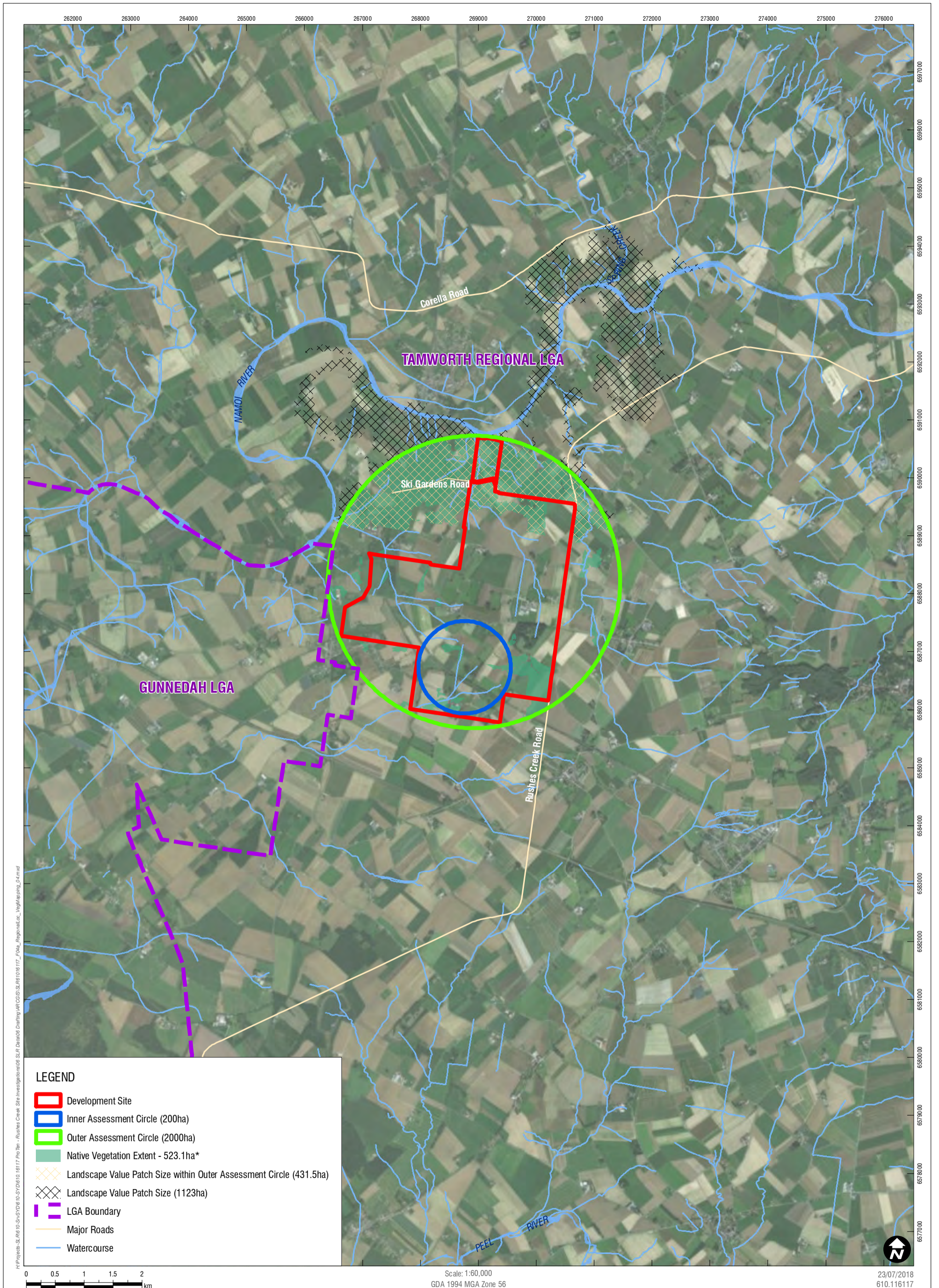
H:\Projects-SLR\10-SYD\10-SYD\10-16117-Pro-1em - Rushes Creek Site Investigation\08 SLR Data\06 Drafting\ARC\GIS\SLR\1016117_F00b_SiteMap_Mitchell_Landscapes_04.mxd

LEGEND

- | | | | |
|--|------------------------------|---|---------------|
| Development Site | Strahler Stream Order | Mitchell Landscapes
Peel Channels and Floodplain | LGA Boundary |
| Inner Assessment Circle (200ha) | 1 | Tamworth - Keepit Slopes and Plains | Major Roads |
| Outer Assessment Circle (2000ha) | 2 | IBRA Across Entire Site | Contour (10m) |
| 20 m riparian buffer (regionally significant link) | 3 | IBRA Region: Nandewar | Poultry Sheds |
| 5 | 5 | IBRA Sub-region: Peel | |

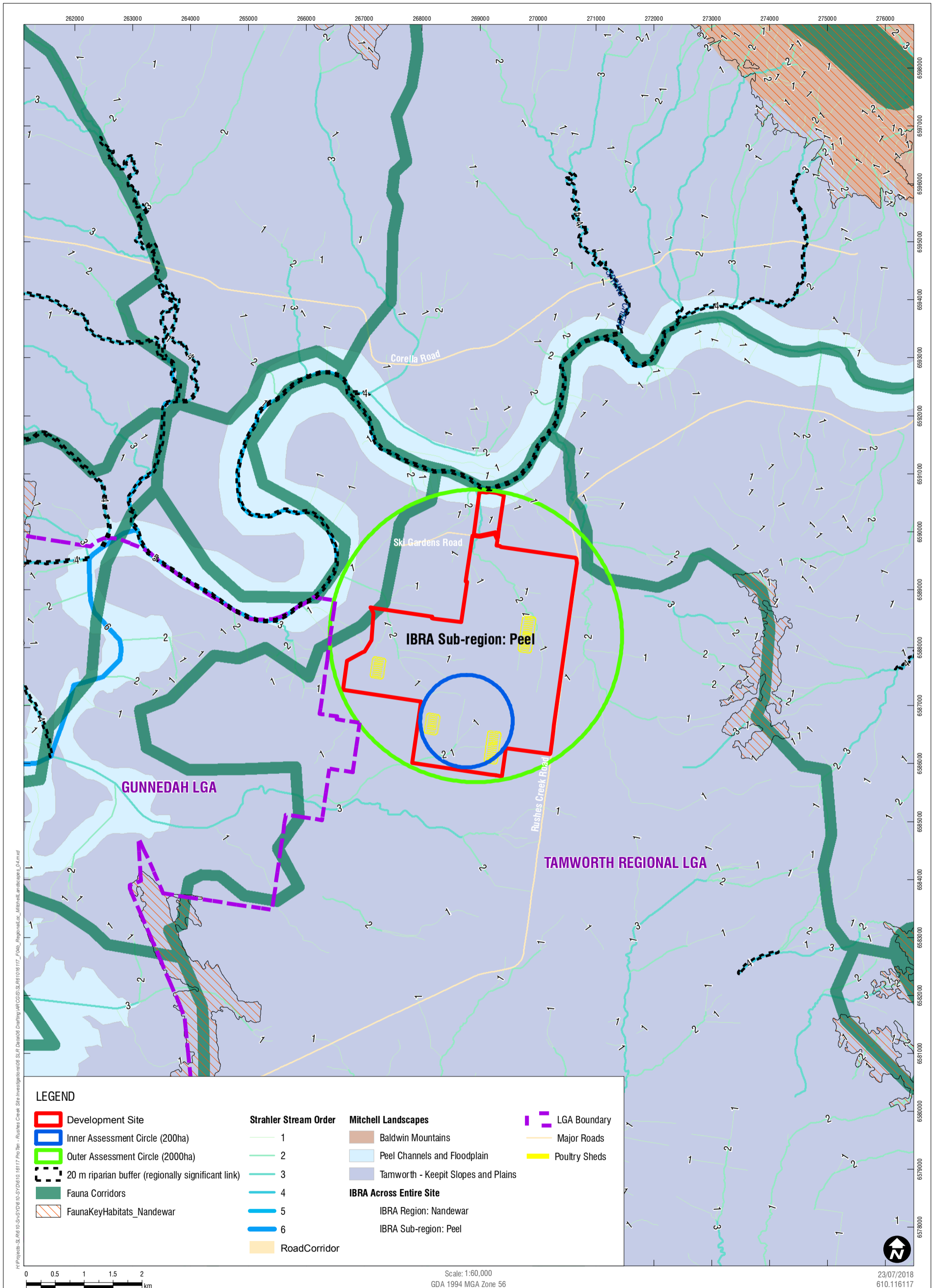
Scale: 1:20,000
GDA 1994 MGA Zone 56

09/07/2018
610.116117



**Location Map
(Native Vegetation Extent)**

FIGURE 4A



2.4 Topography, Geology and Soils

2.4.1 Topography

The Development Site is located in an area dominated by a landscape ranging from broad gently undulating rises, to very gently inclined footslopes and drainage plains on mixed Devonian and Carboniferous colluvium and alluvium in the north-western Duri Hills. The slopes range between 1 and 8%, with local relief less than 100 m and typically less than 20 m. The elevation of this landscape ranges between 290 m and 580 m.

2.4.2 Geology

The NSW Government Manilla-Narrabri 1:250,000 Metallogenic Series Sheet SH/56-9, SH/55-12 First Edition 1992, indicates that the Development Site is likely to be underlain primarily by Carboniferous Namoi Formation, comprising thinly bedded mudstone and siltstone with minor conglomerate, litharenite, calcareous sandstone and siltstone, and bioclastic sandstone. The sheet also indicates the presence of:

- Carboniferous Tulcumba Sandstone adjacent to the eastern boundary of the Development Site, comprised of coarse, cross-bedded feldsarenite, siltstone, conglomerate, calcareous mudstone, oolitic and bioclastic limestone; and
- Devonian Kiah Limestone Member towards the north-eastern corner of the Development Site, comprised of fine grained, grey, thinly bedded and laminated micritic limestone.

2.4.3 Soils

The Development Site is considered to consist of two soil landscapes, these being “Wongo”, which is a residual landscape, and “Oodnadatta”, which is a transferral landscape. These two soil landscapes are mapped within 2 km of the Development Site on both the eastern and western sides of Lake Keepit and the Namoi River. These soil landscapes originally supported open woodlands, most of which have now been cleared for agricultural purposes. Although early yields of winter cereal crops were high, the organic matter depletion in the silty to fine sandy topsoils led to a rapid decline in production and massive sheet erosion events. Much of the area has now been returned to pasture regimes for livestock grazing.

The soils within the area are dominated by moderately deep to deep, well to moderately drained Red and Brown Chromosols. Three soil profiles were recorded in the NSW eSpade soil information system, with two profiles along the eastern boundary of the Development Site (adjacent to Rushes Creek Road) and one located within the western edge of the Development Site. All soil profiles were considered Brown Chromosols.

Given the historical clearing, cultivation and grazing pressures on the soil, much of the area has experienced widespread sheet and gully erosion and severe structural decline within the soil profile. The current pasture management regimes have assisted in stabilising surface soils, however many erosion scalds remain in the landscape.

2.5 Waterbodies

On a regional scale, the Development Site is located within the catchment of the Namoi River, which is one of the Murray-Darling Basin's major NSW sub-catchments. It covers a total area of approximately 42,000 square kilometres (km²) between Tamworth and Walgett. Stream flows in the Namoi catchment are regulated by Lake Keepit on the Namoi River, Split Rock Dam on the Manilla River and Chaffey Dam on the Peel River. The catchment supports significant dryland and irrigated agricultural production, including cotton, livestock production, grain and hay, poultry, horticulture and forestry (NSW Office of Water [NOW] 2011, cited in SLR 2018). The region's local councils also depend on the Namoi and Peel Rivers to meet the urban water requirements of many of the region's urban centres (NOW 2011, cited in SLR 2018).

2.5.1 Rivers and Creeks

The northern most tip of the Development Site is adjacent to the Namoi River which flows east to west and into Lake Keepit. While the Development Site appears on mapping to adjoin the Namoi River, there are two narrow parcels of Crown/public land between the Site and the River. The Development Site does not contain any significant tributaries to the Namoi River and only minor flow paths (mostly ephemeral) exist in swales and gullies across various parts of the Site. The majority of drainage features on the Site have been altered or dammed for agricultural purposes, and some are entirely artificial. As a result of extensive vegetation clearing, cattle grazing and contour shaping (excavations), many drainage features are severely eroded and remain in poor condition with highly exposed soils. A small number of isolated woodland patches still exist and drainage lines within these are in better condition with stable banks and riparian vegetation. The various waterbodies on Development Site and their aquatic habitat characteristics are further explained in **Section 2.5.3** below.

There are two predominant topographical depressions on the Development Site, one which runs from the east to the southwestern corner along the southern boundaries, and one which starts near the central west of the Site and runs north-west through the Site towards the Namoi River. These features have no defined banks and are only distinguishable as drainage features by their location topographically and in some cases the vegetation present within the low lying areas.

Some linear agricultural drains also run along the field boundaries and across paddocks.

2.5.2 Wetlands

There are no wetlands within the Development Site. The nearest wetlands are within Lake Keepit which is a large freshwater dam to the west of the Site. Lake Keepit is an important inland waterway and provides habitat for local fauna groups as well as migratory species.

2.5.3 Aquatic Habitat

The watercourses (mostly ephemeral) and dams within the Development Site are likely to provide some habitats and resources for a selection of locally occurring aquatic and terrestrial fauna. The following aquatic habitats are present on the Development Site.

Farm Dams

Numerous water dams are scattered throughout the Development Site, particularly along the main topographic depressions (refer to **Photo 1**). The majority of these dams were full during the survey after higher than average rainfall in the month before. During other times of the year it is likely that water levels are far lower and some smaller dams would likely dry out periodically. The water in the dams appeared to be highly turbid during the survey and would likely have been unfavourable for many potentially occurring native fauna species. The majority of the dams lack any significant riparian vegetation or aquatic habitat features (such as logs or rocks) and were commonly surrounded by thick exotic pasture grasses. Occasionally, large patches of native reeds dominate the water edges.

Nocturnal surveys revealed that some dams were occupied by a range of common amphibian species, and these areas are likely to be important to local amphibian species. It is also likely that the dams could be utilised by various reptiles (particularly the Eastern Long Neck Turtle *Chelodina longicollis*) or Eels (Long-finned or Short-finned).



Photo 1 Farm dam in southern parts of the site

Contour Banks

A series of contour banks have been excavated across many of the paddocks on the Development Site as part of historical agricultural works. It is likely that water is only present in these during or after rainfall events. The drainage lines are predominately covered by exotic pasture grasses although deeper sections which retain more water contain occasional patches of native reeds such as *Juncus* species (see **Photo 2**). Notable habitat features, such as logs or rocks, are virtually absent and would likely have been removed as part of paddock maintenance and grazing. Aquatic habitat is generally of low quality in these drainage features and due to their highly ephemeral nature, it is unlikely that native aquatic fauna groups would reside here. However, the temporary pools that form in these features during and after rainfall events could be beneficial for assisting dispersal and movements of amphibians, reptiles or eels across the landscape.



Photo 2 Temporary pool within contour drainage bank in central parts of the site

Topographic Depressions and Soaks

The low lying areas of the Development Site accumulate water and contain periodic habitat for a range of native fauna, particularly amphibians (see **Photo 3**). Examples of such habitat were observed in various parts of the Site due to above average rainfall in the month before the surveys.



Photo 3 Temporary ponding in the southwestern parts of the site with established reeds and algae present

Ephemeral Streams

A number of the drainage lines and depressions (some artificial) form stream lines with defined banks. Most features are ephemeral and contain blockages such as dams or contour excavations. Many are also cleared of riparian vegetation and highly eroded. The most prominent natural waterway is the short stream in the central north of the Development Site to the south of Ski Gardens Road (within a woodland patch). This feature is likely a semi-permanent stream, with occasional steep rocky banks and walls, as well as deeper pools. This short waterway offers good quality aquatic habitat and would be an important resource for local fauna groups (aquatic and terrestrial). The condition of this waterway could be greatly enhanced if grazing was ceased and riparian vegetation could re-establish. **Photo 4** below shows the central areas of this waterway.



Photo 4 Watercourse in western portion of the site, located near Ski Gardens Road

2.6 Biodiversity Corridors

The Development Site is predominantly cleared and disturbed due to a history of grazing and cropping practices, and only small and isolated pockets of native vegetation or woodland remain. The patches of woodland contain a canopy of scattered eucalypt species which is generally without native understorey or ground layer vegetation as a result of grazing. The neighbouring properties are in similar condition and lack any significant vegetated corridors which would facilitate fauna movements throughout the landscape. Certain woodland patches on the Site might assist movements of highly mobile species such as birds, flying mammals and macropods. Similarly, scattered paddock trees could also be important features for fauna movement for birds and bats throughout the Development Site.

Potential subregional corridors were previously identified by DECCW (2004) surrounding the northern end of the Study Area, including riparian areas adjoining the Namoi River. **Figure 4** shows the distribution of subregional corridors within and surrounding the Study Area, as mapped by DECCW (2004).

2.7 Landscape Value

2.7.1 Native Vegetation Extent

As detailed earlier in **Section 2.3**, the percentage of native vegetation cover within the outer assessment circle is in the 26-30 % class and within the inner assessment circle it is within the 6-10 % class. Considering the Development will not require substantial clearing of native vegetation (other than small areas of Derived Native Grassland) there will be no change to the percentage of native cover classes within the outer and inner assessment circles when comparing the pre- and post-Development scenarios. Accordingly the score in the Credit Calculator for percentage native vegetation cover is zero.

2.7.2 Connectivity

Connectivity score was calculated according to the FBA, with reference to the *Credit Calculator for Major Projects and BioBanking, Operational manual* (OEH 2016b). Impacts on connectivity as a result of the Development will be avoided, with potential impacts limited to areas of derived grassland that exist in a highly disturbed condition. The proposed installation of a water pump and water pipeline to extract water from the Namoi River (see **Figure 2**) will avoid impacts to native vegetation in the riparian buffer (i.e. within 20 m) of the Namoi River, which is a 4th order stream (and therefore defined as a 'regional biodiversity link' in the FBA). As installation of the pump and pipeline will not require removal of any native vegetation in moderate to good condition, there will be no impacts on a State or regional biodiversity link and a 'site based assessment' of connectivity is required as outlined below.

The broadest connecting link from the Development Site is across Ski Gardens Road in the northeast portion of the Site connecting to a larger (>200 ha) habitat patch to the north of the Study Area. This connecting link is approximately 40 m wide and therefore falls within the 30-100 m category in the Credit Calculator. This connecting link or any other connecting links will not be impacted by the Development and therefore the same category has been assigned pre- and post-Development. Therefore a connectivity value of 0 is assigned in the Calculator.

2.7.3 Patch Size

Patch size is defined in the FBA as an area of native vegetation that is in moderate to good condition and occurs on the development site. The patch size can extend across the site and off the site onto adjoining land to include other patches where the gap between patches is less than 100 m for woody formations and 30 m for non-woody formations. Patch size score is calculated according to broad categories in the FBA that relate to the percentage cleared value of the Mitchell landscape that occupies that majority of the development site.

In the case of the Development Site at Rushes Creek, the native vegetation that forms the largest patch within the Study Area and which intersects with the development footprint is the Derived Native Grassland. The total area of the patches of Derived Naïve Grassland combined, including patches that are less than 30 m apart, is greater than 200 ha (refer to **Figure 4**). The Tamworth – Keepit Slopes and Plains Mitchell Landscape unit occupies the majority of the Development Site (see **Figure 3**) and has a percentage cleared value of 64%. With reference to Appendix 4 of the FBA, where the Mitchell landscape is 30-70% cleared, patches greater than 200 ha are considered 'extra large' and are assigned the highest patch size score of 12, which contributes to the landscape value score in the Credit Calculator.

2.7.4 Landscape Value Score

In accordance with Section 4.2 of the FBA, the development has a landscape value score of 12 in the Credit Calculator. This has been calculated based on the native vegetation cover pre- and post-Development, connectivity value and patch size.

3 Native Vegetation

3.1 Study Area Characteristics

The majority of the Study Area has been historically cleared and used for agricultural purposes and is consequently composed of modified often bare soils and exotic pastures. There are numerous patches of native woodland remaining associated with topographic depressions and drainage features as well as in numerous paddocks where historical clearing has been less intensive. The woodland areas contain virtually no native understorey or native groundcover, most likely as a result of decades of grazing by cattle.

Widely scattered paddock trees are distributed intermittently across the Development Site, with generally limited shrubs cover and low diversity and cover of native groundcover vegetation. The groundcover across most of the open portions on the Study Area is subject to grazing or cropping and is dominated by exotic agricultural pasture, cultivated oats and weed species typical of the locality.

3.2 Regional (Broad-scale) Vegetation Mapping

The most recent published regional scale vegetation mapping applicable to the Development Site is the *Border Rivers / Gwydir / Namoi Regional Vegetation Mapping* (OEH 2015). The mapping as it applies to the Site is shown in **Figure 5**. The mapping indicates that the majority (more than 80 %) of the Study Area comprises non-native vegetation, which is associated with grazed and cropped land. Three native plant community types (PCTs) are mapped within the Development Site, with the remainder of the Site mapped as Candidate Native Grasslands or Non-native, as follows:

- White Box grassy woodland to open woodland (PCT 1383);
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (PCT 589); and
- Grey Box grassy woodland or open forest (PCT 516).

In addition, a small patch of River Red Gum riparian tall woodland / open forest wetland is mapped immediately north of the Development Site (but within the Study Area), adjacent to the Namoi River (see **Figure 5**). The areas of each native PCT, as well as non-native vegetation, as mapped within the Study Area by OEH (2015), are listed in **Table 6**.

Table 6 Plant community types (PCTs) mapped by OEH (2015) within the Study Area²

PCT Code	PCT name	Vegetation Class	Area (ha)
1383	White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region Brigalow Belt South Bioregion	Western Slopes Grassy Woodlands	5.99
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion	Western Slopes Grassy Woodlands	30.52
516	Grey Box grassy woodland or open forest of the Nandewar	Western Slopes	15.02

² *(PCT 78) Sits outside Development Site Boundary to the North near river

PCT Code	PCT name	Vegetation Class	Area (ha)
	Bioregion and New England Tableland Region	Grassy Woodlands	
78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Inland Riverine Forests	0.47
	Candidate Native Grasslands	Candidate Native Grasslands	74.33
	Non-Native	n/a	889.80
		Total Area:	1016 .12

3.3 Vegetation Classes

The native vegetation PCTs mapped across the Development Site comprise two different vegetation classes:

- Western Slopes Grassy Woodlands; and
- Inland Riverine Forests.

These native vegetation classes are described below.

There is no vegetation class for Candidate Native Grasslands.

3.3.1 Western Slopes Grassy Woodlands

Three PCTs mapped across the Development Site are ‘grassy woodland’ communities and form part of the Western Slopes Grassy Woodlands vegetation class:

- White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region Brigalow Belt South Bioregion;
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion; and
- Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion.

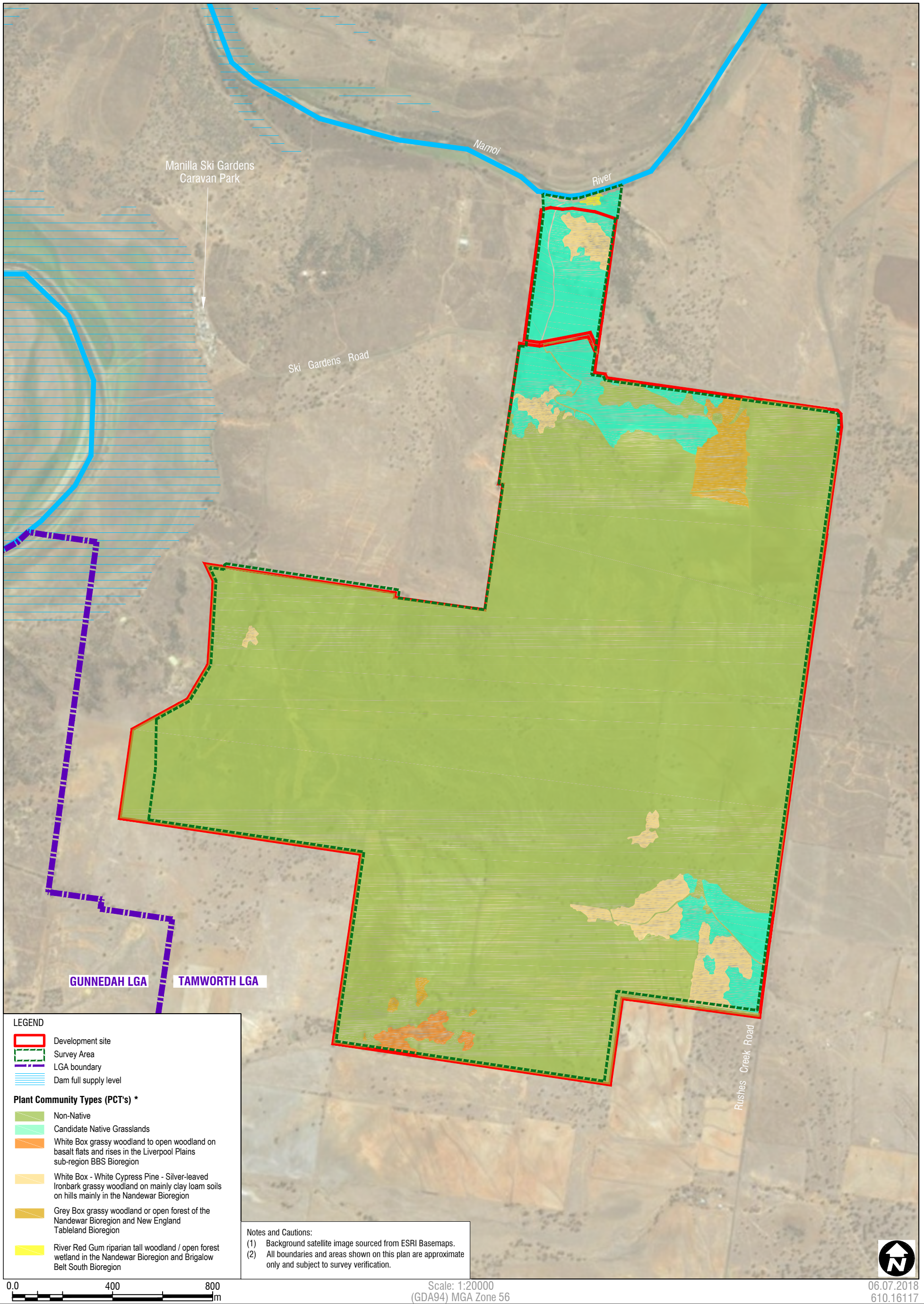
The Western Slopes Grassy Woodlands vegetation class may be described as a eucalypt woodland typically up to 20 m tall dominated by White Box (*Eucalyptus albens*) occurring with Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*). Other common tree species includes Kurrajong (*Brachychiton populneus*), White Cypress Pine (*Callitris glaucophylla*), and in the northern distribution Silver-leaved Ironbark (*Eucalyptus melanophloia*) and Narrow-leaved Grey Box (*Eucalyptus pilligaensis*). There is a sparse shrub stratum present including Blackthorn (*Bursaria spinosa*), Sifton Bush (*Cassinia arcuata*), Winter Apple (*Eremophila debilis*), Native Olive (*Notelaea macrocarpa*), Curved Rice Flower (*Pimelea curviflora*) and Leafy Templetonia (*Templetonia stenophylla*). There is a continuous groundcover of tussock grasses and a variety of herbs including Kangaroo Grass (*Themeda australis*), Snowgrass (*Poa sieberiana*), Red Grass (*Bothriochloa macra*), Hairy Joyweed (*Alternanthera nana*), Common Woodruff (*Asperula conferta*), Bulbine Lily (*Bulbine bulbosa*), Blue Flax Lily (*Dianella longifolia*) and Kidney Weed (*Dichondra repens*). This vegetation class occurs on fertile soils usually derived from basalt and low-quartz sedimentaries on flat to undulating terrain below 700 m elevation on the western fall of the Great Dividing Range.

3.3.2 Inland Riverine Forests

One PCT classed as a 'riverine forest' has been mapped in Study Area within the riparian zone of the Namoi River outside of the northern boundary of the Development Site which is part of the Inland Riverine Forest vegetation class comprising 'River Red Gum riparian tall woodland open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion'.

Inland Riverine Forests are open eucalypt forests of River Red Gum (*Eucalyptus camaldulensis*) up to 40 m tall. Scattered small trees and shrubs that may be present include Cooba (*Acacia salicina*), River Cooba (*A. stenophylla*), Nitre Goosefoot (*Chenopodium nitrariaceum*), Dwarf Cherry (*Exocarpos strictus*) and Lignum (*Muehlenbeckia florulenta*). The groundcover is a dense to patchy, species-rich, and herbaceous layer of forbs and sedges, such as Lesser Joyweed (*Alternanthera denticulata*), Common Buttercup (*Ranunculus lappaceus*), *Carex* spp. and *Juncus* spp. The community occurs on fertile alluvium subject to frequent flooding on the sandy banks of major inland rivers and the beds of intermittent streams, billabongs and channelled floodplains.

H:\Projects\SLR\610-Srv\SYD\610-SYD\610-16117 ProTen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOG\SLR61016117_F05_RegionalVeg_V6.dwg



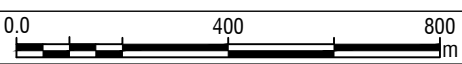
LEGEND

- Development site
- Survey Area
- LGA boundary
- Dam full supply level

Plant Community Types (PCT's) *

- Non-Native
- Candidate Native Grasslands
- White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region BBS Bioregion
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion
- Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion
- River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Notes and Cautions:
 (1) Background satellite image sourced from ESRI Basemaps.
 (2) All boundaries and areas shown on this plan are approximate only and subject to survey verification.



Scale: 1:20000
(GDA94) MGA Zone 56

06.07.2018
610.16117

*Source: OEH (2015)

3.4 Site Specific Mapping - Plant Community Types (PCTs)

3.4.1 Overview of Vegetation recorded within the Development Site

Vegetation recorded on the Development Site included a mix of communities in various states of ecological condition dependant on the degree of previous disturbance. The majority of the Site supports non-native grasslands in low condition, with native vegetation limited to discreet patches of dry sclerophyll woodlands of various sizes.

The following PCTs have been identified within the Study Area based on the results of the field survey:

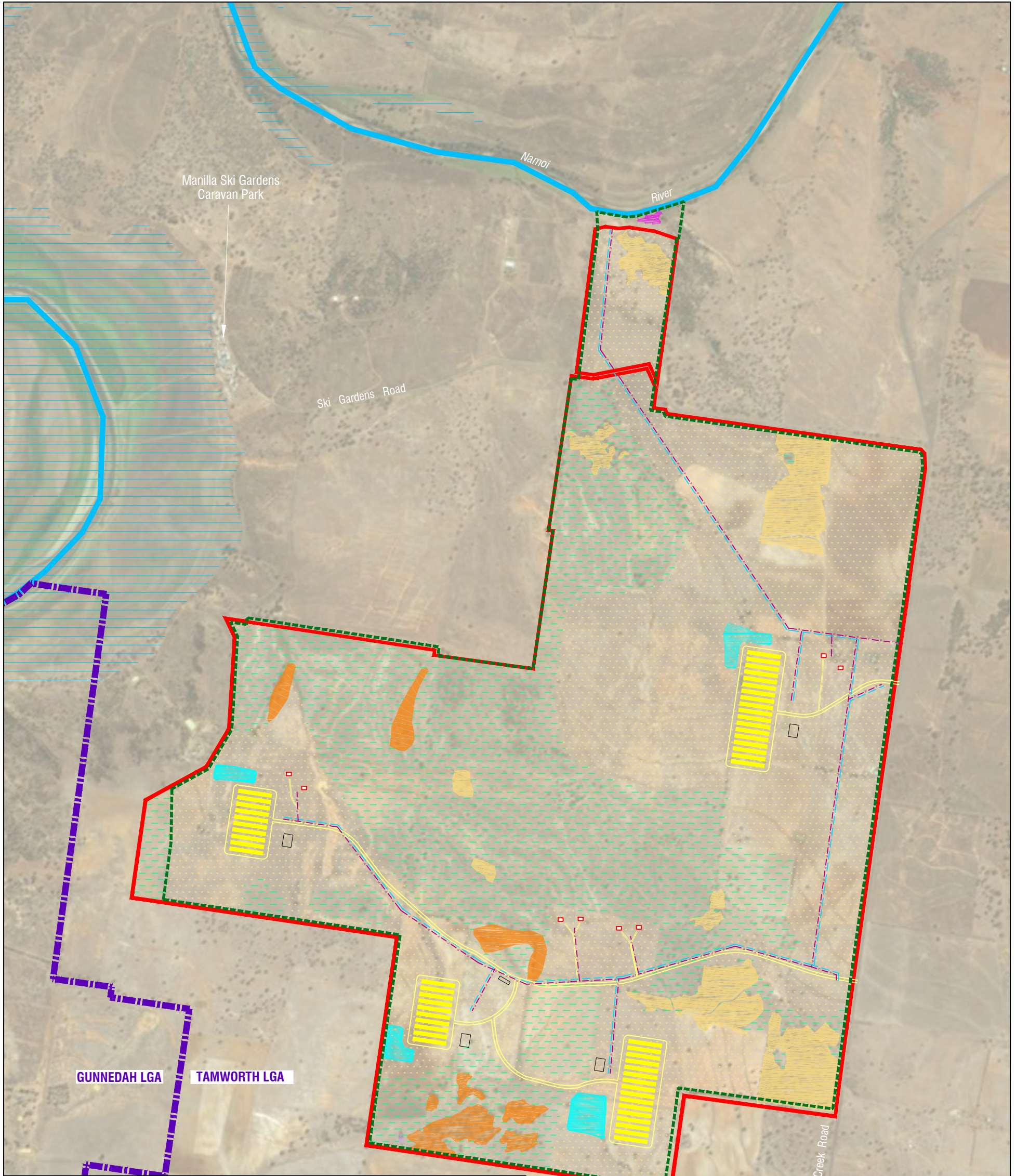
- White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 1383) – with both a woodland form and ‘derived native grassland’ form recorded;
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion (PCT 589);
- Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (PCT 101); and
- River Red Gum riparian tall woodland open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 78).

The distribution of these PCTs within the Development Site is shown in **Figure 6** and their mapped area, vegetation class and vegetation formation are listed in **Table 7**. Additionally, there are large expanses of grazed pasture comprising mainly exotic grasses and herbs and Derived Native Grassland that have been (and are currently) subject to grazing and/or cropping uses, mapped across the majority of the Development Site. The patches of Derived Native Grassland have been assigned, based on the surrounding vegetation type, plot results and prevailing topography, to PCT 1383 White box grassy woodland. The patches of non-native groundcover and Derived Native Grassland intergrade with each other but have been distinguished based on the predominance of exotic groundcover species, which is evident in plot data, values for native species diversity (being below benchmark for non-native plots) and with consideration of the definition of ‘Low condition’ in the FBA (see discussion in **Section 3.6**).

Table 7 Plant community types (PCTs) recorded by SLR within the Study Area

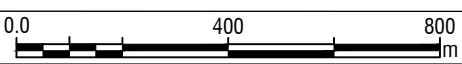
PCT Code	PCT name	Formation	Class	Area (ha)
1383	White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	21.27
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	55.22
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion	Grassy Woodlands	Western Slopes Grassy Woodlands	0.10
78	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Forested Wetlands	Inland Riverine Forests	0.47
1383	Derived grassland (White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion)	Grassy Woodlands	Western Slopes Grassy Woodlands	380.30
N/A	Non-native groundcover	N/A	N/A	558.77
			Total Area:	1016.12

H:\Projects\SLR\610-Srv\610-SYD\610-16117 ProTen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOG\SLR61016117_F06_VegPCTs_V8.dwg



LEGEND	
	Development site
	Survey Area
	Poultry shed
	Proposed internal access road
	Proposed driveway
	Proposed power line
	Proposed water line
	Proposed project related residence
	LGA boundary
	Dam full supply level
Plant Community Types (PCT's)	
	(PCT1383) Derived grassland - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
	Non-native groundcover
	(PCT 1383) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
	(PCT 589) White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion
	(PCT 101) Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion
	(PCT 78) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Notes and Cautions:
 (1) Background satellite image sourced from ESRI Basemaps.
 (2) All boundaries and areas shown on this plan are approximate only and subject to survey verification.



Scale: 1:20000
(GDA94) MGA Zone 56

23.07.2018
610.16117



Plant Community Types (PCTs) recorded within the Development Site

FIGURE 6

3.4.2 White Box Grassy Woodland

This community is dominated by a mix of eucalypt species forming a woodland structure with a mostly grassy groundcover and low cover of shrubs. The community structure and floristics are described below in **Table 8**.

Table 8 White Box grassy woodland

PCT	White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion (1383)
Location	This vegetation type was surveyed in the south-western portion of the Development Site
Area	21.27 ha
Structure	Woodland with a mostly grassy groundcover and occasional low-growing shrubs Trees from 10 to 18 m. FPC 10 to 20%. Shrubs and small trees 0.2 to 1.0 m. FPC 5 to 15% Groundcover 0.1 to 1 m. FPC up to 30%.
Floristics	<p>Trees: Bimble Box (<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>) White Box (<i>Eucalyptus albens</i>) Kurrajong (<i>Brachychiton populneus</i> subsp. <i>populneus</i>)</p> <p>Shrubs Galvanised Burr (<i>Sclerolaena birchii</i>) Small-leaved Bluebush (<i>Maireana microphylla</i>) Narrawa Burr (<i>Solanum cinereum</i>)</p> <p>Groundcovers Bluebells (<i>Wahlenbergia stricta</i>, <i>W. communis</i>) Dock (<i>Rumex brownii</i>) <i>Goodenia pinnatifida</i> Slender Bamboo Grass (<i>Austrostipa verticillata</i>)</p> <p>Exotic Burr medic (<i>*Medicago polymorpha</i>) Rye perenne (<i>*Lolium</i>) Shepherd's Purse (<i>*Capsella bursa-pastoris</i>) Thistle (<i>*Cirsium vulgare</i>) Variegated Thistle (<i>*Silybum marianum</i>)</p>

3.4.3 White Box - White Cypress Pine - Silver-leaved Ironbark Grassy Woodland

This community is dominated by a mix of eucalypt species forming an open to very open woodland with a mostly grassy groundcover with shrubs mainly restricted to rocky locations. The community occurs as a series of discrete patches across the Study Area, generally on slightly higher ground (see **Figure 6**). The community structure and floristics are described below in **Table 9**.

Table 9 White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland

PCT	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion (589)
Location	This vegetation type occurs as small patches in north and south-eastern portions of the Development Site
Area	55.22 ha
Structure	Open to very open woodland with a mostly grassy groundcover with shrubs mainly restricted to rocky locations Trees from 5 to 15 m. FPC 5 to 15%. Shrubs and small trees to 1.5 m. FPC 5 to 15% Groundcover 0.1 to 1 m. FPC up to 40%.
Floristics	<p>Trees: Blakely’s Red Gum (<i>Eucalyptus blakelyi</i>) Silver-leaved Ironbark (<i>Eucalyptus melanophloia</i>) White Cypress Pine (<i>Callitris glaucophylla</i>) Kurrajong (<i>Brachychiton populneus</i> subsp. <i>populneus</i> and (?) subsp. <i>trilobus</i>)</p> <p>Shrubs Galvanised Burr (<i>Sclerolaena birchii</i>) Small-leaved Bluebush (<i>Maireana microphylla</i>) Blackthorn (<i>Bursaria spinosa</i> subsp. <i>spinosa</i>)</p> <p>Groundcovers Purple Wiregrass (<i>Aristida ramosa</i>) Bluebells (<i>Wahlenbergia stricta</i>, <i>W. communis</i>) Australian Cranesbill (<i>Geranium solanderi</i> var. <i>solanderi</i>) Weeping Grass (<i>Microlaena stipoides</i> var. <i>stipoides</i>) Dock (<i>Rumex brownii</i>) <i>Goodenia pinnatifida</i> Poison Rockfern (<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>) Windmill Grass (<i>Chloris truncata</i>)</p> <p>Exotic Burr medic (<i>*Medicago polymorpha</i>) Rye (<i>*Lolium perenne</i>) Catsear (<i>*Hypochaeris radicata</i>) Brome grass (<i>*Bromus catharticus</i>) Haresfoot Clover (<i>*Trifolium arvense</i>)</p>

3.4.4 Poplar Box - Yellow Box - Western Grey Box Grassy Woodland

This community in the Study Area is dominated by Inland (Western) Grey Box (*Eucalyptus microcarpa*) forming an open woodland with a mostly grassy groundcover on alluvial plains and gently undulating slopes. One 0.10 ha patch of this community was recorded within the Study Area (see **Figure 6**). The community structure and floristics are described below in **Table 10**.

Table 10 Poplar Box - Yellow Box - Western Grey Box grassy woodland

PCT	Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (101)
Location	This vegetation type occurs in the north-western portions of the Development Site
Area	0.10 ha
Structure	Open woodland with a mostly grassy groundcover Trees from 5 to 15 m. FPC 5 to 15%. Shrubs and small trees to 1.5 m. FPC 5 to 15% Groundcover 0.1 to 1 m. FPC up to 40%.
Floristics	<p>Trees: Inland Grey Box (<i>Eucalyptus microcarpa</i>) White Box (<i>Eucalyptus albens</i>) Blakely's Red Gum (<i>Eucalyptus blakelyi</i>) Kurrajong (<i>Brachychiton populneus</i> subsp. <i>populneus</i>)</p> <p>Shrubs Galvanised Burr (<i>Sclerolaena birchii</i>)</p> <p>Groundcovers Slender Bamboo Grass (<i>Austrostipa verticillata</i>) Speargrass (<i>Austrostipa scabra</i>) Many-flowered Mat-rush (<i>Lomandra longifolia</i>) Australian Cranesbill (<i>Geranium solanderi</i> var. <i>solanderi</i>) Yellow Burr-daisy (<i>Calotis lappulacea</i>) <i>Goodenia pinnatifida</i> Wheatgrass (<i>Anthosachne scabra</i>) Yellow Autumn-lily (<i>Tricoryne elatior</i>)</p> <p>Exotic *Haresfoot Clover (<i>Trifolium arvense</i>) *Burr Medic (<i>Medicago polymorpha</i>) *Rye (<i>Lolium perenne</i>) *Catsear (<i>Hypochaeris radicata</i>) *Brome Grass (<i>Bromus catharticus</i>)</p>

3.4.5 River Red Gum Riparian Tall Woodland / Open Forest Wetland

This community is dominated by River Red Gum (*Eucalyptus camaldulensis*) forming a very open-woodland with occasional scattered shrubs (native and exotic) and dense groundcover of (mostly exotic) grasses and forbs. One small isolated patch of the community is present on the banks of the Namoi River at the northern end of the Study Area, and lies outside of the Development Site (and east of the proposed water pipeline), as shown in **Figure 6**. The community structure and floristics are described below in **Table 11**.

Table 11 River Red Gum riparian tall woodland / open forest wetland

PCT	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (78)
Location	Small patch adjacent to the northern limit of the Development Site along a tributary flowing along an eroded cutting into the Namoi River. Located outside of development footprint, east of proposed water supply pipeline and intake.
Area	0.47 ha
Structure	Very open-woodland with occasional scattered shrubs (native and exotic) and dense groundcover of (mostly exotic) grasses and forbs. Trees from 12 to 16 m. FPC 5 to 15%. Shrubs from 1 to 2 m; FPC generally to 10%. Groundcover 0.1 to 1m. FPC up to 50%.
Floristics	<p>Trees: River Red Gum (<i>Eucalyptus camaldulensis</i>) – including Mistletoe (<i>Amyema miquelii</i>)</p> <p>Shrubs Small-leaved Bluebush (<i>Maireana microphylla</i>) Galvanised Burr (<i>Sclerolaena birchii</i>)</p> <p>Groundcovers Weeping Grass (<i>Microlaena stipoides</i> var. <i>stipoides</i>) Dock (<i>Rumex brownii</i>) Stout Bamboo Grass (<i>Austrostipa ramosissima</i>) Slender Bamboo Grass (<i>Austrostipa verticillata</i>)</p> <p>Exotic African Boxthorn (<i>*Lycium ferocissimum</i>) Variegated Thistle (<i>*Silybum marianum</i>) Burr medic (<i>*Medicago polymorpha</i>) Buchan Weed (<i>*Hirschfeldia incana</i>) Rye (<i>*Lolium perenne</i>)</p>

3.4.6 White Box Woodland - Derived Native Grassland

Derived grasslands are dominated by a mix of exotic and native grass and herb species. Exotic flora generally dominates the groundcover with patches and/or scattered individuals of native flora species including isolated paddock trees. The dominant exotic species in these areas include Ryegrass (*Lolium perenne*), Brome Grass (*Bromus catharticus*) and Burr Medic (*Medicago polymorpha*). Dominant native flora includes Galvanised Burr (*Sclerolaena birchii*), Small-leaved Bluebush (*Maireana microphylla*), Purple Wiregrass (*Aristida ramosa*) and Bluebells (*Wahlenbergia stricta*, *W. communis*). Large patches of derived grassland extend across the western and southern parts of the Development Site (see **Figure 6**). These areas are further described below in **Table 12**.

Table 12 Derived Native Grassland (White Box Grassy Woodland)

Location	This vegetation type occurs over a large proportion of the Development Site. Plots were undertaken throughout areas of this zone.
Area	380.30 ha
Structure	Mixed exotic/native grassland, probably including historical attempts at improved pasture. Native grass and forb species are co-dominant to occasional. Grassland/forbland with scattered woodland trees. Groundcover generally contains a mixture of native and exotic grasses and forbs. Suite of species varies according to factors including geology, topography and disturbance history. Trees: from 10 to 15 m. FPC 0 to 5% Groundcover: 0.1 to 1 m. FPC up to 40%.
Floristics	Trees: Blakely's Red Gum (<i>Eucalyptus blakelyi</i>) Silver-leaved Ironbark (<i>Eucalyptus melanophloia</i>) White Box (<i>Eucalyptus albens</i>) Bimble Box (<i>Eucalyptus populnea</i> subsp. <i>bimbil</i>) Shrubs Galvanised Burr (<i>Sclerolaena birchii</i>) Small-leaved Bluebush (<i>Maireana microphylla</i>) Groundcovers Windmill Grass (<i>Chloris ventricosa</i>) Wheatgrass (<i>Anthosachne scabra</i>) Speargrass (<i>Austrostipa scabra</i>) Slender Bamboo Grass (<i>Austrostipa verticillata</i>) Purple Wiregrass (<i>Aristida ramosa</i>) Ringed Wallaby Grass (<i>Rytidosperma caespitosum</i>) Bluebells (<i>Wahlenbergia stricta</i> , <i>W. communis</i>) Australian Cranesbill (<i>Geranium solanderi</i> var. <i>solanderi</i>) Carrotweed (<i>Cotula australis</i>) <i>Vittadinia muelleri</i> Yellow Burr-daisy (<i>Calotis lappulacea</i>) <i>Goodenia pinnatifida</i> Poison Rockfern (<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>) Exotic

	<p>Pigeon Grass (<i>*Setaria gracilis</i>) Barley Grass (<i>*Hordeum leporinum</i>) Burr medic (<i>*Medicago polymorpha</i>) Rye (<i>*Lolium perenne</i>) Catsear (<i>*Hypochaeris radicata</i>) Brome grass (<i>*Bromus catharticus</i>) Haresfoot Clover (<i>*Trifolium arvense</i>) Shepherd's Purse (<i>*Capsella bursa-pastoris</i>) Thistle (<i>*Cirsium vulgare</i>) Variegated Thistle (<i>*Silybum marianum</i>)</p>
--	---

3.4.7 Non-native Groundcover

Patches of Non-native Groundcover are dominated by a mix of exotic grasses and herbs. Some areas may support small patches or scattered individuals of native flora species. The dominant species in these areas include the exotic perennial grasses Ryegrass (*Lolium perenne*) and Brome Grass (*Bromus catharticus*), with the exotic herbs Burr Medic (*Medicago polymorpha*) and Variegated Thistle (*Silybum marianum*). Large patches of non-native grassland extend across the eastern and northern parts of the Development Site (see **Figure 6**). These areas are further described below in **Table 13**.

Table 13 Non-native Groundcover

Location	This vegetation type occurs over a large proportion of the Development Site. Plots were undertaken throughout areas of this zone.
Area	558.77 ha
Structure	Exotic grassland, probably including historical attempts at improved pasture. Native grass and forb species are occasional self-recruitments or remnants. Grassland/forbland with no/little canopy cover. Groundcover dominated by exotic grasses and forbs. Groundcover: 0.1 to 1 m. FPC up to 40%.
Floristics	<p>Shrubs</p> Galvanised Burr (<i>Sclerolaena birchii</i>) Small-leaved Bluebush (<i>Maireana microphylla</i>) <p>Groundcovers</p> Speargrass (<i>Auistrostipa scabra</i>) Purple Wiregrass (<i>Aristida ramosa</i>) Bluebells (<i>Wahlenbergia stricta</i> , <i>W. communis</i>) Australian Cranesbill (<i>Geranium solanderi</i> var. <i>solanderi</i>) Yellow Burr-daisy (<i>Calotis lappulacea</i>) <p>Exotic</p> Pigeon Grass (* <i>Setaria gracilis</i>) Barley Grass (* <i>Hordeum leporinum</i>) Burr medic (* <i>Medicago polymorpha</i>) Rye (* <i>Lolium perenne</i>) Cretan Weed (* <i>Hedypnois rhagadioloides</i> subsp. <i>rhagadioloides</i>) Catsear (* <i>Hypochaeris radicata</i>) Brome grass (* <i>Bromus catharticus</i>) Haresfoot Clover (* <i>Trifolium arvense</i>) Shepherd's Purse (* <i>Capsella bursa-pastoris</i>) Thistle (* <i>Cirsium vulgare</i>) Variegated Thistle (* <i>Silybum marianum</i>) Wild Oats (* <i>Avena fatua</i>)

3.5 Site-Specific Vegetation Mapping – Differences to Regional Mapping

The main differences between the site-specific vegetation mapping and the regional mapping (OEH 2015) layer include the following observations:

- Patches of 'Candidate Native Grasslands' are mapped by OEH (2015) in the northern parts of the site (see **Figure 5**). Visual inspection and plot data reveal that these areas extend beyond the mapped area and much of the mapped areas comprise pasture grasslands of mainly exotic perennial grasses and exotic herbs and forbs, interspersed with a limited selection of native grasses and herbs. Hence, patches of Candidate Native Grasslands were re-mapped into either Derived Native Grassland or Non-native Groundcover.
- A large majority of the Development Site is grazed pasture with high cover and diversity of exotic grasses, forbs and herbs and is delineated and identified as 'Non-native Groundcover'.
- Some stands of woodland in the northern portion of the Development Site (south of Ski Gardens Road) are mapped by OEH (2015) as Inland Grey Box Woodland (Poplar Box - Yellow Box - Western Grey Box grassy woodland), but were found to comprise White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland instead.

3.6 Vegetation Zones

According to the FBA, vegetation zones are areas of the same PCT of the same condition class. Vegetation zones are categorised into either 'low' or 'moderate to good' condition. To qualify as low condition the native vegetation (being woody vegetation) within a vegetation zone must have:

- A value of less than 25% of the lower benchmark value in the canopy; and
- A groundcover which is either less than 50% indigenous (or native) or over 90% cleared.

Based on the definition of low condition vegetation and with reference to the plot data collected during field surveys, the PCTs mapped within the Study Area have been further divided into the following vegetation zones:

- White Box grassy woodland (derived grassland) - seven BioBanking plots were undertaken in this zone, of which much is in a poor condition with below benchmark scores for canopy and midstorey cover and close to benchmark scores for other site attributes and as such it still qualifies as moderate to good condition (Vegetation Zone 1 - VZ1);
- Non-native Groundcover - six BioBanking plots were undertaken in this zone, which is in low condition with below benchmark scores for native canopy and midstorey cover and high exotic species cover and as such it does not constitute native vegetation and cannot be assigned to a native vegetation zone (Vegetation Zone 2 – VZ2);
- White Box grassy woodland (moderate to good condition) - three BioBanking plots were undertaken in this zone (Vegetation Zone 3 – VZ3);
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition) - six BioBanking plots were undertaken in this zone (Vegetation Zone 4 – VZ4 and VZ5);

- Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition) - one BioBanking plot was undertaken in this zone (Vegetation Zone 8 – VZ8). The plot was located outside of the Study Area in a potential offset area adjacent to the site, and hence the plot location is not shown in **Figure 7**;
- River Red Gum riparian tall woodland / open forest (moderate to good condition) - one BioBanking plot was undertaken in this zone (Vegetation Zone 6 – VZ6).

The distribution of these vegetation zones within the Development Site is shown in **Figure 7**. The vegetation zones and their mapped extent within the Study Area are listed in **Table 14**.

There are patches of native vegetation (woodland PCTs) that are mapped within the Development Site, but fall outside of the development footprint. Initially, as part of the original field surveys, these patches of woodland were assessed and mapped as native vegetation zones and accordingly, plot/transects were completed within each zone according to the FBA (see **Figure 7**). However, through the design process, the layout of the proposed development was adjusted to avoid these native woodland vegetation zones. For example, the vegetation zone for River Red Gum riparian tall woodland / open forest is outside of the development footprint (**Figure 6**); however it has been included in the assessment due to potential impacts from the proposed water pump and pipeline adjacent to the Namoi River and because the location/alignment of this infrastructure was not known at the time of surveys. On this basis, the entire patch of River Red Gum riparian tall woodland/open forest was surveyed and mapped as part of the assessment. Hence, all figures in the BAR show this patch, but it lies outside of the development footprint. Similarly, other patches of native woodland are mapped as vegetation zones in **Figure 7** but lie outside of the development footprint.

Table 14 Vegetation zones mapped within the Study Area

Code	Vegetation Zone	Mapped Extent (ha)
1383	White Box grassy woodland (moderate to good condition)	21.27
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition)	55.22
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition)	0.1
78	River Red Gum riparian tall woodland / open forest (moderate to good condition) [#]	0.47
1383	White Box grassy woodland (derived grassland)	380.30
N/A	Non-native Groundcover	558.77
Total Area (ha)		1016.12

The patch of River Red Gum (PCT 78) is located outside of the Development Site.

As a result of impact avoidance measures applied during the design of the Development footprint, all of the woody vegetation patches within the Study Area were able to be avoided. Impact avoidance measures are discussed further in **Section 5.1**. The vegetation zones that will be directly impacted by construction of the Development are limited to Derived Native Grassland (VZ1, a treeless form of PCT 1383 White Box woodland) and Non-native Groundcover (VZ2), which is not a native vegetation zone so does not require further assessment (and does not generate ecosystem credits in the Credit Calculator). The impacted vegetation zones that lie within the Development footprint, along with the impact area and the FBA plots completed within each, are listed in **Table 15**.

Table 15 Vegetation zones within the Development Footprint (Impact Areas) – with plots

Zone No.	PCT Code	Vegetation Zone	Impact Area (ha) [#]	Plots [#]
1	1383	White Box grassy woodland (Derived Native Grassland)	1.17	VZ1P2 VZ2P6 VZ2P7 VZ2P8
2	1383	Non-native Groundcover	86.61	VZ1P1 VZ1P3 VZ1P6 VZ2P1 VZ2P2 VZ2P3
		Total	87.78	

Plot names listed are only those that have been used in the BioBanking Credit Calculator.

It is noted also that due to changes in mapping of vegetation zones following field work, some vegetation zones have been combined and/or renumbered. This means that plot names for former vegetation zones are now included in new vegetation zones. For example, as listed in **Table 15**, plots that were located within the original Zone 2 are now included in Zone 1 (Derived Native Grassland).

3.7 Threatened Ecological Communities

According to the Atlas of NSW Wildlife (10 km search – see **Appendix F**), six threatened ecological communities (TECs), as listed under the BC Act, potentially occur on the Development Site, including:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Howell Shrublands in the New England Tableland and Nandewar Bioregions;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions;
- Native Vegetation on Cracking Clay Soils of the Liverpool Plains;
- Semi-evergreen Vine Thicket in the Brigalow Belt South and Nandewar Bioregions; and
- White Box Yellow Box Blakely's Red Gum Woodland.

In relation to the above-listed communities, it is noted that the TEC *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions* is listed in the SEARs as a matter requiring further consideration. However, no evidence of this community, including any individuals of *Brigalow Acacia harpophylla*, was recorded within the Study Area. Accordingly, the Brigalow EEC is not considered further in this assessment.

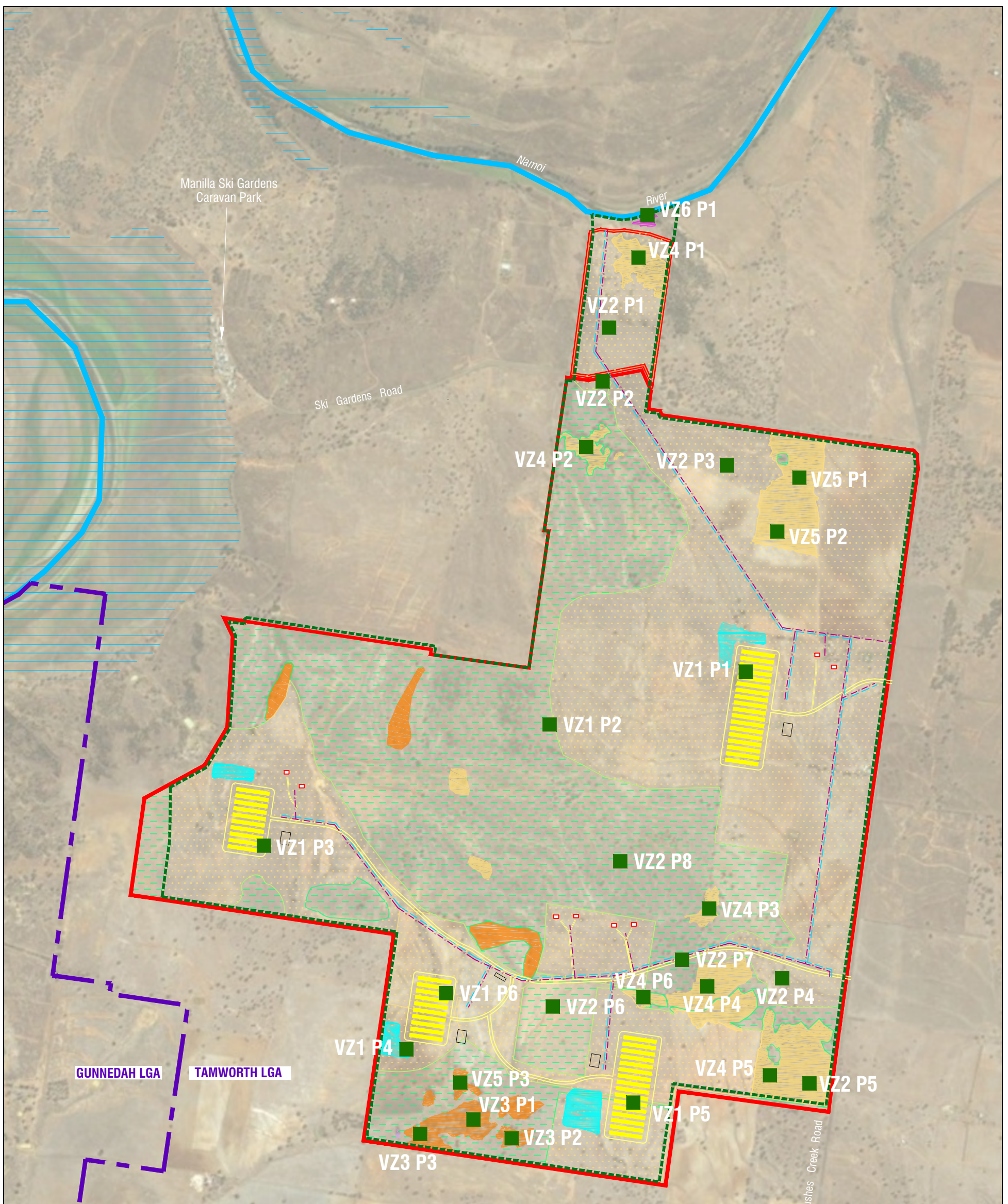
Two of the above listed TECs were identified within the Study Area during the field survey and these are listed below in **Table 16** and displayed in **Figure 8**.

Table 16 Threatened ecological communities mapped within the study area

Threatened Community	PCT Code	Status [#]		Mapped Extent (ha)
		TSC Act	EPBC Act	
White Box Yellow Box Blakely's Red Gum Woodland	1383 589	E	CE	63.15
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	101	E	E	0.10

E = endangered; CE = critically endangered

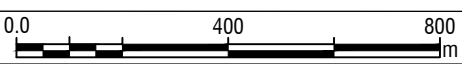
H:\Projects\SLR\610-SYD\610-SYD\610-16117 ProTen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOG\SLR61016117_F07_VegZones&Plots_V6.dwg



- LEGEND**
- FBA Plot / Transect
 - Development site
 - Survey Area
 - Poultry shed
 - Proposed internal access road
 - Proposed driveway
 - Proposed power line
 - Proposed water line
 - Proposed project related residence
 - LGA boundary
 - Dam full supply level

- Vegetation Zones (Impact Zones)**
- White Box grassy woodland - Derived grassland (PCT1383) (VZ1)
 - Non-native groundcover (VZ2)
 - White Box grassy woodland (moderate to good condition) (PCT1383) (VZ3)
 - White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition) (PCT589) (VZ4 and VZ5)
 - Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition)(PCT101)
 - River Red Gum riparian tall woodland / open forest (moderate to good condition) (PCT78) (VZ6)

Notes and Cautions:
 (1) Background satellite image sourced from ESRI Basemaps.
 (2) All boundaries and areas shown on this plan are approximate only and subject to survey verification.

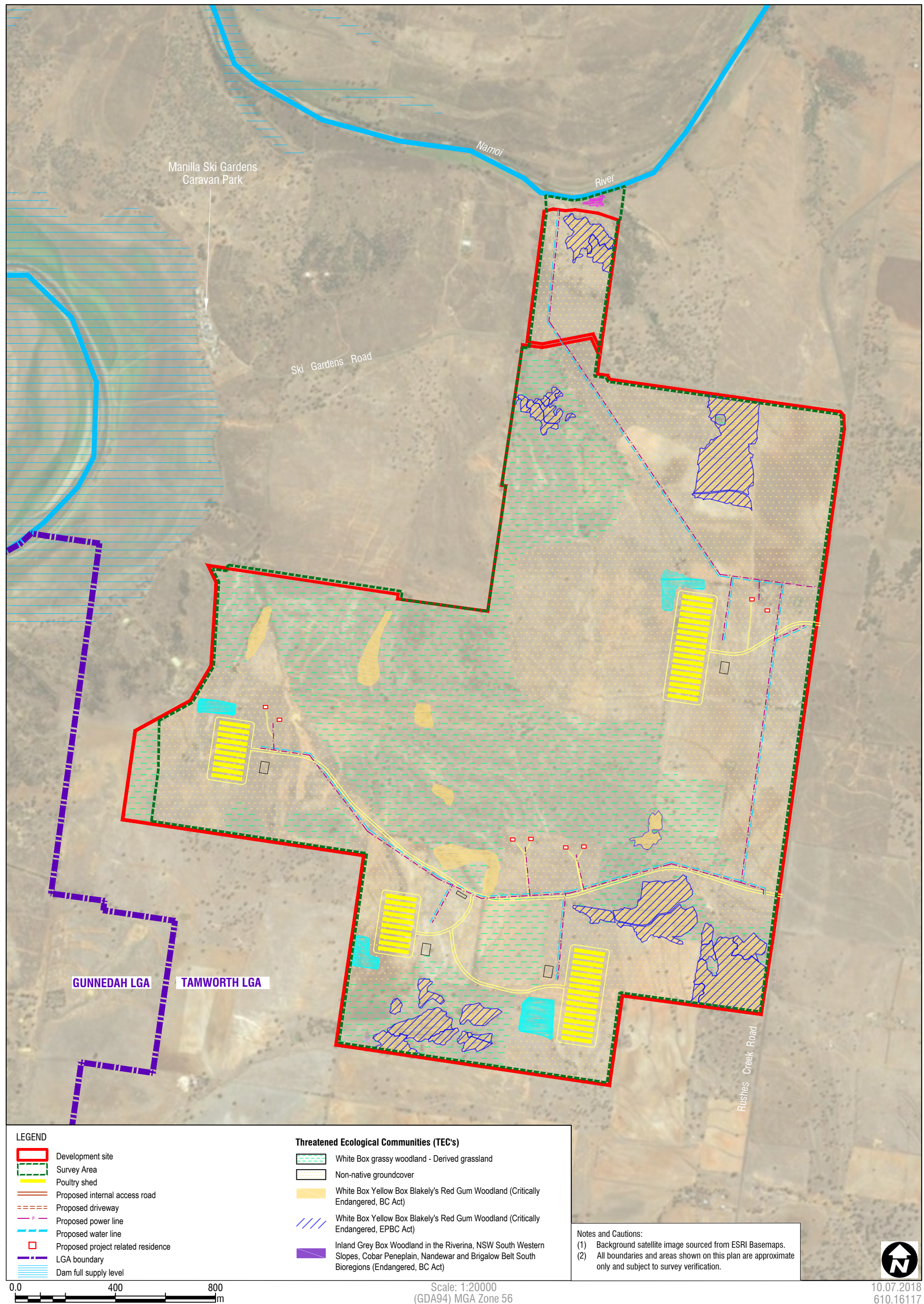


Scale: 1:20000
(GDA94) MGA Zone 56

09.07.2018
610.16117



H:\Projects\SLR\610-Srv\SYD\610-SYD\610-16117 ProTen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOG\SLR61016117_F08_TEC_V5.dwg



4 Threatened Species

This section describes the threatened species predicted to occur within the Study Area, based on the field survey results, the outputs of desktop assessment and the outputs of the BioBanking Credit Calculator, in accordance with Section 6 of the FBA.

4.1 Overview

Several sources of information have been employed to create a list of candidate threatened species and populations relevant to the Study Area. The Credit Calculator outputs of ecosystem credit species and species credit species are used as the main basis of this BAR, along with previous records of threatened species retrieved from the Atlas of NSW Wildlife database (10 km search area). The previous records (retrieved from the Wildlife Atlas) of threatened flora and fauna, as listed under the BC Act, are contained in **Appendix F** and displayed in **Figure 9**.

In addition, as noted in **Section 1.4**, OEH identified the following threatened biota as “requiring further consideration” in its input to the SEARs:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Regent Honeyeater (*Anthochaera phrygia*); and
- Lake Keepit Hakea (*Hakea pulvinifera*).

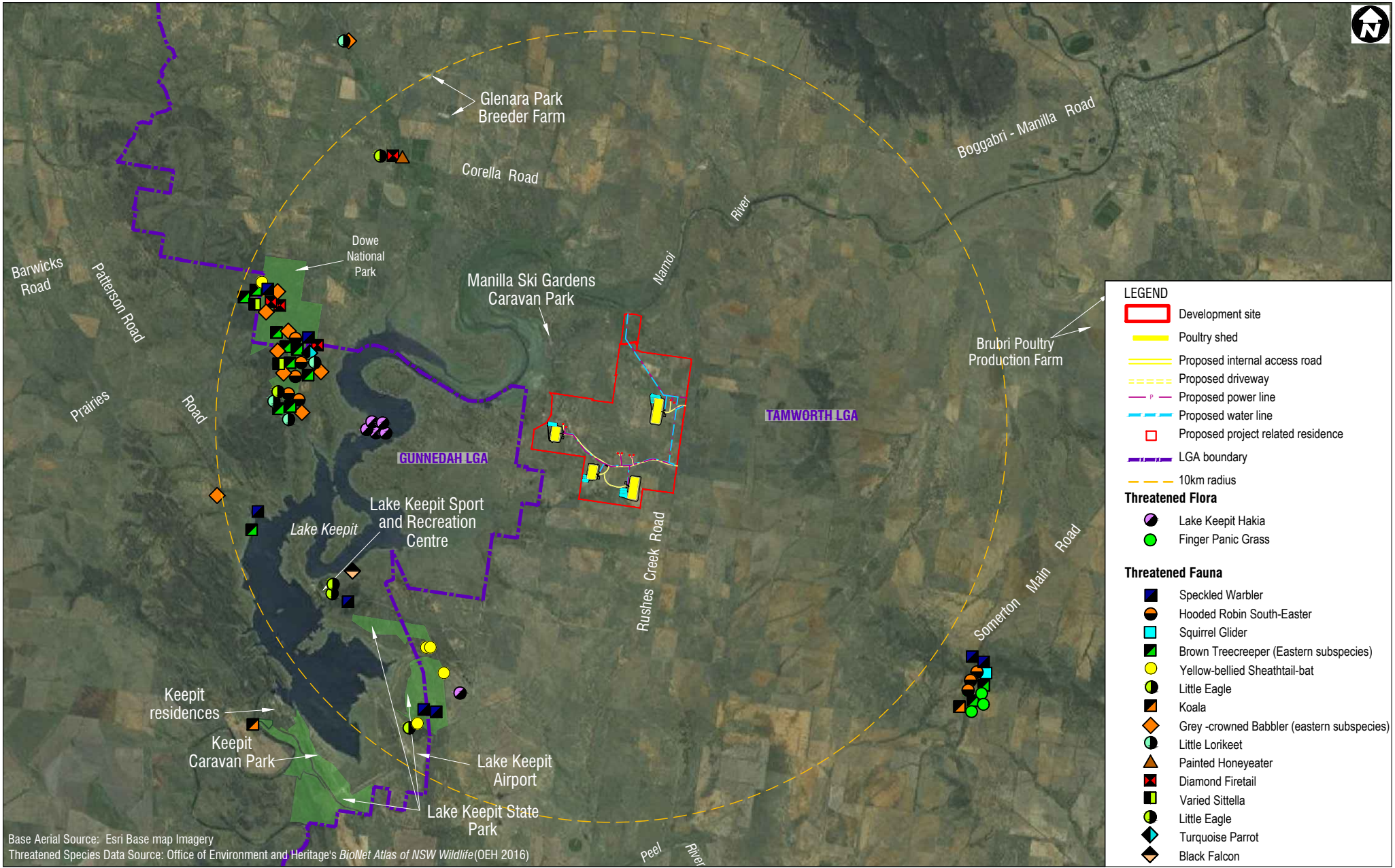
Combining Credit Calculator outputs for threatened species with search results from the Atlas of NSW Wildlife and Protected Matters Search Tool (PMST) results, an assemblage of 81 threatened species and populations has been compiled and each entity has been assessed for its potential relevance to the Study Area. This assemblage consists of 14 plants, 44 birds, 16 mammals, one amphibian, two fish and four reptiles. Additionally six TECs have been identified as potentially occurring (see **Section 3.7**). The habitat requirements and ecology of the potential threatened species and relevant habitat attributes within the Study Area are described in the likelihood of occurrence table presented in **Appendix F** of this report. The likelihood of occurrence rating is based on the results of field surveys, and particularly on the extent, nature and condition of habitat types and habitat features within the Study Area.

Of the 81 threatened biota potentially relevant to the Development Site, two species were recorded within the Study Area during the field surveys: the Little Eagle and Grey-crowned Babbler. Moreover, five threatened bat species that were not predicted to occur in the Credit Calculator or previously recorded within the locality (on the Atlas of NSW Wildlife database), were recorded on the Development Site during field surveys. These results are summarised below in **Table 17**.

Table 17 Threatened species recorded within the Study Area

Species	Status	Credit type
Grey-crowned Babbler (<i>Pomatostomus temporalis temporalis</i>)	Vulnerable (TSC Act)	Ecosystem
Little Eagle (<i>Hieraetus morphnoides</i>)	Vulnerable (TSC Act)	Ecosystem
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Vulnerable (TSC Act)	Ecosystem
Eastern Freetail-bat (<i>Mormopterus norfolkensis</i>)	Vulnerable (TSC Act)	Ecosystem
Eastern Bentwing-bat (<i>Miniopterus schreibersii oceanensis</i>)	Vulnerable (TSC Act)	Ecosystem and Species
Eastern Cave Bat (<i>Vespadelus troughtoni</i>)	Vulnerable (TSC Act)	Ecosystem and Species
Greater Broad-nosed Bat (<i>Scoteanax rueppellii</i>)	Vulnerable (TSC Act)	Ecosystem

H:\Projects-SLR\610-SivSYD\610-SYD\610.16117\Profen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOGYSLR\61016117_F09_ECO_ThreatenedSpec_V4.dwg



Previous Records of Threatened Species within the Locality

FIGURE 9

These species are discussed further in the following section. Details regarding field survey methods and effort are provided in **Appendix C**.

The following sections describe ecosystem credit species and species credit species separately, in accordance with Chapter 6 of the FBA.

4.2 Ecosystem Credit Species

4.2.1 Predicted Threatened Species (by Credit Calculator)

A total of 28 threatened species have been predicted to occur within the Study Area by the Credit Calculator. The predicted occurrence of these threatened species is based on the PCTs that have been mapped within the Study Area, the distributional range of the species (from the Threatened Species Profile Database), condition of the vegetation and patch size (as per Section 6.3 of the FBA).

The predicted threatened species report from the Credit Calculator is provided in **Appendix G**. **Table 18** lists the predicted threatened species for the Study Area (including records from field surveys) and provides reasoning for the predicted presence or absence of the species within the Study Area, according to Section 6.3 of the FBA.

Of the 28 predicted threatened species listed in the Credit Calculator, two were recorded within the Study Area:

- Grey-crowned babbler (eastern subspecies), *Pomatostomus temporalis temporalis*; and
- Little Eagle, *Hieraetus morphnoides*.

Both species are listed as ‘vulnerable’ under Schedule 2 of the BC Act. An additional five threatened bat species that generate ecosystem credits were also recorded on site during field surveys, as discussed in **Section 4.2.3**.

Further details on these species are provided below in **Table 18**.

Table 18 Ecosystem credit species generated by credit calculator

Species ^{##}	BC Act	LoO [#]	On Site ^{##}	Habitat Availability
Australian Painted Snipe <i>Rostratula australis</i>	Endangered	L	Yes	Limited potential habitat on Site near farm dams and Namoi River. Favourable nesting habitat absent.
Barking Owl <i>Ninox connivens</i>	Vulnerable	M	Yes	Potential habitat availability. Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Large home ranges.
Black-chinned Honeyeater <i>Melithreptus gularis gularis</i>	Vulnerable	L	Yes	Habitat available in isolated woodland patches on Site, flowering eucalypts may provide foraging habitat.
Brolga <i>Grus rubicunda</i>	Vulnerable	L	Yes	Potential feeding habitat available on Site, no nearby records, large home range.

Species ^{##}	BC Act	LoO [#]	On Site ^{##}	Habitat Availability
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	Vulnerable	L	Yes	Habitat available in isolated woodland patches on Site, ground layer foraging resources are largely absent. Records within 10 km of Site in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Bush Stone-curlew <i>Burhinus grallarius</i>	Endangered	L	Yes	Habitat available in isolated woodland patches on Site, presence of foxes would be a deterrent. No records within 10 km of Site (Atlas of NSW Wildlife).
Corben's Long-eared Bat <i>Nyctophilus corbeni</i>	Vulnerable	M	Yes	Habitat available in woodland patches on Site. Roosting habitat such as tree hollows and rock crevices is limited.
Diamond Firetail <i>Stagonopleura guttata</i>	Vulnerable	M	Yes	Moderate habitat available on Site, dense shrubs for nesting predominantly absent. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Flame Robin <i>Petroica phoenicea</i>	Vulnerable	L	Yes	Low potential habitat availability in isolated woodland patches. Prefers mountain forest areas, may migrate to open woodland in valleys during winter. No records within 10 km of Site (Atlas of NSW Wildlife).
Freckled Duck <i>Stictonetta naevosa</i>	Vulnerable	L	Yes	Low potential habitat availability. Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree.
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	Vulnerable	M	Yes	Moderate habitat available on Site. Large hollow-bearing trees for nesting scarce. No records within 10 km of Site (Atlas of NSW Wildlife).
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	Vulnerable	L	Yes	Low potential habitat availability in isolated woodland patches. Large hollow-bearing trees for nesting scarce. No significant food sources present on Site (Casuarina and Allocasuarina species).
Grey-crowned babbler (eastern subspecies) <i>Pomatostomus temporalis temporalis</i>	Vulnerable	P	Yes	Recorded in woodland patch in central north of Site. Habitat available in isolated woodland patches. Further records within 10 km of Site, in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Hooded Robin <i>Melanodryas cucullata cucullata</i>	Vulnerable	L	Yes	Habitat available in isolated woodland patches although prefers structurally diverse forests or woodland Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).

Species ^{##}	BC Act	LoO [#]	On Site ^{##}	Habitat Availability
Little Eagle <i>Hieraaetus morphnoides</i>	Vulnerable	P	Yes	One adult individual observed in flight in northwest of Study Area. Habitat available on Site; large home range. Records within 10 km of Site, in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Little Lorikeet <i>Glossopsitta pusilla</i>	Vulnerable	M	Yes	Possible foraging habitat in vegetation patches on Site, flowering eucalypts available on Site. Large home ranges. Records within 10 km of Site in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Magpie Goose <i>Anseranas semipalmata</i>	Vulnerable	L	Yes	Low potential habitat availability. Prefers floodplains and wet grasslands.
Masked Owl <i>Tyto novaehollandiae</i>	Vulnerable	M	Yes	Low potential habitat availability in isolated woodland patches. Inhabits woodland and open forest. No records within 10 km of Site (Atlas of NSW Wildlife).
Painted Honeyeater <i>Grantiella picta</i>	Vulnerable	L	Yes	Habitat available in isolated woodland patches on Site, flowering eucalypts may provide foraging habitat. Lack of favourable Mistletoe food sources. Records within of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Scarlet Robin <i>Petroica boodang</i>	Vulnerable	M	Yes	Habitat available in isolated woodland patches on Site. Large home-ranges. No records within 10 km of Site (Atlas of NSW Wildlife)
Speckled Warbler <i>Chthonicola sagittata</i>	Vulnerable	L	Yes	Low potential habitat availability in isolated woodland patches. Large, relatively undisturbed remnants are required for the species to persist in an area. Records within of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Spotted Harrier <i>Circus assimilis</i>	Vulnerable	L	Yes	Habitat available on Site, largely vagrant - unlikely to occur apart from possible foraging activity. Found most commonly in native grassland.
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	Vulnerable	L	Yes	Low potential habitat availability. Generally a forest dependent species, den opportunities scarce. Large home ranges.
Square-tailed Kite <i>Lophoictinia isura</i>	Vulnerable	M	Yes	Habitat available in isolated woodland patches on Site, large home ranges. Low quality nesting habitat (prefers timbered watercourses).
Swift Parrot <i>Lathamus discolor</i>	Endangered	M	Yes	Possible foraging habitat in woodland patches on Site, flowering eucalypts available on site. Breed in Tasmania.

Species ^{##}	BC Act	LoO [#]	On Site ^{###}	Habitat Availability
Turquoise Parrot <i>Neophema pulchella</i>	Vulnerable	M	Yes	Moderate habitat available, hollow-bearing trees for nesting are present in small vegetation patches and paddock trees. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Varied Sittella <i>Daphoenositta chrysoptera</i>	Vulnerable	H	Yes	Low potential habitat availability in isolated woodland patches. Inhabits woodland and open forest. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Yellow-bellied Sheathtail-bat <i>Saccolaimus flaviventris</i>	Vulnerable	M	Yes	Foraging and roosting habitat available in isolated woodland patches. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).

LoO Likelihood or Occurrence - the probability of a threatened species occurring on the site
P Present or recorded on the subject site
H High likelihood of occurrence
M Moderate likelihood of occurrence
L Low likelihood of occurrence
N No potential relevance

All predicted threatened species listed in the Credit Calculator have been ticked as 'On Site', as the assessor has determined that at least one habitat component for all species is present on the site, as per Section 6.3 of the FBA.

Species in **bold** type were recorded on Site during the field surveys.

4.2.2 Additional Threatened Species - Atlas of NSW Wildlife Database

In addition to the ecosystem credit species predicted to occur on the Development Site in the Credit Calculator, one other ecosystem credit threatened species, the Black Falcon, has previously been recorded within 10 km of the Site in the Atlas of NSW Wildlife. Details regarding the Black Falcon are listed below in **Table 19**, which are also provided in the Likelihood of Occurrence table in **Appendix F**. The process of assessing habitat for such species was undertaken in accordance with the steps of identification in Section 6.3 of the FBA.

Table 19 Additional ecosystem credit species generated by Atlas of NSW Wildlife

Species	BC Act	LoO [#]	On Site	Relevance
Black Falcon (<i>Falco subniger</i>)	Vulnerable	M	No	Possible habitat in isolated woodland patches near to Namoi River or other ephemeral watercourses. Preferred habitat is tree-lined watercourses, mainly in arid and semi-arid areas. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).

LoO Likelihood or Occurrence - the probability of a threatened species occurring on the site
M Moderate likelihood of occurrence

4.2.3 Candidate Ecosystem Credit Species

The relevant steps of Sections 6.2 and 6.3 of the FBA have been used to identify the ecosystem credit species present on the Development Site, or which have a high likelihood of occurrence on the Site. The likelihood of occurrence has been identified for all of the potential ecosystem credit species by conducting habitat and vegetation type assessments across the Site. The results for this are provided in the comprehensive likelihood of occurrence table in **Appendix F**. Furthermore, ecological surveys for species with moderate or high likelihood of occurrence were undertaken on the Site in October 2016.

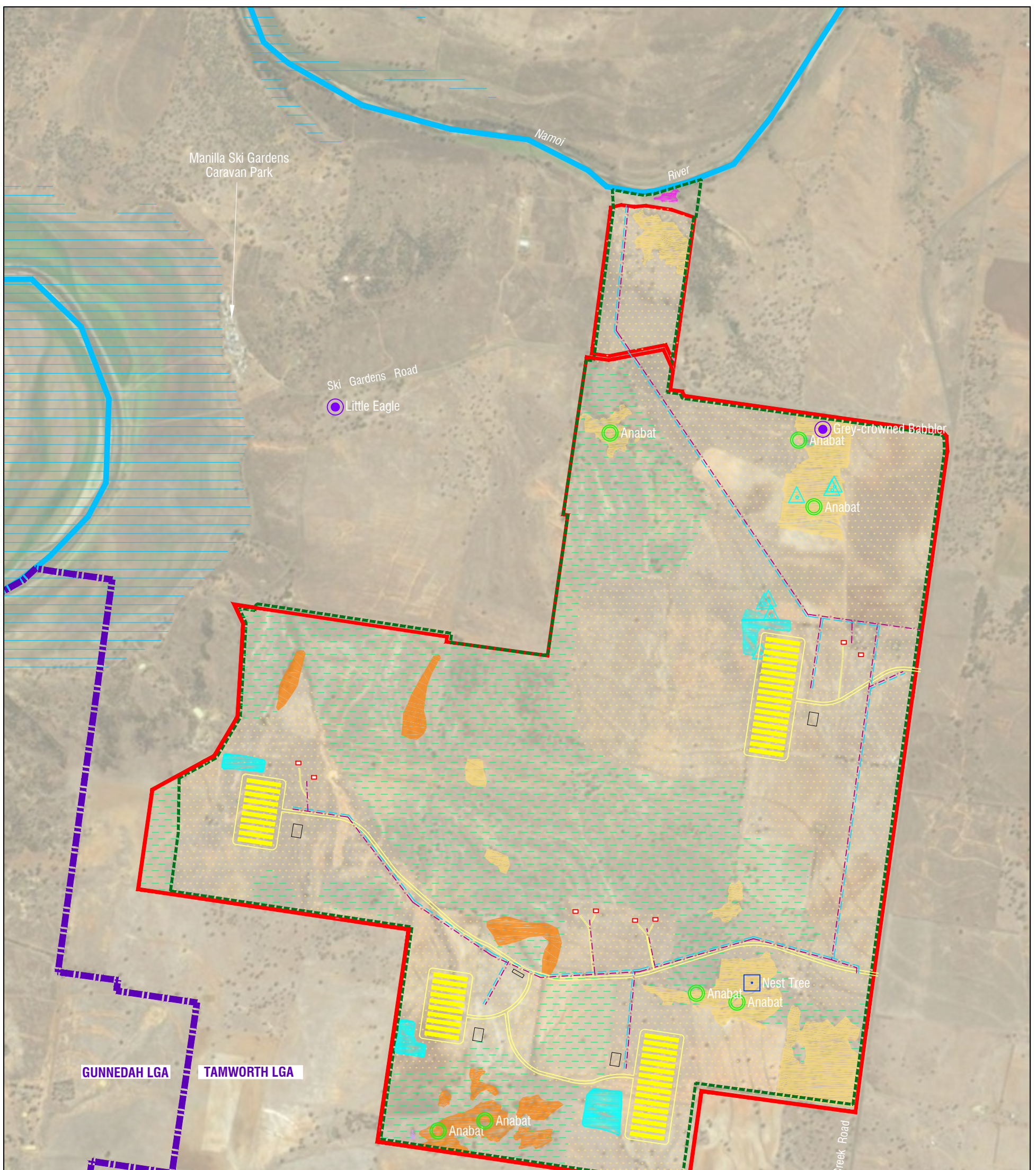
A total of 25 bird and three mammal (two microchiropteran bats) ecosystem credit species have been predicted to occur (**Table 18**) based on the Credit Calculator results. Of these species, two were recorded on the Development Site during field surveys, being the Grey-crowned babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*) and Little Eagle (*Hieraetus morphnoides*).

Additionally, the following five threatened microchiropteran bat species (ecosystem credit species) were recorded on the Development Site, which were not listed in the Credit Calculator output or OEH Atlas of NSW Wildlife 10 km search:

- Eastern False Pipistrelle, *Falsistrellus tasmaniensis*;
- Eastern Freetail-bat, *Mormopterus norfolkensis*;
- Eastern Bent-wing Bat, *Miniopterus schreibersii*;
- Eastern Cave Bat, *Vespadelus troughtoni*; and
- Greater Broad-nosed bat, *Scoteanax rueppellii*.

The additional recordings of the microchiropteran bats were entered into the 'Threatened species survey results' tab of the Credit Calculator and are therefore included in the offset calculation for the Development. The two microbat species identified as predicted to occur have also been included in the candidate species as listed in **Table 20**. The seven recorded species are briefly described below in **Table 20** and the locations of records within the Study Area are shown in **Figure 10**.

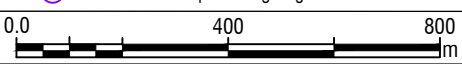
H:\Projects\SLR\610-SV\SYD\610-SYD\610-16117 ProTen - Rushes Creek Site Investigations\06 SLR Data\06 Drafting\CAD\ECOLOG\SLR61016117_F10_ThreatenedSpecies_HBT_V4.dwg



LEGEND

Development site	Survey Area	Poultry shed	Proposed internal access road	Proposed driveway	Proposed power line	Proposed water line	Proposed project related residence	LGA boundary	Dam full supply level
Anabat	HBT	Nest	Threatened Species Sighting	Plant Community Types (PCT's)					
				Derived grassland	Non-native grassland (PCT 1383) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion				
				(PCT 589) White Box - White Cypress Pine - Silver-leaved ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion	(PCT 101) Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion				
				(PCT 78) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion					

Notes and Cautions:
 (1) Background satellite image sourced from ESRI Basemaps.
 (2) All boundaries and areas shown on this plan are approximate only and subject to survey verification.



Scale: 1:20000
(GDA94) MGA Zone 56



30.07.2018
610.16117

*NOTE:
Threatened microchiropteran bat species were recorded at Anabat locations. See Table 17 for list of species

Threatened species and hollow-bearing trees recorded in the Development site

FIGURE 10

Table 20 Ecosystem credit threatened species recorded within the Study Area

Species	Status	Credit Type	Description
Grey-crowned Babbler (<i>Pomatostomus temporalis temporalis</i>)	Vulnerable (BC Act)	Ecosystem	<p>The eastern subspecies (<i>temporalis</i>) occurs from Cape York south through Queensland, NSW and Victoria and formerly to the south east of South Australia. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains. The Grey-crowned Babbler inhabits open box gum woodlands on the slopes and box-cypress-pine and open box woodlands on alluvial plains. They live in family groups up to fifteen birds that consist of a breeding pair and young from previous breeding seasons.</p> <p>Grey-crowned Babblers build numerous dome-shaped stick nests in clusters, usually located in shrubs or sapling eucalypts, although they may be built in low branches of large eucalypts. They feed on invertebrates, either by foraging on the trunks and branches of eucalypts and other woodland trees, or on the ground. This species can tolerate a loss of 10% habitat within the Namoi CMA, however cannot tolerate loss of landscape connectivity.</p> <p>No nests were observed during the survey; however 4+ individuals were observed foraging in single patch of woodland in the central north of the Site. This occurrence indicates that the species is likely to be breeding nearby but outside of the Study Area.</p>
Little Eagle (<i>Hieraetus morphnoides</i>)	Vulnerable (BC Act)	Ecosystem	<p>The Little Eagle is found throughout the Australian mainland apart from the most densely forested parts of the Dividing Range. It occurs as a single population throughout NSW.</p> <p>The Little Eagle occupies open eucalypt forest, woodland or open woodland, casuarina or acacia woodlands and riparian woodlands of interior NSW. It preys on birds, reptiles and mammals, and occasionally large insects and carrion. Adults nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.</p> <p>This species is known to occur in the Namoi CMA, although is not predicted to occur in the Credit Calculator or previously recorded in the locality. Relatively widespread in eastern NSW.</p> <p>No large nests were observed on the Site. It is likely that the individual observed would use the Study Area for foraging and as part of its large home-range.</p>
Eastern False Pipistrelle (<i>Falsistrellus tasmaniensis</i>)	Vulnerable (BC Act)	Ecosystem	<p>The Eastern False Pipistrelle inhabits sclerophyll forests in south eastern Australia from southern Queensland to Tasmania with a preference for moist forest types and tall trees (>20 m). It roosts predominantly in hollow-bearing trees although can use caves or buildings. Foraging distances can be large with one record of a 12 km commute from roost.</p> <p>The Eastern False Pipistrelle's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.</p>
Eastern Freetail-bat	Vulnerable	Ecosystem	<p>The Eastern Freetail-bat is found in dry sclerophyll forest, woodland, swamp forests and mangrove forests, generally to the</p>

Species	Status	Credit Type	Description
<i>(Mormopterus norfolkensis)</i>	(BC Act)		east of the Great Dividing Range. This species nests in hollow-bearing trees although will also roost under bark or in man-made structures. The Site provides limited hollow-bearing trees that might provide roosting habitat for this species. Foraging habitat is available in the isolated woodland patches of the Site. The Threatened Species Profile Database contains no information on the habitat loss tolerance of the Eastern Freetail-bat for the Namoi CMA (likely because this area is the western extremities of its distribution). The Eastern Freetail-bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.
Eastern Bentwing-bat <i>(Miniopterus schreibersii oceanensis)</i>	Vulnerable (BC Act)	Ecosystem and Species	This species occurs in a variety of forest formations along the east and north-west coasts of Australia. Roosting occurs predominantly in caves and occasionally in derelict mines, storm-water tunnels, buildings and other man-made structures. Populations use maternity caves in spring and summer and during other months disperse up to 300 km from these caves. This species was recorded on Site using Anabat detectors (likely foraging). It is possible that this species could use farm sheds for roosting habitat; however, a maternity cave is not present on Site. Foraging habitat is available in the isolated woodland patches of the Site. Whilst foraging habitat is abundant, the Site does not contain a maternity cave or any significant roosting habitat for this species and for this reason, preparation of a species polygon (according to Section 6.5 of the FBA) is not required. The Eastern Bentwing-bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act..
Eastern Cave Bat <i>(Vespadelus troughtoni)</i>	Vulnerable (BC Act)	Ecosystem and Species	Occurs in a broad band on both sides of the Great Dividing Range from Cape York to Kempsey, with records from the New England Tablelands and the upper north coast of NSW. The western limit appears to be the Warrumbungle Range, and there is a single record from southern NSW, east of the ACT. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Whilst foraging habitat is abundant, the Site does not contain a maternity cave or any significant roosting habitat for this species and for this reason, preparation of a species polygon (according to Section 6.5 of the FBA). The Eastern Cave Bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.
Greater Broad-nosed Bat <i>(Scoteanax rueppellii)</i>	Vulnerable (BC Act)	Ecosystem	This species was recorded as 'Probable Identification'. Probable Identification means that the calls recorded by Anabat have some possibility of confusion of calls with those of other bat species. The Greater Broad-nosed Bat utilises habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Its distribution includes slopes of the Great-dividing range and coastal regions from north-eastern Victoria to the Atherton Tableland in

Species	Status	Credit Type	Description
			Queensland. This species predominantly roosts in tree hollows, which are available on the site in small amounts. Woodland foraging habitat for this species is abundant on the Site however preferred creek line and riparian vegetation is largely absent. The Greater Broad-nosed Bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.

Other bat species that are predicted to occur in the Credit Calculator that would likely frequent woodland areas of the Development Site, at least on an occasional basis, are listed as candidate ecosystem credit species in **Table 21**.

Table 21 Other candidate (ecosystem credit) threatened species

<p>Little Bentwing-bat (<i>Miniopterus australis</i>)</p>	<p>Vulnerable (BC Act)</p>	<p>Ecosystem and Species</p>	<p>The Little Bentwing-bat inhabits moist eucalypt forest, rainforest, vine thicket, wet and dry sclerophyll forest, Melaleuca swamps, dense coastal forests and banksia scrub in south eastern Australia from Cape York in Queensland to Wollongong in NSW. This species often uses caves, abandoned mines or buildings as roosting habitat however does also utilise tree hollows, which are available (although limited) on the site. Like the Eastern Bentwing-bat, this species uses maternity caves during summer months to rear young. Whilst foraging habitat is widespread across the Study Area, no maternity caves or other suitable roosting habitats for this species were recorded. For this reason, preparation of a species polygon (according to Section 6.5 of the FBA) is not required for loss of breeding habitat for the Little Bentwing-bat.</p> <p>The Little Bentwing-bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.</p>
<p>Yellow-bellied Sheathtail-bat (<i>Saccolaimus flaviventris</i>)</p>	<p>Vulnerable (BC Act)</p>	<p>Ecosystem</p>	<p>The woodland patches within the Study Area represent suitable foraging habitat for this species, although roosting habitat, such as hollow-bearing trees, is scarce.</p> <p>This species occurs in a variety of habitat types and occupies very large ranges. Like all microchiropteran bats, this species is most active in warmer months between October and March. It forages throughout most habitats over its range, including treeless areas. Individuals roost in tree hollows or even in treeless areas (including in mammal burrows). The limited hollow-bearing trees within the Site could provide roosting habitat for this species. Breeding has been recorded from December to mid-March.</p> <p>The Yellow-bellied Sheathtail-bat sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act.</p>
<p>Corben's Long-eared Bat (<i>Nyctophilus corbeni</i>)</p>	<p>Vulnerable (BC Act)</p>	<p>Ecosystem</p>	<p>This species inhabits a variety of vegetation types, including mallee, Bullocke (<i>Allocasuarina luehmannii</i>) and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation. The distribution of the southeastern form coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Roosts in tree hollows, crevices, and under loose bark.</p> <p>Forages in understorey vegetation to hunt non-flying prey - especially caterpillars and beetles - and will even hunt on the ground.</p> <p>The Corben's Long-eared Bat's sensitivity to habitat loss is classified as moderate in response to the species listing under the BC Act..</p>

4.3 Species Credit Species

4.3.1 Generated by Credit Calculator

A total of 18 species credit species have been determined relevant to the Study Area according to the Credit Calculator. The 'Threatened species requiring survey' report from the Credit Calculator, which lists species credit species and their survey timing requirements, is provided in **Appendix G**. The list of species, along with their specific habitat requirements, has been reproduced in **Table 22**. The list of species is based, *inter alia*, on previous records, distributional range, habitat requirements (as listed in the Threatened Species Profile Database), the 'Geographic/Habitat Features' identified in the Credit Calculator.

Three of these species have been identified as having a moderate likelihood of occurrence with suitable habitat attributes present and on the Development Site (refer to **Table 22**).

No species credit species were recorded during ecological surveys of the Site in October 2016 and October 2017.

There is no roosting/breeding habitat in the Study Area for cave-dwelling microbats, which attract both species credits and ecosystem credits. These species attract ecosystem credits for their foraging habitat and species credits for their breeding habitat, being suitable maternity or roost caves. Several of these species were recorded within the Study Area, including the Eastern Cave Bat (*Vespadelus troughtoni*), the Eastern Bentwing-bat (*Miniopterus schreibersii oceanensis*) and the Little Bentwing-bat (*Miniopterus australis*). These species are listed as ecosystem credit species for the Development Site (see **Section 4.2**), however due to the lack of breeding habitat in the Study Area, they have not been identified as species credit species for the Development. Please refer to **Table 20** and **Table 21** for the descriptions of these microchiropteran bat species.

Table 22 Species credit species – Credit Calculator output

Species	BC Act	LoO [#]	On Site	Explanation (for presence/absence) ^{##}
Austral Toadflax <i>Thesium australe</i>	Vulnerable	L	No	Low habitat availability, prefers grassy woodlands of east coast and tablelands. Often found in association with Kangaroo Grass (<i>Themeda australis</i>). No records within 10 km of Site (Atlas of NSW Wildlife).
Belson's Panic <i>Homopholis belsonii</i>	Endangered	M	No	Possible habitat availability. Often found on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils. No records within 10 km of Site (Atlas of NSW Wildlife).
Black-breasted Buzzard <i>Hamirostra melanosternon</i>	Vulnerable	L	No	Potential habitat availability in isolated woodland areas, prefers timbered watercourses. No records within 10 km of Site (Atlas of NSW Wildlife).
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	Endangered	L	No	Low habitat availability, prefers floodplain wetlands. No records within 10 km of Site (Atlas of NSW Wildlife).
Bluegrass <i>Dichanthium setosum</i>	Vulnerable	M	No	Possible habitat availability. Associated with heavy basaltic black soils and red-brown loams with clay subsoil. No records within of Site (Atlas of NSW

Species	BC Act	LoO [#]	On Site	Explanation (for presence/absence) ^{##}
				Wildlife).
Border Thick-tailed Gecko <i>Uvidicolus sphyrurus</i>	Vulnerable	L	No	Low habitat availability on site, prefers rocky areas, particularly granite (two very small pockets of this habitat exist in south west corner of Site). No records within 10 km of Site (Atlas of NSW Wildlife).
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	Vulnerable	L	No	Moderate habitat available. Foraging habitat abundant throughout woodland containing rough bark trees. Hollows-bearing trees for nesting are relatively scarce. No records within 10 km of Site (Atlas of NSW Wildlife).
Eastern Osprey	Vulnerable	L	No	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within 1 km of the sea. Namoi River represents suitable habitat. No records within 10 km of Site (Atlas of NSW Wildlife).
Eastern Pygmy Possum <i>Cercartetus nanus</i>	Vulnerable	L	No	Very low potential habitat availability in woodland areas. Food resources are highly scarce. Understorey virtually absent and shelter is scarce. No records within 10 km of Site (Atlas of NSW Wildlife).
<i>Euphrasia arguta</i>	Vulnerable	L	No	Historically recorded in open forest country around Bathurst in sub humid places. Plants from the Nundle area have been reported from eucalypt forest with a mixed grass and shrub understorey. Flowering occurring between January and April. This species is semi-parasitic and attaches to the roots of other associated plants. No records within 10 km of Site (Atlas of NSW Wildlife).
Finger Panic Grass <i>Digitaria porrecta</i>	Endangered	L	No	Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Frequently recorded associated tree species are <i>Eucalyptus albens</i> and <i>Acacia pendula</i> . Common associated grasses and forbs in NSW sites include <i>Austrostipa aristiglumis</i> , <i>Enteropogon acicularis</i> , <i>Cyperus bifax</i> , <i>Hibiscus trionum</i> and <i>Neptunia gracilis</i> . Records within 10 km of Site -in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Koala <i>Phascolarctos cinereus</i>	Vulnerable	L	No	No scats or tree trunk scratches observed on site. SEPP 44 feed trees (<i>Eucalyptus populnea</i> and <i>Eucalyptus albens</i>) present in isolated woodland patches. Records within 10 km of Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife).
Native Milkwort <i>Polygala linearifolia</i>	Endangered	M	No	Moderate habitat available. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of <i>Eucalyptus caleyi</i> , <i>Eucalyptus dealbata</i> and <i>Callitris</i> , and in yellow podsolic soil on granite in layered open forest. No records within 10 km of Site (Atlas of NSW Wildlife).

Species	BC Act	LoO [#]	On Site	Explanation (for presence/absence) ^{##}
Pale-headed Snake <i>Hoplocephalus bitorquatus</i>	Vulnerable	L	No	Low potential habitat availability due to lack of forest or riparian woodland (in dryer environments, prefers to be near watercourses). Possible (isolated) shelter habitat in dead trees or hollow bearing paddock trees. No records within 10 km of Site (Atlas of NSW Wildlife).
<i>Prasophyllum</i> sp. Wybong	Not listed	L	No	Possible habitat availability in woodland areas. Perennial orchid, appearing as a single leaf over winter and spring. No records within 10 km of Site (Atlas of NSW Wildlife).
Regent Honeyeater <i>Anthochaera phrygia</i>	Critically Endangered	M	No	Low breeding habitat potential onsite due to small number of mature trees, open canopy, and lack of preferred woodland tree species. Possible foraging habitat in winter. No records within 10 km of Site (Atlas of NSW Wildlife).
Squirrel Glider <i>Petaurus norfolcensis</i>	Vulnerable	L	No	Possible habitat availability in woodland areas. No records within 10 km of Site (Atlas of NSW Wildlife).
Tall Velvet Sea-berry <i>Haloragis exalata</i> subsp. <i>velutina</i>	Vulnerable	L	No	Found in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges. No records within 10 km of Site (Atlas of NSW Wildlife).

[#]
LoO Likelihood or Occurrence - the probability of a threatened species occurring on the site

M Moderate likelihood of occurrence

L Low likelihood of occurrence

^{##} Reference to records in this table refers to NSW Wildlife Atlas records within 10 km of the Site

Other species credit species relevant to the Study Area that have not been generated by the Credit Calculator, but appear in database search results from the Atlas of NSW Wildlife, are identified below in **Section 4.3.2**.

4.3.2 Species Credit Species Generated by Atlas of NSW Wildlife (10 km search)

One other species credit species has been identified in the Atlas of NSW Wildlife database as previously recorded within the locality of the Study Area (10 km search), namely the Lake Keepit Hakea (*Hakea pulvinifera*). This species has very specific habitat requirements and very restricted distribution (i.e. woodland surrounding Lake Keepit). These features are not present within the Study Area and therefore this species is assessed as having a low likelihood of occurrence on the Development Site (see **Appendix F**). The details for *Hakea pulvinifera* are listed below in **Table 23**.

Table 23 Species credit species - Atlas of NSW Wildlife

Species	TSC Act	LoO#	On Site	Explanation (for presence/absence)
Lake Keepit Hakea <i>Hakea pulvinifera</i>	Endangered	L	No	A single population exists within 10 km of the Site - in bushland surrounding Lake Keepit (Atlas of NSW Wildlife The exotic grassed areas of the Site are not favourable for this species.

[#]
LoO Likelihood or Occurrence - the probability of a threatened species occurring on the site
L Low likelihood of occurrence

No evidence for this species (or its habitat) was recorded within the Study Area during field surveys. Accordingly, *Hakea pulvinifera* is not considered further in this BAR.

4.3.3 Matters for Further Consideration

Two candidate 'species credit' threatened species and one threatened ecological community were identified by OEH in its input to the SEARs as "Species/Populations/Ecological Communities which require further consideration". These species and communities, which are listed below, have been identified and assessed in the above sections for potential occurrence within the Study Area:

- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions;
- Lake Keepit Hakea (*Hakea pulvinifera*); and
- Regent Honeyeater (*Anthochaera phrygia*).

In addition, OEH identified the following as "Critically endangered entities specifically excluded from requiring further consideration":

- Swift Parrot (*Lathamus discolor*); and
- White Box Yellow Box Blakely's Red Gum Woodland.

These species and communities were targeted during field surveys conducted during October 2016. Of these, only White Box Yellow Box Blakely's Red Gum Woodland threatened ecological community was recorded. The timing of these surveys was suitable for the detection of most, but not all, species. Species that fall outside the SLR survey timing (i.e. Swift Parrot) are still assessed for their relevance to the Development based on their individual habitat requirements and the nature and condition of habitats present at the Study Area, which are summarised and provided in the Likelihood of Occurrence table in **Appendix F**.

4.3.4 Candidate Species Credit Species

Of the 18 candidate species credit species listed in **Table 22**, two of the candidate species credit species are considered potentially to be impacted. A brief discussion of these candidate species and their relevance to the Development Site is provided below:

- **Regent Honeyeater** – No individuals of this species were observed during the SLR surveys and the woodland areas represent only marginal foraging habitat. One of the two known breeding sites of this species in NSW is the Bundarra-Barraba Important Bird Area, which is approximately 50 km to the north of the Study Area and is roughly bounded by the towns of Bundarra, Barraba, Kingstown and Manilla, and their connecting roads. This species could utilise the Study Area for foraging, however there is limited availability of favoured feed trees. Impacts will be limited to the removal of several paddock trees that potentially provide foraging resources.
- **Swift Parrot** - No individuals of this species were observed during the SLR surveys; however this species is only present during winter on the mainland, as part of seasonal migration and foraging activities. The woodland areas within the Site represent potential foraging habitat for this species, particularly areas supporting the known feed tree species White Box (*Eucalyptus albens*). Impacts will be limited to the removal of several paddock trees which potentially provide foraging resources.

Whilst foraging habitat (i.e. grassy woodland) is available on the Development Site for Regent Honeyeater and Swift Parrot, potential impacts will be limited to the removal of some areas of derived grassland and paddock trees which provide marginal foraging opportunities, and for this reason preparation of a species polygon (according to Section 6.5 of the FBA) is not required. Accordingly, these two candidate species are not ticked as “Impacted by development” in the Credit Calculator.

The threatened plants identified as candidate (species credit) species (Bluegrass, Native Milkwort, Belson’s Panic) were not recorded during the October 2016 and October 2017 surveys. These species flower in summer and SLR acknowledges that some of these species may not have been flowering during the surveys. In any case, potential habitat for these threatened flora species is highly degraded by decades of grazing and disturbance to the ground layer of the Study Area. It is also unlikely that the soil seed bank would have retained any of these species within the Study Area. As a result, the assessor has determined the habitat for such species as substantially degraded according to part (a) of Section 6.5.1.3 of the FBA. As a result these species require no further assessment.

5 Impact Avoidance and Minimisation

This section describes the impacts of the Development in accordance with Section 8 of the FBA.

5.1 Impact Avoidance Measures

5.1.1 Site Selection

The locations of the PPU and associated infrastructure were selected to avoid woodland habitats. Habitats impacted are largely limited to derived native grassland and areas of exotic pasture.

The principal siting requirements for a poultry broiler development, such as that proposed, include:

- Proximity to a chicken hatchery facility;
- Proximity to a reliable poultry feed source;
- Proximity to a processing facility and protein recovery plant;
- Proximity to major regional and State transport routes;
- Adequate separation distances to other poultry farms for biosecurity purposes and also to surrounding sensitive receptors;
- Appropriate land use zoning and surrounding land use activities; and
- Adequate access to a reliable supply of water and electricity.

Any investigation will reveal that finding a site that is both available and meets all of the above criteria is very difficult. Selection of alternative sites must be mindful of transport access to each of the abovementioned support/servicing facilities. The matter of a reliable water supply is crucial and the cost of satisfying the necessary power requirements is sometimes prohibitive. Finding a site that already has a compatible agricultural land use is also preferable, and limits the amount of clearing required to establish the PPU which is advantageous from a biodiversity perspective.

5.1.2 Development Optimisation

The avoidance of trees and native woodland patches was an important factor during the Development design and optimisation process. As a consequence, the layout of the Development successfully avoids all of the woodland patches recorded and mapped within the Study Area, with the exception of a small number of paddock trees.

Consideration of alternative PPU locations is dependent upon a number of factors including both environmental impact considerations and engineering design requirements. While other locations were considered within the Development Site, the proposed layout is considered optimal in terms of minimising the potential for adverse impact and required earthworks. In particular the proposed layout ensures that tree clearing is minimised, whilst ensuring the buffer distances between PPUs is maximised for biosecurity, cumulative odour and other objectives. The proposed layout will also ensure that the Development does not deny access to large areas of viable agricultural lands, nor significantly reduce the land area available for agricultural production.

Impact avoidance measures included as part of the Development include:

- Proposed infrastructure has been positioned away from areas of native vegetation, particularly higher quality vegetation and habitats such as threatened ecological communities (i.e. Box Gum Woodland, Inland Grey Box Woodland);
- The PPUs have been sited within cleared areas, with only a small number (10-12) of paddock trees requiring removal;
- Internal access roads will follow existing tracks where possible and generally avoid native trees. The area of disturbance for the roads is limited to areas of derived grassland and isolated paddock trees (noting that the trees are widely spaced in this area and can largely be avoided);

5.2 Final Development Footprint

The development footprint is defined in the FBA as “the area of land that is directly impacted on by a proposed Major Project that is under the EP&A Act, including access roads, and areas used to store construction materials”.

The proposed layout of the Development is shown in **Figure 2** and the potential impacts of this layout are shown in **Figure 11**. The Development will have a disturbance footprint of approximately 87.78 ha, comprising:

- Four PPUs, including the poultry sheds, ancillary infrastructure, solar panels, perimeter ring road and surface water management system (including upstream diversions);
- Eight new residential dwellings for the farm managers;
- Internal access roads and driveways;
- Internal water and electricity supply infrastructure (including water pump adjacent to the Namoi River); and
- Bedding materials shed and two dead bird freezers.

Impact areas for these features of the Development are listed in **Table 24**.

Table 24 Development Footprint Areas

Infrastructure Description	Disturbance Area (ha)
Four PPUs (including sheds, ancillary infrastructure, solar panels, ring roads, and surface water management structures)	73.43
Eight residential dwellings	0.36
Access roads and driveways	7.99
Water and electricity supply infrastructure (including pump adjacent to Namoi River)	5.87
Bedding materials shed and two dead bird freezers	0.13
Total (ha)	87.78

5.3 Direct Impacts

5.3.1 Overview

According to the FBA, direct impacts on biodiversity values are described as “*an impact on biodiversity values that is a direct result of vegetation clearance from a development. It is predictable, usually occurs at or near to the development site and can be readily identified during the planning, design, construction, and operational phases of a development.*”

The potential ecological impact of the Development will be relatively small, with a disturbance footprint of approximately 87.78 ha, comprising just 8.6% of the Development Site (1,016.12 ha). The impact areas are devoid of high conservation habitats apart from isolated paddock trees. Commercial activity associated with the Development will be confined to the disturbance footprint areas.

The Development will involve some minor impacts to threatened ecological communities and habitat for threatened fauna species comprising the following direct impacts:

- Removal and disturbance of derived grasslands (TEC vegetation), which are dominated by exotic pasture with a low cover and moderate diversity of native species;
- Clearing of some paddock trees to accommodate infrastructure where required; and
- Removal of a small portion of potential fauna foraging habitat, in particular for threatened microchiropteran bats species, the Grey-crowned Babbler and the Little Eagle.

The areas of native vegetation to be cleared have been carefully considered and all high-conservation habitats have been avoided where possible. However, the Development will result in the removal of some highly disturbed derived grassland communities, which form part of the Box-Gum Woodland TEC, and the removal of some isolated paddock trees that cannot be avoided.

5.3.2 Impacts on Vegetation Zones

Areas of native vegetation impacts (or clearing) are shown in **Figure 11** and described in **Table 25**. The total area of native vegetation removal required for construction and operation of the Development is limited to a total of approximately 1.17 ha of native derived grassland. The remaining 86.61 ha comprise areas of exotic pasture in low condition (i.e. Non-native Groundcover), which do not require biodiversity offsets. The impact to native derived grassland areas represents 0.1 % of the total area of the Development Site. These areas of derived grassland will be replaced with permanent infrastructure and therefore the impacts on the native vegetation (and associated habitats) will be permanent (and unavoidable).

Table 25 Vegetation impacts (clearing areas for vegetation zones)

PCT Code	Vegetation Zone Name	Clearing Area (ha)
1383	White Box grassy woodland (moderate to good condition)	0
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition)	0
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition)	0

PCT Code	Vegetation Zone Name	Clearing Area (ha)
78	River Red Gum riparian tall woodland / open forest (moderate to good condition)	0
1383	White Box grassy woodland – moderate to good (derived grassland)	1.17
N/A	Non-native Groundcover	86.61
Total vegetation		87.78

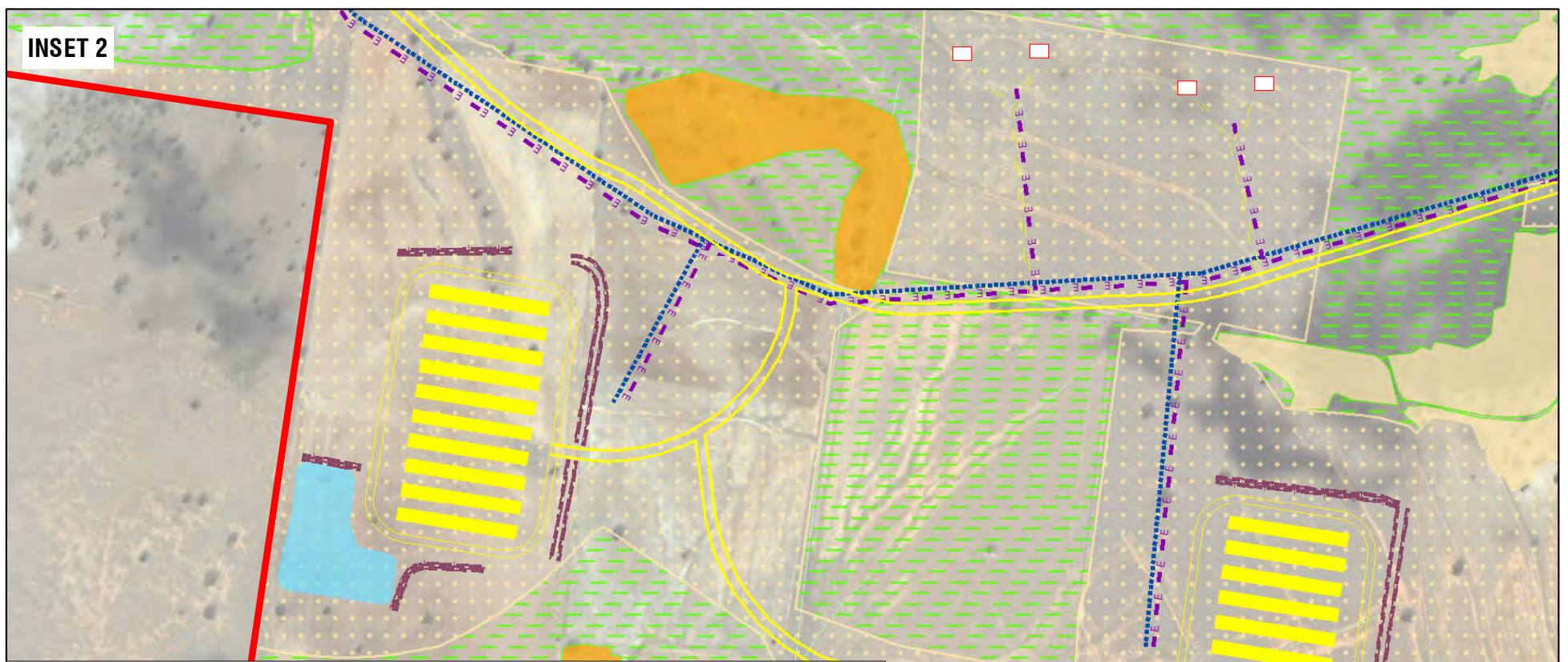
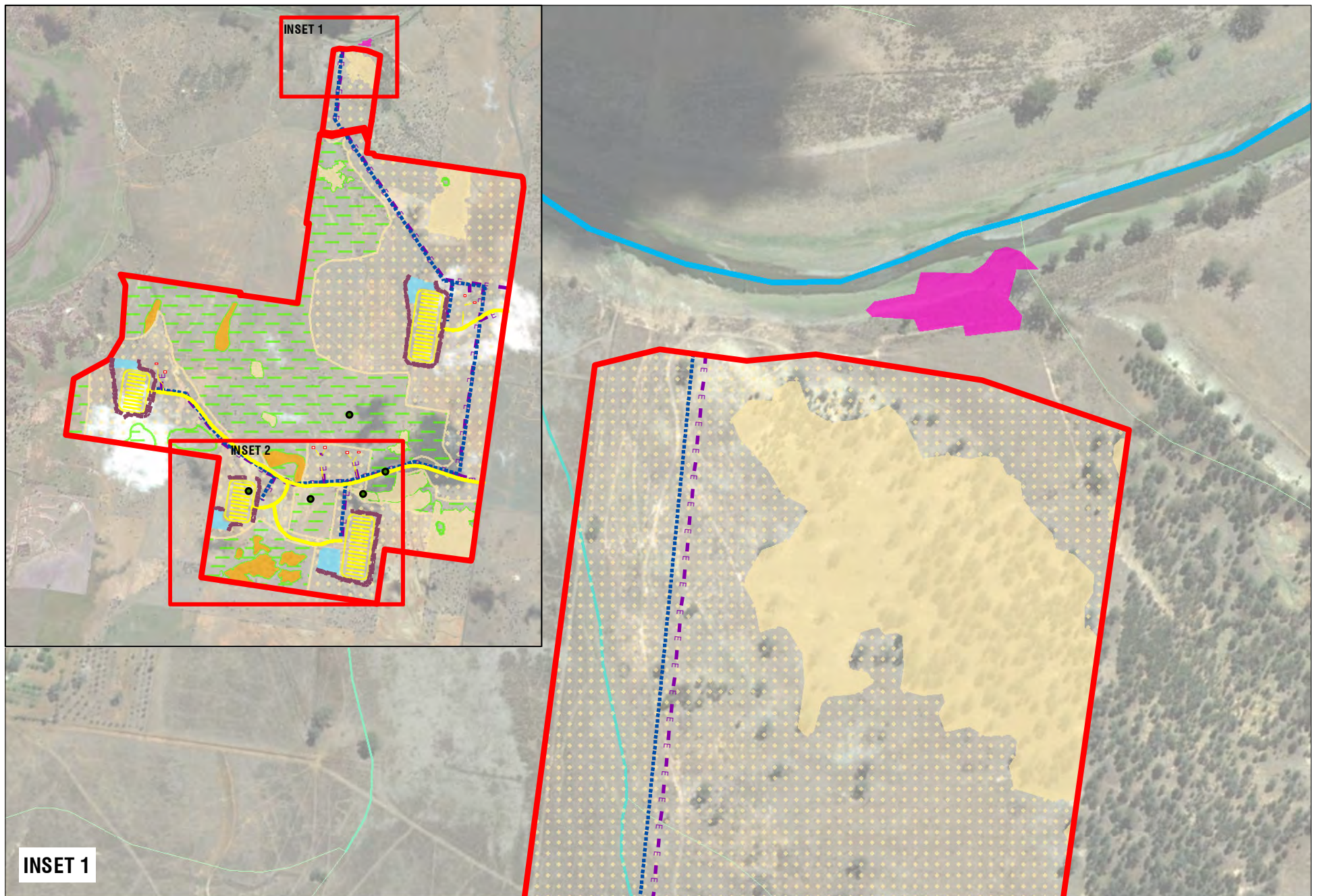
5.4 Indirect Impacts

According to the FBA indirect impacts on biodiversity values are described as *“an impact on biodiversity values that occurs when development related activities affect threatened species, threatened species habitat, populations or ecological communities in a manner other than direct impact. Compared to direct impacts, indirect impacts often:*

- *occur over a wider area than just the site of the development;*
- *have a lower intensity of impact in the extent to which they occur compared to direct impacts;*
- *occur off site;*
- *have a lower predictability of when the impact occurs;*
- *have unclear boundaries of responsibility.”*

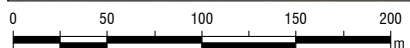
Indirect impacts in relation to the Development include:

- Potential for erosion, runoff and sedimentation to occur during the construction phase, as well as during the operational phase if appropriate control structures are not properly installed and maintained. These potential impacts are to be avoided and/or managed via the installation of appropriate erosion and sediment control measures and an engineered stormwater management system.
- Potential for animal strike (particularly macropods and birds) by increased traffic across the Development Site. However, the speed limit within the Development Site will be limited to 60 km per hour along the access roads and at this speed animal strikes are unlikely.
- Potential for increased presence of weeds across the Development Site. This will be managed by integrating weed management into the construction and operational management measures. A wheel wash facility will be installed at the entrance to each PPU, which will reduce the likelihood of weeds being carried by vehicles and entering native vegetation. On-going farming and maintenance of the residual land within the Development Site will also reduce the likelihood of weeds.
- Potential for rubbish and other waste streams generated by the Development entering the environment. Appropriate management systems will be established for each waste stream to ensure that there will be no on-site stockpiling or disposal of waste materials.
- Increased artificial light. The primary source of external lighting will comprise one light fixture mounted at a height of approximately 4 m over the front and rear loading-unloading areas of each poultry shed. These lights will be aimed downwards and only switched on during loading-unloading and servicing activities outside of daylight hours and during time of low light and/or heavy fog.



LEGEND

- | | |
|---|---|
| Development Site | Derived grassland |
| Proposed Driveway | Non-native groundcover |
| Proposed Internal Access Road | (PCT 1383) White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion |
| Overhead Power | (PCT 589) White Box - White Cypress Pine - Silver-leaved Ironbark grassy Woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion |
| Underground Power | (PCT 101) Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion |
| Underground Water | (PCT 78) River Red Gum riparian tall woodland / open forest wetland in the andewar Bioregion and Brigalow Belt South Bioregion (0.5ha) |
| Proposed Development Related Residence* | |
| Poultry Sheds | |



Scale: Inset 1:1:4,000 Inset 2: 1:8,000
GDA 1994 MGA Zone 56

26/07/2018
610.16117

*Note: Proposed residences are an approximate indication of location and do not represent actual scale or final footprint.

5.5 On-Site Mitigation Measures

On-site mitigation measures to reduce direct and indirect impacts include before, during and after construction measures as outlined in **Table 26**.

Table 26 Mitigation measures to be implemented before, during and after construction

Action	Outcome	Timing	Responsibility
Before Construction			
Protection of native vegetation	Delineate construction zone (to ensure no native vegetation outside construction zone is cleared)	Prior to and for the duration of any works	Construction contractor
Erosion and sediment control measures	Install and maintain erosion and sediment control measures in accordance with the requirements of the 'Blue Book'	Prior to and for the duration of any works	Construction contractor
During Construction			
Fauna management	Supervision of tree felling to rescue and recover any fauna (as necessary)	During clearing	Construction team/ProTen
Weed management	Vehicle wash-down Site maintenance program	Ongoing	Construction team
Rubbish management	Rubbish (such as food scraps and building waste) is to be properly managed during construction and must not be stockpiled on areas of native vegetation	Ongoing	All employees and contractors
Exposed soil surface management	Revegetation – re-use of topsoil layers and seeding of pasture grasses and legumes (see EIS)	Immediately following soil disturbances	Construction team
Traffic management	Vehicle speed limited to 60 km/hr within the Site to reduce the likelihood of animal strikes Educate workers on possibility of animal strike through construction management program	Ongoing	All employees and contractors
After Construction			
Traffic management	Vehicle speed limited to 60 km/hr within the Site to reduce the likelihood of animal strikes	Ongoing	All employees and contractors
Increased artificial light	Each luminaire will be aimed downwards and only switched on during loading-unloading and servicing activities outside of daylight hours and during heavy fog.	Ongoing	Site operator
Waste management	Appropriate systems will be implemented to ensure that each	Ongoing	Site operator

Action	Outcome	Timing	Responsibility
	waste stream generated by the Development is effectively managed and/or disposed of off-site (see detail in EIS). There will not be any on-site stockpiling or disposal of waste materials.		
Surface water and run-off	An engineered surface water management system will be installed at each PPU (see EIS)	Ongoing	Site operator

Numerous best management practices and mitigation measures will be implemented as part of the Development to prevent, minimise and/or manage the potential for adverse impacts upon the local environment and surrounding populace.

ProTen will prepare and implement a site-specific Construction Environmental Management Plan (CEMP) and a site-specific Operational Environmental Management Plan (OEMP) for the Development to ensure that the commitments made within the EIS, along with relevant statutory obligations and the conditions of the development consent and EPL, are fully implemented and complied with.

A Landscaping Strategy will be prepared and implemented to screen the Development from neighbouring landholders and generally improve the visual and environmental amenity of the Development Site.

6 Impact Summary

This section describes the impact of the proposed development in terms of biodiversity credits, in accordance with Section 9 of the FBA.

6.1 Areas Not Requiring Further Assessment

Areas that do not require further assessment are those that do not contain native vegetation, as per Section 9.5 of the FBA (unless otherwise required by the SEARs). Within the Development Site around 380.30 ha (37%) supports derived native grassland in a highly disturbed state, which, although is dominated by exotic flora, supports a moderate diversity and low cover of native flora as well as some isolated paddock trees resulting in a site value score greater than 17. Therefore these areas require further assessment and all cleared areas have been identified as a derived grassland vegetation zone. These areas do contain widely scattered paddock trees, some of which are hollow bearing and therefore could provide habitat for threatened arboreal fauna, particularly birds and bats. Accordingly, these areas have still been assessed for the potential occurrence of threatened species (i.e. those that generate species credits), as outlined in **Section 4** (see FBA, Section 9.5).

6.2 Entities Not Requiring Offsets

Impacts for which the assessor is not required to determine an offset (FBA, Section 9.4) comprise:

- Vegetation clearing within a vegetation zone that has a site value score of less than 17 and the PCT is not a TEC;
- Impacts on PCTs that are not threatened species habitat and are not TECs;
- Threatened species habitat within a vegetation zone that has a site value score of less than 17; and
- Species or populations that are not threatened and do not form part of a TEC.

As listed in **Table 27** all but one of the vegetation zones mapped and assessed have current site value scores of over 17 and all zones represent potential threatened species habitat). Site value scores for each vegetation zone are based on plot/transect data collected during field surveys.

One vegetation zone, Non-Native Groundcover, has a site value score less than 17 (see **Table 27**). Accordingly, the removal of this vegetation does not require an offset.

6.3 Impacts Requiring Offsetting

According to Section 9.3 of the FBA, impacts on native vegetation that require an offset include:

- Impacts on EECs and CEECs, unless specifically nominated in the SEARs as an impact requiring further consideration; and
- Impacts on PCTs associated with threatened species habitat and in a vegetation zone that has a site value score of greater than or equal to 17.

6.3.1 PCTs Requiring Offset

All but one of the vegetation zones mapped with the Development Site have current site value scores of over 17 (see **Table 27**) and represent habitat for at least some threatened species; hence any clearing in these vegetation zones would, in theory, require an offset according to the FBA. However, of the four vegetation zones mapped, clearing will only be required within one native vegetation zone: VZ1 White Box grassy woodland - Derived Native Grassland, with around 1.17 ha to be permanently removed. Conversely, the majority of the development footprint is dominated by exotic pasture, with around 86.61 ha of Non-native Groundcover to be removed (refer to **Table 27**).

Table 27 Vegetation zones requiring offset and credits required

Code	Vegetation Zone Name	Mgt Area (ha)	Current Site Value Score	Future Site Value Score	Ecosystem Credits
1383	White Box grassy woodland (moderate to good condition)	0.0	58.47	58.47	0
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition)	0.0	60.11	60.11	0
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition)	0.0	21.31	21.31	0
78	River Red Gum riparian tall woodland / open forest (moderate to good condition)	0.0	54.1	54.1	0
1383	White Box grassy woodland - Derived Native Grassland	1.17	38.25	0	29
N/A	Non-native Groundcover	86.61	16.94	0	0
Total		87.78	-	-	29

6.3.2 Species Polygons Requiring Offset

As discussed in **Section 4**, no local populations of threatened species that generate species credits are likely to occupy the vegetation within the Study Area other than on a transient basis. Hence, the creation of species polygons for such species is not considered appropriate for this assessment. Hence there are no species credit polygons that require offset as part of the Development.

6.4 Impacts Requiring Further Consideration

There are no impacts associated with the Development that require further consideration.

With reference to the thresholds for such impacts in Table 4 and Section 9.2 of the FBA:

- The Namoi River runs very close to the northern-most boundary of the Development Site and water extraction infrastructure is proposed to be installed next to the River; however; there is no riparian vegetation in this location and hence there will be no impacts that substantially reduce the width of the riparian buffer zone.

- There are no important wetlands or estuarine areas within the Study Area and hence there will be no impacts upon such features.
- There are no State significant biodiversity links within or adjoining the Study Area and hence the Development will have no impact on the movement of native fauna along such links (corridors).
- The estimated impacts on native vegetation (refer to **Section 5.3**) are in no way likely to cause the extinction (or significantly reduce the viability) of a TEC in the Namoi IBRA subregion. Impacts will be limited to areas of highly disturbed derived grassland and will not reduce the viability of vegetation in the locality or IBRA subregion or cause its local extinction.
- There is no critical habitat within the Study Area.
- There are no threatened species or populations likely to become extinct (or have their viability reduced significantly) in the IBRA subregion from the Development.
- The predicted impacts of the Development on native vegetation are not likely to impact on a critically endangered species or on any species that have not previously been recorded in the IBRA subregion on the *Atlas of NSW Wildlife* database.

On the basis of the above points, there are no impacts requiring further consideration in this BAR.

6.5 Biodiversity Credit Requirement

The BioBanking Credit Calculator has been used to calculate the impacts of the Development and potential offset requirements in accordance with Section 8 of the FBA. The below sub-sections provide a summary of the results of the credit calculations. Copies of the 'Full' and 'Final' credit reports from the Credit Calculator, which both list the credit profile for the impacts of the Development, are provided in **Appendix G**.

6.5.1 Ecosystem Credits

The ecosystem credits required to offset the Development are listed by vegetation zone in **Section 5.3.2**. A total of 29 ecosystem credits would be required to offset the clearing of native vegetation as a result of the construction of the Development. The Credit Calculator identifies matching ecosystem credits (and IBRA subregions) that can be used to offset these impacts (see **Section 6.6**).

6.5.2 Landscape Value Score

The loss in landscape value score is 12, as per the credit reports in **Appendix G**. Refer to **Section 2.7** for details regarding the calculation of the landscape value score.

6.5.3 Species credits

No species credits are required to offset the impacts of the Development (see **Appendix G**). Refer to **Section 4.3.4** for the rationale regarding the potential impacts to species credit species.

6.6 Biodiversity Credit Report

Copies of the BioBanking credit reports are provided in **Appendix G. Table 28** lists the ecosystem credit types required to offset the Development and the matching credits and IBRA subregions that can be used as 'offset options'. Any such credits can only be used as substitutes (or offset options) for credit types required if they belong to an IBRA subregion that adjoins the IBRA subregion in which the Development occurs (i.e. Namoi IBRA subregion).

Table 28 Ecosystem credits required for offset and matching credit types

Ecosystem Credit Required	No. Credits	Offset Options
1383 White Box grassy woodland (derived grassland)	29	<ul style="list-style-type: none"> White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion (NA226)
589 White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition)	0	<ul style="list-style-type: none"> Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (NA141) Grey Box - Blakely's Red Gum - Yellow Box grassy open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA144) White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion, (NA230) Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (NA237) White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, Brigalow Belt South Bioregion, (NA400) Silver-leaved Ironbark grassy tall woodland on clay-loam soils on plains in the Brigalow Belt South Bioregion, (NA350) Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA293) White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion, (NA395)
Total Credits	29	

7 BIODIVERSITY OFFSET STRATEGY

This section provides the Biodiversity Offset Strategy (BOS) based on outputs of the BioBanking Credit Calculator in accordance with Section 10 of the FBA.

7.1 Overview

The assessment completed as part of this BAR has determined that a biodiversity offset is required in accordance with the FBA (OEH 2014a) and the Offsets Policy (OEH 2014b). The offset requirement for the Development is described in **Section 6.3**. A total of 29 ecosystem credits are required to offset the predicted impacts, with the type and number of required ecosystem credits and matching credit options listed in **Table 28**. No species credits are required as part of the offset.

According to the Offsets Policy, a BOS is required to set out how the proponent intends to fulfil the Development's offset requirement and is to be submitted to the DPE with the development application.

7.2 Overview of Offset Options

According to the Offsets Policy, proponents can meet their offset obligations through one or a combination of the following offset options:

- Like-for-like credit purchase – the proponent purchases the required number and type of BioBanking credits from the BioBanking credit 'market' (publically available through the BioBanking Credit Register) (Option 1a);
- Like-for-like credit creation - the proponent creates a biobank site on their own land, which generates the required credits to fulfil their offset requirement; the proponent retires the required number and type of credits from their own portfolio of credits (Option 1b);
- Variations – where like-for-like offsets are not available, and the proponent can demonstrate that "reasonable steps" have been taken to find a suitable offset, proponents may apply the FBA 'variation rules' (as outlined in the Offsets Policy) (Option 2);
- Contributing money to supplementary measures - for this option to be available, proponents must demonstrate that reasonable steps have been taken to secure like-for-like offsets under Option 1 and/or 'varied' offsets under Option 2 (Option 3); and/or
- Donating to NSW Government fund - under this scenario, the proponent calculates the equivalent monetary value of their offset requirement and pays this amount into the fund. The Biodiversity Conservation Fund has been established under the BC Act (Option 4).

A summary of the available offsetting options, listed in order of priority, for the Development is provided in **Table 29**.

Table 29 Ecosystem credits required for offset and matching credit types

Option	Offset Option	No. Credits	Offset Options/Comments
1a	Purchase and retire matching (like-for-like) ecosystem credits	29	<ul style="list-style-type: none"> Like-for-like ecosystem credits comprise: <ul style="list-style-type: none"> Those of same PCT; or A PCT from the same vegetation class that has equal or higher percentage cleared value for the CMA. See list of matching credit types in . Number and type of credits must be available on credit register, or become available prior to construction (or during timeframe specified in in the development consent)
1b	Purchase land and create required credits through a BioBanking Agreement	29	<ul style="list-style-type: none"> Requires proponent to find suitable properties for sale in the IBRA subregion, purchase property (or properties) and then generate a BioBanking Agreement on the land; Biobank site should contain matching credit types and number as in Table 28. Proponent retires their own credits to offset development using only Part A costs (i.e. management costs of biobank per credit).
2	Variation rules - Purchase and retire other credits within same vegetation formation	TBC	<ul style="list-style-type: none"> Apply variation rules when matching credit types in Table 28 are not available. Find ecosystem credits for PCTs that fall within same vegetation formation, with equal or greater cleared value for CMA. Cannot be for PCTs that are critically endangered or listed under EPBC Act.
3	Supplementary measures	N/A	<ul style="list-style-type: none"> Aim to supplement like-for-like offsets; Apply FBA variation rules. Apply when suitable credits and/or biobank site unavailable or cannot be secured within BOS and construction timeframe. Aim to target investment in threatened biota affected by the development proposal; Where appropriate, use interim method to calculate monetary contribution for supplementary measures. .
4	Payment to Fund	TBC	<ul style="list-style-type: none"> Convert credits calculated under FBA into equivalent BAM credits; OEH issue 'statement of equivalence' for credits; Calculate monetary value of BAM credits; Proponent pays agreed value into Biodiversity Conservation Fund to fulfil offset obligation. Biodiversity Conservation Trust issues certificate of payment to confirm offset met.

Where the proponent has demonstrated reasonable steps have been taken to find a suitable like-for-like offset, but none are available, the 'variation rules' and subsequently 'supplementary measures' can be used to fulfil offset obligations. The rules for applying and calculating supplementary measures are provided in the Offsets Policy.

A proponent may use a combination of offset sites and supplementary measures to fulfil an offset requirement. All options listed in **Table 29**, as applicable to the Development, have been considered and are discussed further in Section **7.3** below.

Further consultation and discussion with DPE and OEH will be conducted during the EIS assessment process to determine the most suitable offset for the Development.

7.3 Like-For-Like Offsets (Option 1)

7.3.1 Purchase Like-For-Like Credits (Option 1a)

The proponent may choose to purchase and retire the ecosystem credits listed in **Table 28**. At the time of writing, one BioBank site listing ecosystem credits for NA 226 White Box grassy woodland (PCT 1383) is listed on the BioBanking Credit Register (BioBanking Agreement ID 228). In addition, two sites identified as supporting this PCT in the Expression of Interest (EOI) register (EOI ID 35 and ID 128) are currently showing an availability of the required credit type within the Namoi and Liverpool Plains IBRA region. These credits are likely to be suitable like-for-like ecosystem credits that will potentially become available on the credit market in the near future. Accordingly, purchase of like-for-like credits (Option 1a) is a potential option available to the proponent at the time of writing this BOS.

7.3.2 Generate Credits by Creating a BioBanking Agreement (Option 1b)

The proponent may choose to create a BioBanking Agreement over a portion of land in order to generate the required like-for-like credits and retire these to fulfil the offset obligation. However, this option is not favoured as ProTen has entered into a lease agreement with the current landowner that would allow continued use of the land within the Development Site surrounding the PPU's for continued agricultural use (grazing and/or cropping). This proposed future use of the surplus land within the Development Site is not compatible with management of a portion of the land for biodiversity conservation under a BioBanking Agreement.

If Option 1b is not available to the proponent and the proponent has pursued reasonable steps to obtain a suitable like-for-like offset, the proponent can apply the 'variation rules' in accordance with the Offset Policy.

7.4 Apply Variation Rules (Option 2)

In the case where the required credits are not available, and hence a 'like-for-like' offset is not achievable, proponents can apply the variation rules for matching ecosystem credits. However, a hierarchy of options must be followed, with the proponent demonstrating that "all reasonable steps have been taken...to secure a matching ecosystem credit".

The consent authority may approve a variation of the offset rules for matching ecosystem credits by allowing ecosystem credits created for a PCT from the same vegetation formation as the required ecosystem credit to be proposed as part of the BOS, where in the consent authority's opinion the BOS demonstrates that:

- all "reasonable steps" to secure a matching ecosystem credit have been taken by the proponent, and

- the required ecosystem credit is not for a PCT associated with a CEEC listed on the BC Act or an ecological community listed on the EPBC Act, and
- the PCT from the same vegetation formation has a percent cleared value of the PCT in the major catchment area equal to or greater than the percent cleared of the PCT to which the required ecosystem credit relates, and
- where the required ecosystem credit is for a PCT that is associated with a CEEC/EEC, the PCT from the same formation is also associated with a CEEC/EEC.

“Reasonable steps” to locate like-for-like offsets are listed in the Offset Policy and summarised as follows:

- investigating land already owned by the proponent within the IBRA subregion or CMA, whether within the Development Site or other properties;
- liaising with an OEH office and local council to obtain a list of potential sites that meet the requirements for offsetting;
- placing an EOI for the credits wanted on the BioBanking public register (i.e. the ‘Credits Wanted Register’) for at least six months, whilst regularly checking the register to see if the required credits have become available;
- considering properties for sale in the “required area” (presumably within the IBRA subregion or CMA); and
- providing evidence of why offset sites are not feasible (e.g. unwillingness of a landowner to sell).

SLR, in consultation with ProTen, has commenced investigation of realistic offsetting alternatives and proceeding with the ‘reasonable steps’ listed above to identify an acceptable offset. In this regard, we note:

- At the time of writing this BOS, SLR has been notified of a private landholding in the Nandewar bioregion containing NA 226 White Box grassy woodland (PCT 1383) ecosystem credits. The potential purchase of these credits will be investigated following development consent;
- The residual land within the Development Site is not currently available for a biobank site, as outlined above;
- SLR has consulted with OEH’s Dubbo office on the availability of offset lands in the region. At the time of writing, OEH was not aware of any suitable properties that meet the requirements for the Development; and
- Purchasing of offset lands (i.e. suitable properties known to be for sale in the IBRA subregion) is not considered a viable option for the proponent, considering the small quantity of ecosystem credits required and the likely costs of purchasing land and setting up a BioBanking Agreement.

7.5 Supplementary Measures (Option 3)

Where a proponent can demonstrate that all reasonable steps have been taken to obtain like-for-like credits or a suitable offset site (as per the steps listed above), they can choose to use ‘supplementary measures’. Such measures are intended to supplement direct offsets such as purchasing and retiring credits, where there are insufficient credits to fulfil the entire offset obligation. Suitable supplementary measures are listed in the Offsets Policy. There are four tiers of supplementary measures, in order of priority from Tier 1 to Tier 4.

A formula for calculating the monetary contribution of supplementary measures is provided in the Offset Policy.

7.6 Payment to Fund (Option 4)

Under the BC Act, development proponents may choose to pay into the Biodiversity Conservation Fund as an alternative to retiring biodiversity credits. Proponents may only pay into the fund once a consent authority has issued conditions of consent that specify the number and type of credits to be retired. Proponents can choose to use the Fund to meet their offset obligations immediately – they do not have to first try to find their own offsets.

As the offset obligation in this BAR was calculated using the FBA, the proponent will need to seek a 'credit equivalence' statement from the OEH before paying into the Biodiversity Conservation Fund. Where OEH has issued a 'credit equivalence' statement confirming BAM-equivalent credits, proponents may apply to the Biodiversity Conservation Trust to make a payment into the Biodiversity Conservation Fund. The Trust will review the application and advise the proponent in writing whether the proposed payment can be made (including by providing fund deposit details).

Following receipt of payment, the Trust will issue the proponent with a certificate under section 6.33 of the BC Act that may be used to prove to the consent authority that they have met their offset obligations.

7.7 Offset Strategy Actions

Actions proposed to fulfil the offset requirement for the Development will involve:

- Uploading an EOI for the required ecosystem credits on the 'Credit Wanted' register of the BioBanking Credit Register;
- Contacting sellers of White Box (NA 226/PCT 1383) credits currently listed on the BioBanking Agreements Register; BioBanking Agreement ID 228 is currently listed as containing NA 226 credits, as noted above; where credits are available, commence negotiations on agreed price of credits;
- Contact landowners advertising availability of required credits (i.e. NA 226) on the EOI Register, as noted above, where credits are not available (or become unavailable) on the BioBanking Agreements Register; where applicable, commence negotiations with landowner to proceed with Biodiversity Stewardship Agreement to generate required credits;
- Monitoring the availability of matching ecosystem credits during the six month advertisement period (as required by OEH), including regularly checking the credit register for ecosystem credits that match the required type and number of credits (**Table 28**), including 'variation credits' from the same vegetation formations (as listed in **Table 29**);
- Consulting regularly with the OEH BioBanking Team and the Dubbo office of OEH (during the EOI period) on the availability of suitable credits or offset sites;
- During, or at the end of, the advertisement period, either:
 - Purchase like-for-like credits or, if not available, purchase 'variation credits', or if both credit types not available, then:

- Pay monetary value into the Biodiversity Conservation Fund (Option 4); or
- Apply supplementary measures and calculate suitable monetary fund deposit.

These actions and the final outcome will be documented in an addendum to the BOS. This will be completed within 12 months of obtaining development consent.

8 EPBC Act Matters

8.1 Predicted Matters of NES

A search of the on-line PMST was conducted on 7 June 2017. The PMST database provides an indicative list of matters of national environmental significance (matters of NES) listed under the Commonwealth EPBC Act. A copy of the PMST results is provided in **Appendix H**. The PMST results indicate the following matters are either present or relate to the Study Area:

- Twenty nine threatened species;
- Ten listed migratory species;
- Four listed threatened ecological communities; and
- Three wetlands of international importance (Ramsar Wetlands).

Of the above matters of NES that are predicted to occur within the locality of the Development Site, those of potential relevance to the Site and the Development are discussed in the following sections.

8.2 Relevant Matters of NES

8.2.1 Listed Threatened Species

The 29 threatened species (and/or their habitats) listed under the EPBC Act that are predicted to occur within the locality comprise six bird species, two fish species, seven mammal species, one amphibian and 10 plant species. These species and their legal status within NSW and at a national level are listed in **Table 30**.

Table 30 PMST results – listed threatened species

Species		EPBC Act Listing	BC Act Listing
Regent Honeyeater	<i>Anthochaera phrygia</i>	Critically Endangered	Critically Endangered
Curlew Sandpiper	<i>Calidris ferruginea</i>	Critically Endangered	Endangered
Red Goshawk	<i>Erythrotriorchis radiatus</i>	Vulnerable	Vulnerable
Painted Honeyeater	<i>Grantiella picta</i>	Vulnerable	Vulnerable
Australian Painted Snipe	<i>Rostratula australis</i>	Endangered	Endangered
Swift Parrot	<i>Lathamus discolor</i>	Critically Endangered	Endangered
Murray Cod	<i>Maccullochella peelii</i>	Vulnerable	
Silver Perch, Bidyan	<i>Bidyanus bidyanus</i>	Critically Endangered	Endangered
Booroolong Frog	<i>Litoria booroolongensis</i>	Endangered	Endangered
Large-eared Pied Bat, Large Pied Bat	<i>Chalinolobus dwyeri</i>	Vulnerable	Vulnerable
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	<i>Dasyurus maculatus maculatus</i>	Endangered	Vulnerable

Species		EPBC Act Listing	BC Act Listing
Corben's Long-eared Bat, South-eastern Long-eared Bat	<i>Nyctophilus corbeni</i>	Vulnerable	Vulnerable
Greater Glider	<i>Petauroides volans</i>	Vulnerable	
Brush-tailed Rock-wallaby	<i>Petrogale penicillata</i>	Vulnerable	Endangered
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)	<i>Phascolarctos cinereus</i>	Vulnerable	Vulnerable
Grey-headed Flying-fox	<i>Pteropus poliocephalus</i>	Vulnerable	Vulnerable
Ooline	<i>Cadellia pentastylis</i>	Vulnerable	Vulnerable
Bluegrass	<i>Dichanthium setosum</i>	Vulnerable	Vulnerable
	<i>Euphrasia arguta</i>	Critically Endangered	Critically Endangered
Lake Keepit Hakea	<i>Hakea pulvinifera</i>	Endangered	Endangered
Belson's Panic	<i>Homopholis belsonii</i>	Vulnerable	Endangered
	<i>Philothea ericifolia</i>	Vulnerable	
Tarengo Leek Orchid	<i>Prasophyllum petilum</i>	Endangered	Endangered
"a leek-orchid"	<i>Prasophyllum</i> sp. Wybong	Critically Endangered	
Austral Toadflax, Toadflax	<i>Thesium australe</i>	Vulnerable	Vulnerable
	<i>Tylophora linearis</i>	Endangered	Vulnerable
Pink-tailed Worm-lizard, Pink-tailed Legless Lizard	<i>Aprasia parapulchella</i>	Vulnerable	Vulnerable
Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko	<i>Uvidicolus sphyurus</i>	Vulnerable	Vulnerable
Bell's Turtle, Western Sawshelled Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle	<i>Wollumbinia belli</i>	Vulnerable	Endangered

Most of the species listed in **Table 30** are also listed under the BC Act and therefore are considered in **Section 4** of this report, as well as in the likelihood of occurrence table in **Appendix F**. With regard to the EPBC Act listed species that are not listed on the BC Act, SEARs or Credit Calculator, such as the Greater Glider (*Petauroides Volans*), habitat for this species may be present within the Study Area.

As there are no significant watercourses within the Study Area for threatened fish species, namely the Silver Perch and Murray Cod, it is not likely that these species occur within the Study Area.

The Study Area does contain suitable foraging habitat for the Swift Parrot (*Lathamus discolor*) and Regent Honeyeater (*Anthochaera phrygia*) as the species associated with the PCTs recorded within the Study Area.

Threatened grass species (i.e. Bluegrass, Belson's Panic) were not recorded during the October 2016 or October 2017 surveys. These species flower in summer and SLR acknowledges that some of these species may not have been flowering during the surveys. Any potential habitat for these threatened flora species is highly degraded by decades of grazing and disturbance to the ground layer of the Study Area. It is also unlikely that the soil seed bank would have retained any of these species within the Study Area.

The Greater Glider (*Petauroides volans*) also utilises eucalypt species that are present on the Development Site for foraging. However, due to the nature of the Site and the species reliance on a relatively small home range (3 ha) with numerous tree hollows, it is unlikely that species is present.

There is some habitat present for Spotted-tail Quoll; however these habitats are relatively marginal considering the poor connectivity, lack of denning/breeding habitat and understorey cover.

8.2.2 Listed Threatened Communities

The listed threatened communities that have been recorded or are predicted to occur within the locality include:

- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia;
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland;
- New England Peppermint (*Eucalyptus nova-anglica*) Grassy Woodlands
- Weeping Myall Woodlands; and
- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland.

Of these listed threatened communities, only the White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland ('Box Gum Grassy Woodland') is present within the Study Area.

Additionally, it is noted that areas dominated by Inland (Western) Grey Box (*Eucalyptus microcarpa*) have affinities to the EPBC Act listed threatened community *Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia*. However this community is not listed as occurring in the Nandewar bioregion (DSEWPaC 2012), so cannot, by definition, be present at the Development Site.

Box Gum Grassy Woodland

The following PCTs recorded within the Study Area are considered to form part of the Box Gum Grassy Woodland EPBC Act community:

- White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion (PCT 1383);
- White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion (PCT 589); and
- Poplar Box - Yellow Box - Western Grey Box grassy woodland on cracking clay soils mainly in the Liverpool Plains, Brigalow Belt South Bioregion (PCT 101).

With reference to the condition thresholds stated in the guidelines for EPBC Act Box Gum Grassy Woodland (DEH 2006) regarding patch size, species composition, canopy cover and natural regeneration, the extent of the EPBC Act listed vegetation is limited to larger higher condition patches of grassy woodland and excludes smaller degraded patches and areas of derived grassland. The areas of the EPBC Act Box Gum Grassy Woodland are mapped in **Figure 8**. It is also worth noting that patches of woodland within the Study Area that contain Inland (or Western) Grey Box *Eucalyptus microcarpa* (i.e. PCT 101) are included in the Box Gum Grassy Woodland TEC, as defined under the EPBC Act, and not within the Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia TEC, as this latter community is defined as being excluded from the Nandewar bioregion (see DSEWPaC 2012). Conversely, patches of PCT 101 are included in the TSC Act listed community *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penepplain, Nandewar and Brigalow Belt South Bioregions*.

8.2.3 Wetlands of National Significance

Three Wetlands of National Significance identified in the PMST search (using a 10 km buffer around the Study Area) are as follows:

- Banrock station wetland complex (1000 – 1100 km);
- Riverland (900 - 1000 km upstream); and
- The Coorong and Lakes Alexandrina and Albert wetland (1100 – 1200 km).

These wetlands are not located on or connected to the Development Site and will not be affected (directly or indirectly) by the Development.

8.2.4 Migratory Species

A total of 10 migratory species (and/or their habitats) are predicted to occur within the locality, six of which are wetland species (Common Sandpiper, Sharp-tailed Sandpiper, Curlew Sandpiper, Pectoral Sandpiper, Latham's Snipe and Osprey). There are also three terrestrial species, including the White-throated Needletail, Yellow Wagtail and Satin Flycatcher, and one marine species, the Fork-tailed Swift.

The Study Area does not contain suitable habitat for the listed wetland species, with the exception that large or sustained rainfall events could create periodic and temporary soaks or ponds within the low lying parts of the Development Site. Regardless of this, due to their large ranges, such species would not be dependent on the Study Area (if they use it at all) for foraging, breeding or other life cycle processes.

The terrestrial species all occupy a large variety of habitats and similarly have very large ranges. The vegetation within the Study Area does not constitute 'important habitat' for such species, as defined by DoE (2013), most of which utilise more intact and structurally complex woodlands. The White-bellied Sea-Eagle prefers coastal areas or waterways.

8.3 Impacts on Relevant Matters of NES

8.3.1 Listed Threatened Species

The threatened species identified in **Section 4** have been considered in accordance with the 'significant impact criteria' for 'vulnerable' and 'endangered' species in the *Significant Impact Guidelines 1.1* (DoE 2013).

Taking into consideration all stages and components of the Development and all related activities and infrastructure, there is the potential for minor direct and indirect impacts on listed threatened species, being mainly loss of a small area of degraded habitat for mobile threatened fauna species. However, this assessment concludes that the Development will not have a "significant impact" on any such species based on the following:

- Suitable habitat for most of the species is absent within the Study Area. For those species that have either been recorded or could utilise the habitats within the Study Area, there are not likely to be local populations present wholly within the Study Area or reliant on the Study Area for their survival in isolation. Any such populations present within the locality will not be rendered locally extinct by the Development. This is based on the large ranges of these species and the poor quality and condition of the habitats present within the Study Area;
- The Study Area is not assessed as likely to contain habitat critical to the survival of a species;
- The Study Area is not likely to support an 'important population' (as defined by DoE 2013) of any threatened species; and
- The proposed mitigation measures provided in **Section 5.5** will avoid or reduce impacts on threatened species.

With reference to the criteria for vulnerable and endangered species, the Development is not likely to:

- Lead to a long-term decrease in the size of an important population of a species;
- Reduce the area of occupancy of an important population;
- Fragment an existing important population into two or more populations;
- Adversely affect habitat critical to the survival of a species;
- Disrupt the breeding cycle of an important population;
- Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that a species is likely to decline;
- Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat;
- Introduce disease that may cause a species to decline; or
- Interfere substantially with the recovery of any of these species.

8.3.2 Threatened Ecological Communities

As discussed in **Section 8.2.2** and mapped in **Figure 8**, many of the patches of grassy woodland mapped across the Study Area comply with the definition of Box Gum Grassy Woodland threatened ecological community, as defined under the EPBC Act. Smaller degraded patches and areas of derived grassland are below the specified condition thresholds and are not part of the EPBC Act Box Gum Grassy Woodland.

All of the patches of grassy woodland within the Development Site that make up the Box Gum Grassy Woodland TEC have all been avoided in the design of the Development. Hence, there will be no direct impacts on to areas of Box Gum Grassy Woodland.

8.3.3 Migratory Species

The Study Area contains no habitat for the six listed migratory wetland species (Common Sandpiper, Sharp-tailed Sandpiper, Curlew Sandpiper, Pectoral Sandpiper, Latham's Snipe and Osprey) and only marginal habitat for the single migratory marine species, the Fork-tailed Swift. In regards to the three terrestrial species, the Study Area contains marginal foraging habitat amongst the woodland and scattered paddock trees. It is theoretically possible that these species could utilise the Development Site temporarily during foraging or dispersal. Vegetation within the Study Area lacks favourable complexity for these species and would constitute only a relatively small proportion of the large ranges of such species.

With reference to the criteria for migratory species in the *Significant Impact Guidelines 1.1*, the Study Area does not contain an area of 'important habitat' for any migratory species. Furthermore, the Development is highly unlikely to disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.

9 State Environmental Planning Policies (SEPPs)

One State Environmental Planning Policy (SEPP) is relevant to the site: *SEPP 44 Koala Habitat Protection*. The former Manilla local government area which is now part of Tamworth Regional Council and Gunnedah local government area is identified in Schedule 1 of the policy as a local government area to which the policy applies.

SEPP 44 requires the consent authority to determine the applicability of SEPP 44 by addressing two key steps:

- Step 1—Is the land potential koala habitat? (Clause 7); and
- Step 2—Is the land core koala habitat? (Clause 8).

Potential koala habitat is defined under SEPP 44 as “areas of native vegetation where the trees of the types listed in Schedule 2 constitute at least 15% of the total number of trees in the upper or lower strata of the tree component”. According to the policy, the woodland habitats on Site are classified as potential koala habitat, with greater than 15% of the trees in these areas supporting feed trees (*Eucalyptus albens* and *E. populnea*) as listed in Schedule 2 of the policy. These patches of potential koala habitat will not be affected by construction of the proposed development and are proposed to be retained.

The derived grassland habitats within the Development Site area do not comply with the definition of potential koala habitat in the policy, although isolated feed tree species are present.

SEPP 44 defines ‘core koala habitat’ as “an area of land with a resident population of koalas, evidenced by attributes such as breeding females (that is, females with young) and recent sightings of and historical records of a population”. There is no evidence that a resident population of Koala is present on the Site based on the limited number of previous records and lack of evidence on Site of a resident population (i.e. sightings, male calls, fresh scats, recent scratches in bark). The Site, therefore, does not constitute core koala habitat within the meaning of SEPP 44.

Hence SEPP 44 does not apply to the SSD project application pertaining to the subject site at Rushes Creek. Consequently, a koala plan of management is not required.

10 References

- DECCW. 2002. Descriptions for NSW (Mitchell) Landscapes Version 2 (2002). NSW Department of Environment, Climate Change and Water, Sydney.
- DECCW, 2004. *Fauna Corridors for Nandewar*. Department of Environment, Climate Change and Water (NSW).
- DEH. 2006. *EPBC Act Policy Statement. White Box-Yellow Box- Blakely's Red Gum grassy woodlands and derived native grasslands. Nationally threatened species and ecological communities*. Department of the Environment and Heritage, Canberra.
- DoE. 2013. *Matters of National Environmental Significance. Significant Impact Guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment, Canberra.
- DSEWPaC 2012. Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia: A guide to the identification, assessment and management of a nationally threatened ecological community. *Environment Protection and Biodiversity Conservation Act 1999*. Department of Sustainability, Environment, Water, Population and Communities, Canberra.
- OEH. 2014a. *Framework for Biodiversity Assessment. NSW Biodiversity Offsets Policy for Major Projects*. NSW Office of Environment and Heritage, Sydney.
- OEH. 2014b. *NSW Biodiversity Offsets Policy for Major Projects*. NSW Office of Environment and Heritage, Sydney.
- OEH. 2015. *BRG-Namoi Regional Native Vegetation Mapping. Technical Notes*, NSW Office of Environment and Heritage, Sydney, Australia.
- OEH 2016a. *Bioregion Overviews: Nandewar Bioregion*. Available at <http://www.environment.nsw.gov.au/bioregions/NandewarBioregion.htm>.
- OEH. 2016b. *Credit Calculator for Major Projects and BioBanking. Operational manual*. NSW Office of Environment and Heritage, Sydney, Australia.
- SLR Consulting Australia, 2016 *Rushes Creek Poultry Production Farm Preliminary Environmental Assessment*
- Specht R.L. *et al.* 1995. *Conservation Atlas of Plant Communities in Australia*. Centre for Coastal Management, Southern Cross University Press, Lismore.
- Keith, D. 2004. *Ocean shores to desert dunes: the native vegetation of New South Wales and the ACT*. NSW Department of Environment and Conservation, Hurstville.

APPENDIX A

SITE PHOTOGRAPHS







Date & Time: Thu Oct 20 13:33:04 AEDT 2016
Position: -030.79419° / +150.58942°
Altitude: 340m
Datum: WGS-84
Azimuth/Bearing: 078° N78E 1387mils (True)
Elevation Angle: -07.4°
Horizon Angle: +00.1°
Zoom: 1X



APPENDIX B

SEARS (BIODIVERSITY)



DOC16/296417
SSD 7704

Ms Sally Munk
Senior Environmental Planner
Industry Assessments
Department of Planning and Environment
Sally.munk@planning.nsw.gov.au

Dear Ms Munk

Rushes Creek Poultry Farm SEARs – SSD 7704

I refer to your e-mail dated 16 June 2016 seeking input into the Department of Planning and Environment Secretary's Environmental Assessment Requirements (SEARs) for the preparation of an Environmental Impact Assessment (EIS) for the Rushes Creek Poultry Farm (SSD 7704).

The Office of Environment and Heritage (OEH) has considered your request and provides SEARs for the proposed development in Attachments A and B and guidance material in Attachment C.

OEH recommends the EIS needs to appropriately address the following:

1. Biodiversity and offsetting;
2. Aboriginal cultural heritage;
3. Historic heritage;
4. Water and soils; and
5. Flooding.

OEH notes that there are a number of endangered ecological communities (EECs) and threatened species potentially affected by the development, and that Aboriginal cultural heritage items may also be present.

In particular, there is remnant native vegetation on the development site, and this has the potential to contain EECs including:

- White Box Yellow Box Blakely's Red Gum Woodland;
- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Penneplain, Nandewar and Brigalow Belt South Bioregions; and
- Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions.

OEH recommends that the design of the poultry farm and all associated infrastructure (including pipelines, access tracks and residences) avoids areas of native vegetation as much as possible.

Please note that the NSW Biodiversity Offsets Policy for Major Projects <http://www.environment.nsw.gov.au/resources/biodiversity/140672biopolicy.pdf> is now being implemented. The policy provides a standard method for assessing impacts of major projects on biodiversity and determining offsetting arrangements.

The policy is underpinned by the Framework for Biodiversity Assessment (FBA) <http://www.environment.nsw.gov.au/resources/biodiversity/140675fba.pdf> which contains the assessment methodology that is adopted by the policy to quantify and describe the impact assessment requirements and offset guidance that applies to Major Projects. The FBA must be used by a proponent to assess all biodiversity values on the development site.

If you have any questions regarding this matter further please contact Liz Mazzer on 02 6883 5325 or email liz.mazzer@environment.nsw.gov.au.

Yours sincerely,



STEVEN COX
Senior Team Leader Planning
North West Region

Date: 30 June 2016

Contact officer: LIZ MAZZER
6883 5325

Attachment A - Environmental Assessment Requirements

Attachment B – Species/Populations/Ecological Communities which require further consideration

Attachment C - Guidance material

Attachment A – Standard Environmental Assessment Requirements

<p>Biodiversity</p>
<p>1. Biodiversity impacts related to the proposed development are to be assessed and documented in accordance with the Framework for Biodiversity Assessment, unless otherwise agreed by OEH, by a person accredited in accordance with s142B(1)(c) of the <i>Threatened Species Conservation Act 1995</i>.</p>
<p>Aboriginal cultural heritage</p>
<p>2. The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the development and document these in the EIS. This may include the need for surface survey and test excavation. The identification of cultural heritage values should be guided by the <i>Guide to investigating, assessing and reporting on Aboriginal Cultural Heritage in NSW</i> (DECCW, 2011) and consultation with OEH regional officers.</p>
<p>3. Where Aboriginal cultural heritage values are identified, consultation with Aboriginal people must be undertaken and documented in accordance with the <i>Aboriginal cultural heritage consultation requirements for proponents 2010</i> (DECCW). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the EIS.</p>
<p>4. Impacts on Aboriginal cultural heritage values are to be assessed and documented in the EIS. The EIS must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to OEH.</p>
<p>Historic heritage</p>
<p>5. The EIS must provide a heritage assessment including but not limited to an assessment of impacts to <i>State and local heritage</i> including conservation areas, natural heritage areas, places of Aboriginal heritage value, buildings, works, relics, gardens, landscapes, views, trees should be assessed. Where impacts to State or locally significant heritage items are identified, the assessment shall:</p> <ol style="list-style-type: none"> a. outline the proposed mitigation and management measures (including measures to avoid significant impacts and an evaluation of the effectiveness of the mitigation measures) generally consistent with the NSW Heritage Manual (1996), b. be undertaken by a suitably qualified heritage consultant(s) (note: where archaeological excavations are proposed the relevant consultant must meet the NSW Heritage Council's Excavation Director criteria), c. include a statement of heritage impact for all heritage items (including significance assessment), d. consider impacts including, but not limited to, vibration, demolition, archaeological disturbance, altered historical arrangements and access, landscape and vistas, and architectural noise treatment (as relevant), and e. where potential archaeological impacts have been identified develop an appropriate archaeological assessment methodology, including research design, to guide physical archaeological test excavations (terrestrial and maritime as relevant) and include the results of these test excavations.

Water and soils	
6.	The EIS must map the following features relevant to water and soils including: <ol style="list-style-type: none"> a. Acid sulfate soils (Class 1, 2, 3 or 4 on the Acid Sulfate Soil Planning Map). b. Rivers, streams, wetlands, estuaries (as described in Appendix 2 of the Framework for Biodiversity Assessment). c. Groundwater. d. Groundwater dependent ecosystems. e. Proposed intake and discharge locations.
7.	The EIS must describe background conditions for any water resource likely to be affected by the development, including: <ol style="list-style-type: none"> a. Existing surface and groundwater. b. Hydrology, including volume, frequency and quality of discharges at proposed intake and discharge locations. c. Water Quality Objectives (as endorsed by the NSW Government http://www.environment.nsw.gov.au/ieo/index.htm) including groundwater as appropriate that represent the community's uses and values for the receiving waters. d. Indicators and trigger values/criteria for the environmental values identified at (c) in accordance with the ANZECC (2000) Guidelines for Fresh and Marine Water Quality and/or local objectives, criteria or targets endorsed by the NSW Government.
8.	The EIS must assess the impacts of the development on water quality, including: <ol style="list-style-type: none"> a. The nature and degree of impact on receiving waters for both surface and groundwater, demonstrating how the development protects the Water Quality Objectives where they are currently being achieved, and contributes towards achievement of the Water Quality Objectives over time where they are currently not being achieved. This should include an assessment of the mitigating effects of proposed stormwater and wastewater management during and after construction. b. Identification of proposed monitoring of water quality.
9.	The EIS must assess the impact of the development on hydrology, including: <ol style="list-style-type: none"> a. Water balance including quantity, quality and source. b. Effects to downstream rivers, wetlands, estuaries, marine waters and floodplain areas. c. Effects to downstream water-dependent fauna and flora including groundwater dependent ecosystems. d. Impacts to natural processes and functions within rivers, wetlands, estuaries and floodplains that affect river system and landscape health such as nutrient flow, aquatic connectivity and access to habitat for spawning and refuge (eg river benches). e. Changes to environmental water availability, both regulated/licensed and unregulated/rules-based sources of such water. f. Mitigating effects of proposed stormwater and wastewater management during and after construction on hydrological attributes such as volumes, flow rates, management methods and re-use options. g. Identification of proposed monitoring of hydrological attributes.

Flooding	
10.	The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including: <ol style="list-style-type: none"> a. Flood prone land b. Flood planning area, the area below the flood planning level. c. Hydraulic categorisation (floodways and flood storage areas).
11.	The EIS must describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 1 in 10 year, 1 in 100 year flood levels and the probable maximum flood, or an equivalent extreme event.
12.	The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios: <ol style="list-style-type: none"> a. Current flood behaviour for a range of design events as identified in 11 above. This includes the 1 in 200 and 1 in 500 year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change.
13.	Modelling in the EIS must consider and document: <ol style="list-style-type: none"> a. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood. b. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories. c. Relevant provisions of the NSW Floodplain Development Manual 2005.
14.	The EIS must assess the impacts on the proposed development on flood behaviour, including: <ol style="list-style-type: none"> a. Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure. b. Consistency with Council floodplain risk management plans. c. Compatibility with the flood hazard of the land. d. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land. e. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site. f. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses. g. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council. h. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council. i. Emergency management, evacuation and access, and contingency measures for the development considering the full range of flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES. j. Any impacts the development may have on the social and economic costs to the community as consequence of flooding.

Attachment B

Table 1

Species/Populations/Ecological Communities which require further consideration

Class	Scientific Name	Common Name	NSW Status	Comm Status
EEC	<i>Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions</i>	Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions	EEC	Endangered
Fauna	<i>Anthochaera phrygia</i>	Regent Honeyeater	Critically Endangered	Critically Endangered
Flora	<i>Hakea pulvinifera</i>	Lake Keepit Hakea	Endangered	Endangered

Table 2

Critically endangered entities specifically excluded from requiring further consideration*

Class	Scientific Name	Common Name	NSW Status	Comm Status
EEC	<i>White Box Yellow Box Blakely's Red Gum Woodland</i>	White Box Yellow Box Blakely's Red Gum Woodland	EEC	Critically Endangered
Fauna	<i>Lathamus discolor</i>	Swift Parrot	Endangered	Critically Endangered

* Further information, as detailed in section 9.2.5.2 of the FBA, is not required for the excluded entities in Table 2. However, assessment of impacts and offset requirements must still be included in the biodiversity assessment report for these entities in accordance with the FBA.

Attachment C – Guidance material

Title	Web address
<u>Relevant Legislation</u>	
<i>Coastal Protection Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+13+1979+cd+0+N
<i>Commonwealth Environment Protection and Biodiversity Conservation Act 1999</i>	http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
<i>Environmental Planning and Assessment Act 1979</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+203+1979+cd+0+N
<i>Fisheries Management Act 1994</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+38+1994+cd+0+N
<i>Marine Parks Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+64+1997+cd+0+N
<i>National Parks and Wildlife Act 1974</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+80+1974+cd+0+N
<i>Protection of the Environment Operations Act 1997</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+156+1997+cd+0+N
<i>Threatened Species Conservation Act 1995</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+101+1995+cd+0+N
<i>Water Management Act 2000</i>	http://www.legislation.nsw.gov.au/maintop/view/inforce/act+92+2000+cd+0+N
<i>Wilderness Act 1987</i>	http://www.legislation.nsw.gov.au/viewtop/inforce/act+196+1987+FIRST+0+N
<u>Biodiversity</u>	
NSW Biodiversity Offsets Policy for Major Projects (OEH, 2013)	http://www.environment.nsw.gov.au/resources/biodiversity/140672biopolicy.pdf
Framework for Biodiversity Assessment (OEH, 2013)	http://www.environment.nsw.gov.au/resources/biodiversity/140675fba.pdf
Fisheries NSW policies and guidelines	http://www.dpi.nsw.gov.au/fisheries/habitat/publications/policies,-guidelines-and-manuals/fish-habitat-conservation
List of national parks	http://www.environment.nsw.gov.au/NationalParks/parksearchatoz.aspx
Revocation, recategorisation and road adjustment policy (OEH, 2012)	http://www.environment.nsw.gov.au/policies/RevocationOfLandPolicy.htm
Guidelines for developments adjoining land and water managed by the Department of Environment, Climate Change and Water (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/parks/policyRevocations.pdf
<u>Heritage</u>	
The Burra Charter (The Australia ICOMOS charter for places of cultural significance)	http://australia.icomos.org/wp-content/uploads/The-Burra-Charter-2013-Adopted-31.10.2013.pdf
Statements of Heritage Impact 2002 (HO & DUAP)	http://www.environment.nsw.gov.au/resources/heritagebranch/heritage/hmstatementsofhi.pdf
NSW Heritage Manual (DUAP) (scroll through alphabetical list to 'N')	http://www.environment.nsw.gov.au/Heritage/publications/index.htm#M-O

Title	Web address
<u>Aboriginal Cultural Heritage</u>	
Aboriginal Cultural Heritage Consultation Requirements for Proponents (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/comconsultation/09781ACHconsultreq.pdf
Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales (DECCW, 2010)	http://www.environment.nsw.gov.au/resources/cultureheritage/10783FinalArchCoP.pdf
Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)	http://www.environment.nsw.gov.au/resources/cultureheritage/20110263ACHguide.pdf
Aboriginal Site Recording Form	http://www.environment.nsw.gov.au/resources/parks/SiteCardMainV1_1.pdf
Aboriginal Site Impact Recording Form	http://www.environment.nsw.gov.au/resources/cultureheritage/120558asirf.pdf
Aboriginal Heritage Information Management System (AHIMS) Registrar	http://www.environment.nsw.gov.au/contact/AHIMSRegistrar.htm
Care Agreement Application form	http://www.environment.nsw.gov.au/resources/cultureheritage/20110914TransferObject.pdf
<u>Water and Soils</u>	
Acid sulphate soils	
Acid Sulfate Soils Planning Maps via 'The NSW Natural Resource Atlas'	www.nratlas.nsw.gov.au/
Acid Sulfate Soils Manual (Stone et al. 1998)	Manual available for purchase from: http://www.landcom.com.au/whats-new/the-blue-book.aspx Chapters 1 and 2 are on DPI's Guidelines Register at: Chapter 1 Acid Sulfate Soils Planning Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Planning%20Guidelines.pdf Chapter 2 Acid Sulfate Soils Assessment Guidelines: http://www.planning.nsw.gov.au/rdaguidelines/documents/NSW%20Acid%20Sulfate%20Soils%20Assessment%20Guidelines.pdf
Acid Sulfate Soils Laboratory Methods Guidelines (Ahern et al. 2004)	http://www.advancedenvironmentalmanagement.com/Reports/Savannah/Appendix%2015.pdf This replaces Chapter 4 of the Acid Sulfate Soils Manual above.
Flooding and Coastal Erosion	
Reforms to coastal erosion management	http://www.environment.nsw.gov.au/coasts/coastalerosionmgmt.htm
Floodplain development manual	http://www.environment.nsw.gov.au/floodplains/manual.htm
Guidelines for Preparing Coastal Zone Management Plans	Guidelines for Preparing Coastal Zone Management Plans http://www.environment.nsw.gov.au/resources/coasts/130224CZMPGuide.pdf
NSW Climate Impact Profile	NSW Climate Impact Profile
Climate Change Impacts and Risk Management	Climate Change Impacts and Risk Management: A Guide for Business and Government, AGIC Guidelines for Climate Change Adaptation
Water	
Water Quality Objectives	http://www.environment.nsw.gov.au/ieo/index.htm

Title	Web address
ANZECC (2000) Guidelines for Fresh and Marine Water Quality	www.environment.gov.au/water/publications/quality/australian-and-new-zealand-guidelines-fresh-marine-water-quality-volume-1
Applying Goals for Ambient Water Quality Guidance for Operations Officers – Mixing Zones	http://deccnet/water/resources/AWQGuidance7.pdf
Approved Methods for the Sampling and Analysis of Water Pollutant in NSW (2004)	http://www.environment.nsw.gov.au/resources/legislation/approvedmethods-water.pdf

APPENDIX C

METHODS STATEMENT

METHODS STATEMENT

1 OVERVIEW

The surveys were completed as part of the Biodiversity Assessment report for the proposal in accordance with the *Framework for Biodiversity Assessment* (FBA) (OEH 2014a). The Development Site was surveyed by three SLR ecologists from 18 to 21 October 2016, and the 25-26 October 2017 involving:

- Plot/transect surveys according to the FBA.
- Threatened species surveys a two-day survey by two SLR ecologists to conduct plot/transect surveys according to the BioBanking methodology set out in the FBA.
- Ground-truthing of grassland vegetation and delineation of derived native grassland and areas of exotic-dominated pasture.

The aim of the surveys was to gather site data and observations to inform this *Biodiversity Assessment Report* in accordance with the FBA, involving:

- Inspection of areas of native vegetation to refine vegetation community mapping and conditions in accordance with the FBA (OEH 2014a).
- Collection of detailed floristic and habitat data within the plant community types in accordance with the requirements of the FBA.
- Spotlighting surveys throughout woodland and grassland areas and around farm dams and drainage lines to detect nocturnal fauna species.
- Call playback of relevant threatened forest owls and threatened amphibian calls during nocturnal surveys.
- Infrared and motion sensing camera surveys across various woodland habitats on the site to detect ground mammals and other fauna.
- Amphibian surveys (searches and call playback).
- Anabat monitoring for microchiropteran bats, focusing on areas where bat activity would be highest;
- Dawn bird surveys, in particular to target threatened species of birds known to the locality; and
- Surveys for important fauna habitat features.

2 ASSESSING SITE VALUE

2.1 Mapping native vegetation extent

Patches of native vegetation were identified on the site prior to field work using available regional vegetation data from the *BRG-Namoi Regional Native Vegetation Mapping* (OEH 2015) and aerial imagery. Broad vegetation formations and vegetation classes were mapped across the site and their

areas calculated. This mapping allowed a field survey design to be completed, and formed the starting point for identifying native vegetation types.

These patches were assessed during field surveys to ascertain the extent, type and distribution of native vegetation types within these patches. Other parts of the site, including especially those where the proposed PPUs are located, were inspected on foot or driven to determine whether additional areas of native vegetation are present. In accordance with the Biobanking Methodology (DECC 2009) "*Cleared land is land on which the native over-storey has been cleared, there is no native mid-storey, and less than 50% of the ground cover vegetation is indigenous species, or greater than 90% of the ground cover is cleared*".

Subsequent to field work the OEH (2015) vegetation mapping was reviewed. Detailed consideration was given to methods used in that mapping (eg validation effort, patch size, canopy cover) and it was determined that whilst various additional patches of native vegetation are included in that vegetation the field efforts by SLR are most reliable in determining the presence of vegetation patches across the site.

2.2 Stratifying native vegetation

Based on field survey results, vegetation types (or plant community types, PCTs) were identified by matching floristic results from plot surveys (see next section) to floristic descriptions for relevant vegetation types listed for the Namoi CMA in the *VIS Classification Database* (OEH, 2017). Patches of native vegetation types were further stratified into broad condition states of 'low' condition and 'moderate to good condition' (definitions as per DECC 2009a and thereby identified as distinct vegetation zones, according to Section 5.2.2 of the FBA. Vegetation zones are mapped and described in the accompanying report.

2.3 Plot and transect surveys

A plot-based full floristic survey of the development site was undertaken according to the methods outlined in Chapter 5 of the FBA. Plot and transect surveys were conducted to gather data on 'site value' for each vegetation zone and sample the environmental variation encountered within each zone. Several plots were also undertaken in surrounding areas to assess potential biodiversity offsets on the site. The number of plots sampled per vegetation zone was done according to the minimum requirements of the FBA, as listed in **Table C1**.

Table C1 Plots/transects required and collected per vegetation zone in the development footprint (note: additional plots were undertaken in surrounding areas)

	Vegetation Zone	Area (ha)	Min. Plots Required	Plots completed
1383	White Box grassy woodland (moderate to good condition)	21.27	0	0
589	White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland (moderate to good condition)	55.22	1	1
101	Poplar Box - Yellow Box - Western Grey Box grassy woodland (moderate to good condition)	0.1	0	0
78	River Red Gum riparian tall woodland / open forest (moderate to good condition) [#]	0.47	0	0

Field Survey Details

1383	White Box grassy woodland (derived grassland)	558.77	4	5
N/A	Non-native Groundcover	380.30	3	3
	Total	1016.12		9

As listed in Table C1, the minimum number of plots/transects was completed for each vegetation zone.

The surveys were standard biobanking plot surveys (see DECC 2009 and OEH 2014) and involved

- Establishing a plot location randomly within a given vegetation zone, based on marking points randomly within each zone on a map of vegetation types. The locations of all plot/transects are shown in Figure 7;
- A full floristic survey based on a 'nested' 20 m X 20 m quadrat, with all species recorded within the plot, including species name, growth form, and cover-abundance score according to the Braun-Blanquet scoring system (see Poore 1955)
- Establishing a 50 m transect through the centre of the plot and collecting data on six variables at various intervals along the transect (as listed in Table 2 of the FBA). The start point of the 50 m transect was recorded using a hand held GPS unit to allow mapping of the locations of all plot/transects;
- Establishing a 20 m X 50 m plot using the boundaries of the 20 m X 20 m plot and the 50 m transect, and recording (i) total length of fallen logs (>10 cm diameter and over 50 cm in length) and (ii) number of trees with hollows;
- Estimating the proportion of canopy trees that are regenerating within the zone.

The above data were collected using biobanking field sheets (DECC 2009b). The completed field data sheets are attached to the accompanying report in Appendix H.

3 THREATENED SPECIES SURVEYS

3.1 Overview

A range of threatened species have previously been recorded within the locality of the site. Section 6.6 of the FBA specifies the requirements for threatened species surveys:

- should be carried out at the appropriate time of year, as specified in the Threatened Species Profile Database;
- adopt repeatable methods
- must target all 'candidate' species credit species identified according to Section 6.5 of the FBA. All 'species credit' species would be identified during the desktop assessment, but are generally always included in the Wildlife Atlas database, so we are confident that our list provided in Appendix E includes such species.
- be conducted according to DEC (2004) guidelines for all species excluding frogs (see below); and
- frog surveys be conducted according to DECC (2009) guidelines.

Field Survey Details

Based on our search for previous records of threatened species in the Atlas of NSW Wildlife database (within 10 km of the site), we have generated a table listing threatened flora and fauna for consideration in the BAR. The table is provided in Appendix E and provides the recommended survey techniques and survey effort for each of group of threatened fauna. In identifying survey requirements for the BAR, we have relied on the following key guidelines:

- DEC (2004) Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities, for threatened species (excluding frogs) listed under the TSC Act.
- DECC (2009) Threatened species survey and assessment guidelines: field survey methods for fauna. Amphibians, for threatened frogs listed under the TSC Act.
- DEWHA survey guidelines for Australia's threatened birds, bats, frogs and mammals, for threatened fauna listed under the EPBC Act.

In the SEARs, OEH have also identified threatened species 'requiring further consideration' in the BAR, as noted above, which are the threatened species Regent Honeyeater (*Anthochaera phrygia*) and Lake Keepit Hakea (*Hakea pulvinifera*); and the threatened ecological community Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions.

3.2 Infrared Camera Surveys

Infrared cameras were set up in the various woodland vegetation patches throughout the site to target threatened ground and arboreal mammals (refer to **Table C2**). Cameras were installed adjacent to favorable habitat features such as hollow logs or hollow-bearing trees. Cameras are also motion sensing which allowed constant monitoring during day and night.

Table C2 Infrared Camera surveys

Date (2016)	Survey Effort (Trap Nights)	Area Surveyed	Threatened species targeted	Comments
18/10-19/10	2 (2 units)	2 units placed in southern woodland area of site (Happy Hills property)	Spotted-tailed Quoll, Brush-tailed Phascogale	Cameras baited with dog food, banana and molasses. Installed near favourable habitat features such as hollow logs.
19/10-20/10-	5 (5 units)	One camera remain in southern woodland, one moved to southwest woodland area as arboreal setup. Three more units placed in northern woodland areas near Ski Gardens Road (one as arboreal setup, 2 as ground setup).	Spotted-tailed Quoll, Brush-tailed Phascogale, Koala, Squirrel Glider, Eastern Pygmy Possum ,	Ground cameras baited with dog food, arboreal cameras with banana and molasses.
20/10-21/10	5 (5 units)	As above.	Spotted-tailed	Ground cameras baited

Field Survey Details

	Quoll, Brush-tailed Phascogale, Koala, Squirrel Glider, Eastern Pygmy Possum	with dog food, arboreal cameras with banana and molasses.
Total	12 TN	

3.3 Spotlighting

Spotlighting surveys were conducted throughout the various woodland patches across the site, to target nocturnal mammals, owls, amphibians and other nocturnal fauna (refer to **Table C3**). All vegetation types were surveyed and special attention was given to areas of higher habitat value. Fauna species were detected both visually and aurally.

Table C3 Spotlighting surveys

Date (2016)	Survey Effort (person-hours)	Survey notes	Fauna groups targeted	Threatened species targeted
19 October (7:30 – 9:30pm)	4	2 persons surveyed southern woodland area of site	Forest Owls, arboreal mammals, ground mammals, amphibians	Barking Owl, Masked Owl, Spotted-tailed Quoll, Brush-tailed Phascogale, Koala, Squirrel Glider, Eastern Pygmy Possum ,
20 October (7:30 – 9:30pm)	4	2 persons surveyed northern woodland patches of site	Forest Owls, arboreal mammals, ground mammals, amphibians	As above
Total	8			

3.4 Call Playback

Pre-recorded calls of the Masked Owl and Barking Owl were broadcast on numerous locations during the 2016 field surveys (refer to **Table C4**). Each call being broadcast for 5 minutes followed by a two minute listening period. Ten minutes were spent listening for calls prior to and after playback. Call playback was conducted within three hours after sunset.

Table C4 Call playback surveys

Date (2016)	Survey Effort (hrs)	Calls Broadcast	Survey Area	Comments
19 October (8:45 -9:30pm)	0.75	Masked Owl, Barking Owl	Southern woodland area of site	Broadcast during final hour of spotlight; 2 persons observing
20 October (8:30 -9:30pm)	1.0	Masked Owl, Barking Owl	Northern woodland area of site	Broadcast during final hour of spotlight; 2 persons observing

3.5 Microchiropteran Bat Surveys

Anabat recorders were employed to detect microchiropteran bats. Anabats were placed in appropriate areas for bat detection including woodland patches and watercourses. Anabat surveys

Field Survey Details

were conducted passively using three units at stationary points from dusk until dawn (refer to **Table C5**).

Table C5 Microchiropteran bat surveys.

Survey Type	Date (2016)	Survey (hours)	Survey effort (Detector nights)	Area Surveyed
Anabat				
	18/10-19/10	(6pm -6am)	2	2 units placed in southern woodland area of site (Happy Hills property); one on edge of farm dam
	19/10-20/10	(6pm -6am)	3	One unit remain at farm dam. One moved to southwest woodland area (Happy Hills property) near ephemeral watercourse. One set in woodland in central north of site (upslope from Ski gardens Rd) adjacent to ephemeral gully.
	20/10-21/10	(6pm -6am)	3	As above.
TOTAL			8 'Detector Nights'	

3.6 Avifauna Surveys

Diurnal bird surveys involved visual observation of species as well as identification of calls. Terrestrial bird surveys were conducted at dawn (refer to **Table C6**). In addition, bird species were also recorded on an opportunistic basis throughout all surveys, including during vegetation surveys.

Table C6 Avifauna surveys

Date (2016)	Survey Effort (person-hours)	Surveyed Area
19 October (6.00 -7:00am)	2	Opportunistic survey across southern woodland areas. Searches for nests.
20 October (6.00 -7:30am)	3	Opportunistic survey across northern woodland areas. Searches for nests.
TOTAL	5 person hours	

3.7 Habitat Searches

During the surveys, the subject site was thoroughly examined for the occurrence of habitat features including hollow-bearing trees, dead stags, ground logs and debris as well as suitable vegetation types. Habitat features suitable for threatened species were also targeted. The presence of old growth hollows / dead stags favorable for threatened owl species were mapped and were also targeted in Spotlighting and stagwatching surveys. Field ecologists carried out random, opportunistic log and debris searches, targeting reptiles and small mammals.

Field Survey Details

The methods by which candidate 'species credit' threatened species of potential relevance to the site were identified are described in Section 4 of the accompanying report. Targeted surveys for species credit species were conducted, where possible during the October surveys.

3.8 Weather

Weather conditions during days of the detailed survey were hot and sunny with gentle north winds (gusty at times) and intermittent occasional rainfall events (refer to **Table C7**).

Table C7 Weather conditions during the survey period¹

Date (2016)	24-hr Rainfall (mm)	Humidity (%)	Max Wind (km/hr)	Temp Range (°C)	Moon phase
Oct 18 (diurnal)	0	55	18 W	24 clear sky	–
Oct 18 (nocturnal)	0	50	5 WNW	6 – 15 clear sky	80% moon near full
Oct 19 (diurnal)	0	61	20 WSW	14– 26 clear sky	–
Oct 19 (nocturnal)	0	57	5 NW	8 – 12 clear sky	84% moon near full
Oct 20 (diurnal)	0	69	10 NW	14– 28 clear sky	–
Oct 20 (nocturnal)	0	51	9 ESE	8 – 15 clear sky	75% moon near full

¹ Recorded at the nearest BOM weather station at Gunnedah Airport

APPENDIX D

FBA PLOT DATA SUMMARY

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
Impact Vegetation Zones (plots located within Development Footprint)													
VZ1P1	9	0	0	0	6	2	94	0	0	0	269785	6588417	56
VZ1P2	11	0	0	10	2	10	72	0	0	0	268779	6588146	56
VZ1P3	17	1.5	0	16	8	6	92	0	1	0	267313	6587523	56
VZ1P4	11	0.2	0	12	0	10	96	1	1	0	268044	6586478	56
VZ1P5	12	0	0	50	0	0	100	0	0	0	269084	6590183	56
VZ1P6	7	0	0	4	0	0	42	0	0	0	268248	6586766	56
VZ2P1	7	0	0	0	0	4	100	0	0	0	269051	6589907	56
VZ2P2	9	0	0	12	2	2	100	0	0	0	269689	6589476	56
VZ2P3	11	0	0	10	6	18	92	0	0	0	269972	6586843	56
VZ2P4	17	2.7	0	42	0	46	100	0	1	5	270112	6586303	56
VZ2P5	8	0	0	44	0	6	98	0	0	0	268388	6586118	56
VZ2P6	12	0	0	68	0	10	12	0	0	0	268795	6586698	56
VZ2P7	18	0	0	24	0	52	20	0	0	0	269458	6586938	56
VZ2P8	24	0	0	44	0	28	16	0	0	0	269141	6587443	56
Non-impact Veg Zones (plots located outside of Development Footprint)													
VZ3P1	9	1.7	0	20	0	16	100	3	1	21	268584	6586021	56
VZ3P2	12	8.2	0	12	0	28	100	3	0	0	268115	6586044	56
VZ3P3	5	2.6	0	28	0	2	100	6	0	25	268551	6586032	56

Plot Name	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	Easting	Northing	Zone
VZ4P1	13	7.6	0	6	0	8	100	1	1	7	269235	6590542	56
VZ4P2	23	12.5	0	32	4	28	64	3	1	10	268967	6589570	56
VZ4P3	16	3.5	0	28	0	16	100	4	0	8	269598	6587201	56
VZ4P4	16	0.1	0	86	0	16	100	2	1	0	269587	6586801	56
VZ4P5	14	0	0	30	16	40	100	0	1	0	269909	6586344	56
VZ4P6	20	7	0	32	2	10	22	2	0	5	269260	6586756	56
VZ5P1	16	5	0	28	0	12	94	2	1	17	269688	6586765	56
VZ5P2	14	2.1	0	8	0	12	94	2	1	12	270060	6589413	56
VZ6P1	10	13	0	0	0	12	80	3	1	28	269947	6589136	56
VZ7P1	18	3	0	12	8	22	84	1	1	2	268321	6586307	56
VZ8P1	19	2.5	0	8	0	46	92	0	0	0	269281	6590760	56

APPENDIX E

Completed Field Data Sheets

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 21/10/16	Site No.	Rushes Ck FBA	VZ7P1	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Crypt-ogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
Reviewed by: Jeremy PepperIssue Date:
Version:7 May 2016
1.0

Plot No.

V27 P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca mela</i>	6	21	1
	F		<i>Finad. nuda</i> nat.	3	19	2
	S		<i>Maure micro</i>	4	20	3
	S		<i>Austrost. vertic.</i>	15	4000	4
	S		<i>Aristi. ram ram</i>	10	2000	5
	F		<i>Geran. sola.</i>	8	25	6
	D		<i>Dicha. serc.</i>	5	1000	7
	F		<i>Micro. step.</i>	8	2000	8
	A		<i>Wahlen. com.</i>	4	30	9
	S		<i>Rytido. racem.</i>	4	1000	10
	F		<i>Xero bracte.</i>	3	9	11
	E		<i>Cheila sieb sieb.</i>	3	8	12
	D		<i>Chlor. trunc.</i>	2	300	13
	F		<i>Lin. margu.</i>	2	20	14
	F		<i>Ajug. aust.</i>	2	15	15
	F		<i>Vittad. sulc.</i>	2	20	16
	F		<i>Tricor. elat.</i>	3	30	17
	F		<i>Solan. ciner.</i>	3	7	18
	D		* <i>Bram. cath.</i>	10	500	19
	A		* <i>Cardu. tenu.</i>	5	50	20
	F		* <i>Capsel. bur. pag.</i>	5	50	21
	F		* <i>Malva parv.</i>	3	12	22
	F		* <i>Medic. polyn.</i>	12	100	23
	F		* <i>Hypoch. rad.</i>	3	20	24
		cactus	* <i>Opunt. str. str.</i>	1	1	25
	D		* <i>Getana frag.</i>	3	200	26
	F		* <i>Petrov. nante</i>	3	50	27
	F		* <i>Lactuc. gett.</i>	2	20	28
	D		* <i>Lolium proen.</i>	8	300	29
Total Native Species:					18	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub,
G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern,
F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.Cover: <1,1,2,3,4,5
10,15,20,25,30,35,
etc crown cover %Abund: 1,2,3,4,5,6,7,8,9,10
20,50,100,500,1000,>1000
*: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 J2 21 P 1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	S		Maire micro	6	12	1
	F	xero	Bracte bracte	2	15	2
	F		Caletis cunei.	2	30	3
	S		Sclerol. hirc.	8	25	4
	F		Goode. punga.	3	30	5
	F		Wahlea. comm.	3	50	6
	F		Cotul. aust.	3	20	7
	F		Ammod. alat.	2	15	8
	S		Chlor. ventr.	5	100	9
						10
	F		Hypoch. rad.	10	200	11
	F		Medicago. poly.	30	500	12
	F		Capsel. bus. pas	10	300	13
	D		Lolium pere	15	500	14
	F		Hypoch. rad. ^{estabr.}	8	300	15
	F		Argem. ochre.	3	30	16
	F		Silyb. marc	3	20	17
	F		Polyg. avicu.	3	30	18
	F		Seliva sessil.	5	40	19
	D		Bromu. mollif.	25	>500	20
						21
						22
						23
						24
						25
						26
						27
						28
						29
Total Native Species:					9	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders
Date	20/10/16	Site No.	Rushes Ck FBA	V21P1	J Pepper, G Leonard
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness						5	0		No. trees with hollows
Native cover						8	0		Woody debris lineal metres
Exotic cover						0	0		Woody regeneration No. upper stratum

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	1	NR	
Soil erosion	1	R	
Firewood collection	3	0	
Grazing	1	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA	VZ1P2	J Pepper, G Leonard	
AMG grid reference	zone: 54 55 56 datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)			
						Litter	Rock	Bare ground	Fungi	Cryptogam	Other	No. trees with hollows
Native richness						5	0	3	0	0		
Native cover												
Exotic cover						0						

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	1	NR	
Soil erosion	1	NR	
Firewood collection	3	0	
Grazing	1	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Plot No.
 V21 P2

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	F		Wahl. str.	3	40	1
	F		Goodl. pinna.	6	40	2
	F		Cotel. crust.	6	20	3
	F		Calotis cuae.	4	30	4
	F		Chryso apic.	4	30	5
	S		Rytidosp. link.	10	300	6
	V		Convolv. erub.	3	10	7
	F		Geran. sol. sol.	8	15	8
	F		Euchit. involuc.	4	30	9
	F		Annob. alat.	20	60	10
	F		Plantag. debil.	3	20	11
						12
						13
						14
						15
	F		Medic. pdym.	35	500	16
	D		Sefari gracil.	20	300	17
	F		Plantag. lanc.	10	50	18
	F		Silyb. mari.	15	30	19
	D		Horde. lepor.	10	200	20
	F		Cappal. burg-co	10	50	21
	D		Lolium perenne	6	200	22
	F		Hypoch. glabr.	6	30	23
						24
						25
						26
						27
						28
						29
Total Native Species:						11

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000
 * : exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	19/10/16		Rushes Ck FBA	V21A3	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness									No. trees with hollows
Native cover						Bare ground	Fungi		Woody debris lineal metres
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	NR	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 VZ1P3

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca pop bim.</i>	15	12	1
	F		<i>Calot. lapp.</i>	3	20	2
	U		<i>Aristid. ram. ram.</i>	10	400	3
	U		<i>Rytidosp. racem.</i>	5	300	4
	U		<i>Bothr. mac.</i>	5	300	5
	S		<i>Maure. micro.</i>	8	20	6
	F		<i>Cotul. crust.</i>	5	25	7
	G		<i>Sclerol. burch.</i>	10	30	8
	F		<i>Solan. curer.</i>	3	12	9
	F		<i>Wahl. com</i>	2	20	10
	F		<i>Wahl. str.</i>	2	10	11
	F		<i>Plantag. debil.</i>	2	8	12
	U		<i>Chloris! trunc.</i>	3	100	13
	F		<i>Euchit. invol.</i>	2	20	14
	F		<i>Sida subsp.</i>	2	15	15
	F		<i>Rumex brow.</i>	2	10	16
	F		<i>Brachys ang. hete.</i>	5	30	17
						18
						19
						20
	D		<i>Horde. lepar.</i>	15	300	21
	F		<i>Hypoch. radic.</i>	3	20	22
	F		<i>Lactuca serr.</i>	3	25	23
	D		<i>Lolium pere.</i>	5	200	24
	F		<i>Medic. poly.</i>	25	400	25
	F		<i>Trifol. arv.</i>	30	500	26
	F		<i>Capsel. buos-pa.</i>	2	25	27
	D		<i>Bromus cath.</i>	3	150	28
	F		<i>Sisymb. offic.</i>	3	20	29
			Total Native Species:		17	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000
 * : exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	19/10/16	Site No.	Rushes Ck FBA	UZIP4	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 VZ1P4

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		Euca pop. bim.	10	2	1
	F		Cotul. aust.	10	60	2
	S		Maire micro	6	6	3
	F		Good. penna.	3	12	4
	S		Austrostip. vert.	5	200	5
	T		Wahl. str.	3	20	6
	F		Wahl. grac.	2	15	7
	F		Calotis lapp.	10	25	8
	F		Sida subspic.	2	10	9
	F		Geran. soka.	4	10	10
	F		Oxalis. exil.	2	6	11
						12
						13
				2		14
						15
	F		Medic. polym.	15	100	16
	F		Trifol. arve.	15	100	17
	F		Sorgh. oler.	3	12	18
	D		Lolium pere.	5	100	19
	D		Bromus. cath.	5	100	20
	D		Setar. grac.	3	50	21
						22
						23
						24
						25
						26
						27
						28
						29
Total Native Species:						11

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub,
 G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern,
 F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5
 10,15,20,25,30,35,
 etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10
 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 11/10/16	Site No.	Rushes Ck FBA	V21 P5	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %				Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock	Bare ground	Fungi	
Native richness						>5	0			No. trees with hollows
Native cover						>5	0			Woody debris lineal metres
Exotic cover						0				Woody regeneration No. upper stratum

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	1	NR	
Soil erosion	1	R	
Firewood collection	3	0	
Grazing	1	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V21 P5

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		Wahlen. com.	4	25	1
	T		Calot. lappul.	5	30	2
	T		Wahlen. com. lut.	3	15	3
	S		Mairea. microp.	5	10	4
	S		Agrost. avenac.	15	>300	5
	C		Austrost. scab.	10	>300	6
	C		Aristid. ram. ram.	5	>200	7
	F		Caloti. lappul. curk.	2	20	8
	F		Wahlenb. stre.	4	30	9
	G		Bothrioch. mac.	3	>100	10
	T		*Modiol. carol	3	30	11
	F		*Medicag. polym.	20	>100	12
	F		*Trifol. arvens.	25	>200	13
	F		*Hypoch. radic	15	50	14
	D		*Lolium pere.	10	>100	15
	F		*Scolym. hispa.	5	30	16
	F		*Trifol. angust.	5	100	17
	F		*Malva parvif.	2	20	18
	F		*Sonchus olerac.	2	20	19
	J		*Setari. grac.	3	>100	20
	C		Dichanth. seric.	2	100	21
	C		Enneap. nigric.	15	>300	22
						23
						24
						25
	J		*Bromu. mollif.	4	500	26
	D		*Horde. lepo.	3	300	27
	F		*Capsell. bur. past.	3	200	28
						29
				Total Native Species:		12

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5 10,15,20,25,30,35, etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	20/10/16	Site No.	Rushes Ck FBA	V22P1	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	3	NR	
Grazing	3	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V22 P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	F		*Medic. polym.	70	300	1
	F		*Hirschf. uncl.	3	20	2
	D		*Lolium. pere.	20	150	3
	F		*Cirsii vulg.	3	15	4
	F		*Lactuc. serr.	2	15	5
	F		*Horde. lepor.	4	200	6
	F		*Silyb. mari	2	8	7
	F		*Matba parv.	2	10	8
	D		*Aven. barb.	2	200	9
	F		*Hypoch. radi	3	25	10
			*Silyb. mari			11
	F		*Lactuc. serru.	2	20	12
	F		*Sanch. oler.	2	20	13
						14
						15
	F		Geran. sol.	5	15	16
	F		Cotul. aust.	2	6	17
	F		Rume. brow.	1	1	18
	F		Goode. pinn.	2	5	19
	F		Maize micro.	3	6	20
	F		Wahl. com.	2	12	21
	F		Chlor. ventr.	2	100	22
			Hay			23
						24
						25
						26
						27
						28
						29
				Total Native Species:		7

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5 etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10 20,50,100,500,1000,>1000 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	20/10/16	Site No.	Rushes Ck FBA	V22P2	J Pepper, G Leonard	
AMG grid reference	zone: 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Crypt-ogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	1	NR	
Soil erosion	2	R	
Firewood collection	2 2	O	
Grazing	1	R	
Fire damage	0	O	
Storm damage	0	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.

VZ 2 P 2

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	F	Xero	Bract. bract.	1	1	1
	F		Wahl str.	4	60	2
	F		Wahl. com.	24	30	3
	F		Cotula aust.	4	30	4
	F		Rumex brow	3	15	5
	F		Ammob. alat.	2	8	6
	G		Aristida ram. ram.	4	150	7
	F		Calotis cunei	4	30	8
	F		Solan. ciner.	1	1	9
						10
	D		Lolium perenne	40	400	11
	F		Medicago poly.	60	400	12
	F		Capsell purg. par.	3	30	13
	F		Modiol. carel.	2	20	14
	F		Malva parv.	2	20	15
	F		Sonch oler.	10	100	16
	F		Coarct. lanat.	20	150	17
	F		Chondr. junc.	3	20	18
						19
						20
						21
						22
						23
						24
						25
						26
						27
						28
						29
Total Native Species:						9

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000 * : exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	21/10/16	Site No.	Rushes Ck FBA	VZ2P3	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	3	NR	
Grazing	2	R	
Fire damage	1	O	
Storm damage	1	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.

VZ2P3

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	G		Arctida ram. ram	15	500	1
	G		Rytidosp. caesp.	10	300	2
	F		Wahlent. str.	5	30	3
	F		Wahlent. com.	5	30	4
	S		Marr. micro.	10	12	5
	S		Selerol. birch.	8	20	6
	F		Calot. caesp. lap.	12	40	7
	F		Euch. insel.	4	20	8
	F		Goode. palm	5	15	9
	F		Gerani. sola	5	20	10
	F		Luna marg.	2	12	11
						12
						13
						14
						15
	F		Papau. seornif.	3	12	16
	D		Aven. barb.	5	200	17
	F		Medic. polym.	65	300	18
	F		Trifol. ard.	30	200	19
	F		Malva parv.	3	15	20
	F		Capzel. bur. pas.	4	60	21
	F		Lactuca serit	4	40	22
	F		Hirschfel. unc.	3	40	23
	F		Carth. lanat.	3	25	24
	F		Centaur melit.	3	25	25
	D		Lolium. pere.	5	100	26
	F		Petrorh. nant.	2	20	27
						28
						29
				Total Native Species:		11

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub,
 G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern,
 F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5
 10,15,20,25,30,35,
 etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10
 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA	VZ 284	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	
Cultivation (inc. pasture)	0	O	
Soil erosion	0	O	
Firewood collection	1	R	
Grazing	2	R	
Fire damage	0	O	
Storm damage	0	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.

U22 P4

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca alba.</i>	8	1	1
	T		<i>Euca blake</i>	5	1	2
	G		<i>Austrosty. vertic.</i>	20	200	3
	F	X10	<i>Braete. brack.</i>	3	6	4
	F		<i>Calot. lapp.</i>	5	20	5
	F		<i>Wahlen. comm.</i>	5	30	6
	F		<i>Dichop. fimbri.</i>	4	20	7
	F		<i>Brunon. aust.</i>	3	10	8
	F		<i>Sida. subsp.</i>	3	15	9
	F		<i>Euch. involu.</i>	2	10	10
	F		<i>Good. pinnat.</i>	2	10	11
	V		<i>Loma filif. flav.</i>	2	6	12
	T		<i>Erodi. crini.</i>	2	5	13
	T		<i>Geran. sola. sda.</i>	5	10	14
	F		<i>Myopo. monta.</i>	1	1	15
	F		<i>Veron. plebe</i>	1	1	16
	C		<i>cheil sieb.</i>	3		17
						18
	F		* <i>Solva sess.</i>	2	10	19
	F		* <i>Scolum. hsp.</i>	3	20	20
	?	Cactus	* <i>Opunt stri</i>	2	1	21
	F		* <i>Medic. poly</i>	8	200	22
	F		* <i>Trif. arven.</i>	8	200	23
	F		* <i>Souch. oler.</i>	4	20	24
	F		* <i>Petror. nant.</i>	2	20	25
	F		* <i>Hypoch. rad.</i>	4	20	26
	F		* <i>Arcto. calen.</i>	1	1	27
	F		* <i>Vulp. myu.</i>	4	300	28
	F		* <i>Bran. cath.</i>	4	300	29
			Total Native Species:		17	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA	V22 P5	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %				Condition (within 0.1 or 0.04ha quadrat)		
						Litter	Rock	Bare ground	Fungi		Cryptogam	Other
Native richness						>5	0	>5	0			
Native cover												
Exotic cover								>4				

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	
Firewood collection	1	O	
Grazing	1	R	
Fire damage	0	O	
Storm damage	0	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V22 P5

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	U		Austrostip. vert.	5	300	1
	U		Wahlenb. comm.	3	30	2
	U	Xero	Bracte bracte	3	10	3
	U		Geran. sola. gda	8	50	4
	U		Cheil. siet.	4	20	5
	U		Dichop. fumbri.	3	30	6
	U		Rhytid. caespit.	4	200	7
	U		Arist. ramo.	5	200	8
						9
						10
	F		Medic. polym.	15	200	11
	F		Trif. arde!	20	300	12
	F		Hypoch. rad.	15	50	13
	D		Brom. cath.	30	500	14
	D		Lolium pere	10	300	15
	U		Arctoth. calc.	3	30	16
	U		Scelop. hisp.	10	40	17
	U		Capsel. bur. past.	5	20	18
	U		Hypoch. glab.	15	50	19
						20
						21
						22
						23
						24
						25
						26
						27
						28
						29
				Total Native Species:		8

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	19/10/16	Site No.	Rushes Ck FBA	V23P1	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Crypt-ogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

GDA 94

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V23 P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca pop. bim.</i>	22	5	1
	F		<i>Good! punn.</i>	4	20	2
	F		<i>Wahl. com.</i>	4	30	3
	F		<i>Wahl. str.</i>	2	20	4
	F		<i>Brachys. ang. het.</i>	3	30	5
	C		<i>Austrast. vertic.</i>	8	200	6
	F		<i>Euch. involuc.</i>	3	30	7
	F		<i>Brachyc. popu.</i>	5	1	8
	F		<i>Rumex brow.</i>	3	15	9
						10
	L		<i>Cirsium. vulg.</i>	3	20	11
	F		<i>Lactuc. serr.</i>	5	20	12
	O		<i>Lolium pere.</i>	20	400	13
	F		<i>Silyb. mara.</i>	10	30	14
	F		<i>Medica poly.</i>	15	200	15
	F		<i>Sarcob. cler.</i>	12	40	16
	F		<i>Capsel. bur. pes.</i>	15	50	17
						18
						19
						20
						21
						22
						23
						24
						25
						26
						27
						28
						29
Total Native Species:					9	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5 10,15,20,25,30,35, etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA	U23P2	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock	No. trees with hollows	
Native richness									
Native cover						Bare ground	Fungi	Woody debris lineal metres	
Exotic cover						Cryptogam	Other	Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	1	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 VZ3P2

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		Euca alb.	20	2	1
	T		Euca pop. bim.	15	1	2
	F	Xero	Bracte bracte	3	12	3
	F		Geran. sola.	5	10	4
	V		Cyper. lhotzk	2	12	5
	L		Glyc. cland.	2	15	6
	S		Austrost. vertic.	8	300	7
	H		Good. pinna.	6	12	8
	H		Bulb. bulb.	3	15	9
	H		Solan. cuner.	2	5	10
	S		Maire. micro.	5	10	11
	V		Loman. multif.	4	12	12
						13
						14
						15
	H		Hypoch. glab.	3	30	16
	H		Lactuca serri.	4	30	17
	F		Silyb. mar.	5	25	18
	F		Tripl. arvens.	5	100	19
	F		Malva parv.	4	30	20
	H		Sanch. oler.	5	30	21
	S		Lolium peren.	15	500	22
	S		Hord. lepor.	5	200	23
	H		Capsel. burs. past	40	200	24
						25
						26
						27
						28
						29
Total Native Species:					12	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5,10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10,20,50,100,500,1000,>1000
 * : exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA		J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock	No. trees with hollows	
Native richness									
Native cover						Bare ground	Fungi	Woody debris lineal metres	
Exotic cover						Cryptogam	Other	Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	NR	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	O	O	
Storm damage	O	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V23P3

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Eucalypt. bim.</i>	30	4	1
	S		<i>Mairea. micro</i>	3	10	2
	G		<i>Arist. ramo</i>	10	400	3
	G		<i>Austrosty. vert.</i>	10	400	4
	H		<i>Urtic. uncin.</i>	10	25	5
	H		* <i>Lactuca serr.</i>	3	30	6
	H		* <i>Papaver somn.</i>	1	1	7
	H		* <i>Capsel. burs. past.</i>	3	30	8
	D		* <i>Lolium perenne</i>	60	2000	9
	G		* <i>Bromus cath.</i>	10	500	10
	F		* <i>Modiol. carol.</i>	3	30	11
	F		* <i>Verbe. incompt.</i>	3	30	12
						13
						14
						15
						16
						17
						18
						19
						20
						21
						22
						23
						24
						25
						26
						27
						28
						29
				Total Native Species:		5

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub,
 G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern,
 F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5
 10,15,20,25,30,35,
 etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10
 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	20/10/16	Site No.	Rushes Ck FBA		J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness									No. trees with hollows
Native cover						Bare ground	Fungi		Woody debris lineal metres
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Plot No.
 VZ4P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca melano.</i>	10	1	1
	T		<i>Callit. glauco.</i>	25	6	2
	F		<i>Calotis fapp.</i>	8	60	3
	F		<i>Xera. bracte</i>	10	1	4
	F		<i>Goode. plan.</i>	6	20	5
	F		<i>Rumex brow.</i>	3	15	6
	S		<i>Maurea. micro.</i>	2	4	7
	F		<i>Euchit. Wahi. com.</i>	3	20	8
	F		<i>Dichop. fimbri.</i>	3	30	9
	S		<i>Rytido caesp.</i>	4	200	10
	S		<i>Aristid. ramo</i>	2	200	11
	F		<i>Euchita. invol.</i>	2	3	12
	S		<i>Sclerol. burchi.</i>	4	15	13
						14
						15
	F		<i>Lactuc. serrol.</i>	5	40	16
	F		<i>Caps. bur. past.</i>	10	120	17
	A		<i>Malva parv.</i>	10	50	18
	F		<i>Medica. poly</i>	40	800	19
	D		<i>Horde. lepor.</i>	10	300	20
	F		<i>Hirschf. inca.</i>	5	60	21
						22
						23
						24
						25
						26
						27
						28
						29
Total Native Species:					13	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5 10,15,20,25,30,35, etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	19/10/16	Site No.	Rushes Ck FBA		J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)		
Native richness						Litter		Rock		No. trees with hollows	
Native cover						Bare ground		Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam		Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	0	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	NR	
Firewood collection	1	NR	
Grazing	2	NR	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), 0=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.

124 P2

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca albens</i>	25	4	1
	G		<i>Aristid. ram ram.</i>	15	900	2
	S		<i>Maure. micro</i>	3	5	3
	Y		<i>Cyper. gracil.</i>	5	100	4
	D		<i>Microd. stip. st.</i>	20	1000	5
	C		<i>Austrastip. scabr.</i>	3	400	6
	F		<i>Senec. diesch.</i>	1	1	7
	F		<i>Goode. punna.</i>	6	30	8
	V		<i>Lomand. multi</i>	2	5	9
	F		<i>Calot. cune.</i>	2	10	10
	F		<i>Wahl. com.</i>	2	15	11
	F		<i>Wahl. plauif. long</i>	2	15	12
	F		<i>Bruno. aust</i>	2	10	13
	F		<i>Carda. papill.</i>	2	12	14
	F		<i>Oxalis. pere.</i>	3	15	15
	F		<i>Xero bracte</i>	2	5	16
	F		<i>Convolvul. erub.</i>	2	5	17
	F		<i>Rume. brown.</i>	2	6	18
	F		<i>Trachy. incis.</i>	2	12	19
	F		<i>Dichop. fumbri.</i>	3	20	20
	F		<i>Tricar. elati.</i>	3	20	21
	F		<i>Geran. sola.</i>	3	12	22
	L		<i>Sclerol. burchi.</i>	4	15	23
	F		* <i>Medic. poly.</i>	25	200	24
	F		* <i>Lactuca semi.</i>	5	30	25
	S		* <i>Brom. cath.</i>	5	500	26
	G		* <i>Setar. gracil.</i>	3	200	27
	F		* <i>Petrar. nant.</i>	8	100	28
	D		* <i>Lolium perenne</i>	6	300	29
				Total Native Species:		23

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.
 Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %
 Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000
 *: exotic

* *Capsel. bur. past.* 3 25
 * *Sonch. olerac.* 3 15
 * *Triplu. arve.* 5 100

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	19/10/16	Site No.	Rushes Ck FBA	V21P5	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	O	
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	O	
Storm damage	0	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 VZ4P3

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.	
	T		<i>Euca. mela.</i>	20	5	1	
	T		<i>Wahl. com.</i>	8	100	2	
	T		<i>Goode. plana.</i>	6	40	3	
	T		<i>Xero. bract.</i>	3	12	4	
	S		<i>Austrost. scab.</i>	25	2000	5	
	S		<i>Aristid. ram ram.</i>	10	1000	6	
	T		<i>Caloti. cune.</i>	4	30	7	
	T		<i>Sida corrug.</i>	3	10	8	
	T		<i>Geran. sola.</i>	5	30	9	
	L		<i>Maure. micro.</i>	1	1	10	
	T		<i>Cotul. crust.</i>	4	15	11	
	T		<i>Euchit. sphaer.</i>	3	10	12	
	L		<i>Sclerol. buch.</i>	8	3	13	
	T		<i>Senec. diaseh.</i>	2	6	14	
	S		<i>Loman. multi</i>	2	3	15	
	T		<i>Brachys. angust. heter.</i>	2	20	16	
						17	
				5		18	
						19	
						20	
						21	
	T		<i>Cardue tenu.</i>	4	20	22	
	T		<i>Aster subul.</i>	3	50	23	
	T		<i>Capsel. bars. pest</i>	3	50	24	
	T		<i>Malva parvi.</i>	2	25	25	
	T		<i>Sonchus olera.</i>	2	12	26	
	T		<i>Hypoch. glab.</i>	2	15	27	
	T		<i>Lactuc. serr.</i>	3	30	28	
	L		<i>Bromus cath.</i>	5	400	29	
			Total Native Species:			16	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA		J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	0	
Cultivation (inc. pasture)	2	NR	
Soil erosion	2	NR	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), 0=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.

VZ4P4

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca melan.</i>	15	1	1
	T		<i>Euca blakel.</i>	10	2	2
	F		<i>Calotig. ocune.</i>	6	30	3
	G		<i>Austrostip. scabr.</i>	20	600	4
	F		<i>Good. pynnat.</i>	4	30	5
	F		<i>Wahlenb. com.</i>	4	40	6
	F		<i>Xero bract.</i>	2	30	7
	F		<i>Geran. soland.</i>	3	15	8
	G		<i>Aristi. ram. ram.</i>	6	600	9
	S		<i>Maurean. micro.</i>	3	4	10
	F		<i>Rumex brown.</i>	2	6	11
	L		<i>Glycine. tabac.</i>	2	12	12
	F		<i>Sida corrug.</i>	1	1	13
	E		<i>Cheilan. sieb.</i>	4	40	14
	F		<i>Dichop. fumbr.</i>	5	30	15
	G		<i>Chlori trunc.</i>	3	200	16
						17
						18
						19
	D		* <i>Eleus. tristach.</i>	3	250	20
	D		* <i>Digita. cilia.</i>	4	300	21
	F		* <i>Trifol. arv.</i>	15	300	22
	F		* <i>Medic. poly.</i>	15	400	23
	F		* <i>Hypoch. radu.</i>	20	150	24
	D		* <i>Brom. cath.</i>	5	300	25
	F		* <i>Arctoth. calend.</i>	5	30	26
	F		* <i>Carduu tenu.</i>	4	40	27
	F		* <i>Malva parvi.</i>	3	20	28
	F		* <i>Capsel. durq. past.</i>	3	30	29
Total Native Species:					16	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 * : exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No. 610.16117.00100		Survey Name	Plot No.	Recorders	
Date 19/10/16	Site No.	Rushes Ck FBA	V24PS	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot	marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation	TEC (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)			
						Litter	Rock		No. trees with hollows			
Native richness												
Native cover						Bare ground	Fungi		Woody debris lineal metres			
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum			

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	2	NR	
Cultivation (inc. pasture)	2	NR	
Soil erosion	1	NR	
Firewood collection	1	NR	
Grazing	1	NR	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 U24P5

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		Callit. glauc.	20	25	1
	S		Bursa. spin.	40	45	2
	T		Brachy. pop. tr	1	1	3
	G		Austrostip. scab.	8	500	4
	F		Cood. pinnatif	4	40	5
	F		Wahlen. com.	3	40	6
	F		Xero bract	12	8	7
	F		Geran. sol.	6	25	8
	G		Chlor. trunc.	2	50	9
	F		Elnad. nuta nut.	2	6	10
	G		Both. macr.	3	200	11
	D		Agrost. aven. ave.	3	200	12
	E		Cheil. sieb. sieb.	3	15	13
	F		Arthrop. mun.	3	30	14
						15
	F		Arctoth. calend.	4	25	16
	F		Trifol. arvens.	30	30	17
	F		Sonch. olerac.	15	15	18
	F		Capsella burs-pas.	3	50	19
	F		Medicago paly	8	200	20
	D		Lolium perenne	3	300	21
	F		Hypoch. glab.	6	40	22
	F		Petroch. nante.	2	30	23
	F		Setar. grac	3	400	24
	F		Modiol. carol.	3	25	25
	D		Brom. cath.	5	1000	26
			Echium vulg.	1	1	27
						28
						29
Total Native Species:					14	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5
 10,15,20,25,30,35,
 etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10
 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	20/10/16	Site No.	Rushes Ck FBA	U26 P1	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover	0					Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	1	NR	
Soil erosion	2	R	
Firewood collection	2	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	1	NR	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
 V2 6 P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.
	T		<i>Euca camal</i>	35	3	1
			<i>Amorpha</i>			2
	A		<i>Microt. stip.</i>	8	500	3
	F		<i>Rumex brow.</i>	3	6	4
	F		<i>Einad. hast.</i>	1	1	5
	F		<i>Wurm. bugl.</i>	2	6	6
	? -	mistletoe	<i>Amymon nigu.</i>	1	1	7
	G		<i>Austrostip. ramo.</i>	3	100	8
	U		<i>Maire. microp.</i>	3	15	9
	C		<i>Sclerol. birchi</i>	1	1	10
	F		* <i>Silyb. maria.</i>	20	50	11
	L		* <i>Fumar. mur. s. mur.</i>	1	1	12
	F		* <i>Medic. poly</i>	12	100	13
	D		* <i>Loli peren.</i>	8	500	14
	F		* <i>Malva. parv.</i>	2	5	15
	S		* <i>Lyci. feroc.</i>	1	1	16
	F		* <i>Verb. gaudi.</i>	2	12	17
	U		* <i>Avena barb.</i>	5	200	18
	T		* <i>Capsel. bur.-past.</i>	6	300	19
	F		* <i>Hirsch. unca</i>	10	500	20
	F		* <i>Lepid. bonar.</i>	5	200	21
	F		* <i>Cirs. vulg.</i>	5	30	22
	G		* <i>Sorgh. leioc.</i>	5	50	23
						24
						25
	S		<i>Austrostip. vertic.</i>	12	300	26
						27
						28
						29
Total Native Species:					10	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub,
 G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern,
 F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5
 10,15,20,25,30,35,
 etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10
 20,50,100,500,1000,>1000
 *: exotic

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date: 7 May 2016
 Version: 1.0

Job No.	610.16117.00100		Survey Name	Plot No.	Recorders	
Date	21/10/16		Site No.	Rushes Ck FBA	J Pepper, G Leonard	
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:	Position in quadrat:
Base Plot size	400 m ²	Orientation of plot		marked	yes no	photo # / orientation

Structure & Composition (within 0.04 ha quadrat)

Structural Formation		TEC (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	1	NR	
Cultivation (inc. pasture)	1	NR	
Soil erosion	2	R	
Firewood collection	1	NR	
Grazing	2	R	
Fire damage	0	0	
Storm damage	0	0	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope:	Aspect:	Elevation:	Site Drainage:
			Distance to nearest water and type:

Prepared by: Sandy Lonergan
 Reviewed by: Jeremy Pepper

Issue Date:
 Version:

7 May 2016
 1.0

Plot No.
VZ8 P1

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Common Name	Species Name	Cover*	Abund**	No.	
			<i>Euca micro.</i>	10	1	1	
			<i>Maure micro.</i>	3	2	2	
			<i>Senec. diensch.</i>	1	1	3	
			<i>Cyperus grac.</i>	3	60	4	
			<i>Sclerol. birch.</i>	10	40	5	
			<i>Arist. ram. ram.</i>	3	1000	6	
			<i>Calot. lapp.</i>	6	40	7	
			<i>Oxalis pere</i>	3	30	8	
			<i>Wahlen com.</i>	4	40	9	
			<i>Geran. sol.</i>	4	12	10	
			<i>Cotyl. aust</i>	2	15	11	
			<i>Sida corrug</i>	2	20	12	
			<i>Daucus gloch. f.F</i>	3	12	13	
			<i>Chloris trunc.</i>	5	500	14	
			<i>Loman. mult.</i>	3	12	15	
			<i>Goode. panka</i>	3	20	16	
			<i>Dishop. fimbri.</i>	5	60	17	
			<i>Tricar. latu</i>	3	30	18	
			<i>Maure micro</i>	3	2	19	
						20	
			<i>Sanchez. der.</i>	6	30	21	
			<i>Capsel. burc. cap.</i>	5	40	22	
			<i>Horde. lepor.</i>	3	200	23	
			<i>Lactuca serri</i>	5	40	24	
			<i>Petrobrh. nant.</i>	10	100	25	
			<i>Lolium pere.</i>	15	600	26	
			<i>Hirscht. unca</i>	5	20	27	
			<i>Brom. cath.</i>	5	400	28	
			<i>Tripl. arv.</i>	15	200	29	
			Total Native Species:			19	

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub.

Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover %

Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000
 *: exotic

VEGETATION SURVEY FORM (20 m X 20 m plot)

Location			Survey Name	Plot No.	Recorders		
Date	25/10/17	Site No.	V24 P6		A. CARTY		
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	268 248	Northing:	6586766	Position in quadrat:
Base Plot size		Orientation of plot	140°	marked	yes	no	photo # / orientation
							140°

Structure & Composition (within 0.04 ha quadrat)

Photos 6928-32

Structural Formation		Ecological Community (TSC Act 1995)	yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness									No. trees with hollows
Native cover						Bare ground		Fungi	Woody debris lineal metres
Exotic cover						Cryptogam		Other	Woody regeneration No. upper stratum sp. & abund.

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	
Firewood collection	1	O	
Grazing	1	R	
Fire damage	0	O	
Storm damage	0	O	
Other	2	O	Drainage modified by contour banks

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Plain	Landform Element:	Lower slope	Landform Pattern:	Plains / undulating	Microrelief:	
Lithology:		Soil Surface Texture:	Loam/Silt	Soil Colour:	Light Brown	Soil Depth:	Deep
Slope:	Low	Aspect:	West	Elevation:		Site Drainage:	Modified
						Distance to nearest water and type:	

Hollow trees present x2 (Starlings nesting)

VEGETATION SURVEY FORM

SITE No.
VZ496

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Field name	Species name / Comments	Cover*	Abund**	No.
			E.albens	4	1	1
			Chyroso. apic	1	5	2
			Cymbanohes. low	1	1	3
			Rome. brouha	1	1	4
			Sclero. birchi	1	3	5
			Mair. micro	2	10	6
			Atri. spn	1	10	7
			Schroloma. sp.	1	1	8
			Vitta. muel	1	20	9
			Panic. decamp	1	1	10
			Astro. vert	25	100	11
			Sida. corru	1	25	12
			Cheil. sieb	1	5	13
			Dich. repe	2	20	14
			Glyc. tob	1	2	15
			Vitta. cone. hisp	1	50	16
			Corso inversa	2	50	17
			Altern. dent	1	5	18
			Oxal. perre	1	5	19
			Boer. domi	1	5	20
			Enad. poly	2	50	21
			Lepid. otr	2	20	22
			Lolium. per	15	100	23
			Enad. poly Hedy. rhag	1	50	24
			Sola. dig	1	5	25
			Pasp. dila	1	2	26
			Triq. terre	1	5	27
			Port. ole	1	1	28
			Meche. poly	1	5	29
			Vulp. myor	1	20	30
			Makhu. parv	1	1	31
			Bromus. cult	1	2	32
			Paron. bras	1	2	33
				1	1	34
			Plant. varia			
			Total Native Species:			

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub. *Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover % **Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 *: exotic

21 NATIE

VEGETATION SURVEY FORM (20 m X 20 m plot)

Location			Survey Name	Plot No.	Recorders		
Date	25/10/17	Site No.	V22 P6		A. CARTY		
AMG grid reference	zone 54 55 56	datum: GDA	Easting: 268 778	Northing: 6586716	Position in quadrat:		
Base Plot size		Orientation of plot	16°	marked	yes no	photo # / orientation	16°

Structure & Composition (within 0.04 ha quadrat)

Photos 6949-51

Structural Formation	Ecological Community (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness									No. trees with hollows
Native cover						Bare ground	Fungi		Woody debris lineal metres
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum sp. & abund.

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	
Firewood collection	1	0	
Grazing	1	R	Cattle grazing during survey
Fire damage	0	0	
Storm damage	0	0	
Other			Modified drainage / Contour bank

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), 0=old (>10yrs)

Physiography

Morphological Type:	Landform Element: Plain	Landform Pattern: Plains	Microrelief:
Lithology:	Soil Surface Texture: Clay/Silt	Soil Colour: Brown/Red	Soil Depth:
Slope: Low	Aspect: West	Elevation:	Site Drainage:
			Distance to nearest water and type:

VEGETATION SURVEY FORM

SITE No. **V2296**

Floristics

(within 0.04 ha quadrat) *Bolded stratum indicates dominant layer.

Sub-Stratum	Growth form	Field name	Species name / Comments	Cover*	Abund**	No.
		Astro. scup		60	100	1
		Vitta. muc		5	150	2
		Vitta. can. hup		5	150	3
	Rhyncho	Astro. rose		1	5	4
		Dich. rep		2	100	5
		Ech. invol		1	1	6
		Wahl. comm		1	20	7
		Arist. can		2	50	8
		Atri. spin		1	1	9
		Oxal. pers		1	2	10
		Chloris. trun		1	5	11
		Chae. drum		1	1	12
						13
						14
						15
						16
						17
						18
						19
						20
		Cent. sol		1	1	21
		Trif. arve		1	1	22
		Lepid. afr		1	1	23
		Phalaris		1	10	24
		Brom. moll		1	5	25
		Watermelon?		1	5	26
		Melua. parv		1	1	27
		Lolium. pers		2	50	28
		Vulp. myur		2	50	29
		Medic. poly		5	100+	30
		Carth. lanat		5	500	31
						32
						33
						34
Total Native Species:						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub. *Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover % **Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 *: exotic

VEGETATION SURVEY FORM (20 m X 20 m plot)

Location			Survey Name	Plot No.	Recorders		
Date	V22P7	Site No.	25/10/17		A. CARTY		
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:		Position in quadrat:
Base Plot size		Orientation of plot	230°	marked	yes no	photo # / orientation	230°

Structure & Composition (within 0.04 ha quadrat)

Ph 6959-61

Structural Formation	Ecological Community (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)	
						Litter	Rock		No. trees with hollows	
Native richness										
Native cover						Bare ground	Fungi		Woody debris lineal metres	
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum sp. & abund.	

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	O	
Cultivation (inc. pasture)	2	R	
Soil erosion	1	NR	
Firewood collection	1	O	
Grazing	2	R	
Fire damage	O	O	
Storm damage	O	O	
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element: Undulating	Landform Pattern: Mid slope	Microrelief:
Lithology:	Soil Surface Texture: Clay/Silt	Soil Colour: Brown	Soil Depth:
Slope: Low	Aspect: West	Elevation:	Site Drainage:
			Distance to nearest water and type:

VEGETATION SURVEY FORM

SITE No. **V2287**

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Field name	Species name / Comments	Cover*	Abund**	No.
		Arist. can		20	100	1
		Austra. scab		10	100	2
		Calot. lapp		5	100	3
		Cheil. sieb		10	50	4
		Vilva. can. hisp		10	100	5
		Sclero. birch		1	5	6
		Dich. rep		10	1000	7
		Vilva. mbel		2	50	8
		Sida. corr		2 10	1000	9
		Hymn. s. scab		10	100	10
		Bath. macra		1	1	11
		Wahl. com		1	5	12
		Ally. tab		1	2	13
		Cony. erub		1	1	14
		Rume. brow		1	1	15
		Sclero. bract		1	10	16
		Aech. mic		2	50	17
		Aytilis. race		1	1	18
		Brom. s. moll		1	5	19
		Sonch. oleo		1	1	20
		Trif. camp		1	10	21
		Vulp. myr		1	10	22
		Carth. lomat		2	100	23
		Cham. drum		1	1	24
		Hedy. rhag		1	100	25
		Hypo. rad		1	10	26
		Petro. dub		1	1	27
		Anag. arve		1	1	28
		Medic. pol. 7		1	1	29
		Boer. dom.		1	10	30
		Trif. arve		1	10	31
		Pasp. dila		1	10	32
		Cent. sol		1	10	33
		Misop. orontium		1	1	34
Total Native Species:						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub. *Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover % **Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 *: exotic

VEGETATION SURVEY FORM (20 m X 20 m plot)

Location			Survey Name	Plot No.	Recorders		
Date	VZ1P6	Site No.	26/10/17		A. CARTY		
AMG grid reference	zone 54 55 56	datum: GDA	Easting:		Northing:		Position in quadrat:
Base Plot size		Orientation of plot	160°	marked	yes no	photo # / orientation	160°

Structure & Composition (within 0.04 ha quadrat)

Ph 6981-84

Structural Formation	Ecological Community (TSC Act 1995)		yes / likely / no
Keith Class			
Regional Veg Class (BVT)			
BioMetric Type (or NVCA)			
Other:			

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
						Litter	Rock		
Native richness									No. trees with hollows
Native cover						Bare ground	Fungi		Woody debris lineal metres
Exotic cover						Cryptogam	Other		Woody regeneration No. upper stratum sp. & abund.

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	3	NR	
Soil erosion	1	0	
Firewood collection	3	0	
Grazing	3	R	
Fire damage	0		
Storm damage	0		
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Morphological Type:	Landform Element: Lower slope	Landform Pattern: Plains	Microrelief:
Lithology:	Soil Surface Texture: Silty/clay	Soil Colour: Brown	Soil Depth:
Slope: Flat	Aspect: Flat	Elevation:	Site Drainage:
			Distance to nearest water and type:

Rocky soil

VEGETATION SURVEY FORM

SITE No. **VZ1 P6**

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Field name	Species name / Comments	Cover*	Abund**	No.
		Aust. vert		1	20	1
		Broch. popu		3	1	2
		Vitica. muel		1	10	3
		Good. pennat		1	10	4
		Sol. ellipt		1	3	5
		Plant debily		1	5	6
		Calotis. lapp		1	2	7
		Dendro. vitt		1	1	8
						9
						10
		Vulpia. myur		10	100	11
		Malva. puv		1	2	12
		Avena. fat		13	200	13
		Loli. per		5	50	14
		Lepi. afr		1	1	15
		Trif. arve		1	1	16
		Carth. linc		1	5	17
		Sonch. ole		1	1	18
		H-lep. rad		1	2	19
		Medi. pul		1	3	20
		Sola. myr		1	1	21
		Sisy. aff		1	3	22
		Hedy. rhay		1	1	23
						24
						25
						26
						27
						28
						29
						30
						31
						32
						33
						34
Total Native Species:						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub. *Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover % **Abund: 1,2,3,4,5,6,7,8,9,10 * : exotif

VEGETATION SURVEY FORM (20 m X 20 m plot)

Location			Survey Name	Plot No.	Recorders		
Date	VZ2 P8	Site No.	26/10/17				
AMG grid reference	zone 54 55 56	datum: GDA	Easting:	Northing:	Position in quadrat:		
Base Plot size		Orientation of plot	marked	yes no	photo # / orientation	190°	

Structure & Composition (within 0.04 ha quadrat)

Photo 6993-95

Structural Formation	Ecological Community (TSC Act 1995)	yes / likely / no
Keith Class		
Regional Veg Class (BVT)		
BioMetric Type (or NVCA)		
Other:		

Condition (within 0.04 ha)	Upper stratum	Mid stratum	Ground stratum Grasses	Ground stratum Shrubs	Ground stratum Other	Cover %			Condition (within 0.1 or 0.04ha quadrat)
Native richness						Litter		Rock	No. trees with hollows
Native cover						Bare ground		Fungi	Woody debris lineal metres
Exotic cover						Cryptogam		Other	Woody regeneration No. upper stratum sp. & abund.

Land Use (dominant)	nature conservation	travelling stock route	forestry	grazing	grazing / cropping	cropping	other:
Land Cover	none	native	environmental planting	native plantation	exotic plantation	exotic other:	
Age structure	early regeneration	advanced regeneration	uneven age	mature	senescent		

Plot Disturbance	Severity code	Age code	Observational evidence:
Clearing (inc. logging)	3	0	
Cultivation (inc. pasture)	1	0	
Soil erosion	1	0	
Firewood collection	3	0	
Grazing	2	R	
Fire damage	0		
Storm damage	0		
Other			

Severity: 0=no evidence, 1=light, 2=moderate, 3=severe

Age: R=recent (<3yrs), NR=not recent (3-10yrs), O=old (>10yrs)

Physiography

Ridge Upper slope Undulating

Morphological Type:	Landform Element:	Landform Pattern:	Microrelief:
Lithology:	Soil Surface Texture:	Soil Colour:	Soil Depth:
Slope: Mod	Aspect: South	Elevation:	Site Drainage:
			Distance to nearest water and type:

VEGETATION SURVEY FORM

SITE No. VZ2P8

Floristics

(within 0.04 ha quadrat) *Bolted stratum indicates dominant layer.

Sub-Stratum	Growth form	Field name	Species name / Comments	Cover*	Abund**	No.
		Elym. scab		10	100	1
		Aythya race		10	100	2
		Sclero. birch		1	10	3
		Arist. vert		1	1	4
		Arut. rom		10	100	5
		Dich. rep		10	1000	6
		Vitla. can. hyp		10	500	7
		Cher. sint		10	1000	8
		Cer. sola		7	100	9
		Dich. fimb		1	20	10
		Vitt. mult		5	100	11
		Loma. mult		1	2	12
		Plant. debi		1	5	13
		Dich. mic		5	50	14
		Sclero. broct		1	20	15
		Calot. lapp		1	1	16
		Arist. scab		5	50	17
		Marr. mic		1	1	18
		Boer. domi		1	5	19
		Cymbopogon. laet		1	10	20
		Carex. inu		5	100	21
		Ang. orue		1	5	22
		Loch. serru		1	5	23
		Hedy. rhug		10	100	24
		Calk. laet		8	500	25
		Cent. sols		1	50	26
		Enad. poly		1	20	27
		Sporo. aff		1	1	28
		Trif. arv.		1	10	29
		Sonch. ole		1	1	30
		Trif. comp		1	5	31
		Brom. moll		1	20	32
		Brom. call		1	20	33
		Cycho. opi		1	10	34
Total Native Species:						

Growth form: T=tree, M=mallee tree, S=shrub, Y=mallee shrub, Z=heath shrub, C=chenopod shrub, G=tussock grass, H=hummock grass, D=sod grass, V=sedge, R=rush, E=fern, F=forb, L=vine, A=cycad, P=palm, X=xanthorrhoea, U=samphire shrub. *Cover: <1,1,2,3,4,5, 10,15,20,25,30,35, etc crown cover % **Abund: 1,2,3,4,5,6,7,8,9,10, 20,50,100,500,1000,>1000 *: exotic

BioBanking Plot / Transect Data Sheet

VZ1

Entire Vegetation Zone

Site name: *Rushes 'Ch* Job number: *610-16117* Vegetation zone: *VZ1 'Non-native'*
 Observer(s): *J.P. + G.L.* Date: *19.10.16*
 Vegetation type (ID): Condition Class: Moderate/Good or Low / Sub class (optional); high or medium or poor

Threatened Ecological Community Yes or No? TEC type:
 Geomorphic setting:
 Soil depth, colour, texture, gravel content:

Lithology:

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
0	VZ1 P5	0	<i>Dandelion</i>		
1	VZ1 P4	1	<i>Sandbar</i>		
0	VZ1 P1	0	<i>Hypochaeris</i>		
0	VZ1 P2	0	<i>Trifolium</i>		
1	VZ1 P3	1			

Over-storey species present (a) Management Actions (erosion, rubbish, fencing, pest fauna etc)
 Over-storey species regenerating (dbh <= 5cm) (b)
 Regeneration Proportion of over-storey species regenerating (b/a)

Summary of Plot / Transect Data

	Plot ID	VZ1 P5	VZ1 P4	VZ1 P1	VZ1 P2	VZ1 P3		
20m x 20m plot	Native plant species richness in	12	11	9	11	17		
50 m transect	Native over-storey cover (%FC)	0	0.2	0	0	1.5		
	Native mid-storey cover (%FC)	0	0	0	0	0		
	Native ground cover (grass) (%FC)	50	12	0	10	16		
	Native ground cover (shrub) (%FC)	0	0	6	2	8		
	Native ground cover (other) (%FC)	0	10	2	10	6		
	Exotic plant cover (%FC)	0	0	0	0	0		
50 m x 20 m plot	Trees with at least one visible hollow	0	1	0	0	0		
	Total length of logs (>10cm diameter & longer than 0.5m)	0	0	0	0	0		

Plot ID *VZ1 P5* *VZ1 P5* *12.30pm 19/10/16* *wp 15 + 16*

Location of plot marker: GDA94 (Zone) (Easting) *150° 35. 293* (Northing) *30° 50 026* GPS Accuracy: ± 3 m
 Position of plot marker on transect: *middle N end* Bearing of transect from plot marker: *220* °
 Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	11	111	11	11	111	1	1111	11	111	111	25	50
Native ground cover (shrub) present												0
Native ground cover (other) present												0
Exotic ground cover present	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	50	100
Litter / Cryptogam / Rock*												0
Bare earth*												0
50 m x 20 m plot (tally / total)	Trees with hollow(s) <i>0 / 0</i>										Total length of logs <i>0 / 0</i>	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

G.L. to confirm grass ID

Brachyantha *Cotula*

VZ1

BioBanking Plot / Transect Data Sheet

Plot ID VZ1 P4 *E. popul. patul* 2.50 pm 19.10.16 "Non-ndie"

Location of plot marker: GDA94 (Zone) (Easting) <u>150.34.659</u> (Northing) <u>30.50.707</u> GPS Accuracy: ± m												
Position of plot marker on transect: <u>E end / mid 20m</u> Bearing of transect from plot marker: <u>310°</u>												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	2	-	-	-	-	-	-	-	-	-	2	0.2
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											6	12
Native ground cover (shrub) present											0	0
Native ground cover (other) present											5	10
Exotic ground cover present											48	96
Litter / Cryptogram / Rock*											0	0
Bare earth*											7	14
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1 / 1 / 1</u>										Total length of logs <u>0 / 0</u>	

Plot ID VZ1 P1 *Amabium sp.* 10.50am 20.10.16 32+33

Location of plot marker: GDA94 (Zone) (Easting) <u>150.35.674</u> (Northing) <u>30.48.901</u> GPS Accuracy: ± m												
Position of plot marker on transect: <u>N end / mid 20m</u> Bearing of transect from plot marker: <u>170°</u>												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											0	0
Native ground cover (shrub) present											3	6
Native ground cover (other) present											1	2
Exotic ground cover present											47	94
Litter / Cryptogram / Rock*											0	0
Bare earth*											9	18
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>0 / 0</u>										Total length of logs <u>0 / 0</u>	

Plot ID VZ1 P2 11.10am 20.10.16 wp 34, 35

Location of plot marker: GDA94 (Zone) (Easting) <u>150.35.520</u> (Northing) <u>30.48.883</u> GPS Accuracy: ± 3 m												
Position of plot marker on transect: <u>E end / mid 20m</u> Bearing of transect from plot marker: <u>270°</u>												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											5	10
Native ground cover (shrub) present											1	2
Native ground cover (other) present											5	10
Exotic ground cover present											36	72
Litter / Cryptogram / Rock*											0	0
Bare earth*											15	30
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>0 / 0</u>										Total length of logs <u>0 / 0</u>	

BioBanking Plot / Transect Data Sheet

VZI

Entire Vegetation Zone

Site name: <u>Rubber Ch</u>	Job number: <u>610.1617</u>	Vegetation zone: <u>Non-native</u>
Observer(s): <u>J.P. & G.L.</u>	Date: <u>21.10.16</u>	
Vegetation type (ID):	Condition Class: Moderate/Good or Low / Sub class (optional); high or medium or poor	

Threatened Ecological Community Yes or No? TEC type:

Geomorphic setting:

Soil depth, colour, texture, gravel content:

Lithology:

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			

Over-storey species present (a)	Management Actions (erosion, rubbish, fencing, pest fauna etc)
Over-storey species regenerating (dbh<=5cm) (b)	
Regeneration Proportion of over-storey species regenerating (b/a)	

Summary of Plot / Transect Data

	Plot ID											
20m x 20m plot		Native plant species richness in										
50 m transect		Native over-storey cover (%FC)										
		Native mid-storey cover (%FC)										
		Native ground cover (grass) (%FC)										
		Native ground cover (shrub) (%FC)										
		Native ground cover (other) (%FC)										
		Exotic plant cover (%FC)										
50 m x 20 m plot		Trees with at least one visible hollow										
		Total length of logs (>10cm diameter & longer than 0.5m)										

Plot ID VZI P3

8.35 21.10.16

49.50

Location of plot marker: GDA94 (Zone) (Easting) 150.34.007 (Northing) 30.49.356 GPS Accuracy: ± m

Position of plot marker on transect: S end / mid 20m Bearing of transect from plot marker: 0°

Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	15	-	-	-	-	-	-	-	-	-	15	15
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	1	111	11					1	1		8	16
Native ground cover (shrub) present	111		1								4	8
Native ground cover (other) present				1						11	3	6
Exotic ground cover present	111	111111	111	111	111	111	111	111	111	111	46	92
Litter / Cryptogam / Rock*											0	0
Bare earth*						111			11		5	10
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>0 / 0</u>										Total length of logs <u>0 / 0</u>	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

Entire Vegetation Zone

V22

Medicago

Euclytion splendens
Sarcobatus sp.
Tritolium fragiferum

Site name: Rushes Creek Job number: 60-16117 Vegetation zone: Red Gum-White Box
 Observer(s): J.P. & G.L. Date: 19.10.16 9:00am - 9:45am
 Vegetation type (ID): Condition Class: Moderate/Good or Low I
 Sub class (optional); high or medium or poor
 Threatened Ecological Community Yes or No? TEC type: Box Gum Woodland
 Geomorphic setting: relict dune above Namoi floodplain
 Soil depth, colour, texture, gravel content: colluvial reddish brown

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
2	V22/P4	2			
0	V22/P5	0			
0	V22/P1	0			
0	V22/P2	0			
0	V22/P3	0			

Over-storey species present (a) Management Actions (erosion, rubbish, fencing, pest fauna etc)
 Over-storey species regenerating (dbh <= 5cm) (b)
 Regeneration Proportion of over-storey species regenerating (b/a)

Summary of Plot / Transect Data

	Plot ID	V22P4	V22P5	V22P1	V22P2			
20m x 20m plot	Native plant species richness in	17	8	7	9			
50 m transect	Native over-storey cover (%FC)	2.7	0	0	0			
	Native mid-storey cover (%FC)	0	0	0	0			
	Native ground cover (grass) (%FC)	42	44	0	12			
	Native ground cover (shrub) (%FC)	0	0	0	2			
	Native ground cover (other) (%FC)	46	6	4	2			
	Exotic plant cover (%FC)	0	0	0	0			
50 m x 20 m plot	Trees with at least one visible hollow	0	0	0	0			
	Total length of logs (>10cm diameter & longer than 0.5m)	5	0	0	0			

Plot ID V22P4

19.10.16

waypoint 7

Location of plot marker: GDA94 (Zone) (Easting) 150° 35.867 (Northing) 1 30.499375 GPS Accuracy: ± m
 Position of plot marker on transect: middle 20x20m SE end Bearing of transect from plot marker: 330 °
 Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect) -4° slope

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	10	2	-	-	-	-	10	5	-	-	27	2.7
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0

Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											21	42
Native ground cover (shrub) present											0	0
Native ground cover (other) present											23	46
Exotic ground cover present											50	100
Litter / Cryptogam / Rock*											1	2
Bare earth*											0	0

50 m x 20 m plot (tally / total) Trees with hollow(s) 0 / 0 Total length of logs 5 / 5

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

Avena sp. **VZ2**
 Calotis dentata
 Fuschium sp.
 Hypochaeris sp.

Plot ID VZ2 P5 19.10.16 150.35.189°

Location of plot marker: GDA94 (Zone) (Easting) <u>360</u> (Northing) <u>30°50-105</u> GPS Accuracy: ± m	
Position of plot marker on transect: <u>middle SE end</u> Bearing of transect from plot marker: <u>300</u> °	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	- - - - - - - - - 0 0
Native mid-storey cover (%FC)	- - - - - - - - - 0 0
Exotic plant cover (%FC)	- - - - - - - - - 0 0
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	22 44
Native ground cover (shrub) present	0 0
Native ground cover (other) present	1 1 1 3 6
Exotic ground cover present	49 98
Litter / Cryptogram / Rock*	0 0
Bare earth*	0 0
50 m x 20 m plot (tally / total)	Trees with hollow(s) 0 / 0 Total length of logs 0 / 0

Plot ID VZ2 P1 (VZ405) (see other sheet) 150.38.181 30.47.913 2.25pm 20.10.16

Location of plot marker: GDA94 (Zone) (Easting) <u>150°38.760</u> (Northing) <u>30°50.106</u> GPS Accuracy: ± <u>16</u> m	
Position of plot marker on transect: <u>mid NW corner</u> Bearing of transect from plot marker: <u>80</u> °	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	- - - - - - - - - 0 0
Native mid-storey cover (%FC)	- - - - - - - - - 0 0
Exotic plant cover (%FC)	- - - - - - - - - 0 0
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	0 0
Native ground cover (shrub) present	0 0
Native ground cover (other) present	2 4
Exotic ground cover present	50 100
Litter / Cryptogram / Rock*	0 0
Bare earth*	0 0
50 m x 20 m plot (tally / total)	Trees with hollow(s) 0 / 0 Total length of logs 0 / 0

Plot ID VZ2 P2 2.48pm 20.10.16 (up 43) Aristida ramosa

Location of plot marker: GDA94 (Zone) (Easting) <u>150.35.140</u> (Northing) <u>30.48.102</u> GPS Accuracy: ± m	
Position of plot marker on transect: <u>E end / mid 20m</u> Bearing of transect from plot marker: <u>215</u> °	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	- - - - - - - - - 0 0
Native mid-storey cover (%FC)	- - - - - - - - - 0 0
Exotic plant cover (%FC)	- - - - - - - - - 0 0
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	6 12
Native ground cover (shrub) present	1 2
Native ground cover (other) present	1 2
Exotic ground cover present	50 100
Litter / Cryptogram / Rock*	0 0
Bare earth*	0 0
50 m x 20 m plot (tally / total)	Trees with hollow(s) 0 / 0 Total length of logs 0 / 0

Ranking Plot / Transect Data Sheet

VZ2

entire Vegetation Zone

Site name: Rudras Ck Job number: 610.16117 Vegetation zone: VZ2 Candidate Nat.
 Observer(s): J.P. & G.L. Date: 20.10.16 Grass
 Vegetation type (ID): Condition Class: Moderate/Good or Low /
 Sub class (optional); high or medium or poor

Threatened Ecological Community Yes or No? TEC type:

Geomorphic setting:

Soil depth, colour, texture, gravel content:

Lithology:

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
			<u>Linum trigynum</u> <u>*Petrohargia</u> <u>*Lactuca seriola</u>		

Over-storey species present (a) Management Actions (erosion, rubbish, fencing, pest fauna etc)
 Over-storey species regenerating (dbh<=5cm) (b)
 Regeneration Proportion of over-storey species regenerating (b/a)

Summary of Plot / Transect Data

	Plot ID						
	<u>VZ2P3</u>						
20m x 20m plot	Native plant species richness in	<u>11</u>					
50 m transect	Native over-storey cover (%FC)	<u>0</u>					
	Native mid-storey cover (%FC)	<u>0</u>					
	Native ground cover (grass) (%FC)	<u>10</u>					
	Native ground cover (shrub) (%FC)	<u>6</u>					
	Native ground cover (other) (%FC)	<u>18</u>					
	Exotic plant cover (%FC)	<u>0</u>					
50 m x 20 m plot	Trees with at least one visible hollow	<u>0</u>					
	Total length of logs (>10cm diameter & longer than 0.5m)	<u>0</u>					

Plot ID VZ2 P3 3.50pm 20.10.16 wp 47

Location of plot marker: GDA94 (Zone) (Easting) 150.35.572 (Northing) 30.48.317 GPS Accuracy: ± 3 m

Position of plot marker on transect: W end / mid-20m Bearing of transect from plot marker: 120 °

Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present		<u>11</u>			<u>1</u>			<u>1</u>	<u>1</u>		<u>5</u>	<u>10</u>
Native ground cover (shrub) present					<u>1</u>			<u>1</u>	<u>1</u>		<u>3</u>	<u>6</u>
Native ground cover (other) present	<u>1</u>		<u>1</u>		<u>1</u>		<u>11</u>	<u>1</u>	<u>1</u>	<u>11</u>	<u>9</u>	<u>18</u>
Exotic ground cover present	<u>4</u>	<u>4</u>	<u>4</u>	<u>4</u>	<u>11</u>	<u>4</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>4</u>	<u>46</u>	<u>92</u>
Litter / Cryptogam / Rock*											<u>0</u>	<u>0</u>
Bare earth*											<u>0</u>	<u>0</u>
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>0</u> <u>10</u>										Total length of logs <u>0</u> / <u>0</u>	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

Plot ID _____

Location of plot marker: GDA94 (Zone)			(Easting)			(Northing)			GPS Accuracy: ± m				
Position of plot marker on transect:						Bearing of transect from plot marker: °							
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)													
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%	
Native over-storey cover (%FC)													
Native mid-storey cover (%FC)													
Exotic plant cover (%FC)													
Along 50m transect at 1m intervals	Number of hits										Total	%	
Native ground cover (grass) present													
Native ground cover (shrub) present													
Native ground cover (other) present													
Exotic ground cover present													
Litter / Cryptogram / Rock*													
Bare earth*													
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/		Total length of logs					/

Plot ID _____

Location of plot marker: GDA94 (Zone)			(Easting)			(Northing)			GPS Accuracy: ± m				
Position of plot marker on transect:						Bearing of transect from plot marker: °							
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)													
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%	
Native over-storey cover (%FC)													
Native mid-storey cover (%FC)													
Exotic plant cover (%FC)													
Along 50m transect at 1m intervals	Number of hits										Total	%	
Native ground cover (grass) present													
Native ground cover (shrub) present													
Native ground cover (other) present													
Exotic ground cover present													
Litter / Cryptogram / Rock*													
Bare earth*													
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/		Total length of logs					/

Plot ID _____

Location of plot marker: GDA94 (Zone)			(Easting)			(Northing)			GPS Accuracy: ± m				
Position of plot marker on transect:						Bearing of transect from plot marker: °							
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)													
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%	
Native over-storey cover (%FC)													
Native mid-storey cover (%FC)													
Exotic plant cover (%FC)													
Along 50m transect at 1m intervals	Number of hits										Total	%	
Native ground cover (grass) present													
Native ground cover (shrub) present													
Native ground cover (other) present													
Exotic ground cover present													
Litter / Cryptogram / Rock*													
Bare earth*													
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/		Total length of logs					/

BioBanking Plot / Transect Data Sheet

VZ3

Entire Vegetation Zone

Site name: <u>Rushes CK</u>	Job number: <u>610.16117</u>	Vegetation zone: <u>VZ3 White Box Woodland</u>			
Observer(s): <u>J.P.</u>	Date: <u>19.10.16</u>				
Vegetation type (ID):	Condition Class: <u>Moderate/Good</u> or Low / Sub class (optional); high or medium or <u>poor</u>				
Threatened Ecological Community Yes or No ? TEC type: <u>Box Gum Woodland</u>					
Geomorphic setting: <u>south of drainage swale on W sloping land</u>					
Soil depth, colour, texture, gravel content:					
Lithology:					
Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
<u>2</u>	<u>VZ3P2</u>	<u>0</u>			
<u>1</u>	<u>VZ3P1</u>	<u>1</u>			
Over-storey species present (a)		Management Actions (erosion, rubbish, fencing, pest fauna etc)			
Over-storey species regenerating (dbh<=5cm) (b)					
Regeneration Proportion of over-storey species regenerating (b/a)					

Summary of Plot / Transect Data

	Plot ID	<u>VZ3P2</u>	<u>VZ3P1</u>	<u>VZ3P3</u>			
20m x 20m plot	Native plant species richness in	<u>12</u>	<u>9</u>	<u>5</u>			
50 m transect	Native over-storey cover (%FC)	<u>8.2</u>	<u>1.7</u>	<u>2.6</u>			
	Native mid-storey cover (%FC)	<u>0</u>	<u>0</u>	<u>0</u>			
	Native ground cover (grass) (%FC)	<u>12</u>	<u>20</u>	<u>28</u>			
	Native ground cover (shrub) (%FC)	<u>0</u>	<u>0</u>	<u>0</u>			
	Native ground cover (other) (%FC)	<u>28</u>	<u>16</u>	<u>2</u>			
	Exotic plant cover (%FC)	<u>0</u>	<u>0</u>	<u>0</u>			
50 m x 20 m plot	Trees with at least one visible hollow	<u>3</u>	<u>3</u>	<u>6</u>			
	Total length of logs (>10cm diameter & longer than 0.5m)	<u>0</u>	<u>21</u>	<u>25</u>			

Plot ID VZ3P2

1.20pm 19.10.16

up 17 + 18

Location of plot marker: <u>GDA94</u> (Zone) (Easting) <u>158° 34.803</u> (Northing) <u>30° 50.178</u> GPS Accuracy: ± m												
Position of plot marker on transect: <u>SE end / middle of 20m</u> Bearing of transect from plot marker: <u>330°</u>												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	<u>20</u>	<u>2</u>	<u>40</u>	<u>20</u>	-	-	-	-	-	-	<u>82</u>	<u>8.2</u>
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	<u>11</u>		<u>1</u>							<u>11</u>	<u>6</u>	<u>12</u>
Native ground cover (shrub) present											<u>0</u>	<u>0</u>
Native ground cover (other) present	<u>1</u>			<u>11</u>	<u>1</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>		<u>14</u>	<u>28</u>
Exotic ground cover present	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>11</u>	<u>50</u>	<u>100</u>
Litter / Cryptogram / Rock*	<u>1</u>										<u>1</u>	<u>2</u>
Bare earth*									<u>11</u>		<u>2</u>	<u>4</u>
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1+1+1 / 3</u>										Total length of logs	<u>0 / 0</u>

* record a hit for rock, litter, bare or cryptogram only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

VZ3

Plot ID VZ3P1

1.50pm 19.10.16 (wp 19 + 20)

Location of plot marker: GDA94 (Zone) (Easting) 150.34690 (Northing) 30.50.143 GPS Accuracy: ± m	
Position of plot marker on transect: <u>Send / middle of 20m</u> Bearing of transect from plot marker: <u>330°</u>	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	5 5 - - - - 2 5 - 17 1.7
Native mid-storey cover (%FC)	- - - - - - - - - 0 0
Exotic plant cover (%FC)	- - - - - - - - - 0 0
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	10 20
Native ground cover (shrub) present	0 0
Native ground cover (other) present	1 # 8 16
Exotic ground cover present	50 100
Litter / Cryptogram / Rock*	0 0
Bare earth*	0 0
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1,1,1 / 3</u> Total length of logs <u>5,1,4,10 / 21m</u>

Plot ID VZ3P3

2.15pm 19.10.16 (wp 21 + 22)

Location of plot marker: GDA94 (Zone) (Easting) 150.34.546 (Northing) 30.50.139 GPS Accuracy: ± m	
Position of plot marker on transect: <u>NW end / mid 20m</u> Bearing of transect from plot marker: <u>120°</u>	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	5 1. 5 10 5 - - - 26 2.6
Native mid-storey cover (%FC)	- - - - - - - - - 0 0
Exotic plant cover (%FC)	- - - - - - - - - 0 0
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	1 14 28
Native ground cover (shrub) present	0 0
Native ground cover (other) present	1 2
Exotic ground cover present	50 100
Litter / Cryptogram / Rock*	0 0
Bare earth*	0 0
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1,1,1,1 / 6</u> Total length of logs <u>5,2,8,10 / 25</u>

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing) GPS Accuracy: ± m	
Position of plot marker on transect: Bearing of transect from plot marker: °	
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)	
Along 50m transect at 5m intervals	5m 10m 15m 20m 25m 30m 35m 40m 45m 50m Total %
Native over-storey cover (%FC)	
Native mid-storey cover (%FC)	
Exotic plant cover (%FC)	
Along 50m transect at 1m intervals	Number of hits Total %
Native ground cover (grass) present	
Native ground cover (shrub) present	
Native ground cover (other) present	
Exotic ground cover present	
Litter / Cryptogram / Rock*	
Bare earth*	
50 m x 20 m plot (tally / total)	Trees with hollow(s) / Total length of logs /

BioBanking Plot / Transect Data Sheet

VZ4

Ulex europaeus
Bromus catharticus

Entire Vegetation Zone

Site name: Rushes Ck Job number: 610.16117 Vegetation zone: White Box - Cypress - Iron bark
 Observer(s): J. Pepper + G. Leonard Date: 19.10.16
 Vegetation type (ID): _____ Condition Class: Moderate/Good or Low / Sub class (optional); high or medium or poor
 Threatened Ecological Community Yes or No? TEC type: (check) Box Gum Wood ?
 Geomorphic setting: gilgai - shallow depression on W facing slope
 Soil depth, colour, texture, gravel content: red earth

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
<u>3</u>	<u>VZ4P5</u>	<u>2</u>			
<u>2</u>	<u>VZ4P4</u>	<u>0</u>			
	<u>VZ4P3</u>				
<u>2</u>	<u>VZ4P1</u>	<u>0</u>			
<u>1</u>	<u>VZ4P2</u>	<u>1</u>			

Over-storey species present (a) _____ Management Actions (erosion, rubbish, fencing, pest fauna etc) _____
 Over-storey species regenerating (dbh <= 5cm) (b) _____
 Regeneration Proportion of over-storey species regenerating (b/a) _____

Summary of Plot / Transect Data		Plot ID	VZ4P5	VZ4P4	VZ4P3	VZ4P1		
20m x 20m plot	Native plant species richness in		<u>14</u>	<u>16</u>	<u>16</u>	<u>13</u>		
50 m transect	Native over-storey cover (%FC)		<u>0</u>	<u>0.1</u>	<u>3.5</u>	<u>7.6</u>		
	Native mid-storey cover (%FC)		<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
	Native ground cover (grass) (%FC)		<u>30</u>	<u>86</u>	<u>28</u>	<u>6</u>		
	Native ground cover (shrub) (%FC)		<u>16</u>	<u>0</u>	<u>0</u>	<u>0</u>		
	Native ground cover (other) (%FC)		<u>40</u>	<u>16</u>	<u>16</u>	<u>8</u>		
	Exotic plant cover (%FC)		<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>		
50 m x 20 m plot	Trees with at least one visible hollow		<u>0</u>	<u>2</u>	<u>4</u>	<u>1</u>		
	Total length of logs (>10cm diameter & longer than 0.5m)		<u>0</u>	<u>0</u>	<u>8</u>	<u>7</u>		

Plot ID VZ4P5

Location of plot marker: GDA94 (Zone) (Easting) 150° 35.76 (Northing) 3050.106 GPS Accuracy: ± 3 m
 Position of plot marker on transect: SE corner Bearing of transect from plot marker: 330 °
 Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											15	30
Native ground cover (shrub) present											8	16
Native ground cover (other) present											20	40
Exotic ground cover present											50	100
Litter / Cryptogam / Rock*											0	0
Bare earth*											0	0
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>0 / 0</u>										Total length of logs	<u>10</u>

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

Cooden's sp.

Maniana Kelly Moley

BioBanking Plot / Transect Data Sheet

Plot ID VZ4 P4

150° 35.522

30.49.794

VZ4

WP 13 & 14

Location of plot marker: GDA94 (Zone)		(Easting)		" (Northing)		-30.8299		GPS Accuracy: ±		m		
Position of plot marker on transect:						Bearing of transect from plot marker: 330°						
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	1	-	-	-	-	-	-	-	-	-	1	0.1
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	1	111	111	111	111	111	111	111	111	111	43	86
Native ground cover (shrub) present											0	0
Native ground cover (other) present		1	1	1	1	1		1	11		8	16
Exotic ground cover present	111	111	111	111	111	111	111	111	111	111	50	100
Litter / Cryptogram / Rock*											0	0
Bare earth*				11				1	1	1	5	10
50 m x 20 m plot (tally / total)	Trees with hollow(s)						2 / 2		Total length of logs		0 / 0	

Plot ID VZ4 P3

WP 25/26

Location of plot marker: GDA94 (Zone)		(Easting) 150.35.483		(Northing) -30.49.488		GPS Accuracy: ±		3		m		
Position of plot marker on transect: N end / mid 20m						Bearing of transect from plot marker: 170°						
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	-	-	15	-	20	-	-	-	-	35	3.5
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	11	11	111				1	1	111	11	14	28
Native ground cover (shrub) present											0	0
Native ground cover (other) present			11		11	11			1	1	8	16
Exotic ground cover present	111	111	111	111	111	111	111	111	111	111	50	100
Litter / Cryptogram / Rock*								11			2	4
Bare earth*											0	0
50 m x 20 m plot (tally / total)	Trees with hollow(s)						1,1,1 / 4		Total length of logs		7,1 / 8	

Plot ID VZ4 P1

(Ridge above Namoi)

1.50pm 20.10.16

WP 39,40

Location of plot marker: GDA94 (Zone)		(Easting) 150.35.301		(Northing) 30.47.741		GPS Accuracy: ±		3		m		
Position of plot marker on transect: N end / mid 20m						Bearing of transect from plot marker: 130°						
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	1	-	-	-	-	25	20	-	-	30	76	7.6
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present			1	1			1				3	6
Native ground cover (shrub) present											0	0
Native ground cover (other) present				1	11				1		4	8
Exotic ground cover present	111	111	111	111	111	111	111	111	111	111	50	100
Litter / Cryptogram / Rock*											0	0
Bare earth*			1								1	2
50 m x 20 m plot (tally / total)	Trees with hollow(s)						1 / 1		Total length of logs		2,1,3,1 / 7	

BioBanking Plot / Transect Data Sheet

VZ4

Entire Vegetation Zone

Site name:		Job number:		Vegetation zone:	
Observer(s):			Date:		
Vegetation type (ID):			Condition Class: Moderate/Good or Low / Sub class (optional); high or medium or poor		
Threatened Ecological Community Yes or No ? TEC type:					
Geomorphic setting:					
Soil depth, colour, texture, gravel content:					
Lithology:					
Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
Over-storey species present (a)		Management Actions (erosion, rubbish, fencing, pest fauna etc)			
Over-storey species regenerating (dbh <= 5cm) (b)					
Regeneration Proportion of over-storey species regenerating (b/a)					

Summary of Plot / Transect Data

	Plot ID											
20m x 20m plot	VZ4P2	Native plant species richness in	23									
50 m transect		Native over-storey cover (%FC)	12.5									
		Native mid-storey cover (%FC)	0									
		Native ground cover (grass) (%FC)	32									
		Native ground cover (shrub) (%FC)	4									
		Native ground cover (other) (%FC)	28									
		Exotic plant cover (%FC)	0									
50 m x 20 m plot		Trees with at least one visible hollow	3									
		Total length of logs (>10cm diameter & longer than 0.5m)	10									

Plot ID VZ4 P2 3.15pm 20.10.16 150.58562 / 30.80434

Location of plot marker: GDA94 (Zone) (Easting) <u>150.35.140</u> (Northing) <u>-30.48.262</u> GPS Accuracy: ± m												
Position of plot marker on transect: <u>N end / mid 20m</u> Bearing of transect from plot marker: <u>130</u> °												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	30	-	-	-	-	-	35	40	-	20	125	12.5
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-		0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-		0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	11	11				11	111	111	111	1	16	32
Native ground cover (shrub) present							1		1		2	4
Native ground cover (other) present	1	1	1	1111	11	1	11		1	1	14	28
Exotic ground cover present	11	1111	1111	11	111	11	11	111	111	111	32	64
Litter / Cryptogam / Rock*	111	1						1			7	14
Bare earth*				11	1	1				1	5	10
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1,1,1 / 3</u>					Total length of logs <u>1,6,3 / 10</u>						

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m													
Position of plot marker on transect:											Bearing of transect from plot marker: °				
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)															
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%			
Native over-storey cover (%FC)															
Native mid-storey cover (%FC)															
Exotic plant cover (%FC)															
Along 50m transect at 1m intervals	Number of hits										Total	%			
Native ground cover (grass) present															
Native ground cover (shrub) present															
Native ground cover (other) present															
Exotic ground cover present															
Litter / Cryptogram / Rock*															
Bare earth*															
50 m x 20 m plot (tally / total)		Trees with hollow(s)					/			Total length of logs					/

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m													
Position of plot marker on transect:											Bearing of transect from plot marker: °				
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)															
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%			
Native over-storey cover (%FC)															
Native mid-storey cover (%FC)															
Exotic plant cover (%FC)															
Along 50m transect at 1m intervals	Number of hits										Total	%			
Native ground cover (grass) present															
Native ground cover (shrub) present															
Native ground cover (other) present															
Exotic ground cover present															
Litter / Cryptogram / Rock*															
Bare earth*															
50 m x 20 m plot (tally / total)		Trees with hollow(s)					/			Total length of logs					/

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m													
Position of plot marker on transect:											Bearing of transect from plot marker: °				
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)															
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%			
Native over-storey cover (%FC)															
Native mid-storey cover (%FC)															
Exotic plant cover (%FC)															
Along 50m transect at 1m intervals	Number of hits										Total	%			
Native ground cover (grass) present															
Native ground cover (shrub) present															
Native ground cover (other) present															
Exotic ground cover present															
Litter / Cryptogram / Rock*															
Bare earth*															
50 m x 20 m plot (tally / total)		Trees with hollow(s)					/			Total length of logs					/

Cheilanthes? sieberi

VZ5

BioBanking Plot / Transect Data Sheet

Entire Vegetation Zone

Site name: <u>Rushes CK</u>	Job number: <u>610.16117</u>	Vegetation zone: <u>VZ5 Grey Box Woodland</u>			
Observer(s): <u>J.P. & G.L.</u>	Date: <u>20.10.16</u>				
Vegetation type (ID):	Condition Class: <u>Moderate/Good</u> or Low / Sub class (optional); high or medium or <u>poor</u>				
Threatened Ecological Community <u>Yes</u> or No? TEC type: <u>Box Gum Woodland</u>					
Geomorphic setting: <u>undulating basalts rises & flats S Namoi Ri</u>					
Soil depth, colour, texture, gravel content:					
Lithology:					
Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
<u>1</u>	<u>VZ5 P1</u>	<u>6</u>			
<u>3</u>	<u>VZ5 P2</u>	<u>0</u>			
Over-storey species present (a)			Management Actions (erosion, rubbish, fencing, pest fauna etc)		
Over-storey species regenerating (dbh<=5cm) (b)					
Regeneration Proportion of over-storey species regenerating (b/a)					

Summary of Plot / Transect Data

	Plot ID	VZ5 P1	VZ5 P2				
20m x 20m plot	Native plant species richness in						
50 m transect	Native over-storey cover (%FC)	<u>5</u>	<u>2.1</u>				
	Native mid-storey cover (%FC)	<u>0</u>	<u>0</u>				
	Native ground cover (grass) (%FC)	<u>28</u>	<u>8</u>				
	Native ground cover (shrub) (%FC)	<u>0</u>	<u>0</u>				
	Native ground cover (other) (%FC)	<u>12</u>	<u>12</u>				
	Exotic plant cover (%FC)	<u>0</u>	<u>0</u>				
50 m x 20 m plot	Trees with at least one visible hollow	<u>2</u>	<u>2</u>				
	Total length of logs (>10cm diameter & longer than 0.5m)	<u>17</u>	<u>12</u>				

Plot ID VZ5 P1

9.35am 20.10.16 Wp 28+29

Location of plot marker: <u>GDA94</u> (Zone) (Easting) <u>150.35.819</u> (Northing) <u>30.48.268</u> GPS Accuracy: \pm <u>3</u> m												
Position of plot marker on transect: <u>W end / mid 20m</u> Bearing of transect from plot marker: <u>90</u> °												
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	-	<u>10</u>	-	-	-	-	<u>15</u>	<u>5</u>	<u>10</u>	<u>10</u>	<u>50</u>	<u>5</u>
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											<u>14</u>	<u>28</u>
Native ground cover (shrub) present											<u>0</u>	<u>0</u>
Native ground cover (other) present											<u>6</u>	<u>12</u>
Exotic ground cover present											<u>47</u>	<u>94</u>
Litter / Cryptogam / Rock*											<u>2</u>	<u>4</u>
Bare earth*											<u>1</u>	<u>2</u>
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1, 1 / 2</u>										Total length of logs <u>5, 5, 3, 4 / 17</u>	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

VZ5

BioBanking Plot / Transect Data Sheet

Plot ID VZ5 P2

10.07am 20.10.16

30, 31

Location of plot marker: GDA94 (Zone)		(Easting) 150.35.772		(Northing) 30.48.472		GPS Accuracy: ± 3 m						
Position of plot marker on transect: <u>NE end / mid 20m</u>				Bearing of transect from plot marker: <u>220</u> °								
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	1	-	-	-	-	-	5	15	-	-	21	2.1
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present								11	11		4	8
Native ground cover (shrub) present											0	0
Native ground cover (other) present		1	1			11		1	1		6	12
Exotic ground cover present											47	94
Litter / Cryptogram / Rock*										1	1	1
Bare earth*			1				11	1			4	8
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1, 1</u>				/ <u>2</u>		Total length of logs <u>4, 3, 5</u>				/ <u>12</u>	

Cotula dentata "Brown Grass"

Plot ID _____

Location of plot marker: GDA94 (Zone)		(Easting)		(Northing)		GPS Accuracy: ± m						
Position of plot marker on transect:				Bearing of transect from plot marker: °								
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)				/		Total length of logs				/	

Plot ID _____

Location of plot marker: GDA94 (Zone)		(Easting)		(Northing)		GPS Accuracy: ± m						
Position of plot marker on transect:				Bearing of transect from plot marker: °								
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)				/		Total length of logs				/	

BioBanking Plot / Transect Data Sheet

VZ6

Entire Vegetation Zone

Site name: <u>Rushes Ck</u>	Job number: <u>610.16117</u>	Vegetation zone: <u>VZ6</u>			
Observer(s): <u>J.P. + G.L.</u>	Date: <u>20.10.16</u>				
Vegetation type (ID):	Condition Class: Moderate/Good <u>or Low /</u> ? TBC Sub class (optional); high or medium or poor				
Threatened Ecological Community Yes or <u>No</u> ? TEC type:					
Geomorphic setting: <u>river bank, S end bank of Namoi Ri.</u>					
Soil depth, colour, texture, gravel content:					
Lithology:					
Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
<u>1</u>	<u>VZ6 P1</u>	<u>1</u>			
Over-storey species present (a)			Management Actions (erosion, rubbish, fencing, pest fauna etc)		
Over-storey species regenerating (dbh<=5cm) (b)					
Regeneration Proportion of over-storey species regenerating (b/a)					

Summary of Plot / Transect Data

	Plot ID						
20m x 20m plot	<u>VZ6 P1</u>						
Native plant species richness in		<u>10</u>					
50 m transect							
Native over-storey cover (%FC)		<u>13</u>					
Native mid-storey cover (%FC)		<u>0</u>					
Native ground cover (grass) (%FC)		<u>0</u>					
Native ground cover (shrub) (%FC)		<u>0</u>					
Native ground cover (other) (%FC)		<u>12</u>					
Exotic plant cover (%FC)		<u>0</u>					
50 m x 20 m plot							
Trees with at least one visible hollow		<u>3</u>					
Total length of logs (>10cm diameter & longer than 0.5m)		<u>28</u>					

Plot ID VZ6 P1

1.20 pm 20.10.16

36, 37

Location of plot marker: <u>GDA94</u> (Zone) (Easting) <u>150.35.374</u> (Northing) <u>-30.47.660</u> GPS Accuracy: ± m												
Position of plot marker on transect: <u>E end / mid 10m x 40m</u> Bearing of transect from plot marker: <u>330</u> °												
Transect photo NOS. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	<u>35</u>	<u>10</u>	<u>30</u>	<u>35</u>	<u>25</u>	<u>5</u>	-	-	-	-	<u>130</u>	<u>13</u>
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	<u>0</u>	<u>0</u>
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present											<u>0</u>	<u>0</u>
Native ground cover (shrub) present											<u>0</u>	<u>0</u>
Native ground cover (other) present	<u>1</u>	<u>1</u>	<u>1</u>	<u>1</u>	<u>11</u>						<u>6</u>	<u>12</u>
Exotic ground cover present		<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u>40</u>	<u>80</u>
Litter / Cryptogam / Rock*		<u> </u>		<u>1</u>						<u>1</u>	<u>4</u>	<u>8</u>
Bare earth*	<u> </u>										<u>5</u>	<u>10</u>
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1,1,1 / 3</u>										Total length of logs <u>2,3,4,4,4 / 28</u>	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

"offset" Area

VZ7

Entire Vegetation Zone

Site name: Rubus ch Job number: 610-16117 Vegetation zone: VZ7 White Box / Cypress / Ironbark
 Observer(s): J.P. + G.L. Date: 21.10.16
 Vegetation type (ID): Condition Class: Moderate/Good of Low /
 Sub class (optional); high or medium or poor

Threatened Ecological Community Yes or No? TEC type:
 Geomorphic setting:
 Soil depth, colour, texture, gravel content:

Lithology:

Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
1	VZ7P1	0			
	VZ8P1				

Over-storey species present (a) Management Actions (erosion, rubbish, fencing, pest fauna etc)
 Over-storey species regenerating (dbh<=5cm) (b)
 Regeneration Proportion of over-storey species regenerating (b/a)

Summary of Plot / Transect Data

	Plot ID	VZ7P1	VZ8P1				
20m x 20m plot	Native plant species richness in	18	19				
50 m transect	Native over-storey cover (%FC)	3	2.5				
	Native mid-storey cover (%FC)	0	0				
	Native ground cover (grass) (%FC)	12	8				
	Native ground cover (shrub) (%FC)	8	0				
	Native ground cover (other) (%FC)	22	46				
	Exotic plant cover (%FC)	0	0				
50 m x 20 m plot	Trees with at least one visible hollow	1	0				
	Total length of logs (>10cm diameter & longer than 0.5m)	2	0				

Plot ID VZ7P1 White Box - Ironbark 10:35am 21.10.16 wp 52

Location of plot marker: GDA94 (Zone) (Easting) 150.34.67 (Northing) 30.48.130 GPS Accuracy: ± m
 Position of plot marker on transect: Bearing of transect from plot marker: 130°
 Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	10	-	-	-	-	20	-	-	-	-	30	3
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-		0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-		0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	11	11					1			1	6	12
Native ground cover (shrub) present					1		1	1	1		4	8
Native ground cover (other) present		1		11	11	11	11	1	1	1	11	22
Exotic ground cover present	44	110	111	111	111	111	111	111	111	111	42	84
Litter / Cryptogram / Rock*										1	1	1
Bare earth*			1	1		1					3	6
50 m x 20 m plot (tally / total)	Trees with hollow(s) <u>1 / 1 / 1</u>										Total length of logs <u>2 / 2</u>	

* record a hit for rock, litter, bare or cryptogram only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

VZ8

Plot ID VZ8P1 11.00am 21.10.16 Inland Argy Mac (up 54)

Location of plot marker: GDA94 (Zone) (Easting) 15034.433 (Northing) 3048.209 GPS Accuracy: ± m

Position of plot marker on transect: N end / mid 20m Bearing of transect from plot marker: 200°

Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	25	-	-	-	-	-	-	-	-	-	25	25
Native mid-storey cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Exotic plant cover (%FC)	-	-	-	-	-	-	-	-	-	-	0	0
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	111					1					4	8
Native ground cover (shrub) present											0	0
Native ground cover (other) present	111	1	11	111	1	11	111	111	1	111	23	46
Exotic ground cover present	1111	1111	1111	1111	1111	1111	1111	1111	1111	1111	46	92
Litter / Cryptogram / Rock*				11	1						3	6
Bare earth*											0	0
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/ 0					Total length of logs / 0	

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing) GPS Accuracy: ± m

Position of plot marker on transect: Bearing of transect from plot marker: °

Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/					Total length of logs /	

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing) GPS Accuracy: ± m

Position of plot marker on transect: Bearing of transect from plot marker: °

Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)

Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/					Total length of logs /	

BioBanking Plot / Transect Data Sheet

Entire Vegetation Zone

Site name:		Job number:		Vegetation zone:	
Observer(s):			Date:		
Vegetation type (ID):			Condition Class: Moderate/Good or Low / Sub class (optional); high or medium or poor		
Threatened Ecological Community Yes or No ? TEC type:					
Geomorphic setting:					
Soil depth, colour, texture, gravel content:					
Lithology:					
Over-storey species (total number of species = a)	Regenerating (total number of species = b)		Weed species present and requiring management	In plots (record plot IDs)	Elsewhere in zone
	Plot ID	Elsewhere in zone			
Over-storey species present (a)		Management Actions (erosion, rubbish, fencing, pest fauna etc)			
Over-storey species regenerating (dbh<=5cm) (b)					
Regeneration Proportion of over-storey species regenerating (b/a)					

Summary of Plot / Transect Data		Plot ID							
20m x 20m plot	Native plant species richness in								
50 m transect	Native over-storey cover (%FC)								
	Native mid-storey cover (%FC)								
	Native ground cover (grass) (%FC)								
	Native ground cover (shrub) (%FC)								
	Native ground cover (other) (%FC)								
	Exotic plant cover (%FC)								
50 m x 20 m plot	Trees with at least one visible hollow								
	Total length of logs (>10cm diameter & longer than 0.5m)								

Plot ID V24 P6

Location of plot marker: GDA94 (Zone)		(Easting)		(Northing)		GPS Accuracy: ± m						
Position of plot marker on transect:				Bearing of transect from plot marker: °								
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	45	25										7
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present	7	7	7	1								37
Native ground cover (shrub) present	1											2
Native ground cover (other) present	7											10
Exotic ground cover present	7	7	1									22
Litter / Cryptogam / Rock*	7	7	7	1								
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)				2 /		Total length of logs				5m /	

* record a hit for rock, litter, bare or cryptogam only at points where no vegetative groundcover is recorded

BioBanking Plot / Transect Data Sheet

Plot ID V22 P6

Location of plot marker: GDA94 (Zone)		(Easting)	(Northing)	GPS Accuracy: ± m								
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	0											
Native mid-storey cover (%FC)	0											
Exotic plant cover (%FC)	0											
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												69
Native ground cover (shrub) present												
Native ground cover (other) present												10
Exotic ground cover present												12
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/	Total length of logs					/

Plot ID V22 P7

Location of plot marker: GDA94 (Zone)		(Easting)	(Northing)	GPS Accuracy: ± m								
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												0
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												24
Native ground cover (shrub) present												0
Native ground cover (other) present												52
Exotic ground cover present												20
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/	Total length of logs					/

Plot ID V21 P6

Location of plot marker: GDA94 (Zone)		(Easting)	(Northing)	GPS Accuracy: ± m								
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)	0											
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												4
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												42
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s)					/	Total length of logs					/

BioBanking Plot / Transect Data Sheet

Plot ID V22P8

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m										
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s) /						Total length of logs /					

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m										
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												0
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												44
Native ground cover (shrub) present												
Native ground cover (other) present	###	###										28
Exotic ground cover present	###											16
Litter / Cryptogram / Rock*	###											
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s) /						Total length of logs /					

Plot ID _____

Location of plot marker: GDA94 (Zone) (Easting) (Northing)		GPS Accuracy: ± m										
Position of plot marker on transect:		Bearing of transect from plot marker: °										
Transect photo nos. (take 2 [portrait, landscape] from plot marker along transect)												
Along 50m transect at 5m intervals	5m	10m	15m	20m	25m	30m	35m	40m	45m	50m	Total	%
Native over-storey cover (%FC)												
Native mid-storey cover (%FC)												
Exotic plant cover (%FC)												
Along 50m transect at 1m intervals	Number of hits										Total	%
Native ground cover (grass) present												
Native ground cover (shrub) present												
Native ground cover (other) present												
Exotic ground cover present												
Litter / Cryptogram / Rock*												
Bare earth*												
50 m x 20 m plot (tally / total)	Trees with hollow(s) /						Total length of logs /					

APPENDIX F

LIKELIHOOD OF OCCURRENCE FOR THREATENED BIOTA

KEY	
Status	The “ <i>threatened species</i> ” or “ <i>endangered ecological community</i> ” listing in the <i>Threatened Species Conservation Act 1995</i>
V	Species listed as “ <i>Vulnerable</i> ”
E1	Species listed as “ <i>Endangered</i> ”
E4A	Species listed as “ <i>Critically Endangered</i> ”
E2	An “ <i>endangered population</i> ”
E	An EEC listed as “ <i>endangered</i> ”
CE	An EEC listed as “ <i>critically endangered</i> ”
	The “ <i>threatened species</i> ” or “ <i>endangered ecological community</i> ” listing in the <i>Environment Protection and Biodiversity Conservation Act 1999</i>
V	Species listed as “ <i>Vulnerable</i> ”
E	Species listed as “ <i>Endangered</i> ”
CE	Species listed as “ <i>Critically Endangered</i> ”
M	Species listed as “ <i>Migratory</i> ”
MR	Species listed as “ <i>Marine</i> ”
On site	Yes/No. Predicted (ecosystem credit) threatened species are deemed to be “On Site” in the Credit Calculator if any one of their habitat components (breeding, foraging or shelter) are present on the site, in accordance with Section 6.3 of the FBA.
LoO	Likelihood or Occurrence - the probability of a threatened species occurring on the site
P	Present or recorded on the subject site
H	High likelihood of occurrence

KEY	
M	Moderate likelihood of occurrence
L	Low likelihood of occurrence
N	No potential relevance
Source	Data Source
BBCC	Sourced from BioBanking Credit Calculator
PMST	Sourced from EPBC Act Protected Matters Search Tool
BioNet	Sourced from Atlas of NSW Wildlife database
SLR	Sourced from SLR field data and reports

NOTES
<ul style="list-style-type: none"> • The table below is based on data obtained from the recently reformed Atlas of NSW Wildlife website http://www.bionet.nsw.gov.au/, and the following notes accompany this dataset. • In addition, the following species and communities were identified as requiring further consideration in the SEARs: Regent Honeyeater <i>Anthochaera phrygia</i>, Lake Keepit Hakea (<i>Hakea pulvinifera</i>); and Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions. • Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. • Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°). • Copyright the State of NSW through the Office of Environment and Heritage. • Data from the BioNet Atlas of NSW Wildlife website, which holds records from a number of custodians. The data are only indicative and cannot be considered a comprehensive inventory, and may contain errors and omissions. Species listed under the Sensitive Species Data Policy may have their locations denatured (^ rounded to 0.1°; ^^ rounded to 0.01°). Copyright the State of NSW through the Office of Environment and Heritage. Search criteria : Licensed Report of all Valid Records of Threatened (listed on TSC Act 1995) or Commonwealth listed Entities in selected area [North: -30.71 West: 150.47 East: 150.68 South: -30.89] returned a total of 75 records of 18 species • Report generated on 7/06/2017 9:38 AM

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
PLANTAE							
Apocynaceae							
Tylophora linearis <i>Tylophora linearis</i>	Species		E	V	Grows in dry scrub and open forest. Recorded from low-altitude sedimentary flats in dry woodlands of <i>Eucalyptus fibrosa</i> , <i>Eucalyptus sideroxylon</i> , <i>Eucalyptus albens</i> , <i>Callitris endlicheri</i> , <i>Callitris glaucophylla</i> and <i>Allocasuarina luehmannii</i> . Also grows in association with <i>Acacia hakeoides</i> , <i>Acacia lineata</i> , <i>Melaleuca uncinata</i> , <i>Myoporum</i> species and <i>Casuarina</i> species. Flowers in spring, with flowers recorded in November or May	L	PMST
Haloragaceae							
Tall Velvet Sea-berry <i>Haloragis exalata</i> <i>subsp. Velutina</i>	Species		V	V	Grows in damp places near watercourses. This subspecies also occurs in woodland on the steep rocky slopes of gorges.	L	BBCC
Orchidaceae							
Tarengo Leek Orchid <i>Prasophyllum petilum</i>	Species (not listed in Namoi CMA)		E	E1	Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with River Tussock (<i>Poa labillardieri</i>), Black Gum (<i>Eucalyptus aggregata</i>) and tea-trees (<i>Leptospermum</i> spp.) at Captains Flat and within the grassy groundlayer dominated by Kangaroo Grass under Box-Gum Woodland at Ilford. Flowers are followed by fleshy seed capsules in summer.	L	PMST
Orobanchaceae							
<i>Euphrasia arguta</i>	Species		CE	E4A	Eucalypt forest with a mixed grass and shrub understorey, plants are most dense in an open disturbed area and along the roadside, indicating the species had regenerated following disturbance. Flowering occurs between January and April.	L	PMST BBCC
Poaceae							

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
Finger Panic Grass <i>Digitaria porrecta</i>	Species			E1, P	Native grassland, woodlands or open forest with a grassy understorey, on richer soils. Flowering season is summer or late summer from mid-January to late February, with seeds maturing and falling from the plant soon after.	M	BioNet BBCC
Bluegrass <i>Dichanthium setosum</i>	Species		V	V	Flowering time is mostly in summer. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. Locally common or found as scattered clumps in broader populations. The extensive distribution and wide environmental tolerances make predictions about suitable habitat difficult.	M	PMST BBCC
Belson's Panic <i>Homopholis belsonii</i>	Species		E	V	Grows in dry woodland (e.g. Belah) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils.	M	PMST BBCC
<i>Prasophyllum</i> Wybong	sp. Species		CE		Perennial orchid, appearing as a single leaf over winter and spring. Flowers in spring and dies back to a dormant tuber over summer and autumn. Known to occur in open eucalypt woodland and grassland	L	PMST BBCC
Polygalaceae							
Native Milkwort <i>Polygala linariifolia</i>	Species			E1	Sandy soils in dry eucalypt forest and woodland with a sparse understorey. The species has been recorded from the Inverell and Torrington districts growing in dark sandy loam on granite in shrubby forest of <i>Eucalyptus caleyi</i> , <i>Eucalyptus dealbata</i> and <i>Callitris</i> , and in yellow podzolic soil on granite in layered open forest. Flowers from spring to summer.	M	BBCC
Proteaceae							
Lake Keepit Hakea <i>Hakea pulvinifera</i>	Species		E	E1, P, 2	Associated species at the site include <i>Alstonia constricta</i> and <i>Acacia decora</i> also prevalent as shrubs. A sparse cover of grasses and forbs forms a ground layer but at least fifty percent of the site is bare earth or rock. The most common ground cover species is the	L	BioNet PMST

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					introduced plant <i>Petrorhagia nanteuilii</i> . Other common species are the grasses <i>Themeda australis</i> , <i>Cymbopogon obtectus</i> and <i>Aristida</i> species. Flowering time is September to October. Flowering within the population is short and synchronous, lasting around 2 to 3 weeks. No fruiting has ever been recorded.		
Rutaceae							
<i>Philotheca ericifolia</i>	Species		V		Grows chiefly in dry sclerophyll forest and heath on damp sandy flats and gullies. It has been collected from a variety of habitats including heath, open woodland, dry sandy creek beds, and rocky ridge and cliff tops. Flowering time is in the spring. Fruits are produced from November to December.	L	PMST
Santalaceae							
Austral Toadflax <i>Thesium australe</i>	Species		V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (<i>Themeda australis</i>).	L	PMST BBCC
Surianaceae							
Ooline <i>Cadellia pentastylis</i>	Species		V	V	Appears to flower spasmodically, during a general flowering period of October to January. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth.	L	PMST
AVES							
Acanthizidae							
Speckled Warbler <i>Chthonicola sagittata</i>	Ecosystem	Y		V, P	Lives in a wide range of Eucalyptus 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	L	BioNet BBCC

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					to persist in an area.		
Accipitridae							
Little Eagle <i>Hieraaetus morphnoides</i>	Ecosystem	Y		V	Medium-sized bird of prey with dark or pale brown colouring and distinctive underwing patterns. Occupies open eucalypt forest and woodland, also utilising riparian, sheoak or <i>Acacia</i> woodlands of interior NSW. Wide distribution through Australia excluding densely vegetated areas of the Great Divide. Large stick nests built in winter with eggs laid during spring.	P	BioNet BBCC SLR
White-bellied Sea-Eagle <i>Haliaeetus leucogaster</i>	N/A (not listed in Namoi CMA)		MR		The White-bellied Sea-Eagle is found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands	L	BioNet, PMST
Spotted Harrier <i>Circus assimilis</i>	Ecosystem	Y		V	Occurs in grassy open woodland including <i>Acacia</i> and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn)	L	BBCC
Square-tailed Kite <i>Lophoictinia isura</i>	Ecosystem	Y		V	Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland. Breeding is from July to February	M	BBCC
Black-breasted Buzzard <i>Hamirostra melanosternon</i>	Species			V	Lives in a range of inland habitats, especially along timbered watercourses which is the preferred breeding habitat. Also hunts over grasslands and sparsely timbered woodlands. Breeds from August to October near water in a tall tree.	L	BBCC
Eastern Osprey <i>Pandion cristatus</i>	Species		M, MR	V	Favour coastal areas, especially the mouths of large rivers, lagoons and lakes. Feed on fish over clear, open water. Breed from July to	L	BBCC PMST

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					September in NSW. Nests are made high up in dead trees or in dead crowns of live trees, usually within one kilometre of the sea. .		
Red Goshawk <i>Erythrotriorchis radiatus</i>	N/A (not listed in Namoi CMA)		V	E4A	Inhabit open woodland and forest, preferring a mosaic of vegetation types, a large population of birds as a source of food, and permanent water, and are often found in riparian habitats along or near watercourses or wetlands. In NSW, preferred habitats include mixed subtropical rainforest, Melaleuca swamp forest and riparian Eucalyptus forest of coastal rivers.	L	PMST
Anatidae							
Freckled Duck <i>Stictonetta naevosa</i>	Ecosystem	Y		V	Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds. Nesting usually occurs between October and December but can take place at other times when conditions are favourable.	L	BBCC
Anseranatidae							
Magpie Goose <i>Anseranas semipalmata</i>	Ecosystem	Y		V	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes.	L	BBCC
Apodidae							
Fork-tailed Swift <i>Apus pacificus</i>	N/A (not listed in Namoi CMA)		M, MR		The Fork-tailed Swift is a non-breeding visitor to all states and territories of Australia. They mostly occur over inland plains but sometimes above foothills or in coastal areas	H	PMST
White-throated Needletail <i>Hirundapus caudacutus</i>	N/A (not listed in Namoi CMA)		M		Widespread in eastern and south-eastern Australia. 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	H	PMST
Ardeidae							
Eastern Great Egret <i>Ardea modesta</i>	N/A (not listed in		MR		The Eastern Great Egret has been reported in a wide range of wetland habitats	M	PMST

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
	Namoi CMA)						
Cattle Egret <i>Ardea ibis</i>	N/A (not listed in Namoi CMA)		MR		The Cattle Egret occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands	H	PMST
Burhinidae							
Bush Stone-curlew <i>Burhinus grallarius</i>	Ecosystem	Y		E1	Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. Largely nocturnal, being especially active on moonlit nights. Two eggs are laid in spring and early summer.	L	BBCC
Cacatuidae							
Gang-gang Cockatoo <i>Callocephalon fimbriatum</i>	Ecosystem	Y		V	In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, 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. May also occur in sub-alpine Snow Gum (<i>Eucalyptus pauciflora</i>) woodland and occasionally in temperate rainforests.	L	BBCC
Glossy Black-Cockatoo <i>Calyptorhynchus lathami</i>	Ecosystem	Y		V	Inhabits open forest and woodlands of the coast and the Great Dividing Range where stands of sheoak occur. Feeds almost exclusively on the seeds of several species of she-oak (<i>Casuarina</i> and <i>Allocasuarina</i> species). Dependent on large hollow-bearing eucalypts for nest sites. A single egg is laid between March and May.	L	BBCC
Ciconiidae							
Black-necked Stork <i>Ephippiorhynchus asiaticus</i>	Species			E1	Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW for the Black-necked Stork. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries. In NSW, breeding activity occurs May - January	L	BBCC

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
Climacteridae							
Brown Treecreeper <i>Climacteris picumnus victoriae</i>	Ecosystem	Y		V, P	Small grey-brown bird with black streaking on the lower breast/belly and black bars on the undertail. Inhabits Box-Gum woodlands and dry open forest of inland slopes and plains. Preferred woodlands dominant by stringybarks or other rough-barked eucalypts. Forages in trees and on the ground. Endemic to eastern Australia, occurring from the coast to inland plains and western slopes of the great dividing range. Nests in tree or stump hollows greater than 6cm.	L	BioNet BBCC
Dicuridae							
Satin Flycatcher <i>Myiagra cyanoleuca</i>			M, MR		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	PMST
Estrildidae							
Diamond Firetail <i>Stagonopleura guttata</i>	Ecosystem	Y		V, P	Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland. Groups separate into small colonies to breed, between August and January.	M	BioNet BBCC
Falconidae							
Black Falcon <i>Falco subniger</i>	Species			V, P	Sparsely distributed in New South Wales, mostly occurring in inland regions. Some reports of 'Black Falcons' on the tablelands and coast of New South Wales are likely to be referable to the Brown Falcon. In New South Wales there is assumed to be a single population that is continuous with a broader continental population. The Black Falcon occurs as solitary individuals, in pairs, or in family groups of	M	BioNet

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					parents and offspring		
Gruidae							
Brolga <i>Grus rubicunda</i>	Ecosystem	Y		V	Often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. Two eggs are laid from winter to autumn.	L	BCC
Meropidae							
Rainbow Bee-eater <i>Merops ornatus</i>	N/A (not listed in Namoi CMA)		MR		Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation	M	PMST
Meliphagidae							
Painted Honeyeater <i>Grantiella picta</i>	Ecosystem	Y	V	V, P	Nomadic. Greatest concentrations and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern Queensland. Inhabits Boree, Brigalow and Box-Gum Woodlands and Box-Ironbark Forests. Feeds on the fruits of mistletoes growing on woodland eucalypts and acacias. Nests in outer canopy of drooping eucalypts, she-oak, paperbark or mistletoe branches. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland.	L	BioNet PMST BCC
Regent Honeyeater <i>Anthochaera phrygia</i>	Species		CE	E4A	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak, non-breeding flocks are seen foraging in flowering coastal Swamp Mahogany and Spotted Gum forests, particularly on the central coast and occasionally on the upper north coast.	M	PMST BCC
Black-chinned Honeyeater <i>Melithreptus gularis</i>	Ecosystem	Y		V	Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts. Also inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Breeds solitarily or co-	L	BCC

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					operatively, with up to five or six adults, from June to December.		
Motacillidae							
Yellow Wagtail <i>Motacilla flava</i>	N/A (not listed in Namoi CMA)		M, MR		IUCN listed this species as least concern in the Red List of Threatened Species 2015	L	PMST
Neosittidae							
Varied Sittella <i>Daphoenositta chrysoptera</i>	Ecosystem	Y		V, P	Inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west. Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Known to inhabit Black Box Lignum woodland, Black Box grassy open woodland. Floodplain Transition Woodlands	H	BioNet BCC
Petroicidae							
Hooded Robin <i>Melanodryas cucullata cucullata</i>	Ecosystem	Y		V	Widespread, found across Australia, except for the driest deserts and the wetter coastal areas - northern and eastern coastal Queensland and Tasmania. The south-eastern form (subspecies <i>cucullata</i>) is found from Brisbane to Adelaide and throughout much of inland NSW. Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Known to inhabit Black Box grassy open woodland, Black Box Lignum woodland.	L	BioNet BCC
Pomatostomidae							
Grey-crowned Babbler <i>Pomatostomus temporalis temporalis</i>	Ecosystem	Y		V, P	Fairly large brown babbler with distinctive white/grey crown and brow. Live in family groups of up to 15 birds. Inhabits Box-Gum woodlands on slopes, and Box-Cypress pine and Open-Box woodlands when on Alluvial plains. Distribution along most of the	P	BioNet BCC SLR

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
					eastern side of Australia, particularly the western slopes of the Great Dividing Range. Breeding occurs between July and February. Several conspicuous dome-shaped nests are built and maintained in shrubs, sapling eucalypts or lower branches of larger eucalypts. Territories are usually around 10ha, but can be up to 50ha.		
Psittacidae							
Little Lorikeet <i>Glossopsitta pusilla</i>	Ecosystem	Y		V, P	Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity. Also found in isolated flowering trees in open country, e.g. paddocks, roadside remnants and urban trees also help sustain viable populations of the species. Roosts in treetops, often distant from feeding areas. Nesting season extends from May to September.	M	BioNet BBCC
Swift Parrot <i>Lathamus discolor</i>	Ecosystem	Y	CE, MR	E1	On the mainland they occur in areas where eucalypts are flowering profusely or where there are abundant lerp (from sap-sucking bugs) infestations. Favoured feed trees include winter flowering species such as Swamp Mahogany <i>Eucalyptus robusta</i> , Spotted Gum <i>Corymbia maculata</i> , Red Bloodwood <i>C. gummifera</i> , Mugga Ironbark <i>E. sideroxylon</i> , and White Box <i>E. albens</i> .	M	PMST BBCC
Turquoise Parrot <i>Neophema pulchella</i>	Ecosystem	Y		V, P, 3	Inhabits fringes of eucalypt woodlands, often adjacent to clearings, ridges and farmland creeks. Typically forages on the ground under trees. Distributed from southern Queensland to northern Victoria, extending from the coast to the western slopes of the Great Dividing Range. Nesting occurs from December to August in tree hollows.	M	BioNet BBCC
Flame Robin <i>Petroica phoenicea</i>	Ecosystem	Y		V	Prefers clearings or areas with open understoreys. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgeland at high altitudes. In winter lives in dry forests, open woodlands and in pastures and native grasslands, with or without scattered trees.	L	BBCC
Scarlet Robin	Ecosystem	Y		V	Lives in dry eucalypt forests and woodlands. The understorey is	M	BBCC

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
<i>Petroica boodang</i>					usually open and grassy with few scattered shrubs. It occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. Habitat usually contains abundant logs and fallen timber: these are important components of its habitat. Mainly breed between the months of July and January		
Rostratulidae							
Australian Painted Snipe <i>Rostratula australis</i>	Ecosystem	Y	E, MR	E1	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber. Breeding is often in response to local conditions; generally occurs from September to December. Nests on the ground amongst tall vegetation, such as grasses, tussocks or reeds.	L	PMST BBCC
Scolopacidae							
Curlew Sandpiper <i>Calidris ferruginea</i>	Ecosystem (not listed in Namoi CMA)		CE, M, MR	E1	It generally occupies littoral and estuarine habitats, and in New South Wales is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland.	L	PMST
Common Sandpiper <i>Actitis hypoleucos</i>	N/A (not listed in Namoi CMA)		M		The species utilises a wide range of coastal wetlands and some inland wetlands, with varying levels of salinity, and is mostly found around muddy margins or rocky shores and rarely on mudflats	L	PMST
Sharp-tailed Sandpiper <i>Calidris acuminata</i>	N/A (not listed in Namoi CMA)		M, MR		In Australasia, the Sharp-tailed Sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation.	L	PMST
Pectoral Sandpiper <i>Calidris melanotos</i>	N/A (not listed in Namoi CMA)		M, MR		In Australasia, the Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	L	PMST
Latham's Snipe <i>Gallinago hardwickii</i>	N/A (not listed in Namoi CMA)		M, MR		In Australia, Latham's Snipe occurs in permanent and ephemeral wetlands up to 2000 m above sea-level	L	PMST
Srtigidae							

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
Barking Owl <i>Ninox connivens</i>	Ecosystem	Y		V	Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. It is flexible in its habitat use, and hunting can extend in to closed forest and more open areas. Sometimes able to successfully breed along timbered watercourses in heavily cleared habitats	M	BBCC
Tytonidae							
Masked Owl <i>Tyto novaehollandiae</i>	Ecosystem	Y		V	Lives in dry eucalypt forests and woodlands from sea level to 1100 m. A forest owl, but often hunts along the edges of forests, including roadsides. Roosts and breeds in moist eucalypt forested gullies, using large tree hollows or sometimes caves for nesting.	M	BBCC
FISH							
Percichthyidae							
Murray Cod <i>Maccullochella peelii</i>	N/A		V		Live in a variety of habitats ranging from clear, rocky streams to slow flowing turbid rivers, lakes and billabongs. They are absent from some of the cooler areas such as the upper reaches of the Murray and Murrumbidgee Rivers, preferring warmer waters.	L	PMST
Terapontidae							
Silver Perch <i>Bidyanus bidyanus</i>	N/A		CE		Inhabits freshwater rivers, lakes and reservoirs, particularly in areas of high water flow. Widespread throughout much of the Murray-Darling River System.	L	PMST
FROGS							
Hylidae							
Booroolong Frog <i>Litoria booroolongensis</i>	Species		E	E1	Live along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses. Adults occur on or near cobble banks and other rock structures within stream margins. Breeding occurs in spring and early summer.	L	PMST
MAMMALS							
Burramyidae							

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
Eastern Pygmy-Possum <i>Cercartetus concinnus</i>	Species			E1	In NSW, has been found in mallee shrubland either dominated by spinifex (<i>Triodia</i> spp.) or with an understorey of tea-tree (<i>Leptospermum</i> spp.) and also in Belah (<i>Casuarina pauper</i>) in a mixed woodland with well-developed understorey of saltbush. In other states is also frequently found in woodlands with dense heath understorey (particularly Proteaceae species such as <i>Banksia</i> and <i>Hakea</i> species). Breeding can occur at any time of year	L	BBCC
Dasyuridae							
Spotted-tailed Quoll <i>Dasyurus maculatus</i>	Ecosystem	Y	E	V	Range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites. Mostly nocturnal, although will hunt during the day; spends most of the time on the ground, although also an excellent climber and will hunt possums and gliders in tree hollows and prey on roosting birds.	L	PMST BBCC
Brush-tailed Phascogale <i>Phascogale tapoatafa</i>	Species			V	Prefer dry sclerophyll open forest with sparse groundcover of herbs, grasses, shrubs or leaf litter. Also inhabit heath, swamps, rainforest and wet sclerophyll forest. Mating occurs May - July	L	BBCC
Emballonuridae							
Yellow-bellied Sheath-tail-bat <i>Saccolaimus flaviventris</i>	Ecosystem	Y		V, P	Wide ranging, occupies a large variety of habitats throughout NSW. Forages in most habitats across its wide range, with and without trees. Roosts in hollow-bearing trees, buildings and mammal burrows in treeless areas. Breeding has been recorded from December to mid-March. Seasonal movements are unknown.	M	BioNet SLR BBCC
Macropodidae							
Brush-tailed Rock-wallaby	Species		E	V	Occupy rocky escarpments, outcrops and cliffs with a preference for complex structures with fissures, caves and ledges, often facing	L	PMST

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
<i>Petrogale penicillata</i>					north. Browse on vegetation in and adjacent to rocky areas eating grasses and forbs as well as the foliage and fruits of shrubs and trees. Shelter or bask during the day in rock crevices, caves and overhangs and are most active at night.		
Petauridae							
Squirrel Glider <i>Petaurus norfolcensis</i>	Species			V	The species is widely though sparsely distributed in eastern Australia, from northern Queensland to western Victoria. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites. Diet varies seasonally and consists of Acacia gum, eucalypt sap, nectar, honeydew and manna, with invertebrates and pollen providing protein. . Known to occur in Black Box Lignum woodland, Black Box grassy open woodland.	L	BioNet BBCC
Phascolarctidae							
Koala <i>Phascolarctos cinereus</i>	Species		V	E1, P	Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species. Inactive for most of the day, feeding and moving mostly at night. Spend most of their time in trees, but will descend and traverse open ground to move between trees.	L	BioNet BBCC
Molossidae							
Eastern Freetail-bat <i>Mormopterus</i>	N/A	Y		V	Occur in dry sclerophyll forest, woodland, swamp forests and mangrove forests east of the Great Dividing Range. Roost mainly in	P	SLR

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
<i>norfolkensis</i>					tree hollows but will also roost under bark or in man-made structures.		
Pseudocheiridae							
Greater Glider <i>Petauroides volans</i>	Species		V		Feeds exclusively on eucalypt leaves, buds, flowers and mistletoe. Shelter during the day in tree hollows and will use up to 18 hollows in their home range. Occupy a relatively small home range with an average size of 1 to 3 ha.	L	PMST
Pteropodidae							
Grey-headed Flying-fox <i>Pteropus poliocephalus</i>	Eco & Species	Y	V	V	Occur in 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 km of a regular food source and are commonly found in gullies, close to water, in vegetation with a dense canopy. Annual mating commences in January	L	PMST
Vespertilionidae							
Large-eared Pied Bat <i>Chalinolobus dwyeri</i>	Eco & Species		V	V	Found in well-timbered areas containing gullies. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (<i>Petrochelidon ariel</i>), frequenting low to mid-elevation dry open forest and woodland close to these features. Likely to hibernate through the coolest months.	L	PMST
Corben's Long-eared Bat <i>Nyctophilus corbeni</i>	Ecosystem	Y	V	V	Inhabits a variety of vegetation types, including mallee, bullocke <i>Allocasuarina leuhmanni</i> and box eucalypt dominated communities, but it is distinctly more common in box/ironbark/cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.		PMST BBCC
Eastern False Pipistrelle	Ecosystem	Y		V	Prefers moist habitats, with trees taller than 20 m. Generally roosts	P	SLR

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
<i>Falsistrellus tasmaniensis</i>					in eucalypt hollows, but has also been found under loose bark on trees or in buildings. Hibernates in winter. Females are pregnant in late spring to early summer.		
Eastern Bentwing-bat <i>Miniopterus schreibersii oceanensis</i>	Eco & Species	Y		V	Caves are the primary roosting habitat, but also use derelict mines, storm-water tunnels, buildings and other man-made structures. Hunt in forested areas, catching moths and other flying insects above the tree tops.	P	SLR
Eastern Cave Bat <i>Vespadelus troughtoni</i>	Eco & Species	Y		V	Very little is known about the biology of this uncommon species. A cave-roosting species that is usually found in dry open forest and woodland, near cliffs or rocky overhangs; has been recorded roosting in disused mine workings, occasionally in colonies of up to 500 individuals. Occasionally found along cliff-lines in wet eucalypt forest and rainforest	P	SLR
Greater Broad-nosed Bat <i>Scoteanax rueppellii</i>	Ecosystem	Y		V	Utilises a variety of habitats from woodland through to moist and dry eucalypt forest and rainforest, though it is most commonly found in tall wet forest. Although this species usually roosts in tree hollows, it has also been found in buildings. Open woodland habitat and dry open forest suits the direct flight of this species	P	SLR
REPTILES							
Chelidae							
Bell's Turtle, Western Sawshelled Turtle <i>Myucheles belli</i>	Species		V	V	Shallow to deep pools in upper reaches or small tributaries of major rivers in granite country. Occupied pools are most commonly less than 3 m deep with rocky or sandy bottoms and patches of vegetation. Most typically uses narrow stretches of rivers 30 - 40 m wide	L	PMST
Elapidae							
Pale-headed Snake <i>Hoplocephalus</i>	Species			V	Highly cryptic species that can spend weeks at a time hidden in tree hollows. Found mainly in dry eucalypt forests and woodlands,	L	BCC

Species Name	Credit Type	On site [#]	EPBC Act	TSC Act	Habitat Requirements	LoO	Source
<i>bitorquatus</i>					cypress forest and occasionally in rainforest or moist eucalypt forest. In drier environments, it appears to favour habitats close to riparian areas.		
Gekkonidae							
Border Thick-tailed Gecko <i>Uvidicolus sphyurus</i>	Species		V	V	Species often occurs on steep rocky or scree slopes, especially granite. Favours forest and woodland areas with boulders, rock slabs, fallen timber and deep leaf litter. Occupied sites often have a dense tree canopy that helps create a sparse understorey. These Geckos are active at night and shelter by day under rock slabs, in or under logs, and under the bark of standing trees.	L	PMST BBCC
Pygopodidae							
Pink-tailed Legless Lizard <i>Aprasia parapulchella</i>	N/A		V	V	Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (<i>Themeda australis</i>). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks	L	PMST

All predicted threatened species listed in the Credit Calculator have been ticked as 'On Site', as the assessor has determined that at least one habitat component for all species is present on the site, as per Section 6.3 of the FBA.

* Probable Identification. Some possibility of confusion of calls with those of other bat species.

APPENDIX G

BIOBANKING CREDIT REPORTS

Biodiversity credit report



This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 17/07/2018

Time: 7:56:59AM

Calculator version: v4.0

Major Project details

Proposal ID: 0107/2016/3991MP

Proposal name: Rushes Creek Poultry Facility SSD 7704

Proposal address: Rushes Creek Road Rushes Creek NSW 2346

Proponent name: ProTen Tamworth Ltd

Proponent address: Berry Street North Sydney NSW 2060

Proponent phone: (02) 9458-1700

Assessor name: Jeremy Pepper

Assessor address: Level 3 10 Kings Road New Lambton NSW 2305

Assessor phone: 02 4037 3200

Assessor accreditation: 0107

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	87.78	29.00
Total	87.78	29

Credit profiles

1. White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA226)

Number of ecosystem credits created

29

IBRA sub-region

Peel - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA226)</p> <p>Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (NA141)</p> <p>Grey Box - Blakely's Red Gum - Yellow Box grassy open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA144)</p> <p>White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion, (NA230)</p> <p>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (NA237)</p> <p>White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion, (NA400)</p> <p>Silver-leaved Ironbark grassy tall woodland on clay-loam soils on plains in the Brigalow Belt South Bioregion, (NA350)</p> <p>Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA293)</p> <p>White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion, (NA395)</p>	<p>Peel - Namoi</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

2. White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA226)

Number of ecosystem credits created 0
 IBRA sub-region Peel - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions
<p>Fuzzy Box woodland on colluvium and alluvial flats in the Brigalow Belt South Bioregion (including Pilliga) and Nandewar Bioregion, (NA141)</p> <p>Grey Box - Blakely's Red Gum - Yellow Box grassy open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA144)</p> <p>White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA226)</p> <p>White Cypress Pine - Silver-leaved Ironbark grassy woodland of the Nandewar Bioregion, (NA230)</p> <p>Yellow Box - Blakely's Red Gum grassy woodland of the Nandewar Bioregion, (NA237)</p> <p>White Box grassy woodland to open woodland on basalt flats and rises in the Liverpool Plains sub-region, BBS Bioregion, (NA400)</p> <p>Silver-leaved Ironbark grassy tall woodland on clay-loam soils on plains in the Brigalow Belt South Bioregion, (NA350)</p> <p>Grey Box grassy woodland or open forest of the Nandewar Bioregion and New England Tableland Bioregion, (NA293)</p> <p>White Box - White Cypress Pine - Silver-leaved Ironbark grassy woodland on mainly clay loam soils on hills mainly in the Nandewar Bioregion, (NA395)</p>	<p>Peel - Namoi</p> <p>and any IBRA subregion that adjoins the IBRA subregion in which the development occurs</p>

Summary of species credits required

BioBanking Credit Calculator

Ecosystem credits

Proposal ID : 0107/2016/3991MP
 Proposal name : Rushes Creek Poultry Facility SSD 7704
 Assessor name : Jeremy Pepper
 Assessor accreditation number : 0107
 Tool version : v4.0
 Report created : 17/07/2018 07:56

Assessment circle name	Landsc ape score	Vegetation zone name	Vegetation type name	Condition	Red flag status	Management zone name	Management zone area	Current site value	Future site value	Loss in site value	Credit required for bio diversity	Credit required for TS	TS with highest credit requirement	Average species loss	Species TG Value	Final credit requirement for management zone
Dev Cicle 1	12.00	NA226_Moderate/Good_Derived grassland	White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Moderate/Good_Derived grassland	No	1	1.17	28.96	0.00	28.96	0	29	Barking Owl	20.00	3.00	29
Dev Cicle 1	12.00	NA226_Low	White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion	Low	No	7	86.61	16.94	0.00	16.94	0	0		0.00	0.00	0

BioBanking Credit Calculator

Species credits

Proposal ID :

Proposal name :

Assessor name :

Assessor accreditation number :

Tool version : v4.0

Report created : 17/07/2018 07:56

Scientific name	Common name	Species TG value	Identified population?	Can Id. popn. be offset?	Area / Negligible number of loss	Red flag status	Number of credits
No							

BioBanking Credit Calculator

Threatened species predicted on site

Proposal ID : 0107/2016/3991MP
Proposal name : Rushes Creek Poultry Facility SSD 7704
Assessor name : Jeremy Pepper
Assessor accreditation number : 0107
Tool version : v4.0
Report created : 17/07/2018 07:40

Threatened species reliably predicted to utilise the site. No surveys are required for these species. Ecosystem credits apply to these species.

Common name	Scientific name	Vegetation type(s)
Barking Owl	<i>Ninox connivens</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Black-chinned Honeyeater (eastern subspecies)	<i>Melithreptus gularis</i> subsp. <i>gularis</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Brown Treecreeper (eastern subspecies)	<i>Climacteris picumnus</i> subsp. <i>victoriae</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Bush Stone-curlew	<i>Burhinus grallarius</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Corben's Long-eared Bat	<i>Nyctophilus corbeni</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Diamond Firetail	<i>Stagonopleura guttata</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

Common name	Scientific name	Vegetation type(s)
Diamond Firetail	<i>Stagonopleura guttata</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Gang-gang Cockatoo	<i>Callocephalon fimbriatum</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Grey-crowned Babbler (eastern subspecies)	<i>Pomatostomus temporalis</i> subsp. <i>temporalis</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Hooded Robin (south-eastern form)	<i>Melanodryas cucullata</i> subsp. <i>cucullata</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Little Eagle	<i>Hieraaetus morphnoides</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Little Lorikeet	<i>Glossopsitta pusilla</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Masked Owl	<i>Tyto novaehollandiae</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Painted Honeyeater	<i>Grantiella picta</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Scarlet Robin	<i>Petroica boodang</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Speckled Warbler	<i>Chthonicola sagittata</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

Common name	Scientific name	Vegetation type(s)
Spotted Harrier	<i>Circus assimilis</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Spotted-tailed Quoll	<i>Dasyurus maculatus</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Square-tailed Kite	<i>Lophoictinia isura</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Swift Parrot	<i>Lathamus discolor</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Turquoise Parrot	<i>Neophema pulchella</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Varied Sittella	<i>Daphoenositta chrysoptera</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion
Yellow-bellied Sheath-tail-bat	<i>Saccolaimus flaviventris</i>	NA226 - White Box grassy woodland of the Nandewar Bioregion and Brigalow Belt South Bioregion

BioBanking Credit Calculator

Threatened species requiring survey

Proposal ID : 0107/2016/3991MP
Proposal name : Rushes Creek Poultry Facility SSD 7704
Assessor name : Jeremy Pepper
Assessor accreditation number : 0107
Tool version : v4.0
Report created : 17/07/2018 07:39

List of species requiring survey

Common name	Scientific name	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Austral Toadflax	<i>Thesium australe</i>	Y	Y	N	N	N	N	N	N	Y	Y	Y	Y
Belson's Panic	<i>Homopholis belsonii</i>	Y	Y	Y	Y	N	N	N	N	N	N	N	Y
Bluegrass	<i>Dichanthium setosum</i>	Y	Y	Y	Y	Y	N	N	N	N	N	N	Y
Brush-tailed Phascogale	<i>Phascogale tapoatafa</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Eastern Pygmy-possum	<i>Cercartetus nanus</i>	Y	Y	Y	Y	N	N	N	N	Y	Y	Y	Y
Euphrasia arguta	<i>Euphrasia arguta</i>	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y
Finger Panic Grass	<i>Digitaria porrecta</i>	Y	Y	Y	Y	Y	N	N	N	N	N	N	Y
Koala	<i>Phascolarctos cinereus</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Pale-headed Snake	<i>Hoplocephalus bitorquatus</i>	Y	Y	Y	Y	N	N	N	N	N	Y	Y	Y
Prasophyllum sp. Wybong	<i>Prasophyllum sp. Wybong</i>	N	N	N	N	N	N	N	N	N	Y	N	N
Regent Honeyeater	<i>Anthochaera phrygia</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Squirrel Glider	<i>Petaurus norfolcensis</i>	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

APPENDIX H

EPBC ACT PROTECTED MATTERS SEARCH TOOL RESULTS



EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about [Environment Assessments](#) and the EPBC Act including significance guidelines, forms and application process details.

Report created: 07/06/17 12:37:34

[Summary](#)

[Details](#)

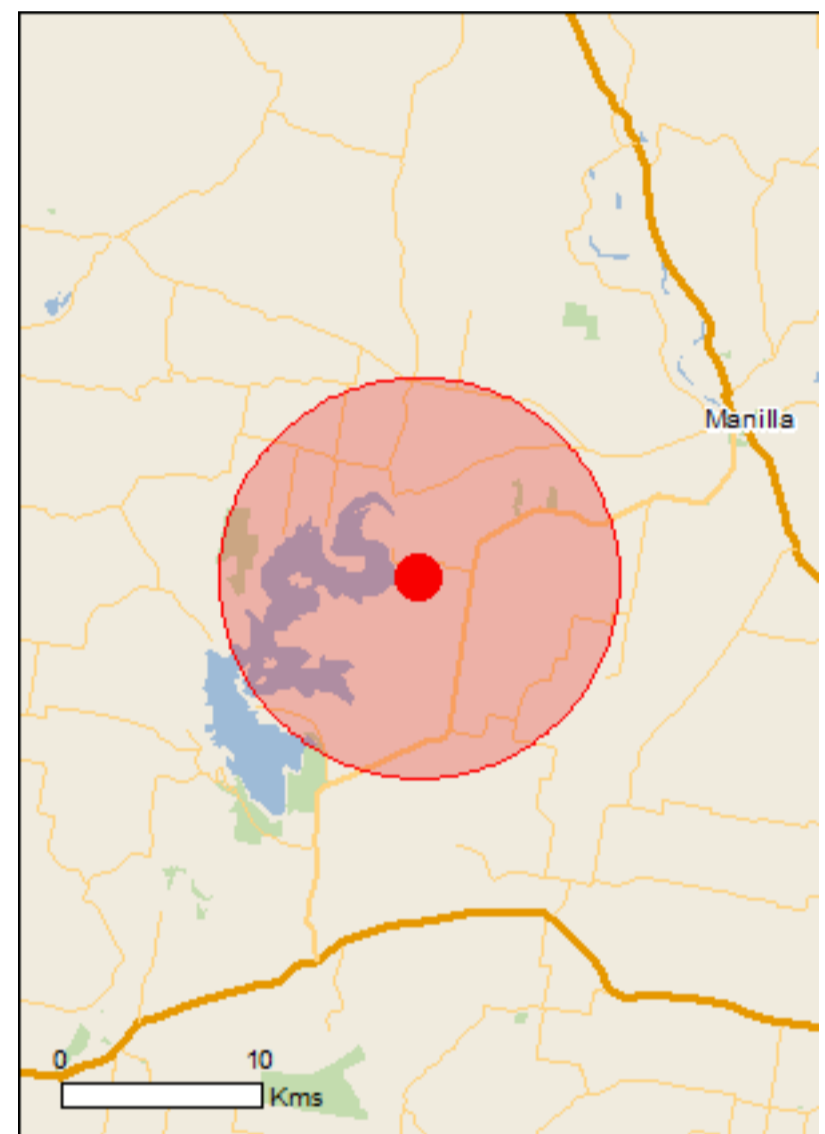
[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

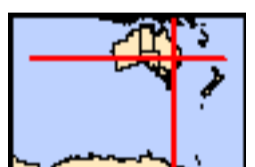
[Acknowledgements](#)



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

[Coordinates](#)

Buffer: 10.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	3
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	4
Listed Threatened Species:	29
Listed Migratory Species:	10

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <http://www.environment.gov.au/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	1
Regional Forest Agreements:	None
Invasive Species:	27
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Wetlands of International Importance (Ramsar)	[Resource Information]
Name	Proximity
Banrock station wetland complex	1000 - 1100km
Riverland	900 - 1000km upstream
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area
New England Peppermint (<i>Eucalyptus nova-anglica</i>) Grassy Woodlands	Critically Endangered	Community may occur within area
Weeping Myall Woodlands	Endangered	Community likely to occur within area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community likely to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Erythrotriorchis radiatus Red Goshawk [942]	Vulnerable	Species or species habitat may occur within area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area

Fish

Bidyanus bidyanus Silver Perch, Bidyan [76155]	Critically Endangered	Species or species habitat known to occur within area
Maccullochella peelii Murray Cod [66633]	Vulnerable	Species or species

Name	Status	Type of Presence
habitat may occur within area		
Frogs		
Litoria booroolongensis Booroolong Frog [1844]	Endangered	Species or species habitat may occur within area
Mammals		
Chalinolobus dwyeri Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat likely to occur within area
Dasyurus maculatus maculatus (SE mainland population) Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Nyctophilus corbeni Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat likely to occur within area
Petauroides volans Greater Glider [254]	Vulnerable	Species or species habitat may occur within area
Petrogale penicillata Brush-tailed Rock-wallaby [225]	Vulnerable	Species or species habitat may occur within area
Phascolarctos cinereus (combined populations of Qld, NSW and the ACT) Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Vulnerable	Species or species habitat known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Plants		
Cadellia pentastylis Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area
Dichanthium setosum bluegrass [14159]	Vulnerable	Species or species habitat likely to occur within area
Euphrasia arguta [4325]	Critically Endangered	Species or species habitat may occur within area
Hakea pulvinifera Lake Keepit Hakea [14228]	Endangered	Species or species habitat known to occur within area
Homopholis belsonii Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area
Philothea ericifolia [64942]	Vulnerable	Species or species habitat likely to occur within area
Prasophyllum petilum Tarengo Leek Orchid [55144]	Endangered	Species or species habitat may occur within area
Prasophyllum sp. Wybong (C.Phelps ORG 5269) a leek-orchid [81964]	Critically Endangered	Species or species habitat may occur within area
Thesium australe Austral Toadflax, Toadflax [15202]	Vulnerable	Species or species habitat may occur within area

Name	Status	Type of Presence
Tylophora linearis [55231]	Endangered	Species or species habitat may occur within area
Reptiles		
Aprasia parapulchella Pink-tailed Worm-lizard, Pink-tailed Legless Lizard [1665]	Vulnerable	Species or species habitat may occur within area
Uvidicolus sphyrurus Border Thick-tailed Gecko, Granite Belt Thick-tailed Gecko [84578]	Vulnerable	Species or species habitat likely to occur within area
Wollumbinia belli Bell's Turtle, Western Sawshelled Turtle, Namoi River Turtle, Bell's Saw-shelled Turtle [86071]	Vulnerable	Species or species habitat may occur within area

Listed Migratory Species [\[Resource Information \]](#)

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]		Species or species habitat likely to occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca Satin Flycatcher [612]		Species or species habitat likely to occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Pandion haliaetus Osprey [952]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species [[Resource Information](#)]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat may occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Gallinago hardwickii		
Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]		Species or species habitat likely to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat likely to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within

Name	Threatened	Type of Presence area
------	------------	-----------------------

Extra Information

State and Territory Reserves [\[Resource Information \]](#)

Name	State
Dowe	NSW

Invasive Species [\[Resource Information \]](#)

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resources Audit, 2001.

Name	Status	Type of Presence
------	--------	------------------

Birds

Acridotheres tristis Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
--	--	--

Carduelis carduelis European Goldfinch [403]		Species or species habitat likely to occur within area
---	--	--

Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
--	--	--

Passer domesticus House Sparrow [405]		Species or species habitat likely to occur within area
--	--	--

Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
---	--	--

Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
---	--	--

Turdus merula Common Blackbird, Eurasian Blackbird [596]		Species or species habitat likely to occur within area
---	--	--

Mammals

Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
------------------------------------	--	--

Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
--	--	--

Capra hircus Goat [2]		Species or species
--------------------------	--	--------------------

Name	Status	Type of Presence
Felis catus Cat, House Cat, Domestic Cat [19]		habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Lepus capensis Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cylindropuntia spp. Prickly Pears [85131]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat likely to occur within area
Opuntia spp. Prickly Pears [82753]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-30.80749 150.57791

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- [-Natural history museums of Australia](#)
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- [-Other groups and individuals](#)

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact Us](#) page.

ASIA PACIFIC OFFICES

BRISBANE

Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

MELBOURNE

Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

SYDNEY

2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

AUCKLAND

68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

TAMWORTH

PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

NELSON

5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

DARWIN

5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

PERTH

589 Hay Street
Jolimont WA 6014
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

TOWNSVILLE

Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

NEW PLYMOUTH

Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

ROCKHAMPTON

rockhampton@slrconsulting.com
M: +61 407 810 417

Appendix H

Aboriginal Cultural Heritage Assessment Report (OzArk Environmental and Heritage Management 2018)





View across the Survey Area from a rocky outcrop in the south.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT

RUSHES CREEK POULTRY PRODUCTION FARM

RUSHES CREEK, NSW

TAMWORTH REGIONAL LOCAL GOVERNMENT AREA

JULY 2018

Report Prepared by
OzArk Environmental & Heritage Management Pty Ltd
for SLR Consulting Australia Pty Ltd
on behalf of
ProTen Tamworth Pty Limited



**Environmental and
Heritage Management P/L**

OzArk EHM

145 Wingewarra St
(PO Box 2069)
Dubbo NSW 2830

Phone: (02) 6882 0118
Fax: (02) 6882 0630
enquiry@ozarkehm.com.au
www.ozarkehm.com.au

This page has intentionally been left blank.

ABORIGINAL CULTURAL HERITAGE ASSESSMENT REPORT COVER SHEET

Report Title Aboriginal Cultural Heritage Assessment Report: Rushes Creek Poultry Production Farm, Rushes Creek NSW, Tamworth Regional Local Government Area.

Author(s) Name Stephanie Rusden

Author(s) Organisation Name (if applicable) OzArk Environment & Heritage Management

Author(s) contact details
 Email: stephanie@ozarkehm.com.au
 Phone: 02 6882 0118
 Fax: 02 6882 0630

Address of Survey Area

Lot	Deposited Plan (DP)
Lot 1	DP 44215
Lot 1	DP 1108119
Lot 1	DP 1132298
Lots 26, 85, 86, 101, 118, 165, 166 and 171	DP 752169
Part Lot 143	DP 752189
Lot 1	DP 1132078
Lot 1	DP 1141148
Lot 1	DP 504111
Untitled land parcel traversing through Lot 171 DP 752169 – unformed Council public road	
Untitled land parcel traversing through Lot 1 DP 504111 – unformed Crown public road	

Report prepared for Company Name: SLR Consulting Australia on behalf of ProTen Tamworth Pty Limited

Address: 10 Kings Road, New Lambton NSW 2305
 Email: ajwilliams@slrconsulting.com
 Phone: 0412 450 227

Date of Report July 2018

Use of Report/ Confidentiality © OzArk Environmental & Heritage Management Pty Ltd 2017, © SLR Consulting Australia Pty Ltd 2017 © ProTen Pty Ltd 2017

This report is not confidential except as expressly stated: *This report may be used by OEH in a number of ways including: placing it in a database generally making hard and electronic copies available to the public and communicating the report to the public. However, If this report (or part thereof) is confidential or sensitive please advise OEH of this fact and any restrictions as to use of this report in the space above, otherwise leave it blank.*

Copyright owner of the report **Circumstances under which report was prepared:** *Provide information about the circumstances which led to the preparation of the report. For example: is the author the copyright owner? Was the author retained by a commissioning party and if so did the agreement contain a clause about copyright ownership? Was the report first published in Australia and/or was it prepared under the direction or control of a state department, agency or statutory corporation.*

Indemnity *If the person/entity who claims to be the copyright owner of the report is not entitled to claim copyright in the report, he/she/it indemnifies all persons using the report in accordance with the National Parks & Wildlife Act 1974, against any claim, action, damage or loss in respect of breach of copyright*

This page has intentionally been left blank.

DOCUMENT CONTROLS

Proponent	ProTen Tamworth Pty Limited		
Client	SLR Consulting Australia Pty Ltd		
Document Description	<i>Aboriginal Cultural Heritage Assessment Report: Rushes Creek Poultry Production Farm, Near Manilla NSW, Tamworth Local Government Area.</i>		
	Name	Signed	Date
Clients Reviewing Officer			
Clients Representative Managing this Document	OzArk Person(s) Managing this Document		
Adam Williams			
Location	OzArk Job No.		
Document Status V3.1 FINAL	Date 18 July 2018		
Draft V1.1 Author to Editor OzArk 1 st Internal (Series V1._ = OzArk internal edits)	V1.0: SR author. 15/8/17 V1.1 BC edit 16/8/17 V1.2: SR incorporate edits 18/8/17		
Draft V2.0 Report Draft for release to client (Series V2._ = OzArk and Client edits)	V2.0: OzArk to Client 18/8/17 V2.1 OzArk to Client for review 29/8/17 V2.2: OzArk to Client 29/8/17 V2.3: OzArk to RAPs 29/8/17 V2.4 OzArk to Client 9/10/17 V2.5 OzArk to Client 15/2/18 V2.6 OzArk to Client 21/2/18 V2.7 OzArk to Client 10/7/18		
FINAL V3._once latest version of draft approved by client	V3.0 OzArk to Client 13/7/18 V3.1 OzArk to Client 18/7/18		
Prepared For	Prepared By		
SLR Consulting Australia Pty Ltd 10 Kings Road New Lambton NSW 2305 P: 0412 450 227 ajwilliams@slrconsulting.com	Stephanie Rusden Archaeologist OzArk Environmental & Heritage Management Pty. Limited 145 Wingewarra Street (PO Box 2069) Dubbo NSW 2830 P: 02 6882 0118 F: 02 6882 6030 stephanie@ozarkehm.com.au		
COPYRIGHT			
© OzArk Environmental & Heritage Management Pty Ltd 2017, © SLR Consulting Australia Pty Ltd 2017 © ProTen Pty Ltd 2017			
All intellectual property and copyright reserved.			
Apart from any fair dealing for the purpose of private study, research, criticism or review, as permitted under the Copyright Act, 1968, no part of this report may be reproduced, transmitted, stored in a retrieval system or adapted in any form or by any means (electronic, mechanical, photocopying, recording or otherwise) without written permission.			

Enquiries should be addressed to OzArk Environmental & Heritage Management Pty Ltd.

Acknowledgement

OzArk acknowledge Traditional Owners of the area on which this assessment took place and pay respect to their beliefs, cultural heritage and continuing connection with the land. We also acknowledge and pay respect to the post-contact experiences of Aboriginal people with attachment to the area and to the elders, past and present, as the next generation of role models and vessels for memories, traditions, culture and hopes of local Aboriginal people.

ABBREVIATIONS

ACHAR	Aboriginal Cultural Heritage Assessment Report
ACHCRs	Aboriginal Cultural Heritage Consultation Requirements
ACHMP	Aboriginal Cultural Heritage Management Plan
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASDST	Aboriginal Sites Decision Support Tool
DP&E	Department of Planning and Environment
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
GPS	Global positioning system
GSE	Ground surface exposure
GSV	Ground surface visibility
IBRA	Interim Biogeographic Regionalisation of Australia
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
NPW Act	National Parks and Wildlife Act 1974
NSW	New South Wales
OEH	Office of Environment and Heritage
OzArk	OzArk Environmental & Heritage Management
PAD	Potential archaeological deposit
PPUs	Poultry production units
RAPs	Registered Aboriginal Parties
SEARs	Secretary's Environmental Assessment Requirements

EXECUTIVE SUMMARY

OzArk Environmental & Heritage Management has been engaged by SLR Consulting Australia (the Client), on behalf of ProTen Tamworth Pty Limited (the Proponent) to complete an Aboriginal Cultural Heritage Assessment Report (ACHAR) of the Survey Area, which is located approximately 12 kilometres (km) southwest of Manilla; 33km northeast of Gunnedah and 43km northwest of Tamworth in the New England North West region of New South Wales. The Survey Area for this ACHAR includes approximately 1010.8 hectares (ha), including two rural properties, Happy Hills and Bondah, and is located within the Tamworth Regional Local Government Area.

The long-term and existing use of the Survey Area is agricultural production, including both livestock and cropping. Under the provisions of the Tamworth Regional Local Environmental Plan 2010 (Tamworth LEP 2010), the Survey Area is zoned 'RU1 Primary Production'.

The Proponent is seeking development consent to develop a large-scale intensive poultry broiler production farm and associated infrastructure (the Development). The Development is classified as State significant development under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* in accordance with the *State Environmental Planning Policy (State and Regional Development) 2011*. This ACHAR forms part of the Environmental Impact Statement prepared to accompany the development application to the Department of Planning and Environment (DP&E).

The Development will comprise four individual farms and will also include the following:

- Eight new residences to house the farm managers;
- Various other infrastructure items to support the poultry operations (see **Section 1.2**);
- Water supply infrastructure to extract, transfer, treat and store water from the Namoi River;
- Electricity supply infrastructure; and
- Two new access driveways from Rushes Creek Road and internal access roads.

The field survey was completed over four days, from 18 October to 21 October 2016. Registered Aboriginal Parties (RAPs) from the Tamworth Local Aboriginal Land Council and the Gomerioi People NC2011/006 (C/- Sam Hegney; T/A Gomerioi Country Services Pty Ltd) participated in the survey.

A total of 35 previously unrecorded Aboriginal sites were recorded during the field survey of the Survey Area. Recorded Aboriginal sites include 17 isolated finds (Happy Hills-IF1 to Happy Hills-IF4 and Bondah-IF1 to Bondah-IF13); 14 artefact scatters (Happy Hills-OS1 to Happy Hills-OS3 and Bondah-OS1 to Bondah-OS11); one hearth (Bondah-H1); and three scarred trees (Happy Hills-ST1 to Happy Hills-ST3).

The majority of sites (n=33 or 94%) have been assessed as having low scientific significance. In most cases this is because the sites are either low density artefact scatters or isolated finds located in landforms with thin A Horizon soils where further subsurface archaeological deposits are unlikely. In some instances, the assessment of low scientific significance is because the recorded sites are well-represented within the region and are unlikely to yield further scientific data. One site, Bondah-OS3, was assessed as having moderate archaeological significance as it is a low density artefact scatter with potential for subsurface archaeological deposits and Bondah-H1 was assessed as having moderate to high scientific significance based on the amount of information that may be gathered for further local and regional archaeological studies as the site could be subjected to chronological dating.

Of the 35 newly recorded sites, seven sites (five isolated finds and two low density artefact scatters consisting of four artefacts and two artefacts per site) are within the impact footprint and are liable to be harmed by the Development. The remaining 28 sites are outside of the impact footprint area but will require management measures to ensure they are not inadvertently impacted. It is recommended that the seven sites within the impact footprint be salvaged by a surface collection and recording of all visible surface artefacts.

As a consequence of the proposed impacts to Aboriginal cultural heritage sites within the Survey Area, the following archaeological recommendations are made in an effort to responsibly manage Aboriginal cultural heritage sites *in situ*, or where appropriate, mitigate the loss of cultural heritage at those sites within the impact footprint.

1. Should development consent for the Development be granted, archaeological management strategies to manage and mitigate the impact of the proposed works are set out in **Section 6**. All sites within the impact footprint for the Development should be salvaged by a surface collection of all visible artefacts (see **Section 6.3.1**).
2. The salvage works will include the mapping, analysis and collection of all surface artefacts at the affected sites. Results will be included in a report to preserve the data in a useable form.
3. All land-disturbing activities must be confined to within the assessed Survey Area. Should the parameters of the proposed work extend beyond the assessed area, then further archaeological assessment may be required.
4. Following development consent, an Aboriginal Heritage Impact Permit will not be required for impacts to cultural heritage, so long as the impact accords with the terms and conditions of the consent. Instead, mitigation to impacts on Aboriginal heritage (including the implementation of an unanticipated finds protocol and heritage site induction), would be managed through an Aboriginal Cultural Heritage Management Plan (ACHMP) which is to be agreed to by the Proponent, RAPs, Office of Environment and Heritage (OEH) and DP&E. The archaeological management recommendations within this report would

normally be incorporated into the ACHMP that is usually formulated following development consent.

CONTENTS

Abbreviations	v
Executive Summary	vi
1 Introduction	1
1.1 Brief Description of the Development	1
1.2 The Development	2
1.3 Survey Area	6
1.4 Relevant Legislation.....	8
1.4.1 State Legislation	8
1.4.2 Commonwealth Legislation	9
1.4.3 Applicability to the Development	10
2 The Archaeological Assessment	11
2.1 Purpose and Objectives	11
2.1.1 Aboriginal Archaeological and Cultural Heritage Values Assessment Objectives	11
2.2 Date of Archaeological Assessment.....	11
2.3 Aboriginal Community Involvement.....	11
2.3.1 Stage 1: Notification of the Development and registration of interest	11
2.3.2 Stage 2/3: Presentation of information about the proposed development and gathering information about cultural significance.....	12
2.3.3 Stage 4: Review of draft ACHAR	14
2.4 OzArk Involvement.....	14
2.4.1 Field Assessment	14
2.4.2 Reporting	14
3 Landscape Context.....	15
3.1 Topography.....	15
3.2 Geology and Soils.....	17
3.3 Hydrology	18
3.4 Vegetation	20
3.5 Climate	20
3.6 Land–Use History	20

3.6.1	Existing Levels of Disturbance	21
3.7	Conclusion	22
4	Aboriginal Archaeology Background	24
4.1	Ethno-Historic Sources of Regional Aboriginal Culture	24
4.2	Regional Archaeological Context	27
4.2.1	Tamworth Regional Context.....	27
4.2.2	Gunnedah Regional Context.....	28
4.3	Local Archaeological Context.....	33
4.3.1	Desktop Database Searches Conducted	33
4.4	Predictive Model for Site Location.....	35
5	Results of Aboriginal Archaeological Assessment.....	43
5.1	Sampling Strategy and Field Methods.....	43
5.2	Development Constraints.....	45
5.3	Effective Survey Coverage.....	45
5.4	Aboriginal Sites Recorded.....	48
	Happy Hills-IF1	51
	Happy Hills-IF2	52
	Happy Hills-IF3	53
	Happy Hills-IF4	54
	Bondah-IF1	55
	Bondah-IF2.....	56
	Bondah-IF3.....	57
	Bondah-IF4	58
	Bondah-IF5.....	59
	Bondah-IF6.....	60
	Bondah-IF7	61
	Bondah-IF8.....	62
	Bondah-IF9.....	63
	Bondah-IF10	64
	Bondah-IF11	65

Bondah-IF12	66
Bondah-IF13	67
Happy Hills-OS1	69
Happy Hills-OS2	71
Happy Hills-OS3	72
Bondah-OS1	74
Bondah-OS2	76
Bondah-OS3	77
Bondah-OS4	81
Bondah-OS5	83
Bondah-OS6	84
Bondah-OS7	86
Bondah-OS8	88
Bondah-OS9	89
Bondah-OS10	91
Bondah-OS11	93
Bondah-H1.....	94
Happy Hills-ST1	96
Happy Hills-ST2	98
Happy Hills-ST3	99
5.5 Previously Recorded Aboriginal Site Located.....	100
AHIMS #20-5-0091	100
5.6 Aboriginal Community Input	102
5.7 Discussion	103
5.7.1 Site types.....	103
5.7.2 Landscape context.....	104
5.7.3 Representativeness, rarity and integrity	105
5.8 Assessment of Significance	106
5.8.1 Introduction.....	106
5.8.2 Assessed Significance of the Recorded Sites	107

5.9	Likely Impacts to Aboriginal Heritage from The Development	111
5.9.1	Ecological Sustainable Development Principles	114
5.10	Overall value of potential impact on heritage items	114
6	Management and Mitigation: Aboriginal Heritage	118
6.1	General Principles for the Management of Aboriginal Sites.....	118
6.2	Management and Mitigation of Recorded Aboriginal Sites	118
6.3	Management Process	121
6.3.1	Archaeological salvage: artefact collection.....	121
7	Recommendations	123
	References	124
	Plates	129
	Appendix 1: ACHCRs.....	132
	Log of Aboriginal community consultation	132
	Stage 1 advertisement placed in <i>the Northern Daily Leader</i> newspaper, Friday 12 August 2016.....	144
	Stage 1 letter to agencies and Aboriginal community organisations.....	145
	Initial stage 2/3 consultation letter (sent to: all RAPs).....	147
	Stage 2/3 consultation update letter (sent to: all RAPs).....	160
	Stage 2/3 update 2 letter (sent to: all RAPs)	167
	Appendix 2: AHIMS Extensive Search Result	169

FIGURES

Figure 1-1: Location map of the Survey Area.	2
Figure 1-2: The Survey Area showing the indicative impact footprint of the Development.	5
Figure 3-1. Major landform units within the Survey Area.	16
Figure 3-2. Watercourses within the Survey Area.	19
Figure 4-1: Location of the Survey Area in relation to Tindale (1974).	24
Figure 4-2: Location of AHIMS sites in relation to the Survey Area.	35
Figure 4-3. ASDST predictive data of the Survey Area.	37
Figure 5-1. The Survey Area showing pedestrian transects.	44
Figure 5-2. The Survey Area showing pedestrian transects and landforms.	47
Figure 5-3: Location of the recorded sites in relation to landform.	49
Figure 5-4: Location of the recorded isolated finds within the Survey Area.	50
Figure 5-5: Happy Hills-IF1. View of site and recorded artefact.	51
Figure 5-6: Happy Hills-IF2. View of site and recorded artefact.	52
Figure 5-7: Happy Hills-IF3. View of site and recorded artefact.	53
Figure 5-8: Happy Hills-IF4. View of site and recorded artefact.	54
Figure 5-9: Bondah-IF1. View of site and recorded artefact.	55
Figure 5-10: Bondah-IF2. View of site and recorded artefact.	56
Figure 5-11: Bondah-IF3. View of site and recorded artefact.	57
Figure 5-12: Bondah-IF4. View of site and recorded artefact.	58
Figure 5-13: Bondah-IF5. View of site and recorded artefact.	59
Figure 5-14: Bondah-IF6. View of site and recorded artefact.	60
Figure 5-15: Bondah-IF7. View of site and recorded artefact.	61
Figure 5-16: Bondah-IF8. View of site and recorded artefact.	62
Figure 5-17: Bondah-IF9. View of site and recorded artefact.	63
Figure 5-18: Bondah-IF10. View of site and recorded artefact.	64
Figure 5-19: Bondah-IF11. View of site and recorded artefact.	65
Figure 5-20: Bondah-IF12. View of site and recorded artefact.	66
Figure 5-21: Bondah-IF13. View of site and recorded artefact.	67
Figure 5-22: Location of the recorded artefact scatters within the Survey Area.	68
Figure 5-23: Location of Happy Hills-OS1 and OS2 in relation to the Survey Area's southern boundary.	69
Figure 5-24: Happy Hills-OS1. View of site and selection of recorded artefacts.	70
Figure 5-25: Happy Hills-OS2. View of site and selection of recorded artefacts.	71
Figure 5-26: Location of Happy Hills-OS3 in relation to the Survey Area's south-eastern boundary.	73
Figure 5-27: Happy Hills-OS3. View of site and selection of recorded artefacts.	73

Figure 5-28: Location of Bondah-OS1 and Bondah-OS2 in relation to the Survey Area and the Namoi River.....	75
Figure 5-29: Bondah-OS1. View of site and selection of recorded artefacts.....	75
Figure 5-30: Bondah-OS2. View of site and selection of recorded artefacts.....	77
Figure 5-31: Location of Bondah-OS3 to Bondah-OS5 in relation to the Survey Area.....	79
Figure 5-32: Bondah-OS3. View of site and selection of recorded artefacts.....	80
Figure 5-33: Bondah-OS4. View of site and recorded artefacts.....	82
Figure 5-34: Bondah-OS5. View of site and selection of recorded artefacts.....	83
Figure 5-35: Location of Bondah-OS6.....	85
Figure 5-36: Bondah-OS6. View of site and selection of recorded artefacts.....	85
Figure 5-37: Location of Bondah-OS7 and Bondah-OS8 and a drainage feature.....	87
Figure 5-38: Bondah-OS7. View of site and recorded artefacts.....	87
Figure 5-39: Bondah-OS8. View of site and recorded artefacts.....	88
Figure 5-40: Location of Bondah-OS9.....	90
Figure 5-41: Bondah-OS9. View of site and recorded artefacts.....	90
Figure 5-42: Location of Bondah-OS10 in relation to the southern boundary of the Survey Area.....	92
Figure 5-43: Bondah-OS10. View of site and recorded artefacts.....	92
Figure 5-44: Location of Bondah-OS11.....	93
Figure 5-45: Bondah-OS11. View of site and recorded artefact.....	94
Figure 5-46: Location of the recorded hearth and scarred trees within the Survey Area.....	95
Figure 5-47: Bondah-H1. View of site and recorded hearth.....	96
Figure 5-48: Happy Hills-ST1. View of the scarred tree.....	97
Figure 5-49: Happy Hills-ST1. View of the scarred tree.....	98
Figure 5-50: Happy Hills-ST3. View of the scarred tree.....	99
Figure 5-51: Location of AHIMS site #20-5-0091 in relation to the Survey Area.....	101
Figure 5-52: AHIMS #20-5-0091. View of tree and close up view of scar.....	102
Figure 5-53: View of recorded sites to be impacted by the Development.....	113
Figure 5-54: Potential impact to heritage items reference matrix.....	115

TABLES

Table 1-1: Summary of the Development.....	3
Table 1-2: Land titles within the Survey Area.....	6
Table 3-1. Landform descriptions.....	15
Table 3-2. Summary of key terrain features within the Survey Area.....	17
Table 4-1: Aboriginal heritage: desktop-database search results.....	33
Table 4-2: AHIMS site types and frequencies.....	34

Table 5-1: Survey coverage data.	46
Table 5-2: Landform summary—sampled areas.....	46
Table 5-3: Survey results.	48
Table 5-4: Happy Hills-IF1. Recorded artefact attributes.....	51
Table 5-5: Happy Hills-IF2. Recorded artefact attributes.....	52
Table 5-6: Happy Hills-IF3. Recorded artefact attributes.....	53
Table 5-7: Happy Hills-IF4. Recorded artefact attributes.....	54
Table 5-8: Bondah-IF1. Recorded artefact attributes.....	55
Table 5-9: Bondah-IF2. Recorded artefact attributes.....	56
Table 5-10: Bondah-IF3. Recorded artefact attributes.....	57
Table 5-11: Bondah-IF4. Recorded artefact attributes.....	58
Table 5-12: Bondah-IF5. Recorded artefact attributes.....	59
Table 5-13: Bondah-IF6. Recorded artefact attributes.....	60
Table 5-14: Bondah-IF7. Recorded artefact attributes.....	61
Table 5-15: Bondah-IF8. Recorded artefact attributes.....	62
Table 5-16: Bondah-IF9. Recorded artefact attributes.....	63
Table 5-17: Bondah-IF10. Recorded artefact attributes.....	65
Table 5-18: Bondah-IF11. Recorded artefact attributes.....	65
Table 5-19: Bondah-IF12. Recorded artefact attributes.....	66
Table 5-20: Bondah-IF13. Recorded artefact attributes.....	67
Table 5-21: Happy Hills-OS1. Sample of recorded artefact attributes.....	71
Table 5-22: Happy Hills-OS2. Sample of recorded artefact attributes.....	72
Table 5-23: Happy Hills-OS3. Sample of recorded artefact attributes.....	74
Table 5-24: Bondah-OS1. Sample of recorded artefact attributes.	76
Table 5-25: Bondah-OS2. Sample of recorded artefact attributes.	77
Table 5-26: Bondah-OS3. Sample of recorded artefact attributes.	81
Table 5-27: Bondah-OS4. Sample of recorded artefact attributes.	82
Table 5-28: Bondah-OS5. Sample of recorded artefact attributes.	84
Table 5-29: Bondah-OS6. Sample of recorded artefact attributes.	86
Table 5-30: Bondah-OS7. Sample of recorded artefact attributes.	87
Table 5-31: Bondah-OS8. Recorded artefact attributes.....	89
Table 5-32: Bondah-OS9. Recorded artefact attributes.....	91
Table 5-33: Bondah-OS10. Recorded artefact attributes.....	92
Table 5-34: Bondah-OS11. Recorded artefact attributes.....	94
Table 5-35: Happy Hills-ST1 scarred tree attributes.	97
Table 5-36: Happy Hills-ST2 scarred tree attributes.	98
Table 5-37: Happy Hills-ST3 scarred tree attributes.	100
Table 5-38: AHIMS #20-5-0091 scar attributes.	102

Table 5-39: Significance assessment.....	109
Table 5-40: Impact assessment.	111
Table 5-41: Overall value of potential impact on heritage item.	116
Table 6-1: Management recommendations for sites within or adjacent to the impact footprint of the Development.....	119

PLATES

Plate 1: View across a cleared paddock along a broad ridge. View to the west.....	129
Plate 2: View along a tributary of the Namoi River and the flat land on either side.	129
Plate 3: View along a drainage on a mid-slope landform looking towards Lake Keepit.....	130
Plate 4: View along an upper slope landform with no GSE.....	130
Plate 5: View along a lower slope landform adjacent to a drainage line.	131

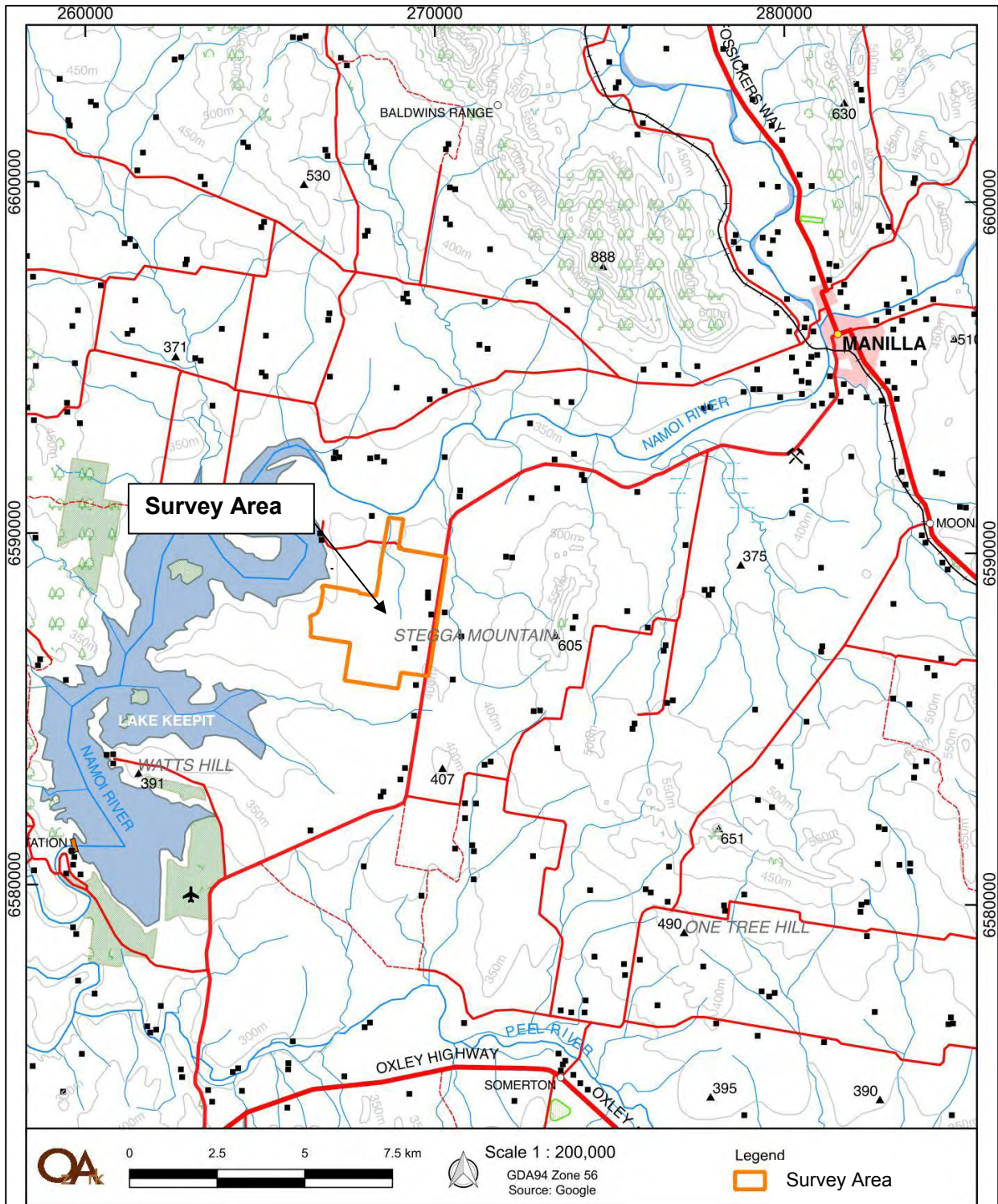
1 INTRODUCTION

1.1 BRIEF DESCRIPTION OF THE DEVELOPMENT

OzArk Environmental & Heritage Management (OzArk) has been engaged by SLR Consulting Australia (the Client), on behalf of ProTen Tamworth Pty Limited (the Proponent) to complete an Aboriginal Cultural Heritage Assessment Report (ACHAR) of the Survey Area. The Survey Area is located approximately 12 kilometres (km) southwest of Manilla; 33km northeast of Gunnedah and 43km northwest of Tamworth in the New England North West region of New South Wales (NSW) (**Figure 1-1**). The Survey Area for this ACHAR includes approximately 1010.8 hectares (ha) and is located in the Tamworth Regional Local Government Area (LGA).

The Proponent is seeking development consent to develop a large-scale intensive poultry broiler production farm (the Development). The Development is classified as State significant development (SSD) under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* in accordance with the *State Environmental Planning Policy (State and Regional Development) 2011*. This ACHAR forms part of the Environmental Impact Statement (EIS) prepared to accompany the development application to the Department of Planning and Environment (DP&E).

Figure 1-1: Location map of the Survey Area.



1.2 THE DEVELOPMENT

The Development will include the construction and operation of a large-scale intensive poultry broiler production farm and associated infrastructure. The components of the Development are summarised in **Table 1-1**. The Development will comprise 54 tunnel-ventilated fully-enclosed climate-controlled poultry sheds across four individual farms (poultry production units; PPU),

where broiler birds will be grown for human consumption. The proposed number of sheds at each PPU will be (**Figure 1-2**):

- Farm 1 – 10 sheds;
- Farm 2 – 18 sheds;
- Farm 3 – 10 sheds; and
- Farm 4 – 16 sheds.

Each shed will have the capacity to house 56,500 birds at any one time, equating to a combined site population of 3.05 million birds.

In addition to the poultry shedding, the Development will comprise various support. Servicing infrastructure, including:

- Eight new residences to house the farm managers;
- Water supply infrastructure to extract, transfer, treat and store water from the Namoi River;
- Electricity supply infrastructure and solar panels at each farm);
- Two new access driveways from Rashes Creek Road and internal access roads;
- A staff amenities facility at each farm (office space, toilets, change rooms);
- Two dead bird freezers adjacent to the internal access roads near Rashes Creek Road;
- One poultry bedding material storage shed;
- Chemical and fuel storage facilities at each farm;
- Bulk liquid petroleum gas (LPG) tanks at each farm;
- Generators and generator enclosures/sheds at each farm (emergency use only);
- A workshop at each farm;
- A wheel wash facility at the entrance to each farm;
- Feed silos at each farm;
- Water storage tanks at each farm; and
- Surface water management system at each farm (swale drains, table drains, detention dams and upstream diversions).

The direct impact footprint of the Development will be approximately 87.78 ha. The location and alignment of associated infrastructure has been illustrated on **Figure 1-2**.

Table 1-1: Summary of the Development.

Development characteristic	Proposed Development
Purpose	Birds grown for human consumption
Number of individual farms	Four (Farms 1, 2, 3 and 4)
Number of poultry sheds (total)	54, each measuring 160m long by 18m wide by 4.2m high (to roof ridge)
Type of poultry sheds	Tunnel-ventilated, fully-enclosed, climate-controlled
Maximum shed population	56,500 birds
Maximum site population	3,051,000 birds
Hours of operation	24 hours a day, 7 days a week
Production cycle length	Approximately 65 days, comprising a maximum bird occupation of 55 days and a cleaning phase of 10 days
Number of production cycles per year	On average, approximately 5.6

Figure 1-2: The Survey Area showing the indicative impact footprint of the Development.

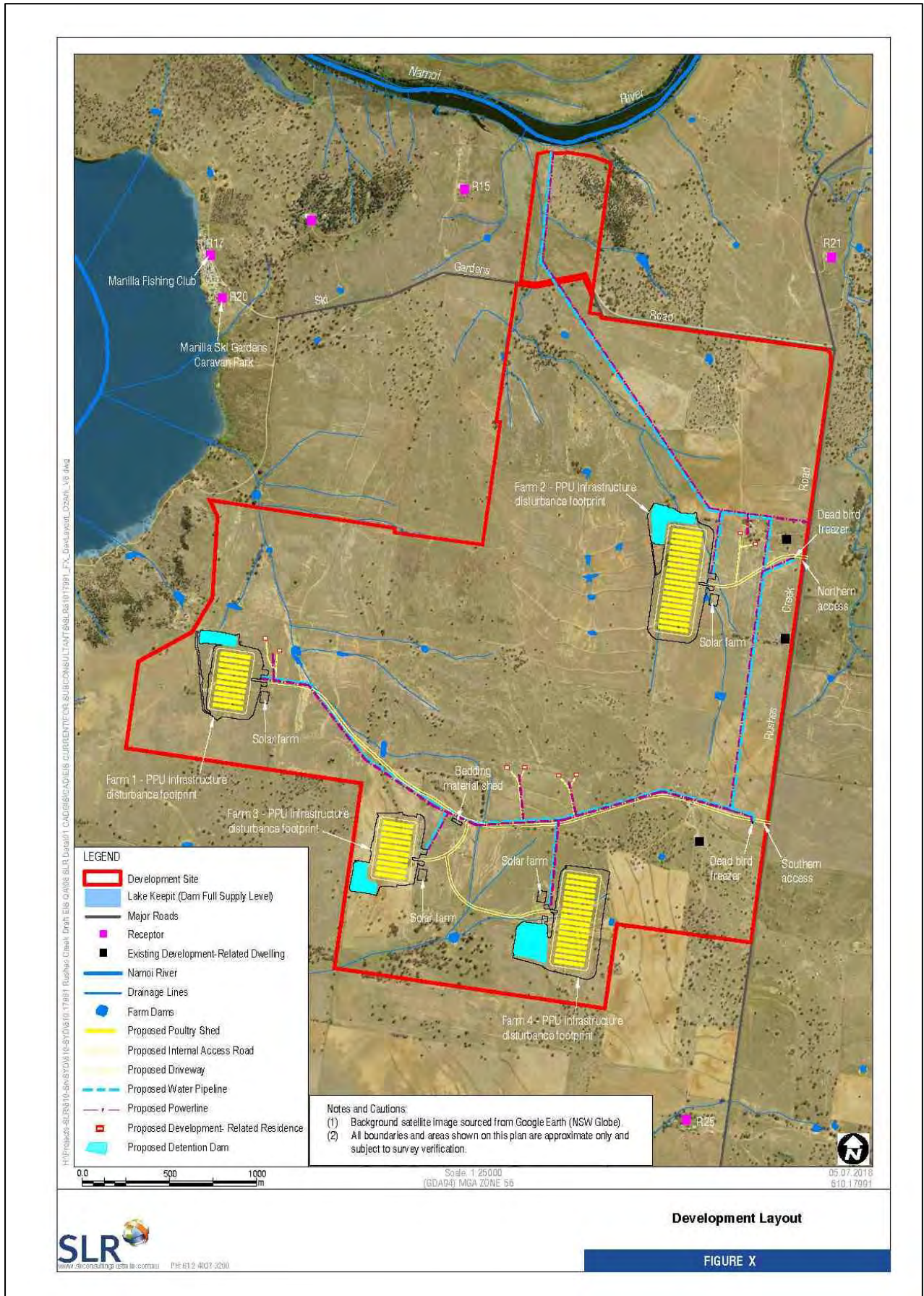


Figure 1-3: Example of poultry sheds from ProTen's Murrami PPUs (Somerton, NSW).



1.3 SURVEY AREA

The Survey Area for this ACHAR is approximately 1010.8 ha in size, including a number of land titles and encompassing two rural properties, Happy Hills and Bondah (**Table 1-2**). The Survey Area is located southwest of Manilla; to the north of agricultural properties; to the east and south of the Namoi River and Lake Keepit; and to the west of Rushes Creek Road (**Figure 1-5**).

The long-term and existing use of the Survey Area is agricultural production, including both livestock and cropping. Under the provisions of the Tamworth Regional Local Environmental Plan 2010 (Tamworth LEP 2010), the Survey Area is zoned 'RU1 Primary Production'. All land adjoining the Survey Area is also zoned RU1 Primary Production.

The Survey Area (**Figure 1-4**) covers areas within and adjoining the Development Site. The areas beyond the limits of the Development Site have been surveyed to assess potential impacts from proposed water supply infrastructure and vehicular access driveways.

Table 1-2: Land titles within the Survey Area.

Lot	Deposited Plan (DP)	Tenure
Lot 1	DP 44215	Freehold – ProTen
Lot 1	DP 1108119	
Lot 1	DP 1132298	
Lots 26, 85, 86, 101, 118, 165, 166 and 171	DP 752169	
Part Lot 143	DP 752189	
Lot 1	DP 1132078	
Lot 1	DP 1141148	
Lot 1	DP 504111	
Untitled land parcel traversing through Lot 171 DP 752169		Unformed Council public road
Untitled land parcel traversing through Lot 1 DP 504111		Unformed Crown public road
Ski Gardens Road – 442 m section traversing through Development Site		Council public road
Rushes Creek Road – 3.4 km section adjoining the Development Site		Council public road

Figure 1-4: Aerial showing the Survey Area.



1.4 RELEVANT LEGISLATION

Cultural heritage is managed by a number of state and national Acts. Baseline principles for the conservation of heritage places and relics can be found in the *Burra Charter* (Australia ICOMOS 2013). The *Burra Charter* has become the standard of best practice in the conservation of heritage places in Australia, and heritage organisations and local government authorities have incorporated the inherent principles and logic into guidelines and other conservation planning documents. The *Burra Charter* generally advocates a cautious approach to changing places of heritage significance. This conservative notion embodies the basic premise behind legislation designed to protect our heritage, which operates primarily at a state level.

A number of Acts of parliament provide for the protection of heritage at various levels of government.

1.4.1 State Legislation

Environmental Planning and Assessment Act 1979 (EP&A Act)

This Act established requirements relating to land use and planning. The framework governing environmental and heritage assessment in NSW is contained within the following parts of the EP&A Act:

- **Part 4:** Local government development assessments, including heritage. May include schedules of heritage items;
 - **Division 4.7:** Approvals process for State significant development;
- **Part 5:** Environmental impact assessment on any heritage items which may be impacted by activities undertaken by a state government authority or a local government acting as a self-determining authority; and
- **Part 5.2:** Approvals process for State significant infrastructure.

Secretary's *Environmental Assessment Requirements* (SEARs)

The Development SEARs state that the following documents and guidelines should be followed:

- *The Burra Charter* (The Australia ICOMOS charter for places of cultural significance);
- *Draft Guidelines for Aboriginal Cultural Heritage Assessment and Community Consultation* (DP&E);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (OEH) (ACHCRs; DECCW 2010b); and
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (OEH) (Code of Practice; DECCW 2010a).

National Parks and Wildlife Act 1974 (NPW Act)

Amended during 2010, the NPW Act provides for the protection of Aboriginal objects (sites, objects and cultural material) and Aboriginal places. Under the Act (Part 6), an Aboriginal object is defined as:

any deposit, object or material evidence (not being a handicraft for sale) relating to indigenous and non-European habitation of the area that comprises NSW, being habitation both prior to and concurrent with the occupation of that area by persons of European extraction, and includes Aboriginal remains.

An Aboriginal place is defined under the NPW Act as an area which has been declared by the Minister administering the Act as a place of special significance for Aboriginal culture. It may or may not contain physical Aboriginal objects.

As of 1 October 2010, it is an offence under Section 86 of the NPW Act to 'harm or desecrate an object the person knows is an Aboriginal object'. It is also a strict liability offence to 'harm an Aboriginal object' or to 'harm or desecrate an Aboriginal place', whether knowingly or unknowingly. Section 87 of the Act provides a series of defences against the offences listed in Section 86, such as:

- The harm was authorised by and conducted in accordance with the requirements of an *Aboriginal Heritage Impact Permit* (AHIP) under Section 90 of the Act;
- The defendant exercised 'due diligence' to determine whether the action would harm an Aboriginal object; or
- The harm to the Aboriginal object occurred during the undertaking of a 'low impact activity' (as defined in the regulations).

Under Section 89A of the Act, it is a requirement to notify the Office of Environment and Heritage (OEH) Director-General of the location of an Aboriginal object. Identified Aboriginal items and sites are registered on Aboriginal Heritage Information Management System (AHIMS).

1.4.2 Commonwealth Legislation

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

Matters of National Environmental Significance listed under the EPBC Act include the National Heritage List and the Commonwealth Heritage List, both administered by the Commonwealth Department of the Environment and Energy. Ministerial approval is required under the EPBC Act for proposals involving significant impacts to National/Commonwealth heritage places.

1.4.3 Applicability to the Development

The current Development will be assessed under Part 4, Division 4.7 of the EP&A Act. As a Division 4.7 consent, management of Aboriginal cultural heritage will be conducted under an approved Aboriginal Cultural Heritage Management Plan (ACHMP) rather than an AHIP.

The SEARs issued for the Development pertaining to Aboriginal cultural heritage have been followed in this assessment. Field assessment and reporting followed the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) and the Code of Practice. The current assessment also follows the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* to gather information about the cultural significance of recorded sites and the landscape. This ACHAR details the archaeological investigation of the material culture of the Survey Area and considers the intangible cultural connections within the Survey Area.

The EPBC Act does not apply to Aboriginal Cultural Heritage within the Survey Area.

Any Aboriginal sites within the Survey Area are afforded legislative protection under the NPW Act.

It is noted that the Survey Area includes land currently subject to Native Title Claim by the Gomeroi People (Tribunal File No. NC2011/006, Federal Court No. NSD2308/2011). The Proponent will need to obtain legal advice as to whether land tenure will require Native Title consultation.

2 THE ARCHAEOLOGICAL ASSESSMENT

2.1 PURPOSE AND OBJECTIVES

The purpose of the current study is to identify and assess Aboriginal heritage constraints relevant to the proposed works.

2.1.1 Aboriginal Archaeological and Cultural Heritage Values Assessment Objectives

The current assessment will apply the Code of Practice and the ACHCRs to complete an Aboriginal cultural heritage assessment, in order to meet the following objectives:

Objective One: To undertake an Aboriginal archaeological survey of the Survey Area as per the Code of Practice.

Objective Two: To undertake an Aboriginal cultural values assessment of sites located within the Survey Area with the potential to be impacted by the Development, in consultation with Registered Aboriginal Parties (RAPs) and consistent with the ACHCRs.

Objective Three: To assess the significance of any recorded Aboriginal sites, objects or places likely to be impacted by the project, in consultation with RAPs, consistent with the Code of Practice and ACHCRs.

Object Four: To assess the likely impacts of the Development to any recorded Aboriginal sites, objects, places or cultural values, and to develop management recommendations, in consultation with RAPs, consistent with the Code of Practice and ACHCRs.

2.2 DATE OF ARCHAEOLOGICAL ASSESSMENT

The fieldwork component of this assessment was undertaken by OzArk on the following days:

- Tuesday 18 October 2016;
- Wednesday 19 October 2016;
- Thursday 20 October 2016; and
- Friday 21 October 2016.

2.3 ABORIGINAL COMMUNITY INVOLVEMENT

The assessment has followed the ACHCRs. Information regarding the ACHCRs, detailing the main stages, follows.

2.3.1 Stage 1: Notification of the Development and registration of interest

- Advertisement placed in the Northern Daily Leader 12 August 2016 (**Appendix 1**);

- Letter seeking information from agencies sent on 10 August 2016 (**Appendix 1**¹). Letters were sent to NTSCORP Ltd, Local Land Services, Native Title Tribunal, OEH, Tamworth Local Aboriginal Land Council (TLALC) and Tamworth Shire Council.
- By the closing date for registration concerning this Development, 12 groups or individuals registered to be consulted as RAPs. They are as follows:
 - TLALC;
 - T&G Culture Consultants;
 - Richard Slater;
 - DFTV Enterprises;
 - Gomery Cultural Consultant;
 - Brian Draper;
 - White Cockatoo Aboriginal Corporation;
 - Gomerai People NC2011/006 (C/- Sam Hegney; T/A Gomerai Country Services Pty Ltd);
 - Gomerai People NC2011/006 (C/- NTSCORP);
 - Natasha Rodgers;
 - AT Gomilaroi Cultural Consultancy; and
 - Veronica Talbott.

2.3.2 Stage 2/3: Presentation of information about the proposed development and gathering information about cultural significance

- On 12 September 2016 all RAPs were sent:
 - Development overview (**Appendix 1**);
 - Survey methodology (**Appendix 1**).

Natasha Rodgers

During the Stage 2/3 period, feedback was received from Natasha Rodgers (**Appendix 1**). Verbal feedback provided by Natasha Rodgers can be summarised in the following points:

- GPS points are to be taken and recorded wherever artefacts are found;
- Artefacts, bush tucker and medicine are to be put back on country after they have been salvaged;

¹ Please note that **Appendix 1** contains only a sample of each stage letter sent. Should OEH require every letter sent to all agencies and RAPs, OzArk can provide these.

- If shields and boomerangs are found then refer to the Aboriginal community for preservation options; and
- If something significant is found that is non-perishable (i.e. an axe head), it is to be reburied on country for its preservation.

OzArk response

OzArk Archaeologist Philippa Sokol sent Natasha Rodgers an email to discuss the feedback provided on the proposed methodology on 14 October 2016. The following outcomes were discussed:

- GPS points will be taken of all salvaged artefacts, should a salvage be required. In addition to this, basic attributes such as size, artefact type etc. will be recorded and photographs will be taken both of the artefacts and the site environment;
- Salvaged artefacts can be reburied on site, in a nearby location where no future development will take place, however, should any significant artefacts be recovered such as shields, boomerangs and axe heads then discussions will be had with an organisation such as the TLALC with the possibility of having these placed in a secure, display cabinet; and
- The Survey Area has been largely cleared of all native vegetation and farmed and, as such, bush tucker and medicine plants may be rare, however, if any bush tucker or medicine plants are identified then the locations of these will be recorded.

AT Gomilaroi Cultural Consultancy

Feedback was also received from AT Gomilaroi Cultural Consultancy on 17 October 2016 which highlighted that test pits will need to be excavated near the Namoi River prior to any disturbance.

OzArk response

OzArk Community Liaison Sheridan Baker spoke to the representative of AT Gomilaroi Cultural Consultancy and highlighted that the field survey would concentrate on the area adjacent to the Namoi River and the results of the survey would determine whether there is potential for sub-surface deposits.

2.3.2.1 Field survey participation

Fieldwork was undertaken from 18–21 October 2016. The following RAPs or representatives of RAPs participated in the fieldwork program:

- 18–21 October 2016: Chris Former (TLALC);
- 18 October 2016: Richard Green (two hours participation; Gomeroi People NC2011/006 [T/A Gomeroi Country Services Pty Ltd]);
- 19 October 2016: Tony Griffiths (Gomeroi People NC2011/006 [T/A Gomeroi Country Services Pty Ltd]);

- 20–21 October 2016: Alf Priestly (Gomeroi People NC2011/006 [T/A Gomeroi Country Services Pty Ltd]); and
- 21 October 2016: Leon Winters (Gomeroi People NC2011/006 [T/A Gomeroi Country Services Pty Ltd]).

2.3.2.2 Development update letter

As a result of delays to the Development in order to finalise the impact footprint, an update letter was sent to all RAPs on 6 June 2017 (**Appendix 1**). This letter highlighted the following:

- Summary of consultation completed to date;
- Results of the survey; and
- Notification of consultation going forward.

2.3.3 Stage 4: Review of draft ACHAR

The draft ACHAR was sent on the 29 August 2017 to all RAPs. A 28 day review period was provided closing on the 28 September 2017.

One of the RAPs telephoned OzArk for an update on the project and whether the development has commenced construction; this correspondence is documented in **Appendix 1**. No comments or feedback were received from the RAPs which relates directly to the contents of this ACHAR.

A log and copies of all correspondence with Aboriginal community stakeholders is presented in **Appendix 1**.

2.4 OZARK INVOLVEMENT

2.4.1 Field Assessment

The fieldwork component of the assessment was undertaken by:

- Archaeologist: Stephanie Rusden (OzArk Project Archaeologist, BS University of Wollongong, BA University of New England); and
- Archaeologist: Philippa Sokol (OzArk Project Archaeologist, BA University of New England).

2.4.2 Reporting

The reporting component of the assessment was undertaken by:

- Report Author: Stephanie Rusden;
- Contributor: Philippa Sokol (**Section 5.4**); and
- Reviewer: Ben Churcher (OzArk Principal Archaeologist; BA[Hons], Dip Ed).

3 LANDSCAPE CONTEXT

An understanding of the environmental contexts of a Survey Area is requisite in any Aboriginal archaeological investigation (DECCW 2010a). It is a particularly important consideration in the development and implementation of survey strategies for the detection of archaeological sites. In addition, natural geomorphic processes of erosion and/or deposition, as well as humanly activated landscape processes, influence the degree to which these material culture remains are retained in the landscape as archaeological sites; and the degree to which they are preserved, revealed and/or conserved in present environmental settings.

According to the Interim Biogeographic Regionalisation of Australia (IBRA) described by NSW National Parks and Wildlife Service the Survey Area is located within the Nandewar bioregion and the Peel subregion.

The Nandewar bioregion lies in northern NSW and across the Queensland border. The bioregion is bounded by the North Coast, New England Tablelands and Brigalow Belt South bioregions in the south, east and west respectively (NPWS 2003: 145).

3.1 TOPOGRAPHY

The topography of the Survey Area is consistent with the Tamworth–Keepit Slopes and Plains landscape unit as described by Mitchell (2002). This landscape unit comprises extensive area of undulating to rolling slopes and plains with low hills and low ranges forming the western fall of the New England plateau (Mitchell 2002: 49). The Survey Area comprises a number of landforms, including valley flats with creek banks and drainage lines, basal and lower slopes with occasional spurs, mid and upper slopes associated with stony hills, crests and broad ridges.

Explanations for the terms used on **Figure 3-1** are in **Table 3-1**. **Table 3-2** quantifies the extent of these landform features specific to the Survey Area and examples of each landform are shown in **Plates 1 to 5**.

Table 3-1. Landform descriptions.

Landform	Description
Crest / Ridge	Raised area with a confined summit.
Upper slope	Sloping land adjoining hill tops or ridges. In the Survey Area upper slopes are moderately steep with over 10° slope.
Mid slope	Sloping land often between upper and lower slopes. In the Survey Area mid slopes form an undulating topography with average slopes between 5° and 10°.
Lower slope	Sloping land often between mid-slopes and flat landforms. In the Survey Area lower slopes are gentle with less than 5° slope
Flat / Drainage	For much of the Survey Area, flat landforms are associated with drainage lines.

Figure 3-1. Major landform units within the Survey Area.

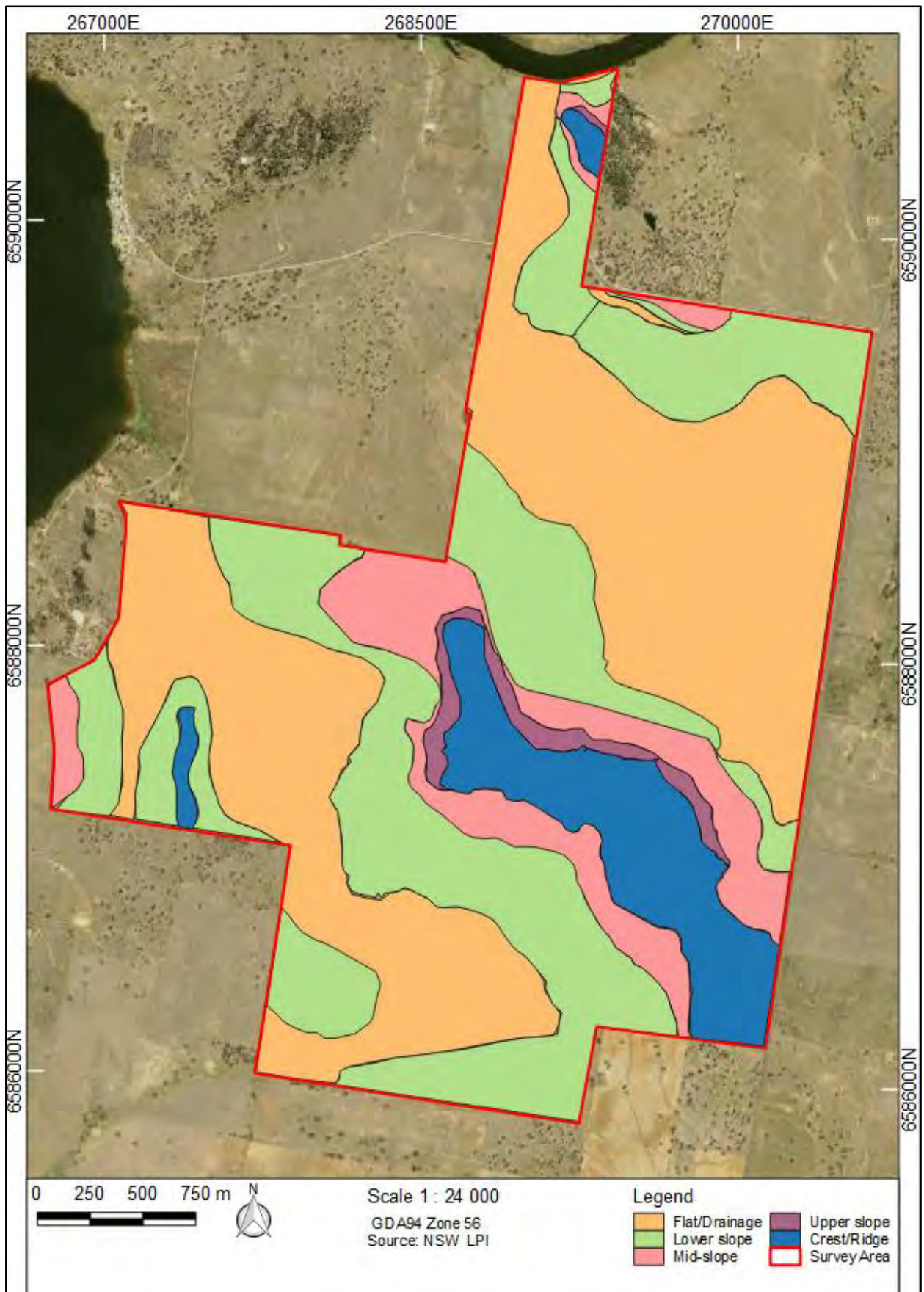


Table 3-2. Summary of key terrain features within the Survey Area.

Total Survey Area	Crest/ Ridge	Upper slope	Mid slope	Lower slope	Flat/ Drainage
1010.8ha	105.8ha (10.50%)	65.6ha (6.51%)	113.2ha (11.23%)	346.1ha (34.34%)	377.4ha (37.44%)

3.2 GEOLOGY AND SOILS

Understanding land formation processes is an important part of assessing the availability of exploitable resources in the landscape and predicting the ability of that landscape to preserve archaeological material (DECCW 2010b).

The Nandewar bioregion is comprised of the New England Fold Belt, the youngest structural feature in NSW, and is separated from the Lachlan Fold Belt by the Sydney–Bowen Basin that is filled with Mesozoic sediments (NPWS 2003: 146). The oldest rocks in the sequence are Devonian sedimentary and volcanic rocks, while the youngest are Triassic sandstones and shales deposited by rivers on the edge of the Gunnedah Basin (NPWS 2003: 146). Lithic profiles from the Tamworth–Keepit Slopes and Plains landscape are characterised by Silurian–Devonian chert, slate, phyllite, tuff, schist and Carboniferous conglomerate, basalt, sandstone, mudstone, andesite and small areas of limestone (Mitchell 2002: 49).

The bioregion is characterised by clay or loam soils, but siliceous soils derived from acid volcanic rocks are also found. On sedimentary rocks, shallow stony soils occur on ridges passing to texture-contrast soils on almost all slopes (NPWS 2003: 146). These soils support diverse vegetation communities that are also affected by altitude. The granites develop gritty, shallow profiles between outcrops and tors on the crests, grading to texture-contrast soils with yellow clay subsoils that are prone to gully development. Basalt areas have frequent rock outcrops interspersed with shallow, stony, brown loams. Sedimentology across the Tamworth–Keepit Slopes and Plains landscape is dominated by texture-contrast soils on almost all slopes shifting in colour from red-brown on upper slopes to yellow with harsh subsoils prone to gully development on lower slopes (Mitchell 2002: 49).

The soil of the Survey Area is variable as it crosses differing landforms. Parts of the Survey Area, particularly those in previously cultivated paddocks, have been subject to pasture improvement and fertilisation and in this assessment these soils are termed brown humic loam. Outside the cultivated paddocks, soils generally comprised redeposited sandy or clayey loam. The primary mode of geomorphic activity within the Survey Area is erosion as a result of historical land clearing, cultivation and grazing making the soil more susceptible to movement down-slope. These impacts have led to a structural decline in the soil profile, particularly in areas adjacent to waterways and on slopes.

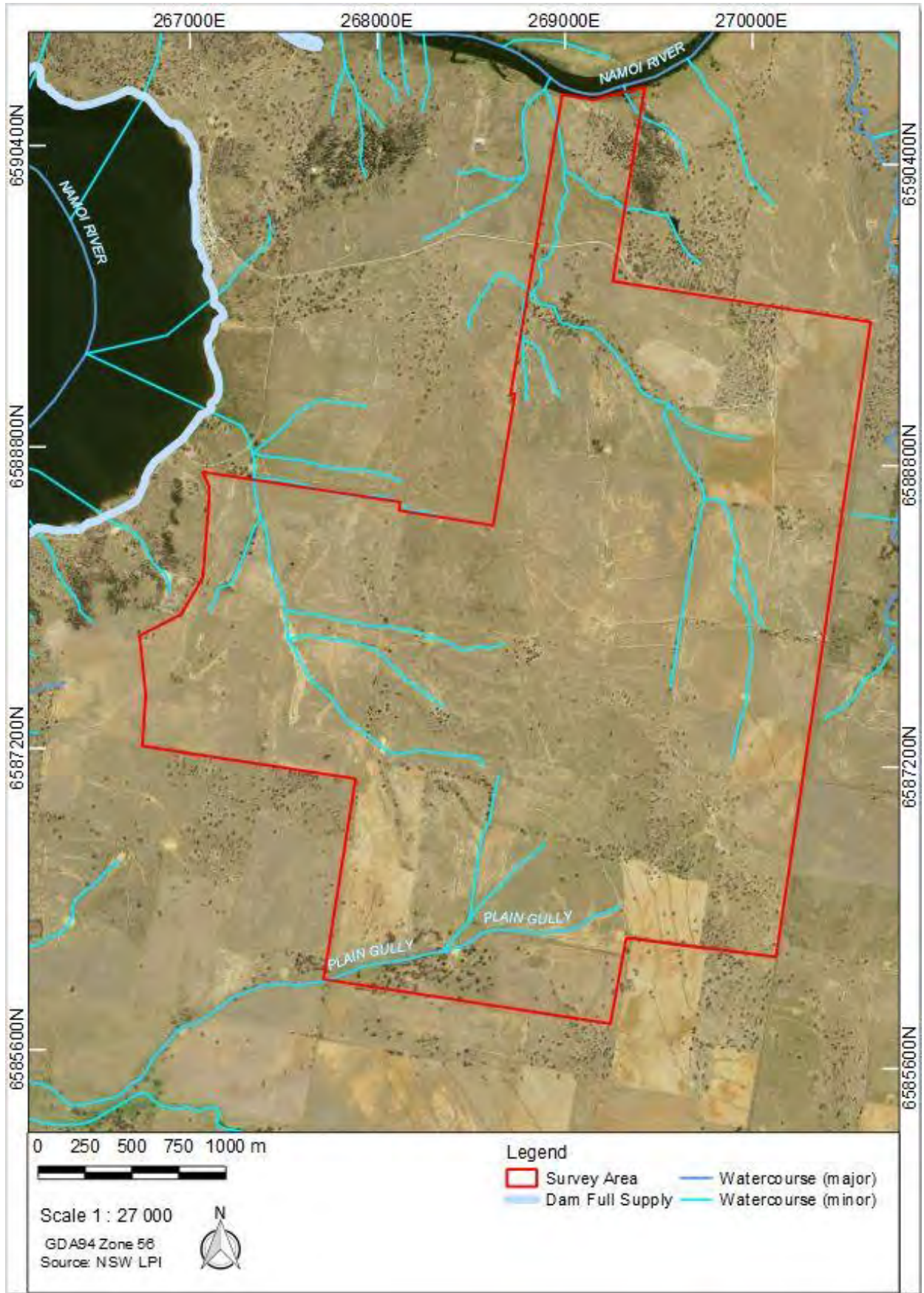
3.3 HYDROLOGY

On a regional scale, the Survey Area is located within the catchment of the Namoi River, which is one of the Murray–Darling Basin’s major NSW sub-catchment. The Namoi River covers a total area of approximately 42,000km² between Tamworth and Walgett (NOW 2011). Stream flows in the Namoi catchment are regulated by Lake Keepit on the Namoi River, Split Rock Dam on the Manilla River and Chaffey Dam on the Peel River. The catchment supports significant dryland and irrigated agricultural production, including cotton, livestock production, grain and hay, poultry, horticulture and forestry (NOW 2011).

The Namoi River flows westerly to the north and west of the Survey Area to Lake Keepit. Lake Keepit, which is located to the west and southwest of the Survey Area was commissioned in 1960 as the major irrigation storage for the Namoi Catchment. The Peel River, a major tributary of the Namoi River, flows westerly approximately 8.5km to the south of the Survey Area.

Several intermittent drainage lines traverse the Survey Area (**Figure 3-2**). Plain Gully, an ephemeral watercourse which flows to the west towards the Namoi River (where Lake Keepit has been constructed), transects the south-western corner of the Survey Area. Other notable ephemeral named watercourses surrounding the Survey Area are Rushes Creek, to the east, and Milliwinah Gully, to the west. A number of ephemeral, unnamed watercourses of the Namoi River also transect the Survey Area. Several farms dams have been constructed to capture water in these ephemeral watercourses.

Figure 3-2. Watercourses within the Survey Area.



3.4 VEGETATION

Prior to European occupation, the vegetation within the Survey Area would have been consistent with the Tamworth–Keepit Slopes and Plains landscape unit. The Tamworth–Keepit Slopes and Plains landscape unit is characterised by white box grassy woodlands, with yellow box, Blakely’s red gum, willow wattle and lightwood on lower slopes. Rough barked apple and yellow box on flats. River oak is present along major streams with river red gum increasing to the west. Patches of red stringybark and red ironbark are found on steeper slopes in the east (Mitchell 2002: 49).

The Survey Area is highly modified and disturbed as a result of historic land clearance and long-term agricultural activities. The majority of the Survey Area has been cleared of remnant vegetation with only limited areas of scattered trees remaining.

3.5 CLIMATE

The Nandewar bioregion is considered to be fairly warm and dry, although average annual temperatures and rainfall vary markedly across the bioregion in relation to elevation (NPWS 2003). The central areas, such as the Nandewar Range and the northern slopes of the Liverpool Range, are generally cooler due to their higher elevation, whereas warmer areas correspond to the lowlands around main river catchment areas which comprise the Survey Area. Average annual rainfall varies across the bioregion but generally decreases from east to west, but the differing topography across the bioregion alters this trend somewhat.

Climate statistics from Gunnedah airport, located approximately 35km southwest of the Survey Area, indicate that temperatures range from a monthly mean maximum of 34.1° Celcius (C) in January to a monthly mean minimum of 2.1°C in July. Average annual precipitation is 555.3 millimetres (mm) with high rainfall periods between November and February and the highest rainfall occurring in December (80.6mm). The driest months are April and May with 22.8mm and 25.mm, respectively (BoM 2017).

3.6 LAND–USE HISTORY

Aboriginal people have sustainably harvested resources within the Nandewar bioregion for more than 20,000 years (**Section 4.2**). Aboriginal people in prehistory are known to have used fire-stick farming, or controlled burns, to alter vegetation communities, promoting the growth of desirable plants. Aboriginal fire regimes were widespread (Gammage 2011) and are considered an early land-use practice.

Squatters began to occupy the Nandewar bioregion in the 1830s with cattle grazing becoming the dominant land use in the early days of European settlement. By the end of the 1800s sheep grazing was expanded due to improved pastures. In the interim, the bioregion has been subjected to a variety of landscape disturbances due to: pastoralism, mining, vegetation clearance, erosion, timber harvesting, feral animal introductions, river regulation and plant cultivation (Eardley 1999:

21–25; NPWS 2003: 95–96). The long-standing and existing use of the Survey Area is agricultural production, including both livestock grazing and crop cultivation.

3.6.1 Existing Levels of Disturbance

Disturbance, historical or natural, potentially alters the archaeological record. It can do this in a variety of ways, directly or indirectly. For example, land clearing directly removes a particular site type: usually scarred trees or stone arrangements. Indirectly, land clearing accelerates soil erosion, potentially resulting in previously buried occupation / activity sites becoming exposed and altered / damaged.

The Survey Area has moderate to high levels of disturbance mostly consisting of impacts related to the area's agricultural use. Disturbances across the Survey Area are summarised below:

- **Agriculture and Pastoralism.** Farming and grazing are fundamental to the local economy and dominate land-use throughout the area. The Survey Area is wholly contained within farming and grazing land which has had the following impacts:
 - **Vegetation removal.** The Survey Area has been subject to significant levels of vegetation removal (**Section 3.4**). Culturally modified trees may have been removed during the land clearance phase in the area, thereby distorting the archaeological landscape by removing this site type;
 - **Cultivation.** Portions of the Survey Area have been subjected to repeated cultivation. Repeated cultivation since the commencement of European settlement will have altered soil profiles and potentially disturbed sub-surface archaeological deposits;
 - **Grazing.** The Survey Area has been used historically and is currently used for low-intensity livestock grazing. The presence of hooved livestock is likely to have resulted in trampling and compaction of the ground surface which accelerates soil loss; and
 - **Farm Infrastructure and remediation works.** The Survey Area has an overall low level of disturbance generated by the construction of dams, contour banks, agricultural buildings and fencing. Earthworks associated with contour banking and dams can reveal lithic artefacts which may have been otherwise concealed by low ground surface visibility (GSV).
- **Dwellings.** Five dwellings are located within the Survey Area. These include dwellings within the Happy Hills and Bondah properties; however, one is noted to be derelict.
- **Transport.** Numerous unsealed roads and tracks intersect the Survey Area. Ski Gardens Road, a sealed road, also transects the Survey Area in the north. In the case of unsealed tracks, this disturbance tends to provide exposures, thus enabling the identification of otherwise obscured artefacts.
- **Erosion.** Erosion includes sometimes severe gully erosion and widespread sheet wash erosion, primarily adjacent to waterways. Varying scales of erosion on the archaeological

landscape has the capacity to completely remove archaeological sites. However, in the process of erosion, many archaeological sites can become freshly exposed.

3.7 CONCLUSION

The topography, hydrology and climate of the Survey Area would have been conducive to year-round occupation by Aboriginal people in the past. In such a relatively hospitable environment one could expect wide-spread evidence of Aboriginal occupation. Rather than being confined to the banks of waterways, as is often the case in drier environments, the Survey Area could expect evidence of occupation in all landforms apart from the slopes of steep gradient hills.

Reference to the landform map (**Figure 3-1**) indicates that the impact to potential archaeological deposits will vary depending on the landform in which they may exist. With respect to the landforms within the Survey Area, the following observations can be made:

- Ridge and crest landforms can preserve archaeological deposits, particularly as this landform unit within the Survey Area is reasonably broad. This ridge landform separates the catchments of Rushes Creek from that of Plain Gully and could have been used for both transit and reconnaissance. However, given that there are no known sources of permanent water adjacent to much of these landforms, any occupation is likely to have been short-term or sporadic and it is not expected that this landform would contain numerous or complex sites. Further, as a degrading environment with soil loss stemming from vegetation clearing, it is likely that such sites, should they have existed in the past, have been removed or dissipated and large areas of these landforms comprise rocky outcrops;
- Upper slopes are characterised by very thin soils due to soil loss following clearing. Intact sites are highly unlikely to be located on the flank of slopes and any finds in this environment would be in a secondary context as a result of erosion;
- Mid slopes preserve few opportunities for the retention of archaeological deposits. As with steep slopes, the flanks of the slope are both unsuitable for camping or for the retention of archaeological deposits. Further, the ridge lines within this landform type are unlikely to have been prominent enough to act as a pathway and therefore evidence of transit camps would be lacking. Moderate slopes are within a degrading environment where soil loss would impact any sites had they existed. Creek systems in this landform type are generally steep-sided and unsuitable for long-term occupation;
- Lower slopes are most commonly associated with drainage lines and are landforms that are suitable for camping and the retention of artefacts. These landforms generally retain A-Horizon soils and may contain intact sites, depending on previous levels of disturbance; and
- Flat/Drainage landforms are not a hindrance for occupation in the past. However, evidence of this occupation may have become obscured or dissipated due to the impact of sheet wash and gully erosion in this landform type. Further, with respect to the Survey Area, the majority of the drainage lines are ephemeral and, as such, probably only supported short-term occupation resulting in sites with a low artefact density and a low level of site complexity. The northern-most portion of the Survey Area is adjacent to the Namoi River, a permanent water source, and sites are likely to be present in this area.

There are no known natural resource sites within the Survey Area that may have been a focus for past Aboriginal occupation.

Following Oxley's European 'discovery'² of the Liverpool Plains in 1817, a runaway convict George Clarke ("The Barber") began the first European settlement of the Boggabri area (1828? prior to his capture in 1831). According to historical reports Clarke made first contact with local Aboriginal people and was adopted into the Aboriginal community (Dunlop et al 1957 as cited in Hamm 2005).

In 1831 Mitchell's exploring party, following Clarke's route, came across the Leard Forest. Their native guide "Mr Brown" noticed axe marking called "Mogo" on a number of trees which he described as a sign 'to keep away' (O'Rourke 1995).

Moore Creek, not far from Daruka (located 45km southeast of the Survey Area), was an important ceremonial area for initiation and corroboree (Gardner 1878 as cited in Boileau 2007). In 1844, William Telfer provided accounts of a corroboree at Tamworth with over 250 Aboriginal people in attendance. Oral history from members of the local Aboriginal community in Tamworth refers to 'clever men' using the site at Moore Creek for ceremony. In their site study of Tamworth, Wilson and McAdam predict that archaeological investigations at Moore Creek may locate ritual and ceremonial sites, including art and engraving sites.

Borah Crossing, in the vicinity of Keepit Dam, was another important ceremonial area in the local region. Thompson (1981) states:

"Early this century Aboriginal people camped at Borah Crossing 25 kilometres southeast of Vickery. The site of this Aboriginal Reserve (AR35745, Parish Keepit, Gazetted 23/05/1903) of eight hectares was flooded by Keepit Dam in 1960. Another eight hectare Aboriginal Reserve (AR 32747) existed at Baan Baa 30 kilometres northwest of Vickery, between 1901 and 1918."

Telfer was one of the original employees of the Australian Agricultural Company (A.A. Company) and brought the first consignment of sheep to the Peel River holdings in 1836, pioneering the overland route from the A.A. Company land at Port Stephens. His son William Telfer Jr, was born in Tamworth in July 1841. The reminiscences of William Telfer Jr, known as the Wallabadah manuscript, provide one of the few contemporary accounts of the early years of European settlement in the Tamworth region. Although he was relatively uneducated, and at times prone to exaggeration, Telfer's accounts provide an insight into relations between Aborigines and Europeans on the frontier of white settlement and a unique picture of the vanishing lifeways of the Gamilaroi people (Gardner 1878). For example Telfer vividly describes a corroboree near Tamworth that he witnessed in his childhood:

... there was a tribe of Aborigines on Tamworth in those days about 1844 two hundred and fifty males and females there was a great corroboree or dance all male

² 'discovery' to NSW government knowledge.

Aboriginals were painted with white chalk or pipeclay the long lines of fires and the dark night amongst the white gum and apple trees with the figures of the blacks had a most striking appearance glyding from tree to tree flourishing their boomerangs. Some of them looked like demons whooping and shouting in their own language some with figures of Emus cut out of bark carrying in their hands also figures of Kangaroos made the same way astonished us Children. Some of the gentlemen said there were fully three hundred aboriginals in the performance ...

Social interchange occurred between the Kamilaroi and other language and tribal groups such as the Gweagal (Scone district), the Wonnarua (Hunter Valley), Darkinjung (Central Coast) and the Anaiwan (New England Tablelands). Such interchanges included conflicts and alliances, marriage, songs, stories, dances and ceremonial practices. Resources from stone axe quarries at Daruka, 20km south of the Survey Area, were exchanged throughout these social networks (McBryde and Binns 1970).

O'Rourke (1997) estimates that there were at least 60 Kamilaroi clans, with perhaps 160 adult men, women, adolescents and children in each, suggesting a total regional population in central-northern NSW of around 10,000 people. Each clan probably resided most of the year at a small number of established, favourable locations within their estate.

The Kamilaroi caught fish including eels, freshwater crayfish, yabbies, tortoises and freshwater mussels in the rivers, creeks and wetlands in the region (O'Rourke, 1997). Watercraft were manufactured from large slabs of bark cut from river red gum trees. Fish were caught using fishing lines and nets made from reed fibre. Nets were used to catch waterbirds, whose eggs were also collected. Some of the other animals that Aboriginal people of the North West Slopes hunted include kangaroos, wallabies, koalas, possums, emus, echidnas, lizards, snakes and frogs (Fison et al 1880; O'Rourke 1997). Plant foods included grass seeds, wild orange, emu apple, melons, tubers, yams and roots (Gott 1983; O'Rourke, 1997).

During the 1830s European settlement continued in the Gunnedah and Tamworth areas with several sheep and cattle pastoral runs established through the A.A. Company (Dunlop et al 1957 as cited in Hamm 2005). Local Aboriginal people were employed as stock keepers and shepherds by the 1850's and a number of conflicts were reported between European settlers and Aboriginal people near Manilla on the Namoi River (Hamm 2005).

Disease spread rapidly among Aboriginal people ahead of the European explorers. Between 1830 and 1832 a smallpox pandemic decimated the indigenous population of New South Wales. When Major Mitchell's party crossed the Murrurundi Pass from the Hunter Valley to the Liverpool Plains, they encountered Aborigines already affected by smallpox. Mitchell's diary entry for 5 December 1839 records:

We reached at length a watercourse called 'Currungai' and encamped upon its bank, beside the natives from Dart Brook, who had crossed the range before us, apparently to join some of their tribe who lay at this place extremely ill, being affected with a virulent kind of small pox. We found the helpless creatures, stretched on their backs beside the water, under the shade of the wattle or mimosa trees to avoid the intense heat of the sun.

4.2 REGIONAL ARCHAEOLOGICAL CONTEXT

Recent archaeological evidence indicates that Aboriginal people have occupied the continent for at least 60,000 years. The earliest dates for human occupation in northern NSW range from 9,000 BP (years before present) at Graman rock shelter near Inverell to 20,310 BP at Crazyman rock shelter near Coonabarabran (Gaynor 1997). In the Tamworth region there are dates of 4,950 BP from Bendemeer rock shelter on Glendon Station and 3,600 BP from Moore Creek 4 rock shelter (McAdam and Wilson 2000). In their archaeological study of the Tamworth area, McAdam and Wilson (2000) suggest that in light of the dates for the wider region, it is likely that the Gamilaraay have occupied their country for at least 20,000 years, and these dates may be extended with further excavations in the area (Gorecki et al 1984).

The collective archaeological / scientific evidence from the region suggests that occupation during the late Holocene was centred on small family groups (10 to 15 people) making use of terraces, palaeochannels and floodplains as temporary camps as they moved throughout the territory (Purcell 2000; Appleton 2008).

4.2.1 Tamworth Regional Context

Tamworth Regional Council prepared the Tamworth City Aboriginal / archaeological study (Wilson and McAdam 2000). Prior to this assessment 28 Aboriginal archaeological sites were registered on the AHIMS database for this area and after the 20 days of fieldwork the site total had reached 66 (McAdam and Wilson 2000). The study identified numerous sites across the region, the majority of which being artefact scatters of varying densities and raw materials including chert, cherty argillite, hornfels, quartz, andesitic greywacke tuff and chalcedony. Scarred trees were also noted and Kamilaroi walking tracks were identified (McAdam and Wilson 2000).

OzArk (2010a) was commissioned by TransGrid to complete a heritage assessment in advance of the dismantling of an electricity transmission line between Tamworth and Gunnedah, located to the east of Gunnedah and running east to Tamworth. A range of previously recorded site types were registered with AHIMS, with artefacts (either open campsites or isolated finds), scarred trees and grinding grooves being the most common site types. Two previously unrecorded Aboriginal sites were identified during the survey, with one comprising a small open campsite and the other

being a scarred tree. The open campsite contained a single mudstone flake and was recorded as an open campsite as it was considered likely that other artefacts may be present, due to its location in the landscape, near a 2nd order tributary of Swains Creek and near a slight elevation. The scarred tree was identified as a 'coolamon' scar on a white box. Several previously recorded scarred trees were reassessed as not being of cultural origin and AHIMS was notified of the reassessment to allow them to update their records.

In 2013, Niche Environment and Heritage (Niche) completed an Aboriginal archaeological assessment for the proposed Strathfield Intensive Livestock Facility located 8km north of Manilla within the locality of the Namoi River. Niche predicted that isolated finds and artefact scatters were the most likely site type that would be encountered. These sites were predicted to be in association with well-drained, flat to gently inclined land; land elevated above the floodplain; creek banks, valley flats, basal and lower slopes and alluvial silts. A total of 20 sites containing 39 Aboriginal objects were identified during the survey. Sites were recorded as low density background scatters of less than one artefact per square metre. Artefacts were located on flats and hill slopes (basal, lower and simple slopes); on level to gently inclined land, generally within 400m of third order or higher streams or within 100m of 1st and 2nd order drainage channels. Artefact densities remained low but increased in density and frequency in proximity to streams and gullies which were third order or higher. Recorded materials included quartz, tuff and agate.

Everick Heritage Solutions (Everick 2014) undertook a Due Diligence assessment for the Tamworth Regional Council's South Tamworth Rural Lands Master Plan Development of the Goonoo Goonoo Road site. Five Aboriginal sites were recorded during the inspection including isolated finds and artefact scatters interpreted as being representations of background scatters in disturbed landscapes and therefore, not *in situ*. Three retouched artefacts were recorded within three different sites. All were identified as being retouched flakes and recorded materials included basalt, greywacke chert.

4.2.2 Gunnedah Regional Context

In 1981 the area known as 'Authorisation 138' (Mine Authorisation 138) at 'Springfield' was surveyed by Gorecki (1981). Seventeen locations with artefacts were recorded approximately 48km southwest of the current Survey Area. These locations were recorded on AHIMS as three sites. The number of artefacts at each site varied, with some locations containing a single stone artefact and others containing clusters. All were found adjacent to Springfield Knob and relatively close to minor drainage features in red soils. The majority of sites recorded comprised low density artefact scatters. One site with a high density of artefacts was identified. The main artefact types identified comprised of flakes, scrapers and cores. One blade and a grindstone was also recorded. The dominant raw material types comprised locally sourced chert, quartz, quartzite and silcrete. One artefact manufactured from petrified wood was also recorded. Gorecki argued that

these artefacts were located in secondary contexts as agriculture / pastoralism, erosion and construction of contour banks had disturbed their original locations (Gorecki 1981). It is important to note that no artefacts were found either up slope in the surrounding hills or down slope on the plains.

Haglund (1984a and 1984b) undertook two studies during 1984 in the vicinity of Gunnedah. The first study (Haglund 1984a) consisted of a survey of the proposed Red Hill–Top Rocks–Trunk Road 72 coal haulage route. In this study, Haglund refers to sites previously located at Greenwood Creek (Thompson 1981) and Top Rocks (Haglund 1982), with particular emphasis on twenty axe grinding grooves and an extensive archaeological deposit at Top Rocks, located 35km west of the Survey Area. The grinding grooves were situated in the vicinity of sandstone outcrops at the water's edge. The archaeological deposit consisted of stone tools and evidence of manufacturing. Haglund (1984b) also examined the proposed location for a coal loader, situated between the North Western Railway and Trunk Road 72, 3km west of Gunnedah. This study, covering 87ha of cultivated / cleared land, located no archaeological deposits.

In 1985, Haglund conducted a survey of all previous studies relating to the area immediately north of Gunnedah and the Namoi River. The survey covered a variety of landscapes, encompassing the lands of the Blue Vale, Greenwood, Welkeree, Shannon Hill and Vickery Mines. Seven archaeological sites were identified during the survey including isolated finds and artefact scatters. Artefacts identified included flakes and blades, flake fragments, hammerstones, sandstone fragments with grinding faces, cores and backed blades. Raw material types recorded included indurated mudstone, chert, agate, silcrete, quartz, quartzite and igneous rock. This survey concluded that the archaeology of the area is concentrated along rivers and other permanent waterways. This concentration is a result of both prehistoric land use patterns, in which such locations arguably constituted more permanent camps, and historical land use patterns, such as agriculture, which may have disturbed and/or destroyed the archaeology present in areas away from these waterways (Haglund 1985).

Haglund returned to Gunnedah in 1986 to conduct two test excavations of sites requiring ground truthing (Haglund 1987). These sites were located on opposite sides of the Namoi River and one was a portion of the extensive Namoi River/C.W.R. site. Artefacts were recovered at these sites, however, Haglund noted that the artefacts were largely too dispersed to be considered archaeologically significant and were situated in secondary contexts created by vehicle movement and water flows (Haglund 1987).

Suzanne Hudson (2004) undertook an assessment of 'Porky's Cave' at Porcupine Hill, Gunnedah, for Red Chief Local Aboriginal Land Council (LALC). The cave contained rock engravings, a bat population, and an ironstone cobble. Appleton refers to the cave as a 'Dreaming site' (2007). Hudson recommended that access be restricted on cultural grounds (the cave is of ceremonial significance to the community), safety (due to loose scree), ecological grounds (fires

were affecting the resident bat community), and archaeological grounds (trampling and vandalism were gradually destroying the rock engravings).

John Appleton (2007) surveyed Lot 2, DP848920, Lincoln St, Gunnedah in response to a proposal to subdivide the site into 137 residential blocks. This area is located on the southern edge of the Gunnedah township, and is bounded to the north by Lincoln St. No artefacts were located during this study, however, Appleton does refer to an isolated artefact and nine grinding grooves located by himself in 2006 in the vicinity of Wandobah Road. His conclusion was that this area was most likely a transit zone between desirable campsites. Appleton noted that Red Chief LALC considered the 2007 study area of cultural significance, as the nearby Porcupine Hill was closely associated with the legendary figure, Red Chief (Appleton 2007).

Appleton (2008) returned to the area to conduct salvage operations at Rocglen Coal Mine, following his 2002 survey of the site of the proposed Belmont Coal Mine (now re-named). The salvage area consisted of three locations close to a creek on Portion 31, DP405391, in Tulcumba, situated 25km north of Gunnedah, between Vickery State Forest and Wean Road. Appleton (2002) had previously noted artefacts, including a silcrete core at Site "B1", a micro-debitage scatter of eight small silcrete flakes at Site "B2", and an extended artefact scatter (over 40 artefacts consisting of three cores, with the remainder flaked pieces and flakes) at Site "B3". The salvage operation noted significant disturbance between 2002 and 2008, caused by agricultural activity or storms and slope-wash. Additional artefacts were recovered at "B1" (eight stone artefacts, no cores), at "B2" (13 stone artefacts), and at "B3" (67 artefacts, including three cores). Appleton interpreted the 'Rocglen Assemblage' as a camping area to which various groups returned over an extended period of time.

In 2010, OzArk completed a test excavation program at Boonalla Cave, located 23km west of the Survey Area, within the Kelvin State Forest (OzArk 2010b). The aim of the test excavation program was to ascertain if the cave contained an Aboriginal site and to gain some idea of the nature and extent of any archaeological deposits should they exist. The test excavation program occurred over three days and consisted of two 1 x 1 m squares being excavated. One square was placed just inside the drip-line of the cave (Square 1), while a second (Square 2) was placed three metres further into the cave from Square 1. Square 2 was excavated to a depth of 60cm when excavation was halted. There was no sign that deposits had ceased at this level. Square 1 was excavated to a depth of 1.7m, again, with no sign that the deposits had ceased. Square 1 showed signs of clear stratigraphy with a sealing layer of very dark soil at a depth of 10cm extending down to 20cm. The excavations recorded 162 artefacts (across both squares and including chips and debitage) along with good samples of animal bone and charcoal. A range of artefacts were recorded including unmodified flakes, backed blades, cores, burins, scrapers and debitage. preliminary indications are that the major concentration of artefacts are in Square 1 at a depth of between 50–75 cm (spits 10–14) and that artefacts were still being recorded from the

lowest reaches (spit 30) of Square 1 indicating that archaeological deposits continue beneath the arbitrary stop point in Square 1. Interestingly, Square 2 was ceased at 60 cm and while similar levels in Square 1 recorded high densities of artefacts, this was not reflected in levels at the same depth in Square 2. Carbon 14 (14C) dating was undertaken on three charcoal samples from Square 1. The dates returned were:

- Square 1, Spit 11: 3491 ± 30 BP (Wk28543).
- Square 1, Spit 16: 3895 ± 30 BP (Wk28544).
- Square 1, Spit 24: 4279 ± 30 BP (Wk28545).

These dates indicate that the deposits so far excavated in Square 1 date to the latter half of the Holocene period (The Holocene period begins around 12,000 BP and continues to the present). The 14C dates also indicate that there is stratigraphic integrity within Square 1 with higher spits recording more recent dates than lower spits.

OzArk returned to Boonalla Cave in 2012 to continue archaeological excavations under AHIP #1114484. The 2012 excavation produced a statistically valid number of recorded artefacts with 430 artefacts recorded from the excavation squares. 371 artefacts are from secure contexts, while 59 artefacts were recorded in unstratified contexts. The 2012 artefact assemblage had the following characteristics:

- Most artefacts are medium to small in size;
- Dark volcanic stone dominates the raw material;
- Flakes are the most common artefact type; and
- Debitage (small flakes less than 10mm) and shatter make up a reasonable proportion of the spit assemblage.

The following conclusions concerning Aboriginal occupation at Boonalla Cave were made:

- Aboriginal people have used the cave for at least 4,300 years and probably for as long as 5,400 years (the 2010 radiocarbon dating of the lower levels suggests that, very roughly, 25cm of deposit is equivalent to around 400 years allowing an extrapolation below the lowest secure date we have).
- Aboriginal people used the cave during periods when the deposits show that, over time, considerable amounts of gravels and small stones fell from the cave roof. Artefact densities in the lowest layer (Layer 4) are low but in Layer 3 moderate densities of artefacts are recorded. No archaeological features were found associated with Layer 3 or Layer 4 so it is not certain how the cave was being used. Layer 3 had evidence that the knapping of fine-grained dark volcanic stone was taking place in the cave and the recording of burnt and broken bone in the layer suggests cooking was taking place somewhere but probably not in the area investigated.

- While Layer 2, where excavated, showed evidence of long term use as a hearth area, all excavation squares were in the hearth area and so it is unclear how this area related to the use of the rest of the cave. Artefacts were of a low density in Layer 2 although good samples of burnt and broken animal bone were recorded. The thick bands of ash, particularly white ash, show that a large and hot fire was in this location. Additionally Layer 2 is 20cm deep. For ash deposits to build up to this depth implies long term use as a hearth area.
- Layer 1, the most recent, has very little evidence of Aboriginal occupation although climatic conditions were the same during the time Layer 2 was being created. For some reason the cave appears to have been abandoned, or at least not used for occupational activities such as tool making and cooking.

In 2016, Apex Archaeology was commissioned by the applicant to complete a Due Diligence assessment for the proposed realignment of Blackjack Creek, near Gunnedah. A desktop review of environmental factors, a search of the Aboriginal Heritage Information Management (AHIMS register) search, literature review and a field inspection were undertaken as part of the assessment. No previously recorded archaeological sites were located within or in close proximity to the study area. Three archaeological sites, BJC01, BJC02 and BJC03, and one area of potential archaeological potential (PAD) were recorded during the field inspection. The study area was identified as being heavily disturbed, particularly in the north by previous vegetation clearance, flood events, flood mitigation works and revegetation. The southern portion of the study area was noted as being less modified, primarily disturbed by vegetation clearance for agricultural purposes. OzArk (2017) completed the salvage of sites BJC02 and BJC03 as per the conditions of AHIP C0002532. The original recorded surface artefacts were recorded, including two backed flakes and two cores. The artefacts were manufactured from chalcedony, quartz and tuff. Grader scrapes were undertaken in areas close to Blackjack Creek where areas of PAD were delineated in Apex Archaeology (Apex Archaeology 2016) following a recommendations made by the RAPs. A total of 11 artefacts were recovered from the seven grader scrape locations at the areas identified as being PADs. Six of the 11 artefacts were flakes (55%), three were flaked pieces (27%) and the remaining two pieces were recorded as shatter (18%). The most common recorded material was chalcedony (55%), followed by chert (36%) and a volcanic material (9%) (OzArk 2017).

4.3 LOCAL ARCHAEOLOGICAL CONTEXT

4.3.1 Desktop Database Searches Conducted

A desktop search was conducted on the following databases to identify any potential previously-recorded heritage within the Survey Area. The results of this search are summarised in **Table 4-1** and presented in detail in **Appendix 2**.

Table 4-1: Aboriginal heritage: desktop-database search results.

Name of Database Searched	Date of Search	Type of Search	Comment
Commonwealth Heritage Listings	12.10.16	Tamworth LGA	No places listed on either the National or Commonwealth heritage lists are located within the Survey Area.
National Native Title Claims Search	12.10.16	NSW	One Native Title Claim covers the Survey Area.
State Heritage Register	12.10.16	Tamworth LGA	No places listed are located within the Survey Area.
OEH AHIMS	12.10.16	17.5km x 18km with no buffer centred on the Survey Area	20 AHIMS sites returned within the designated search area.
Local Environment Plan (LEP)	12.10.16	Tamworth Regional LEP of 2010	None of the Aboriginal places noted occur near the Survey Area.

As per **Table 4-1**, it is noted that the Survey Area includes land currently subject to Native Title Claim by the Gomeroi People (Tribunal File No. NC2011/006, Federal Court No. NSD2308/2011). The Proponent will need to obtain legal advice as to whether land tenure will require Native Title consultation.

A search of the OEH administered AHIMS database on 12 October 2016 returned 20 records for Aboriginal heritage sites within the designated search area (see **Table 4-2** for the AHIMS search area; results mapped in **Figure 4-2**). **Table 4-2** indicates that the most common site type in the district are artefact scatters (45% of sites), followed by modified (scarred) trees (30% of all sites).

Table 4-2: AHIMS site types and frequencies.

Site Type	Number	% Frequency
Artefact scatter	9	45%
Modified Tree (Carved or Scarred)	6	30%
Artefact and Modified Tree (Carved or Scarred)	2	10%
Axe Grinding Grooves	1	5%
Burial	1	5%
Stone Quarry and Artefact	1	5%
Total	20	100%

A number of studies were undertaken for the Keepit Dam upgrade project, located 8 km south-west of the Survey Area (Environmental Resources Management (ERM) 2002, Navin Officer Heritage Consultants 2003, 2005 and 2007). These studies provide a cluster of Aboriginal sites and a predictive model which may be applied to the wider region for comparison. Twenty-eight Aboriginal sites were recorded across the project including five isolated finds, 13 artefact scatters, nine scarred trees and a stone source. Common characteristics for all artefact sites in the study area were:

- Situated on low gradient slopes to level ground;
- Often slightly elevated above the watercourse; and
- Within approximately 200m of a watercourse.

The study also found that the largest and most dense sites had the following characteristics:

- Close proximity to Namoi River or creek line (three within 20m of the river, one within 10m of a creek and 250m from the river);
- Gentle basal slopes extending down to level ground adjacent to watercourse; and
- Silty deposits with little surface gravel evident.

Sites were found in a range of disturbed and undisturbed contexts within the Keepit Dam study area including in gravel river beds and in plough zones. Less dense sites were found in the plough zone but it was unclear whether deposits were obscured by the act of ploughing. Of relevance to the current Survey Area was the observation that stone artefacts tended to be found more frequently where little surface gravel was present. Tuff, volcanic and chert were the dominant raw material types for the production of stone artefacts. A small number of artefacts were made of quartz, quartzite, chalcedony, jasper and rhyolite. Tool technologies present within the Keepit Dam area included micro blade and stone axe production.

A cultural heritage assessment for interim safety works on the Lake Keepit subsidiary dam wall was conducted in 2002 by ERM. No sites were recorded as a result of the assessment. Ground visibility was very low and the absence of Aboriginal sites was attributed to past ground surface

disturbances. It was further noted that while the majority of Lake Keepit has been subject to land uses that would have disturbed the integrity of cultural materials, the most likely locations of archaeological sensitivity within the subsidiary dam wall was around Lake Keepit, and the Peel and Namoi Rivers and their tributaries.

The closest recorded site to the Survey Area is AHIMS #20-5-0091. The site is recorded as being located 65m from the Ski Gardens Road intersection to Lake Keepit. AHIMS #20-5-0091 is noted as being a box scarred tree displaying one cultural scar. The site was recorded by Jane Delaney-John, and does not appear to be associated with an archaeological assessment.

Figure 4-2: Location of AHIMS sites in relation to the Survey Area.



4.4 PREDICTIVE MODEL FOR SITE LOCATION

Across Australia, numerous archaeological studies in widely varying environmental zones and contexts have demonstrated a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural/mythological significance. Consequently sites tend to be found along permanent and ephemeral water sources, along access or trade routes or in areas that have good flora/fauna resources and appropriate shelter.

In formulating a predictive model for Aboriginal archaeological site location within any landscape it is also necessary to consider post-depositional influences on Aboriginal material culture. In all but the best preservation conditions very little of the organic material culture remains of ancestral Aboriginal communities survives to the present. Generally it is the more durable materials such as stone artefacts, stone hearths, shell, and some bones that remain preserved in the current landscape. Even these however may not be found in their original depositional context since these may be subject to either (a) the effects of wind and water erosion/transport - both over short and long time scales or (b) the historical impacts associated with the introduction of European farming practices including: grazing and cropping; land degradation associated with exotic pests such as goats and rabbits and the installation of farm related infrastructure including water-storage, utilities, roads, fences, stockyards and residential quarters. Scarred trees may survive for up to several hundred years but rarely beyond.

OEH (2014) have produced a series of 'pre-1750' predictive models termed the Aboriginal Sites Decision Support Tool (ASDST) which combines data derived from AHIMS with a series of spatial variables that describe the landscape such as elevation, geology and proximity to water. The ASDST outputs GIS raster layers composed of one hectare cells that predict the likelihood of Aboriginal sites (e.g. mounds, artefacts, modified trees, grinding grooves, burials and hearths) occurring in the landscape prior to European settlement (**Figure 4-3**). These models do not account for land use disturbance in the intervening period, or local conditions leading to differential preservation of features. However, the ASDST includes an 'accumulated impacts' model that indicates impacts of post-European settlement land-use and its impact upon Aboriginal site features in the landscape (**Figure 4-3**; image 7). In combination, these models are used to predict the likelihood of encountering different Aboriginal site types prior to European settlement, and how the distribution of Aboriginal sites are likely to have been affected since this time.

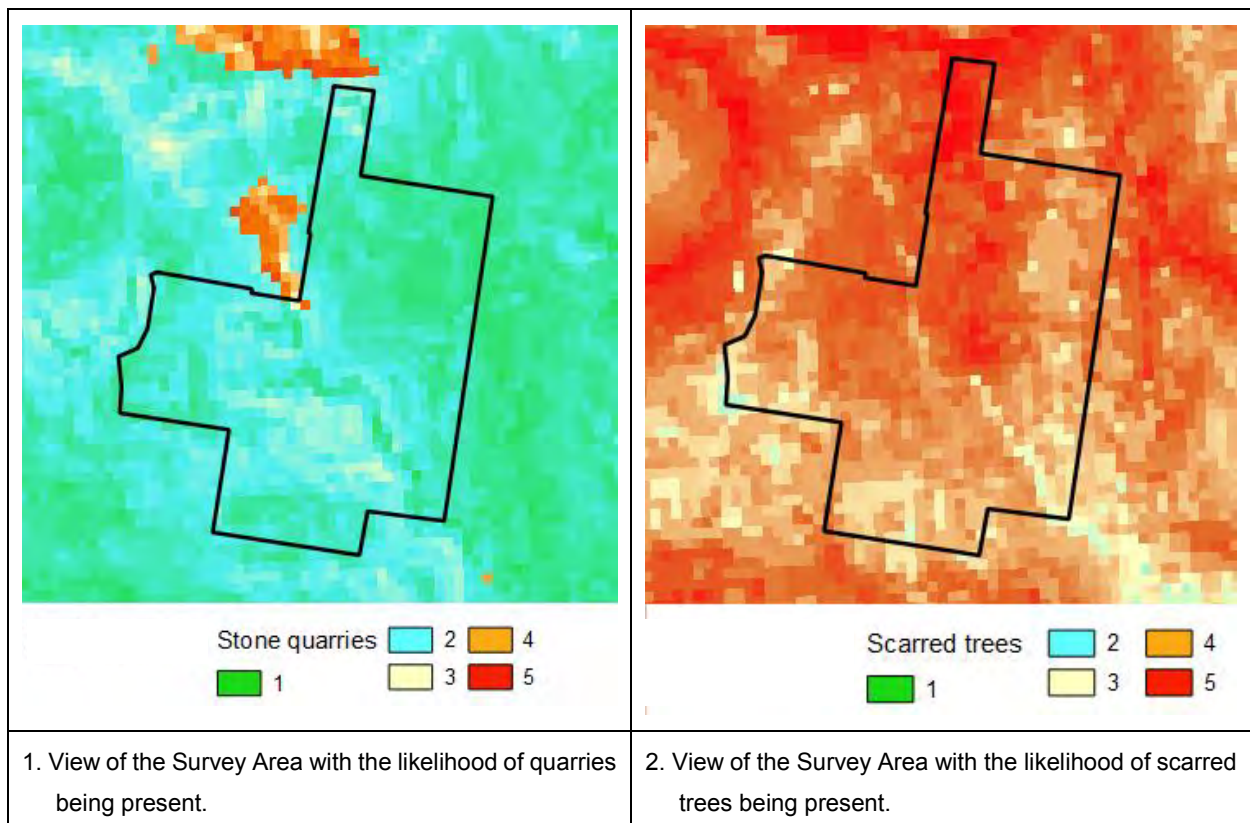
The images shown in **Figure 4-3** show the likelihood that a particular site type could have been present in any one hectare cell. In the figure legend, a low (i.e. 1) reading represents a low likelihood of a particular site being present while a higher reading (i.e. 5) represents a higher likelihood. This ranking is for site likelihood, i.e. 'potential', and can be used on a broad scale only. While most of the models in **Figure 4-3** show that portions of the Survey Area may once have had potential to contain certain Aboriginal sites, **Figure 4-3**: image 7; shows a relatively moderate degree of accumulated impact indicating that many of these sites, had they actually existed in the Survey Area, have been removed or disturbed.

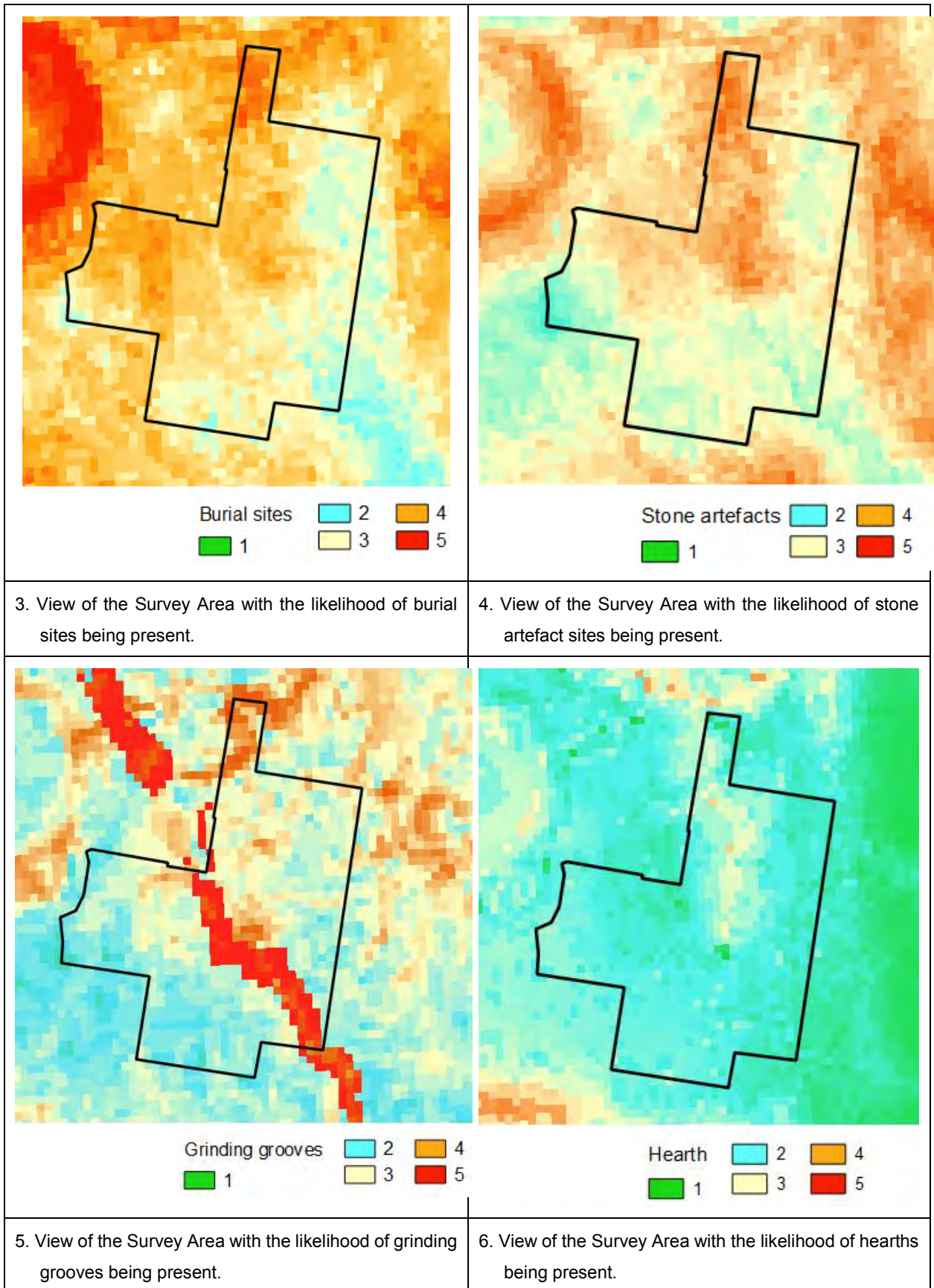
According to the pre-1750 models:

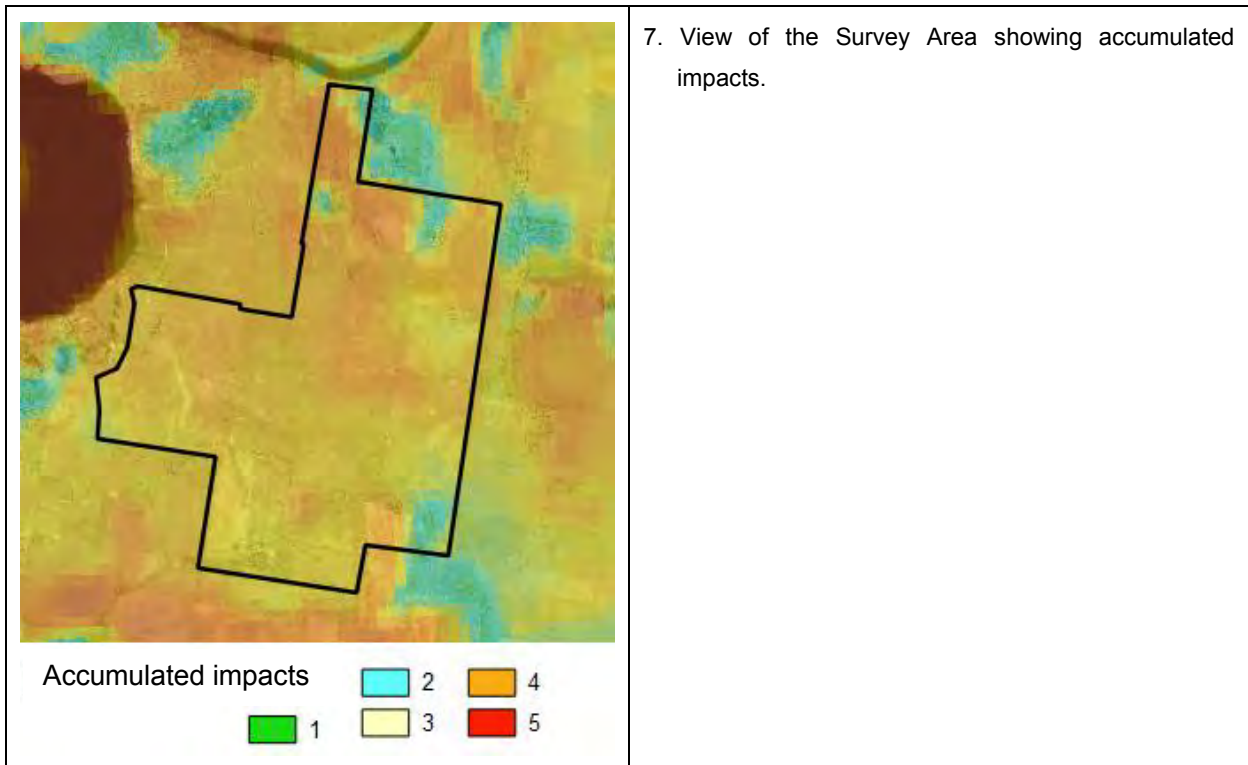
- Stone quarries are more likely to occur in the very northwest of the Survey Area;
- Modified (scarred) trees had potential to be located across the majority of the Survey Area, particularly along the drainage lines but historical vegetation clearing for agricultural practices will have reduced this pre-1750 likelihood;

- Burial sites would have had a greater likelihood of being located to the northwest of the Survey Area closest to the Namoi River. As in the case of scarred trees, however, had this site type once existed, it has probably been impacted by historical land use practices;
- The Survey Area models as an area with moderate potential to contain stone artefact sites. This site type is more associated with the lower gradients of the valley floor rather than the more-steeply sloped landforms and hills in the south. The likelihood of locating this site type is also closely associated with the area's waterways;
- Grinding groove sites would have had a greater likelihood of being located through the central portion of the Survey Area, along a tributary of the Namoi River, should suitable sandstone shelving or outcrops be available; and
- The ASDST accumulated impacts model indicates disturbance throughout the Survey Area probably reflecting the long-term agricultural use of the area.

Figure 4-3. ASDST predictive data of the Survey Area.







Preliminary predictive modelling, based upon numerous archaeological studies in various environmental zones and contexts throughout Australia and the ASDST models shown above, indicates a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural significance. Consequently, sites tend to be found along permanent and ephemeral water sources, along access or trade routes, and in areas that have good flora/fauna resources and appropriate topography (i.e. flat or gently sloping landforms or those providing shelter).

Knowledge of the environmental contexts of the Survey Area and a desktop review of the known local and regional archaeological record, the following predictions are made concerning the probability of those site types being recorded within the Survey Area:

- Isolated finds may be indicative of: random loss or deliberate discard of a single artefact, the remnant of a now dispersed and disturbed artefact scatter, or an otherwise obscured or sub-surface artefact scatter. They may occur anywhere within the landscape but are more likely to occur in topographies where open artefact scatters typically occur.
 - As isolated finds can occur anywhere, particularly within disturbed contexts, it is predicted that this site type could be recorded within the Survey Area.
- Open artefact scatters are defined as two or more artefacts, not located within a rock shelter, and located no more than 50m away from any other constituent artefact. This site type may occur almost anywhere that Aboriginal people have travelled and may be associated with hunting and gathering activities, short or long term camps, and the manufacture and maintenance of stone tools. Artefact scatters typically consist of surface

scatters or sub-surface distributions of flaked stone discarded during the manufacture of tools, but may also include other artefactual rock types such as hearth and anvil stones. Less commonly, artefact scatters may include archaeological stratigraphic features such as hearths and artefact concentrations which relate to activity areas. Artefact density can vary considerably between and across individual sites. Small ground exposures revealing low density scatters may be indicative of background scatter rather than a spatially or temporally distinct artefact assemblage. These sites are classed as 'open', that is, occurring on the land surface unprotected by rock overhangs, and are sometimes referred to as 'open camp sites'.

Artefact scatters are most likely to occur on level or low gradient contexts, along the crests of ridgelines and spurs, and elevated areas fringing watercourses or wetlands. Larger sites may be expected in association with permanent water sources (such as the Namoi River).

Topographies which afford effective through-access across, and relative to, the surrounding landscape, such as the open basal valley slopes and the valleys of creeks, will tend to contain more and larger sites, mostly camp sites evidenced by open artefact scatters.

- Artefact scatters, as well as isolated stone artefacts, are the predominant site types occurring in the region. The expected location of artefact scatters is on eroded exposures most commonly adjacent to creek lines, such as Plain Gully and the Namoi River and its associated tributaries, along flat and lower slope landforms or elevated ridges and crests. This site type is likely to be in a secondary context from disturbances such as erosion, and agricultural practices. It is likely that any sites associated with such landforms are likely to have a low artefact density and a low complexity of tool types as the sites are either one-off events or only infrequently used. Should these site types be present, the artefact assemblage is likely to comprise basalt, sandstone, mudstone, chert, quartz, quartzite, silcrete and andesite. Open camp sites may also contain subsurface archaeological deposits, although given past ground surface disturbances across the Survey Area, deposits are unlikely to be intact.
- Aboriginal scarred trees contain evidence of the removal of bark (and sometimes wood) in the past by Aboriginal people, in the form of a scar. Bark was removed from trees for a wide range of reasons. It was a raw material used in the manufacture of various tools, vessels and commodities such as string, water containers, roofing for shelters, shields and canoes. Bark was also removed as a consequence of gathering food, such as collecting wood boring grubs or creating footholds to climb a tree for possum hunting or bark removal. Due to the multiplicity of uses and the continuous process of occlusion (or healing) following removal, it is difficult to accurately determine the intended purpose for any particular example of bark removal. Scarred trees may occur anywhere old growth trees survive. The identification of scars as Aboriginal cultural heritage items can be problematical because some forms of natural trauma and European bark extraction create similar scars. Many remaining scarred trees probably date to the historic period when bark was removed by Aboriginal people for both their own purposes and for roofing on early European houses. Consequently the distinction between European and Aboriginal scarred trees may not be clear.

- Vegetation within the Survey Area includes remnant box species. These stands of native vegetation include trees of a type, age and size well suited to scar-producing activities. This site type therefore may be encountered and it is also noted that this site type has been recorded locally (**Table 4-2**).
- Hearths/ovens are often used by Aboriginal people for the preparation of food and would generally be located in the vicinity of available resources, such as water sources to procure fish and shellfish, and on elevated ground to avoid impact from environmental threats.
 - This site type is considered possible in areas where A-Horizon soils are relatively undisturbed and could be found in association with larger artefact scatters.
- Grinding grooves include elongated and/or oval-shaped indentations in sandstone outcrops. Aboriginal people made the grooves when they shaped and sharpened stone axes (comprised of volcanic materials) by grinding them against the sandstone. This site type is most likely to occur on flat outcrops of coarse-grained sandstone in the vicinity of water sources.
 - The underlying geology of the Survey Area and the known presence of a grinding groove site along the Namoi River suggest that this site type may occur if suitable outcrops are present.
- Fresh water middens are defined as a concentration of artefactual debris that includes a significant percentage of freshwater shell. They may be the result of an individual's meal or larger interim or base camp activity and are normally situated within riparian zones characterised by relatively permanent water. They may occur in open contexts or in rock shelters. Fresh water middens are rare in the region, but are most likely to occur adjacent to large permanent rivers or their billabongs.
 - There are few topographic features within the Survey Area that could contain this site type and therefore its occurrence is considered to be rare. Elevated landforms adjacent to the Namoi River may include this site.
- Quarry sites and stone procurement sites typically consist of exposures of stone material where evidence for human collection, extraction and/or preliminary processing has survived. Typically these involve the extraction of siliceous or fine grained igneous and meta-sedimentary rock types for the manufacture of artefacts. The presence of quarry/extraction sites is dependent on the availability of suitable rock formations.
 - The local region is known for its abundant lithic sources and quarries (Niche 2013). As such, this site type could be recorded within the Survey Area should suitable rock outcroppings be available.
- Burials are generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts. Burials are also known to have occurred on rocky hilltops in some limited areas. Burials are generally only visible where there has been some disturbance of sub-surface sediments or where some erosional process has exposed them.

- A small percentage of the Survey Area is adjacent to the Namoi River and it is possible that burial sites may be present in this area should soft, sandy soils be present in well-drained areas. It is possible but less likely that burials may be present along the Namoi River. Although it is possible that this site type could be found within the Survey Area, it is considered a rare site type especially given the disturbance that has occurred.
- Bora/Ceremonial sites are places which have ceremonial or spiritual connections. Ceremonial sites may comprise of natural landscapes or have archaeological material. Bora sites are ceremonial sites which consist of a cleared area and earthen rings.
 - This site type does not necessarily follow landform predictability and are, overall, a rare site type with a low likelihood of being present and remaining extant.

5 RESULTS OF ABORIGINAL ARCHAEOLOGICAL ASSESSMENT

5.1 SAMPLING STRATEGY AND FIELD METHODS

The archaeological methods utilised in the Aboriginal archaeological assessment followed the *Code of Practice* and the proposed methodology (**Appendix 1**). Standard archaeological field survey and recording methods were employed in this survey (Burke & Smith 2004). The entirety of the Survey Area was assessed by pedestrian transects. Greater survey effort was expended on landforms deemed to have greater Aboriginal archaeological potential. 'Full pedestrian survey' refers to systematic transects walked by surveyors spaced approximately 10m apart throughout the landform or area being surveyed. 'Targeted pedestrian survey' refers to transects walked by surveyors spaced approximately 10m apart that do not cover the entire landform or area.

The field assessment included:

- Full pedestrian survey of all four proposed farm locations;
- Full pedestrian survey in areas with minimal disturbance and good GSV within landforms possessing Aboriginal archaeological potential. A focus of the survey included: raised areas adjacent to the Namoi River; areas within 200m of the Namoi River; areas within 200m of other watercourses (e.g. Rushes Creek, Plain Gully and Milliwinah Gully); and the flat or gently sloping crests and benches of all ridges, spurs and hills;
- Targeted pedestrian survey occurred in all other areas – i.e. areas more than 200m from watercourses; areas with poor GSV; landforms with low archaeological potential; and areas with significant prior disturbance;
- All mature, native trees impacted by the Development and with the potential to contain Aboriginal scarring were inspected;
- AHIMS site 20-5-0091 (Ski Gardens Road Manila; modified tree) was located and assessed; and
- Some areas not physically assessed when deemed by the RAPs and OzArk that they were too disturbed, or possessed a very low likelihood of sites.

Representatives of the RAPs assisted the archaeologists by placing flags at artefacts and/or alerting the archaeologists that an artefact had been found. A located site was then more closely examined and all artefacts observed on the surface were flagged. For newly recorded sites, all artefacts and features were located with a GPS (global positioning system).

Sites were recorded with digital photography and by GPS units loaded with Mobile Mapper software and were described on field recording sheets. General notes pertaining to the survey and ground covered by the archaeologists were kept as well.

Figure 5-1 illustrates pedestrian coverage of the Survey Area. It should be noted that the below figure only displays transects of two surveyors although the Survey Area was assessed by four surveyors each day.

Figure 5-1. The Survey Area showing pedestrian transects.



5.2 DEVELOPMENT CONSTRAINTS

There were no significant constraints in completing the archaeological assessment. GSV posed the greatest constraint during field inspection (**Section 5.3**), however, not to the extent that the efficacy of the survey was unduly diminished.

5.3 EFFECTIVE SURVEY COVERAGE

Two of the key factors influencing the effectiveness of archaeological survey are GSV and ground surface exposure (GSE). These factors are quantified in order to ensure that the survey data provides adequate evidence for the evaluation of the archaeological materials across the landscape. For the purposes of the current assessment, these terms are used in accordance with the definitions provided in the *Code of Practice* (DECCW 2010a).

GSV is defined as:

... the amount of bare ground (or visibility) on the exposures which might reveal artefacts or other archaeological materials. It is important to note that visibility, on its own, is not a reliable indicator of the detectability of buried archaeological material. Things like vegetation, plant or leaf litter, loose sand, stone ground or introduced materials will affect the visibility. Put another way, visibility refers to 'what conceals' (DECCW 2010b: 39).

GSE is defined as:

... different to visibility because it estimates the area with a likelihood of revealing buried artefacts or deposits rather than just being an observation of the amount of bare ground. It is the percentage of land for which erosion and exposure was sufficient to reveal archaeological evidence on the surface of the ground. Put another way, exposure refers to 'what reveals' (DECCW 2010b: 37).

These factors are quantified in order to ensure that the survey data provides adequate evidence for the evaluation of the archaeological materials across the Survey Area. For the purposes of the current assessment, these terms are used in accordance with the definitions provided in the *Code of Practice* (DECCW 2010a).

Tables 5-1 and **5-2** present the effective survey coverage within the Survey Area in more detail.

The effective survey coverage over the Survey Area was variable; mostly either due to GSE incidence or the amount of ground surface visibility away from exposures. **Table 5-1** and **Table 5-2** indicate the most effectively surveyed landform was the flat areas surrounding drainages (24%). This landform, being adjacent to water, has the greatest archaeological potential and survey efficacy was high due to erosion scalds along the banks of watercourses. This landform unit also recorded the highest number of sites (**Table 5-2** and **Figure 5-2**) demonstrating the higher archaeological potential of this landform type, as well as the greater

survey efficacy. GSV was lower on ridge, upper slope, mid-slope and lower slope landforms within the Survey Area, averaging 60-65%, due to thick grass cover. Exposures within these landforms were afforded by existing access tracks, mounds and fence lines. While GSV did not allow a full investigation of the ground surface in these landform types, there were sufficient exposures to allow the archaeological potential of the landform to be assessed.

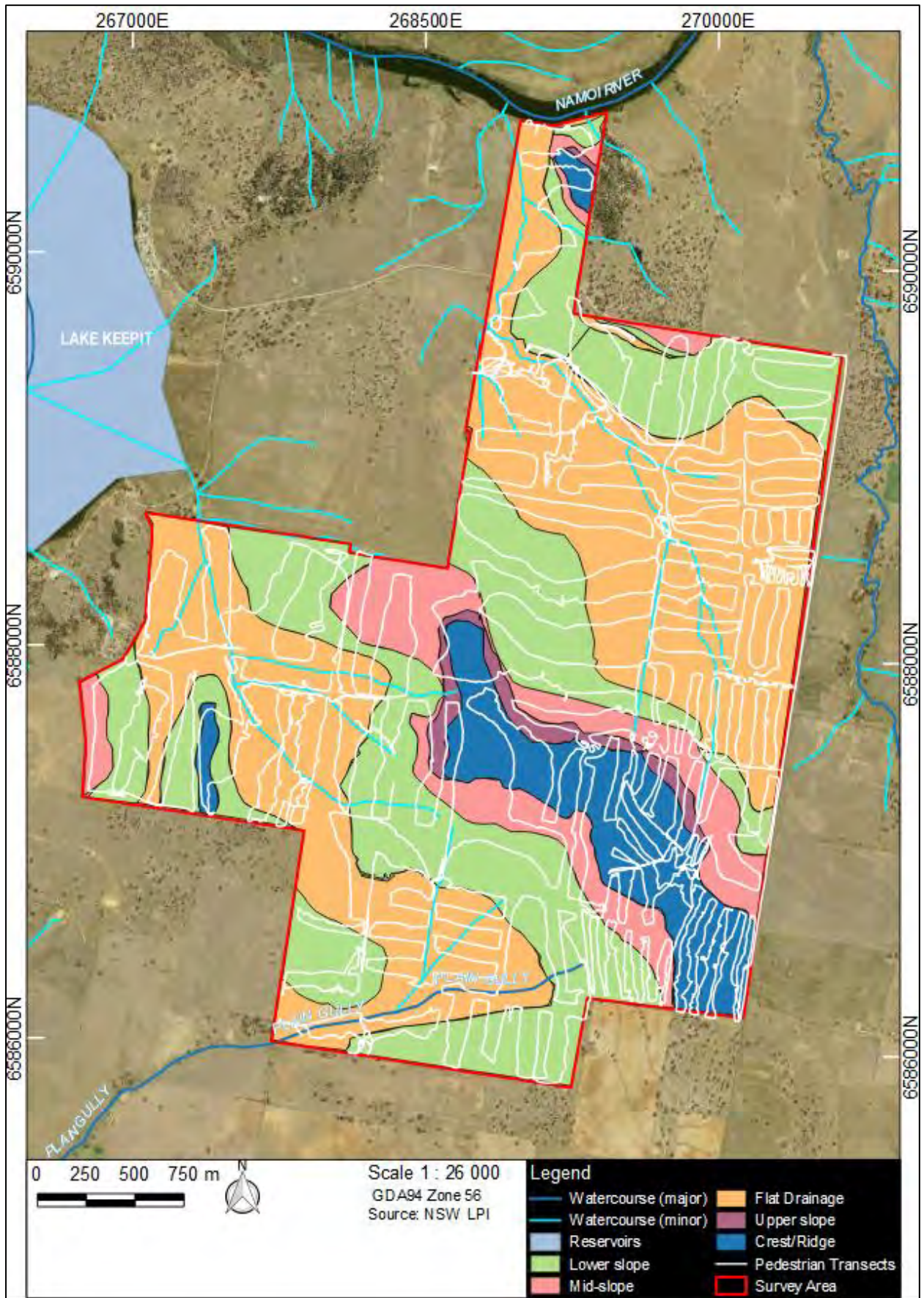
Table 5-1: Survey coverage data.

Survey Unit	Landform	Survey Unit Area (sq m)	Visibility %	Exposure %	Effective Coverage Area (sq m) (= Survey Unit Area x Visibility % x Exposure %)	Effective Coverage % (= Effective Coverage Area / Survey Unit Area x 100)
1	Crest / Ridge	1 058 000	60	15	9 522	9%
2	Upper slope	656 000	65	5	21 320	3.25%
3	Mid-slope	1 132 000	60	10	147 160	13%
4	Lower slope	3 461 000	65	20	449 930	13%
5	Flat / Drainage	3 774 000	80	30	905 760	24%

Table 5-2: Landform summary—sampled areas.

Landform	Landform area (sq m)	Area Effectively Surveyed (sq m) (= Effective Coverage Area)	% of Landform Effectively Surveyed (= Area Effectively Surveyed / Landform x 100)	Number of Sites
Crest / Ridge	1 058 000	9 522	9%	1
Upper slope	656 000	21 320	3.25%	0
Mid-slope	1 132 000	147 160	13%	0
Lower slope	3 461 000	449 930	13%	12
Flat / Drainage	3 774 000	905 760	24%	22

Figure 5-2. The Survey Area showing pedestrian transects and landforms.



5.4 ABORIGINAL SITES RECORDED

A total of 35 previously unrecorded Aboriginal sites were recorded during the field survey of the Survey Area. Recorded Aboriginal sites include 17 isolated finds (Happy Hills-IF1 to Happy Hills-IF4 and Bondah-IF1 to Bondah-IF13); 14 artefact scatters (Happy Hills-OS1 to Happy Hills-OS3 and Bondah-OS1 to Bondah-OS11); one hearth (Bondah-H1); and three scarred trees (Happy Hills-ST1 to Happy Hills-ST3). The sites recorded during the survey are summarised in **Table 5-3** and described in the following sections and their locations are shown in **Figure 5-3**.

Table 5-3: Survey results.

Site Name	Feature(s)	Survey Unit	Landform
Happy Hills-IF1	Isolated find	4	Lower slope
Happy Hills-IF2	Isolated find	5	Flat/drainage
Happy Hills-IF3	Isolated find	4	Lower slope
Happy Hills-IF4	Isolated find	5	Flat/drainage
Bondah-IF1	Isolated find	5	Flat/drainage
Bondah-IF2	Isolated find	5	Flat/drainage
Bondah-IF3	Isolated find	4	Lower slope
Bondah-IF4	Isolated find	5	Flat/drainage
Bondah-IF5	Isolated find	5	Flat/drainage
Bondah-IF6	Isolated find	5	Flat/drainage
Bondah-IF7	Isolated find	5	Flat/drainage
Bondah-IF8	Isolated find	4	Lower slope
Bondah-IF9	Isolated find	5	Flat/drainage
Bondah-IF10	Isolated find	5	Flat/drainage
Bondah-IF11	Isolated find	5	Flat/drainage
Bondah-IF12	Isolated find	1	Crest/ridge
Bondah-IF13	Isolated find	5	Flat/drainage
Happy Hills-OS1	Artefact scatter	4	Lower slope
Happy Hills-OS2	Artefact scatter	4	Lower slope
Happy Hills-OS3	Artefact scatter	5	Flat/drainage
Bondah-OS1	Artefact scatter	4	Lower slope
Bondah-OS2	Artefact scatter	5	Flat/drainage
Bondah-OS3	Artefact scatter with PAD	5	Flat/drainage
Bondah-OS4	Artefact scatter	5	Flat/drainage
Bondah-OS5	Artefact scatter	5	Flat/drainage
Bondah-OS6	Artefact scatter	5	Flat/drainage
Bondah-OS7	Artefact scatter	5	Flat/drainage
Bondah-OS8	Artefact scatter	5	Flat/drainage
Bondah-OS9	Artefact scatter	5	Flat/drainage
Bondah-OS10	Artefact scatter	4	Lower slope
Bondah-OS11	Artefact scatter	4	Lower slope
Bondah-H1	Hearth	5	Flat/drainage
Happy Hills-ST1	Scarred tree	4	Lower slope
Happy Hills-ST2	Scarred tree	4	Lower slope

Site Name	Feature(s)	Survey Unit	Landform
Happy Hills-ST3	Scarred tree	4	Lower slope

Figure 5-3: Location of the recorded sites in relation to landform.

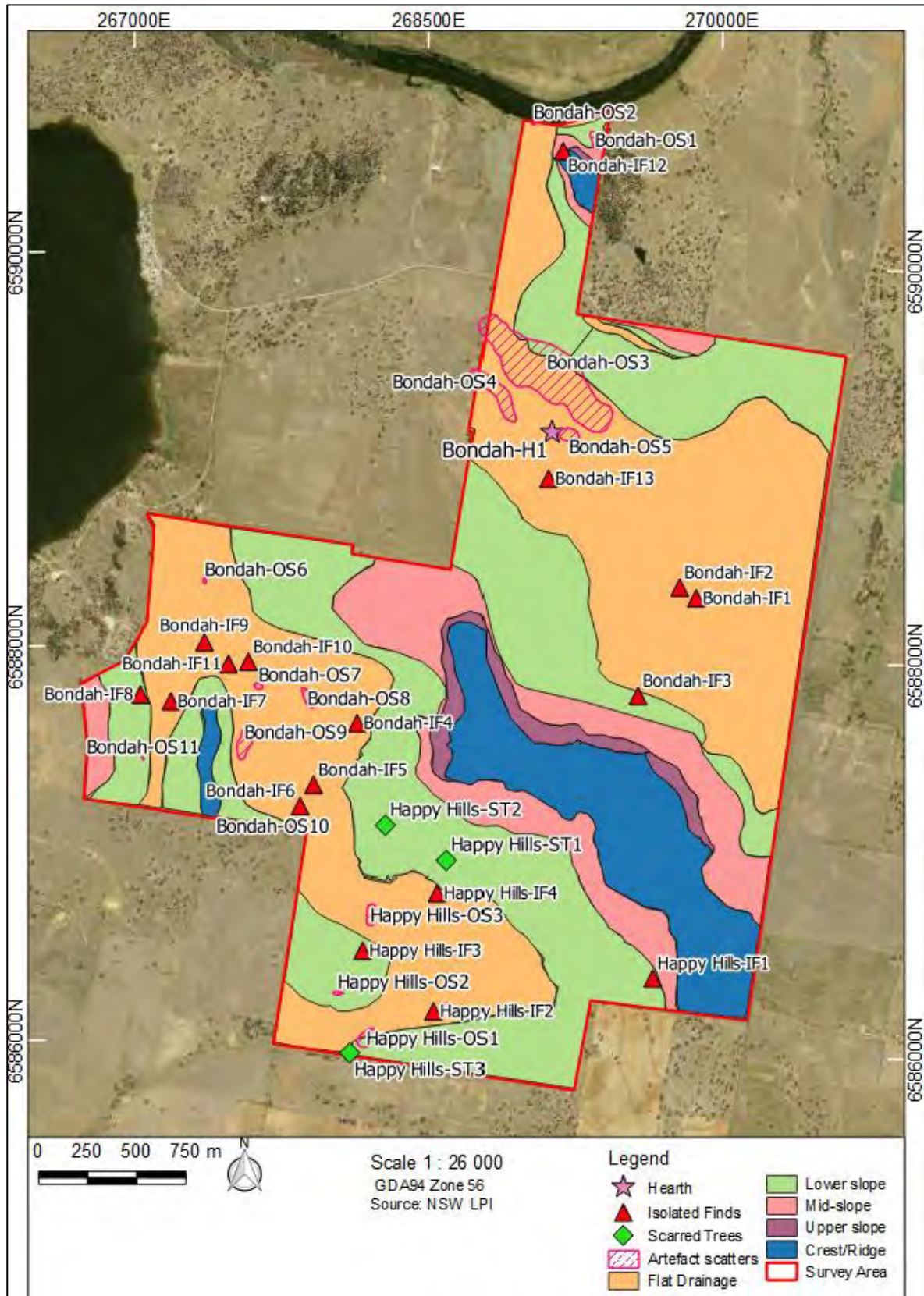
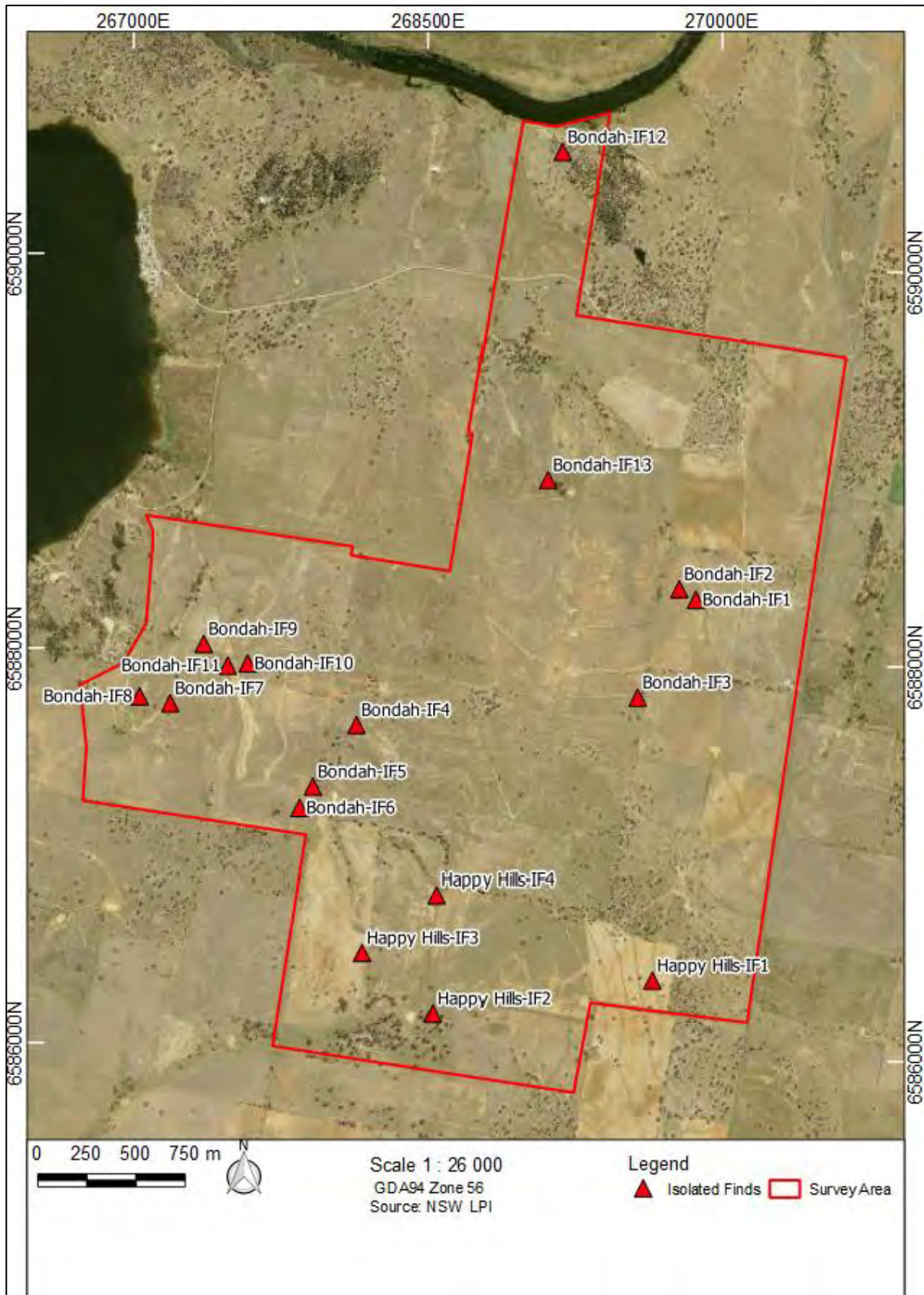


Figure 5-4: Location of the recorded isolated finds within the Survey Area.



Happy Hills-IF1

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269741E 6586383N

Location of Site: Happy Hills agricultural property, approximately 512m southwest of the Happy Hills main entrance gates on Rushes Creek Road, 402m south southwest of the more recent Happy Hills homestead and 144m north of the Happy Hills southern boundary (**Figure 5-4**).

Description of Site: Happy Hills-IF1 consists of an isolated, broken blade. The blade is a medial fragment which has been manufactured from a volcanic material (**Figure 5-5** and **Table 5-4**). The site comprises a large exposure on an eroding contour bank in a lower slope landform. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-5: Happy Hills-IF1. View of site and recorded artefact.

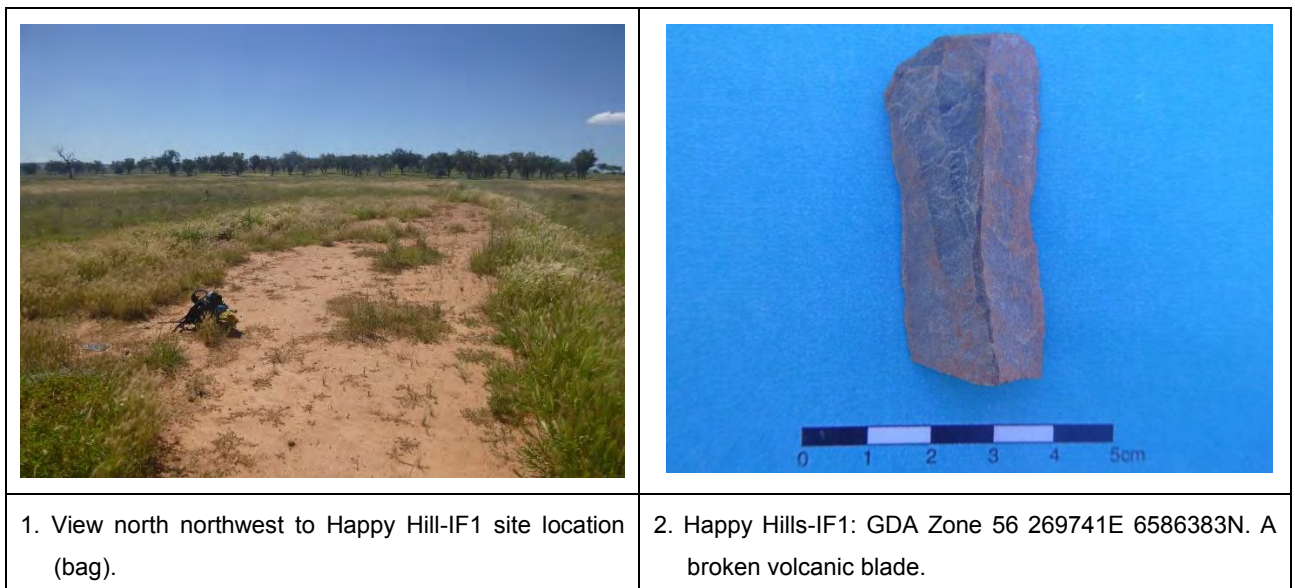


Table 5-4: Happy Hills-IF1. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Blade	Volcanic	Medial fragment	Tertiary	6cm

Happy Hills-IF2

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 268635E 6586196N

Location of Site: The site is situated within the Happy Hills agricultural property, approximately 60m south of Plain Creek and 120m west of a property dam, within the southern portion of the Happy Hills property boundary (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufacture from a fine-grained siliceous material. The site area comprised an open ground exposures in the vicinity of an existing dam (**Figure 5-6** and **Table 5-5**). The site is considered to be within a highly disturbed context subject to previously vegetation and ground clearing, grazing, inundation and general farming practices. Therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-6: Happy Hills-IF2. View of site and recorded artefact.

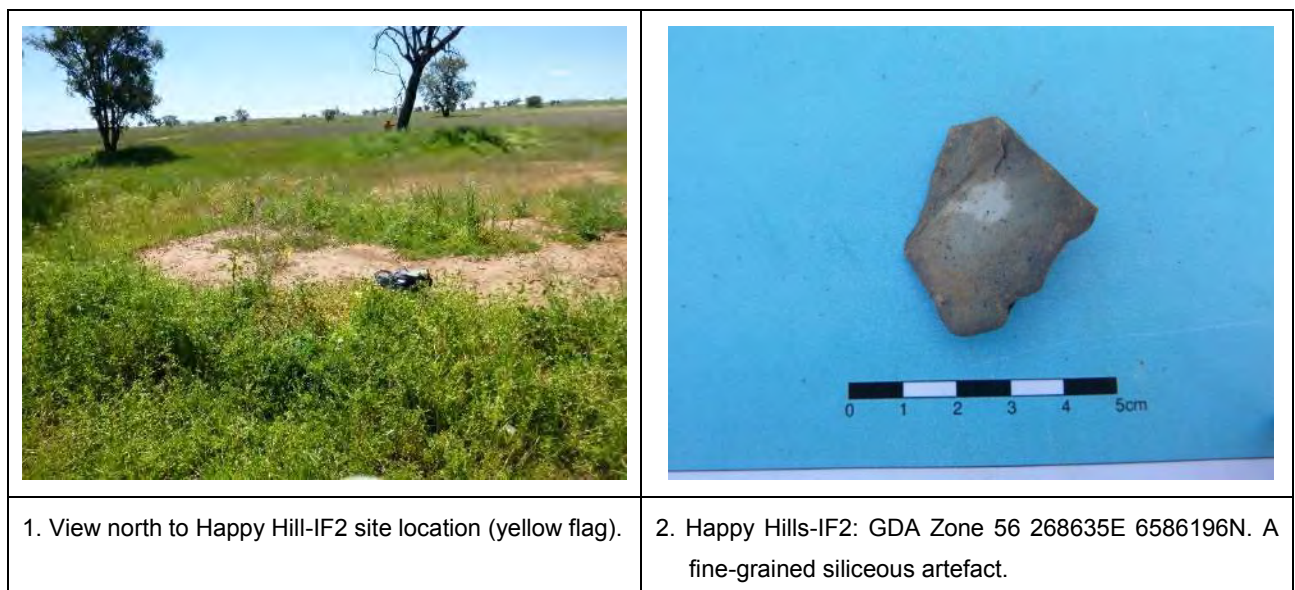


Table 5-5: Happy Hills-IF2. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Complete	Secondary	4cm

Happy Hills-IF3

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 268267E 6586496N

Location of Site: The site is situated within the Happy Hills agricultural property, within a cleared and previously cropped paddock. The site is just west of the property fence and south of a contour bank (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufactured from a volcanic material. The site area is on a gentle lower slope exposure, associated with the adjacent contour bank (**Figure 5-7** and **Table 5-6**). The site is situated within a disturbed context that has been subject to previous vegetation clearing, agricultural and grazing activities, contour bank construction and erosion. Therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-7: Happy Hills-IF3. View of site and recorded artefact.

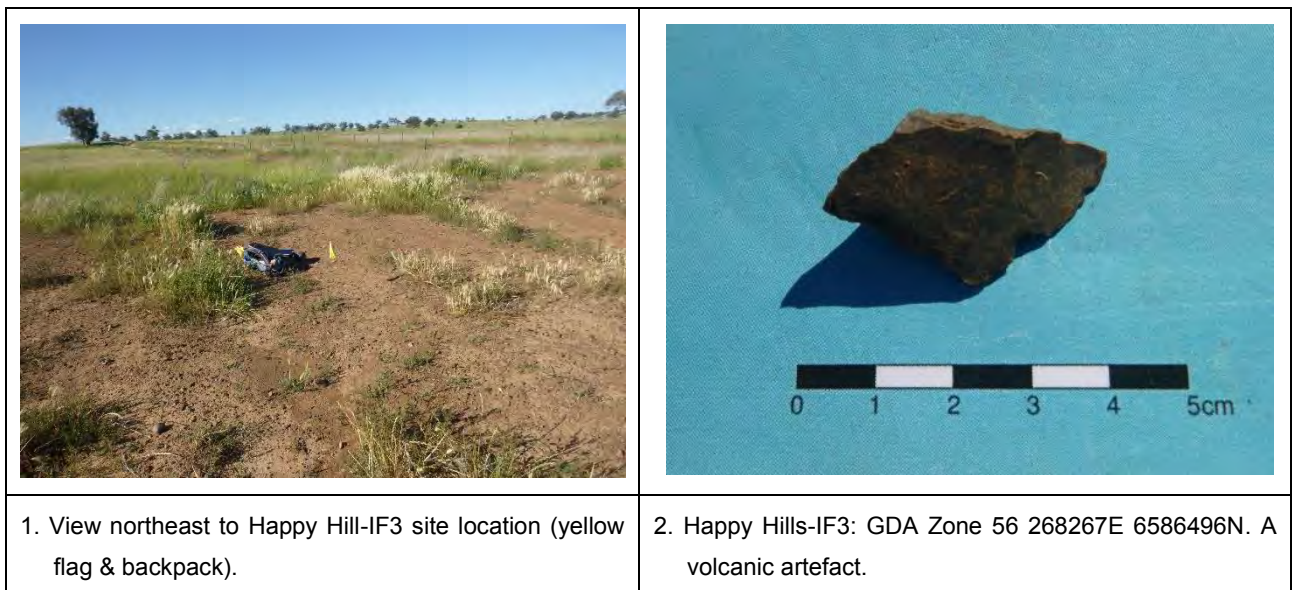


Table 5-6: Happy Hills-IF3. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Volcanic	Distal fragment	Tertiary	3.5cm

Happy Hills-IF4

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 268641E 6586796N

Location of Site: The site is situated within the Happy Hills agricultural property, nearby and south of the northern property boundary, adjacent to a cleared and densely grassed reserve corridor (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufacture from a fine-grained siliceous material. The site area comprised an open exposed access track which merges further to the northwest with a contour bank (**Figure 5-8** and **Table 4-7**). The site is situated within a disturbed context that has been subject to previous vegetation clearing, fencing, track formation and contour bank construction, grazing, cultivation and active erosion. Therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-8: Happy Hills-IF4. View of site and recorded artefact.

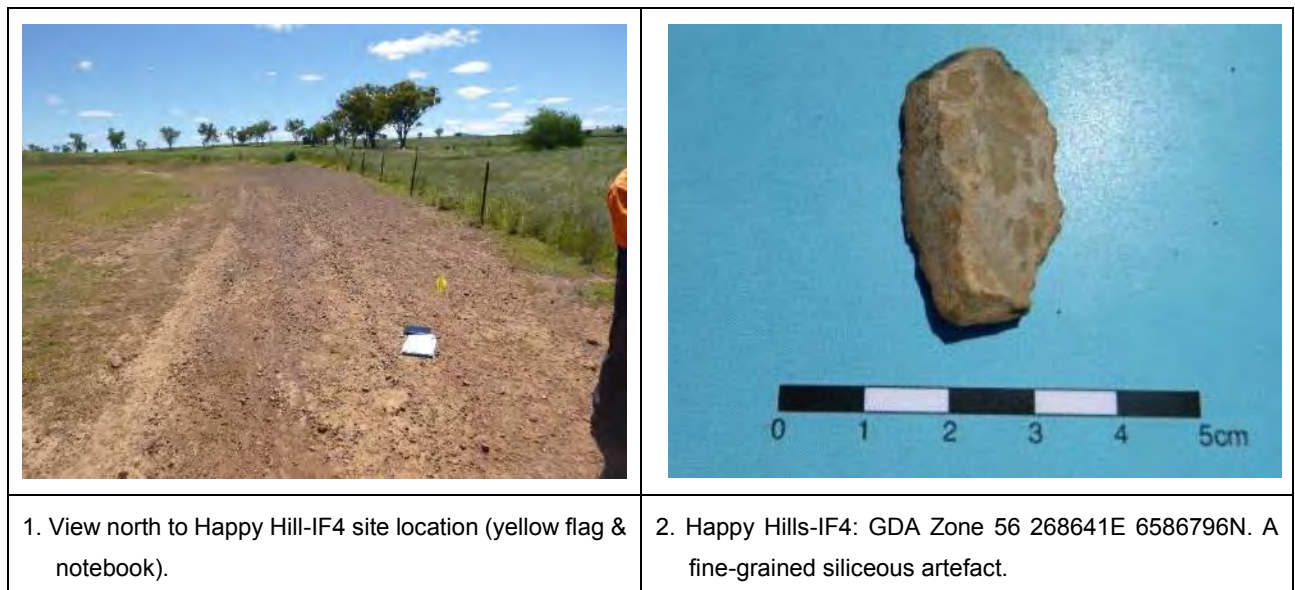


Table 5-7: Happy Hills-IF4. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Complete	Tertiary	3.5cm

Bondah-IF1

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269923E 6588309N

Location of Site: Bondah agricultural property, approximately 630m south west of the Bondah main entrance gates on Rushes Creek Road, 490m southwest of the Bondah homestead, 360m southwest of the Bondah infrastructure complex, 180m north of a dam and 12m west of a drainage feature (**Figure 5-4**).

Description of Site: Bondah-IF1 consists of an isolated, proximal flake fragment. The flake has been manufactured from a volcanic material and comprises no cortex (**Figure 5-9** and **Table 5-8**). The site comprises a large exposure on an eroding contour bank. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-9: Bondah-IF1. View of site and recorded artefact.

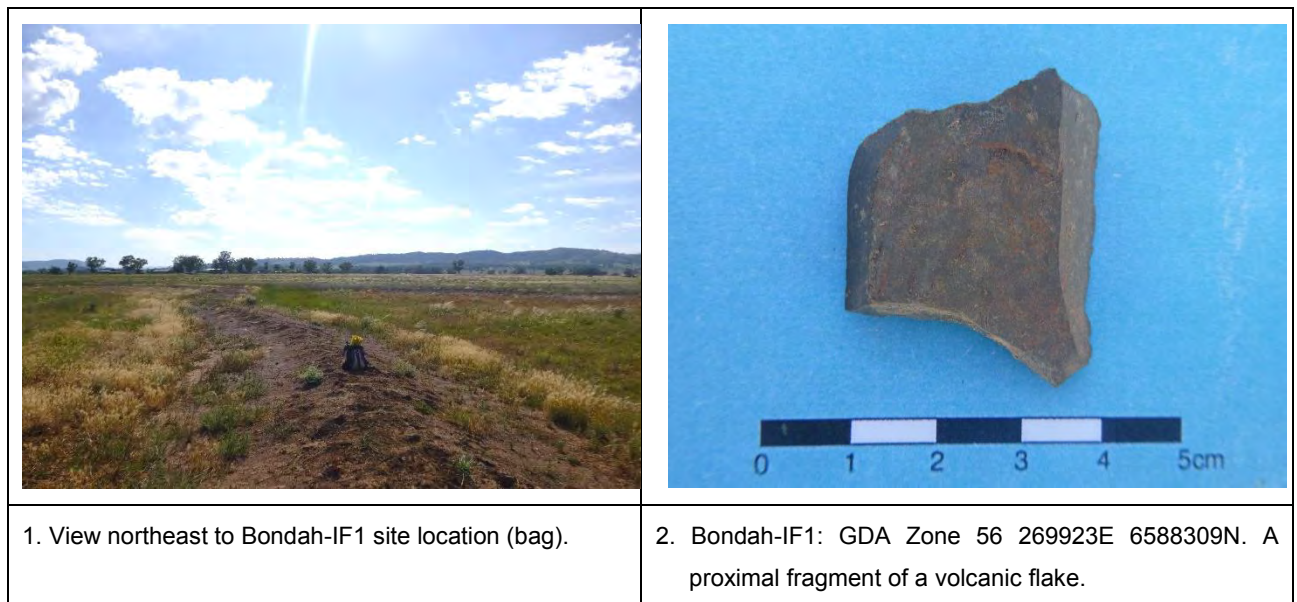


Table 5-8: Bondah-IF1. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Volcanic	Proximal fragment	Tertiary	4cm

Bondah-IF2

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269837E 6588361N

Location of Site: Bondah agricultural property, approximately 722m west southwest of the Bondah main entrance gates on Rushes Creek Road, 568m southwest of the Bondah homestead, 442m southwest of the Bondah infrastructure complex, 233m northwest of a dam (**Figure 5-4**).

Description of Site: Bondah-IF2 consists of a complete, fine-grained siliceous flake with no cortex (**Table 5-9**). The site comprises a small exposure along a generally flat landform in a previously ploughed paddock (**Figure 5-10**). The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-10: Bondah-IF2. View of site and recorded artefact.

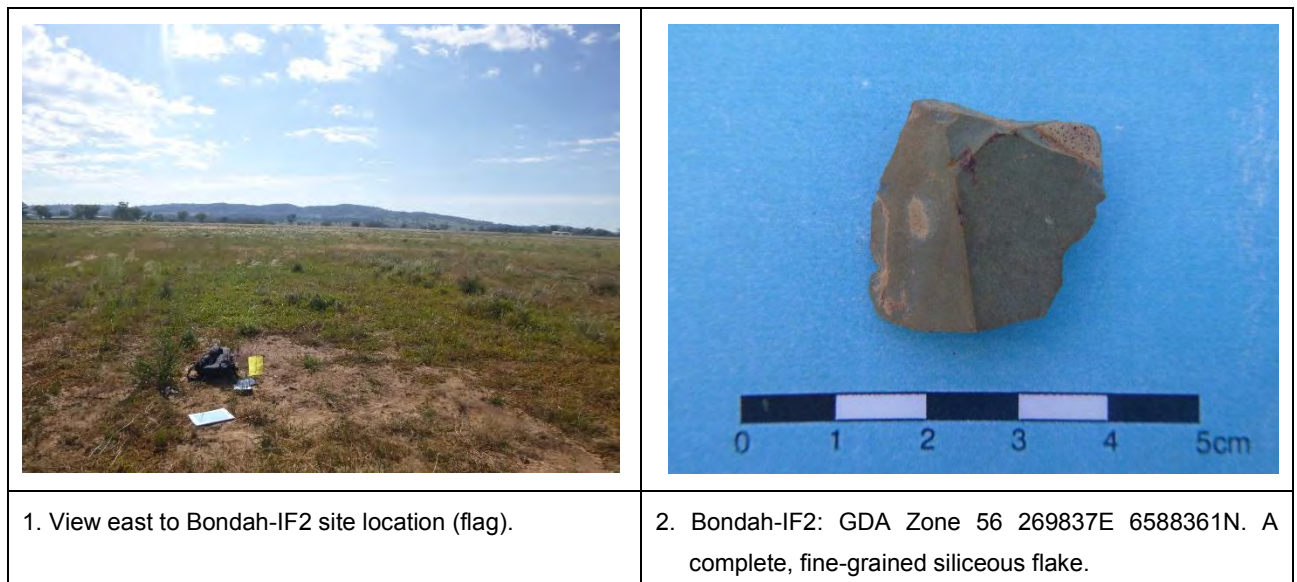


Table 5-9: Bondah-IF2. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Complete	Tertiary	2.5cm

Bondah-IF3

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269641E 6587816N

Location of Site: Bondah agricultural property, approximately 1.1km south west of the Bondah main entrance gates on Rushes Creek Road, 1km southwest of the Bondah homestead, 933m southwest of the Bondah infrastructure complex, 330m southeast of a dam and 25m west of a drainage feature (**Figure 5-4**).

Description of Site: Bondah-IF3 consists of a complete, mudstone flake with no cortex (**Table 5-10**). The site comprises a large exposure on an eroding contour bank (**Figure 5-11**). The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-11: Bondah-IF3. View of site and recorded artefact.

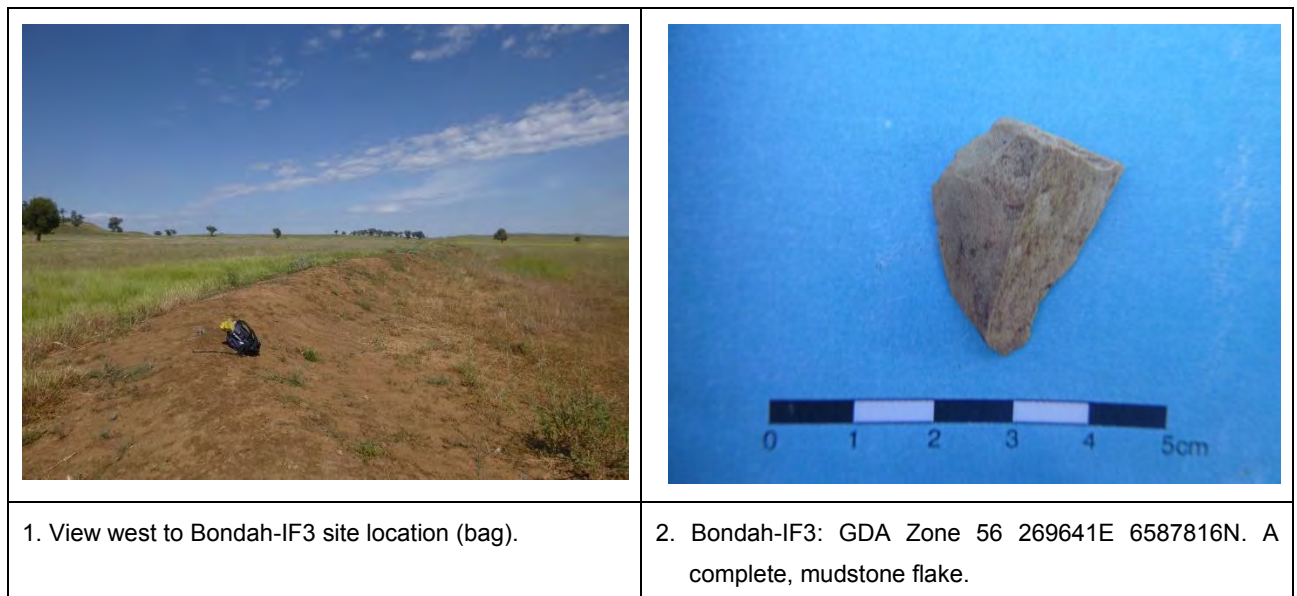


Table 5-10: Bondah-IF3. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Mudstone	Complete	Tertiary	3cm

Bondah-IF4

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 268212E 6587644N

Location of Site: Bondah agricultural property, approximately 2.5km south west of the Bondah main entrance gates on Rushes Creek Road, 2.3km southwest of the Bondah homestead, 2.2km southwest of the Bondah infrastructure complex, 223m southwest of a dam and 10m north of a drainage feature (**Figure 5-4**).

Description of Site: Bondah-IF4 consists of a flaked piece of chert with no cortex (**Table 5-11**). The site comprises a large eroding exposure along a drainage feature of the Namoi River (**Figure 5-12**). GSV within the exposure averaged 50% with small fragments of schist present throughout from the outcropping bedrock. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-12: Bondah-IF4. View of site and recorded artefact.

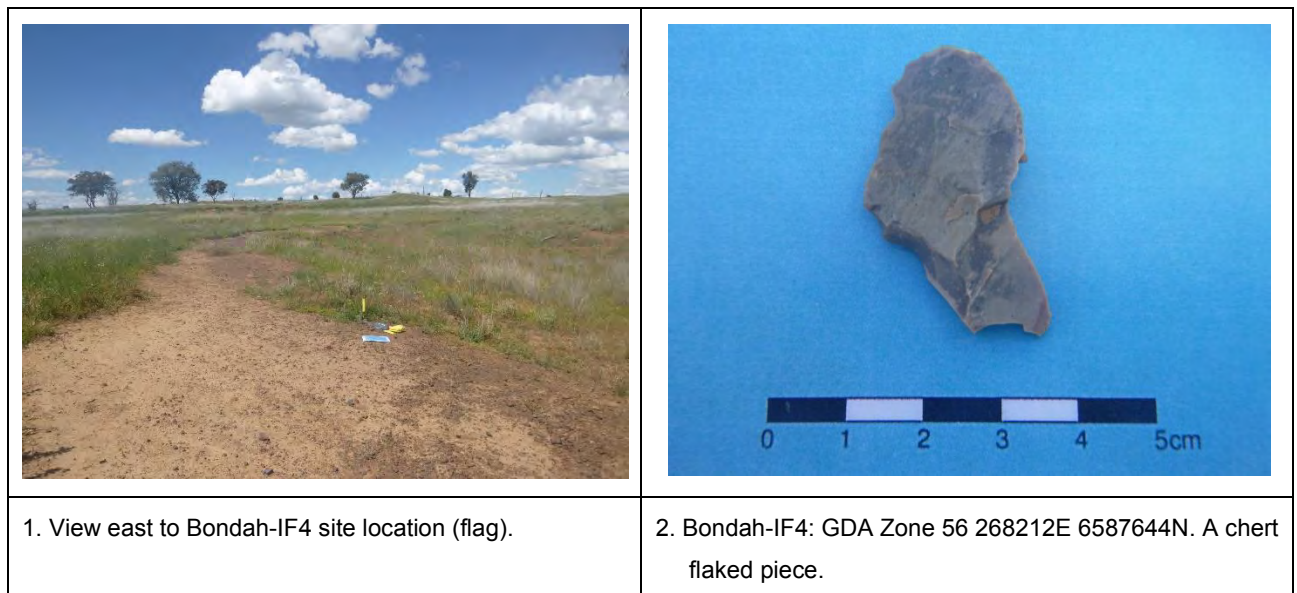


Table 5-11: Bondah-IF4. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flaked piece	Chert	N/A	Tertiary	4cm

Bondah-IF5

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267996E 6587325N

Location of Site: Bondah agricultural property, approximately 2.8km southwest of the Bondah main entrance gates on Rushes Creek Road, 2.6km southwest of the Bondah homestead, 2.5km southwest of the Bondah infrastructure complex, 29m southeast of a dam and along a drainage feature of the Namoi River (**Figure 5-4**).

Description of Site: Bondah-IF5 consists of an isolated mudstone flake which is complete and is without cortex (**Figure 5-13** and **Table 5-12**). The site comprises a large exposure along a drainage feature of the Namoi River. GSV within the exposure averaged 30% with small fragments of schist present throughout from the outcropping bedrock. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-13: Bondah-IF5. View of site and recorded artefact.

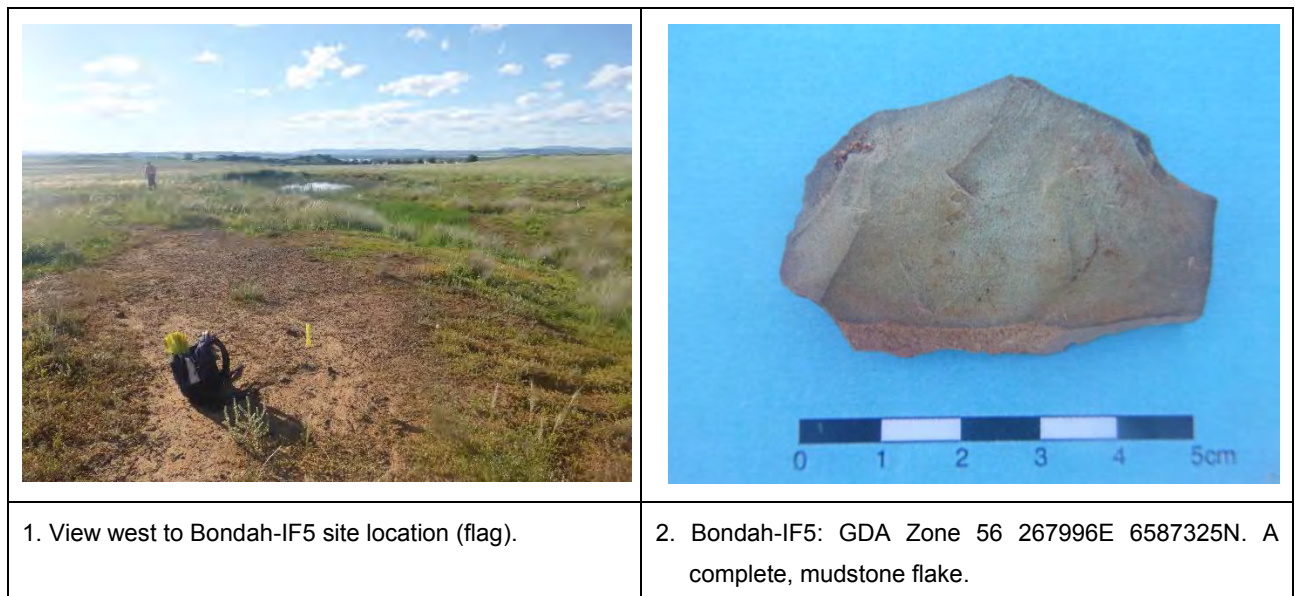


Table 5-12: Bondah-IF5. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Mudstone	Complete	Tertiary	5.5cm

Bondah-IF6

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267931E 6587218N

Location of Site: Bondah agricultural property, approximately 2.9km southwest of the Bondah main entrance gates on Rushes Creek Road, 2.7km southwest of the Bondah homestead, 2.6km southwest of the Bondah infrastructure complex, 145m south of a dam and along a drainage feature of the Namoi River (**Figure 5-4**).

Description of Site: Bondah-IF6 consists of an isolated chert flake which is complete and has partial cortex (**Figure 5-14** and **Table 5-13**). The site is located within a moderately sized exposure surrounded by larger areas of exposure which have eroded along a drainage feature. GSV within the exposure averaged 30% with small fragments of schist present throughout from the outcropping bedrock. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-14: Bondah-IF6. View of site and recorded artefact.

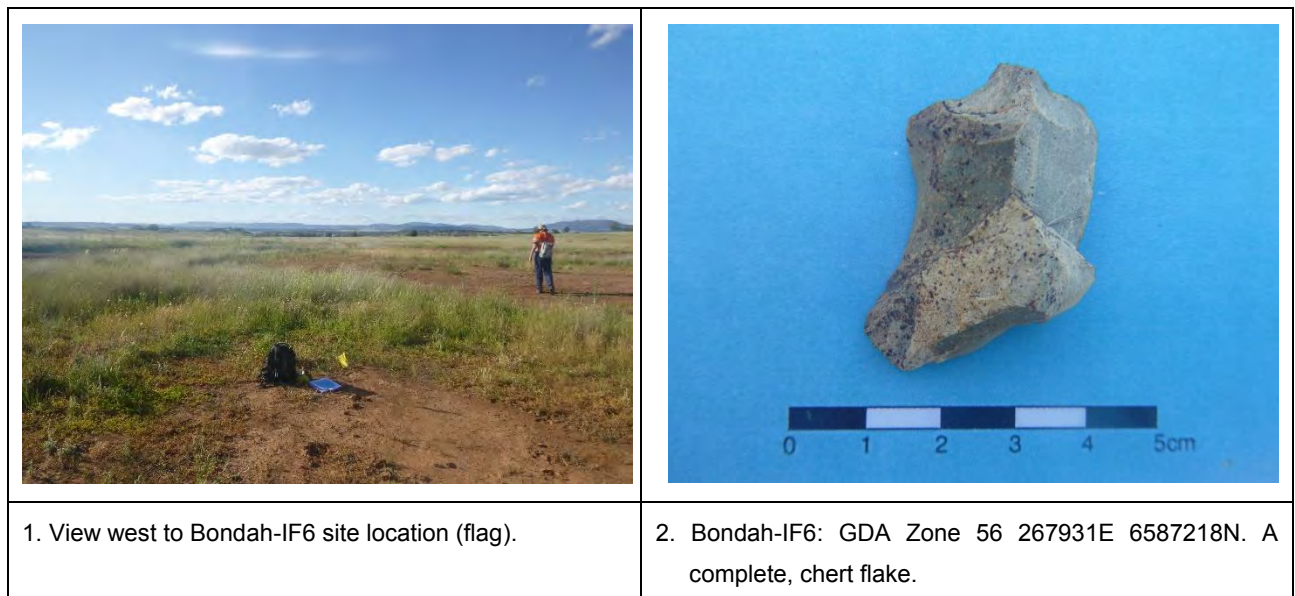


Table 5-13: Bondah-IF6. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Chert	Complete	Secondary	4.5cm

Bondah-IF7

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267260E 6587726N

Location of Site: Bondah agricultural property, approximately 3.3km southwest of the Bondah main entrance gates on Rushes Creek Road, 3.2km southwest of the Bondah homestead, 3.1km southwest of the Bondah infrastructure complex, 1km southeast of the Namoi River and 216m northwest of a dam (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufactured from chert. The artefact has 10% cortex on the platform surface (**Table 5-14**). The site area comprised an exposed contour bank within a predominantly cleared paddock surrounded by isolated mature trees (**Figure 5-15**). The site is situated within a disturbed context, on the surface of a contour bank, within a paddock that has been subject to previous vegetation clearing and cultivation, livestock grazing, contour bank construction, and active erosion; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-15: Bondah-IF7. View of site and recorded artefact.

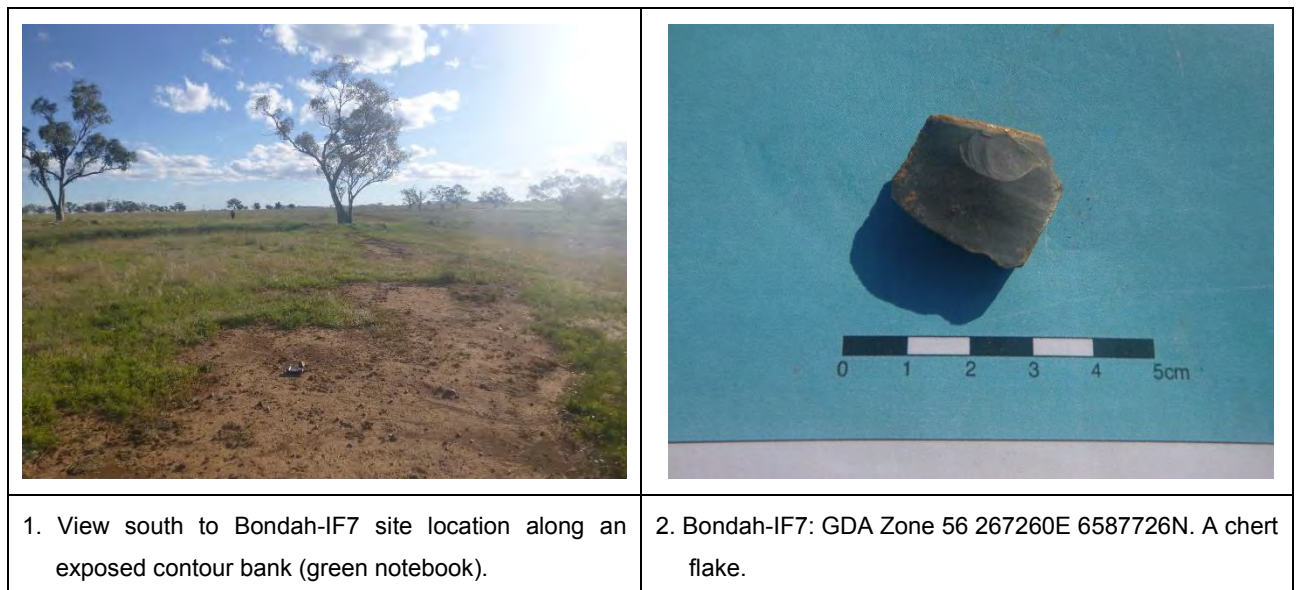


Table 5-14: Bondah-IF7. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Chert	Complete	Secondary	2.5cm

Bondah-IF8

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267098E 6587759N

Location of Site: Bondah agricultural property, approximately 3.5km southwest of the Bondah main entrance gates on Rushes Creek Road, 3.3km southwest of the Bondah homestead, 3.2km southwest of the Bondah infrastructure complex, 900m southeast of the Namoi River and 94m northeast of a dam (**Figure 5-4**).

Description of Site: The site identified one artefact manufactured from basalt (**Table 5-15**). The site area comprised an open elongated exposure, to the northeast of a property dam (**Figure 5-16**). The site is situated within a disturbed context that has been subject to previous vegetation clearing and cultivation, livestock grazing, and active erosion; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-16: Bondah-IF8. View of site and recorded artefact.

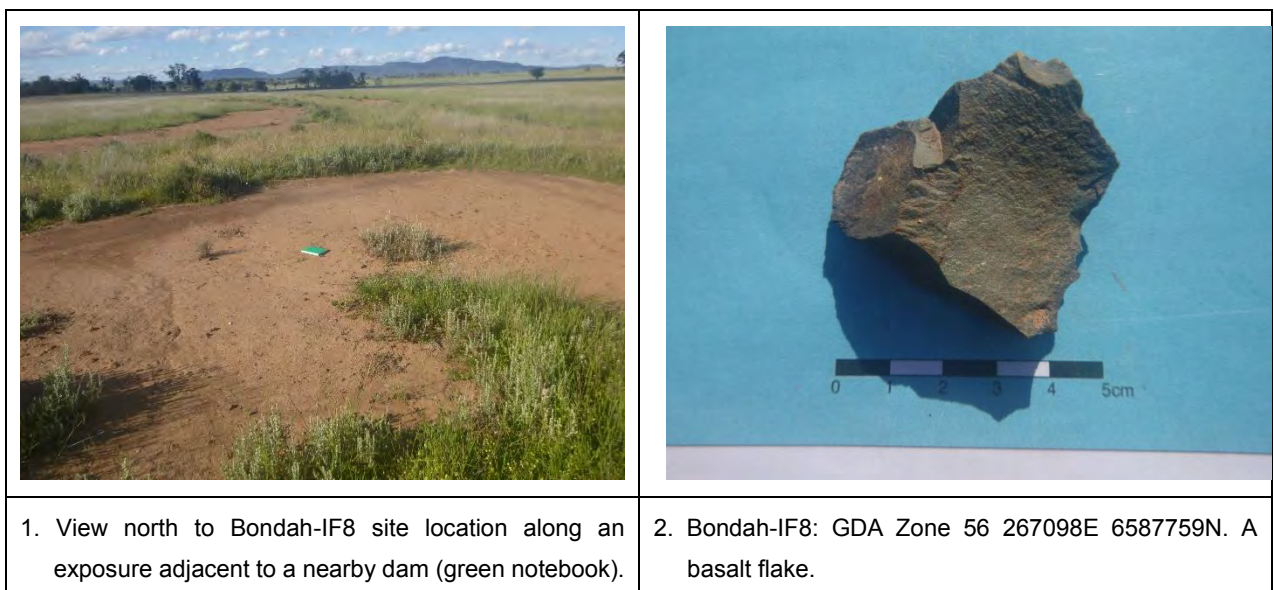


Table 5-15: Bondah-IF8. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Basalt	Distal fragment	Tertiary	5.5cm

Bondah-IF9

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267425E 6588036N

Location of Site: Bondah agricultural property, approximately 3.1km west southwest of the Bondah main entrance gates on Rushes Creek Road, 3.2km west southwest of the Bondah homestead, 3.1km west southwest of the Bondah infrastructure complex, 930m southeast of the Namoi River and 350m south of a dam (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufactured from basalt (**Table 5-16**). The site area comprised an exposed livestock track within a cleared paddock comprising pasture grasses (**Figure 5-17**). The site is situated within a disturbed context that has been subject to previous vegetation clearing and cultivation, livestock grazing, and active erosion; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-17: Bondah-IF9. View of site and recorded artefact.



Table 5-16: Bondah-IF9. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Basalt	Complete	Tertiary	3cm

Bondah-IF10

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267652E 6587944N

Location of Site: Bondah agricultural property, approximately 2.9km west southwest of the Bondah main entrance gates on Rushes Creek Road, 2.7km south southwest of the Bondah homestead, 2.6km south southwest of the Bondah infrastructure complex, 102m north of a dam (**Figure 5-4**).

Description of Site: Bondah-IF10 consists of an isolated fine-grained siliceous broken flake with possible retouch and use-wear along the margin (**Figure 5-18** and **Table 5-17**). The artefact is a distal fragment which has no cortex. The site comprises a large exposure on an eroding contour bank. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-18: Bondah-IF10. View of site and recorded artefact.

	
<p>1. View north to Bondah-IF10 site location (flag).</p>	<p>2. Bondah-IF10: GDA Zone 56 267652E 6587944N. A retouched complete flake.</p>
	<p>3. View of retouch and retouch along the margin of Bondah-IF10.</p>

Table 5-17: Bondah-IF10. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Retouched flake	Fine-grained siliceous	Distal fragment	Tertiary	3.5cm

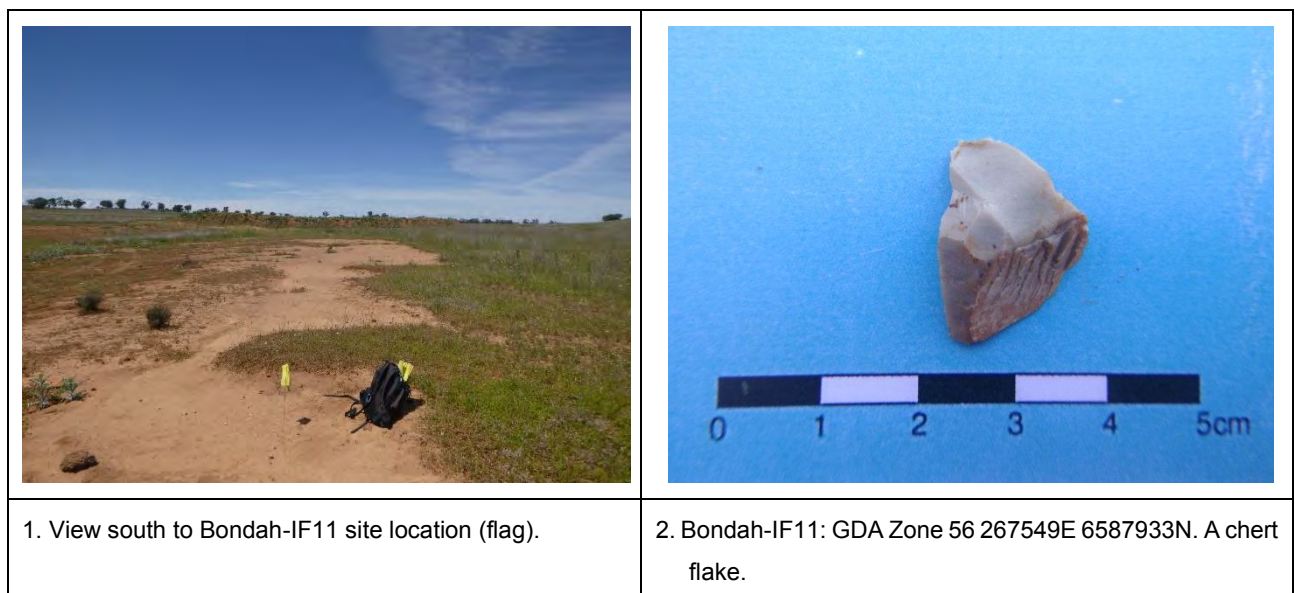
Bondah-IF11

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 267549E 6587933N

Location of Site: Bondah agricultural property, approximately three kilometres west southwest of the Bondah main entrance gates on Ruses Creek Road, 2.9km west southwest of the Bondah homestead, 2.7km west southwest of the Bondah infrastructure complex, 65m north of a dam (**Figure 5-4**).

Description of Site: Bondah-IF11 consists of an isolated chert flake which is complete and has partial cortex (**Figure 5-19** and **Table 5-18**). The site is located within an erosion scald along a drainage feature which has been impacted by the construction of a dam to the south. GSV within the exposure averaged 80% with small fragments of schist present throughout from the outcropping bedrock. The site is assessed as being within a secondary context and not associated with any subsurface deposits.

Figure 5-19: Bondah-IF11. View of site and recorded artefact.**Table 5-18: Bondah-IF11. Recorded artefact attributes.**

Artefact type	Material	Integrity	Reduction	Size
Flake	Chert	Longitudinal break	Tertiary	2cm

Bondah-IF12

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269195E 6590574N

Location of Site: Bondah agricultural property, approximately 2.4km northwest of the Bondah main entrance gates on Rushes Creek Road, 640m north of Ski Gardens Road and 115m south of the Namoi River (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufactured from chert (**Table 5-19**). The site area is located around an exposed ant nest situated in a densely grassed area on top of a north facing gentle crest (**Figure 5-20**). The site is situated within a disturbed context that has been subject to vegetation clearing, livestock grazing, burrowing animals and active erosion exposing shallow soils and rock outcrops; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-20: Bondah-IF12. View of site and recorded artefact.

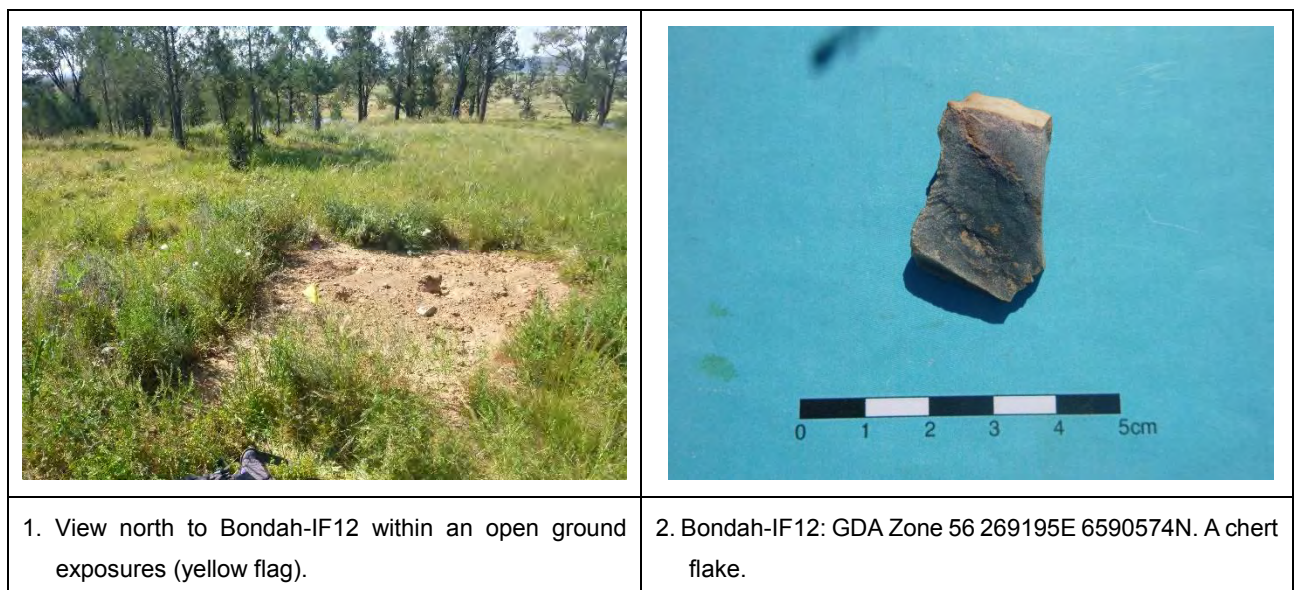


Table 5-19: Bondah-IF12. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Chert	Complete	Secondary	3.5cm

Bondah-IF13

Site Type: Isolated find

GPS Coordinates: GDA Zone 56 269157E 6588907N

Location of Site: Bondah agricultural property, approximately 1.3km west northwest of the Bondah main entrance gates on Rushes Creek Road, 1.8km south of the Namoi River and 931m south of Ski Gardens Road (**Figure 5-4**).

Description of Site: The site identified one stone artefact manufactured from mudstone (**Table 5-20**). The site is identified on an erosion scour near to an ephemeral drainage gully, within a lower slope landform unit (**Figure 5-21**). The site is situated within a disturbed context that has been subject to focused vegetation clearing, livestock grazing, water wash and erosion exposing shallow soils; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-21: Bondah-IF13. View of site and recorded artefact.

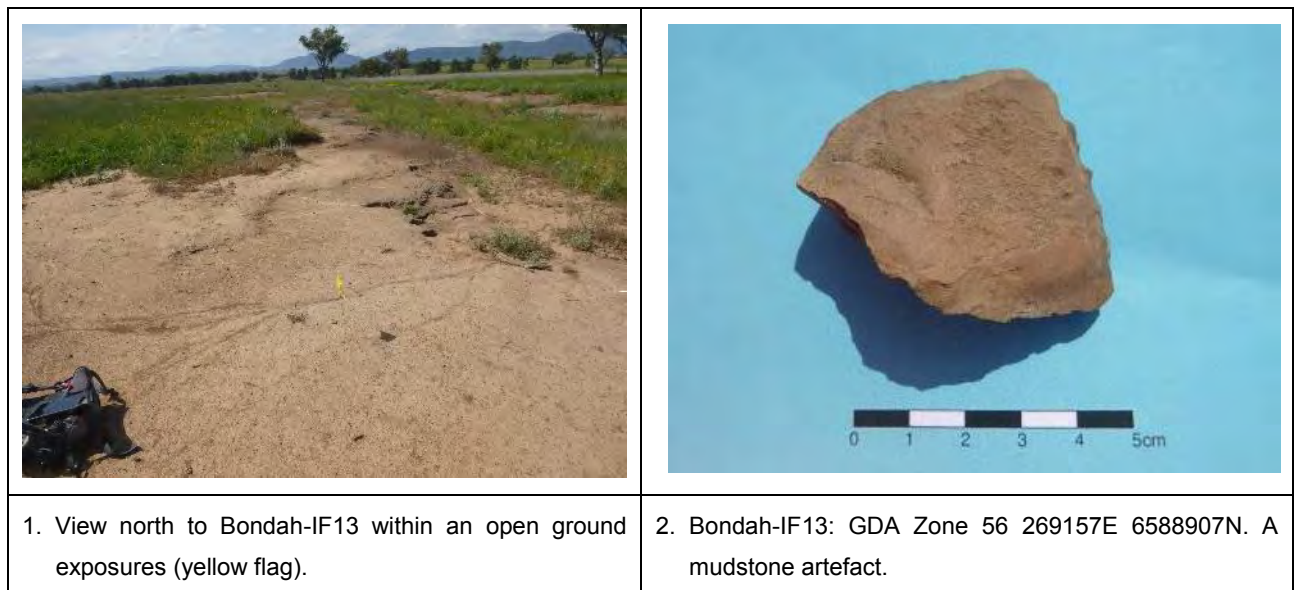
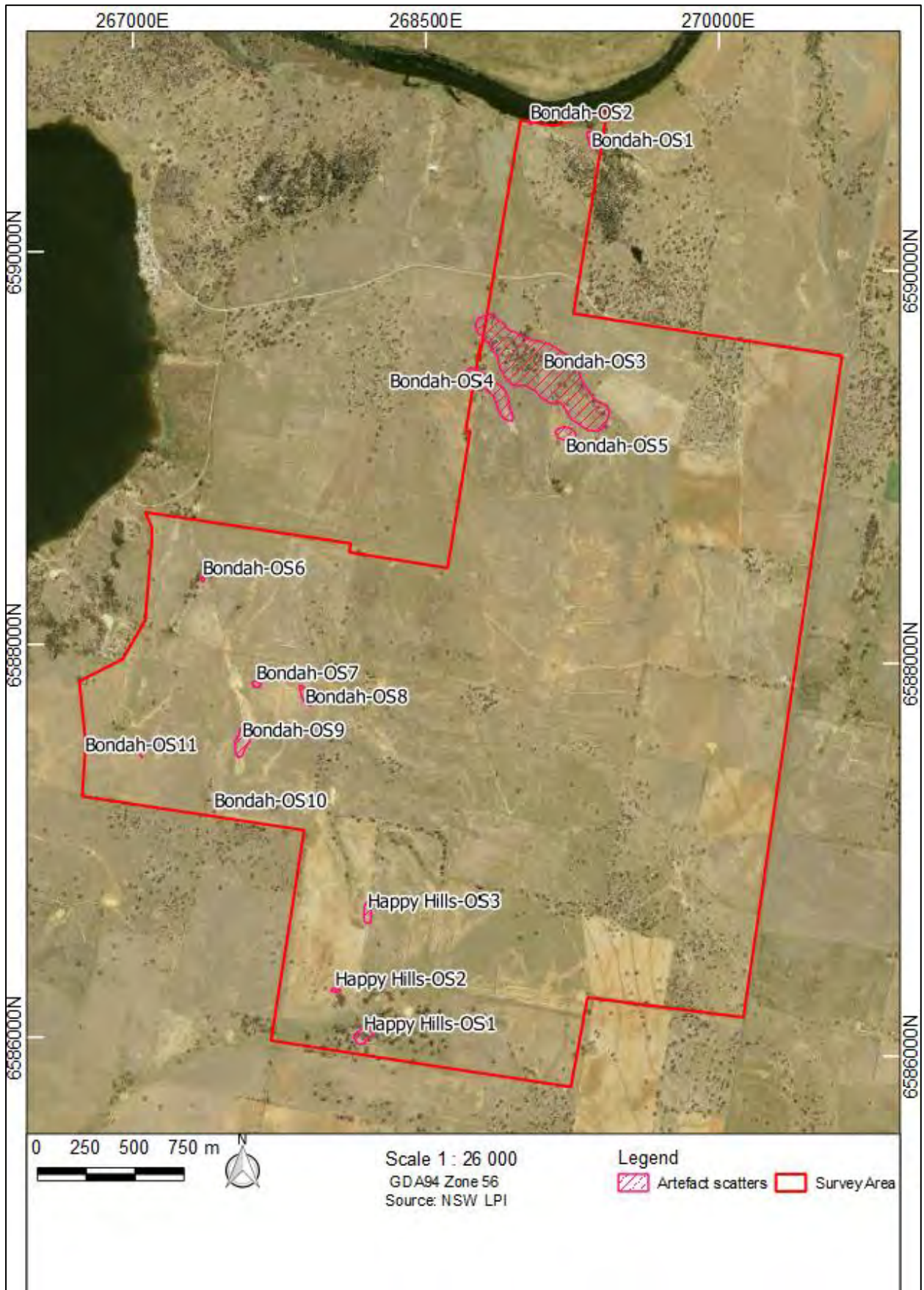


Table 5-20: Bondah-IF13. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Mudstone	Complete	Tertiary	6cm

Figure 5-22: Location of the recorded artefact scatters within the Survey Area.



Happy Hills-OS1

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 268294E 6586054N

Location of Site: Happy Hills agricultural property, approximately 1.9km southwest of the Happy Hills main entrance gates on Rushes Creek Road, 1.7km southwest of the more recent Happy Hills homestead, 163m southwest of a dam and 124m north of the Happy Hills southern boundary (**Figure 5-22 and 5-23**).

Description of Site: The site consists of nine stone artefacts manufactured from volcanic materials, chert and fine-grained siliceous materials (**Figure 5-24 and Table 5-21**). The site comprised a large exposure with adjacent small exposures surrounded by dense grass. The GSE was approximately 60% with a high GSV of 70%. Soils consisted of redeposited sandy loam with a hard setting, clayey base. Other surface stone at the site was predominantly ironstone pebbles and small quartz fragments. Vegetation immediately surrounding the site comprised dense grass, weeds, and scattered mature trees. Disturbances include previous partial clearing, livestock, fencing and erosion. The site is assessed as having no potential for subsurface deposits based on the thin A-Horizon.

Figure 5-23: Location of Happy Hills-OS1 and OS2 in relation to the Survey Area's southern boundary.

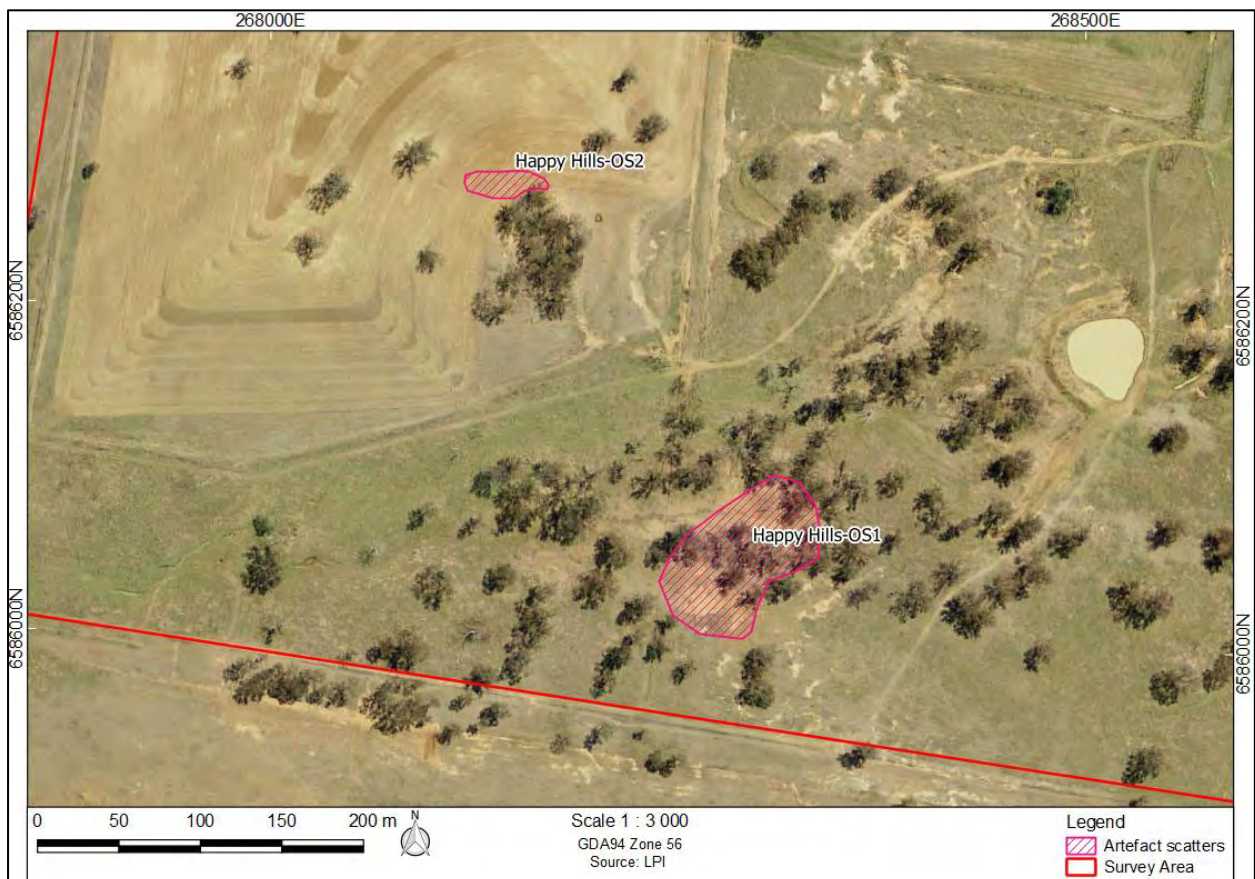


Figure 5-24: Happy Hills-OS1. View of site and selection of recorded artefacts.

	
<p>1. View north to Happy Hill-OS1 site location.</p>	<p>2. View west to Happy Hill-OS1 site location.</p>
	
<p>3. Sample of chert artefacts from Happy Hill-OS1.</p>	<p>4. Basalt flake from Happy Hill-OS1.</p>
	
<p>5. Bladelet core and chert flake recorded at Happy Hills-OS1.</p>	<p>6. Fine-grained siliceous flake from Happy Hills-OS1.</p>

Table 5-21: Happy Hills-OS1. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Basalt	Proximal fragment	Secondary	4cm
Flake	Chert	Proximal fragment	Secondary	2cm
Flake	Chert	Complete	Secondary	5cm
Blade	Chert	Complete	Secondary	3.5cm
Flake	Fine-grained siliceous	Complete	Tertiary	3cm
Flake	Chert	Proximal fragment	Tertiary	2.5cm
Core (bladelet)	Volcanic	N/A	Tertiary	5.5cm

Happy Hills-OS2

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 268144E 6586277N

Location of Site: Happy Hills agricultural property, approximately 2.1km west-southwest of the Happy Hills main entrance gates on Rushes Creek Road, 1.8km southwest of the more recent Happy Hills homestead, 370m west southwest of a dam and 295m north of the Happy Hills southern boundary (**Figure 5-22** and **5-23**).

Description of Site: The site consists of five stone artefacts manufactured from fine-grained siliceous materials and chalcedony (**Figure 5-25** and **Table 5-22**). The site is located on a gentle lower slope, with an open aspect, situated within a large exposure within a previously cleared and cultivated paddock. The GSE was approximately 60% with a high GSV of 85%. Soils consisted of redeposited fine-grained alluvium. Other stone observed comprised small fragments of quartz and ironstone. Vegetation comprised paddock grasses and weeds. The site is located within a previously cultivated paddock, and as such, is assessed as having no potential surface deposits.

Figure 5-25: Happy Hills-OS2. View of site and selection of recorded artefacts.



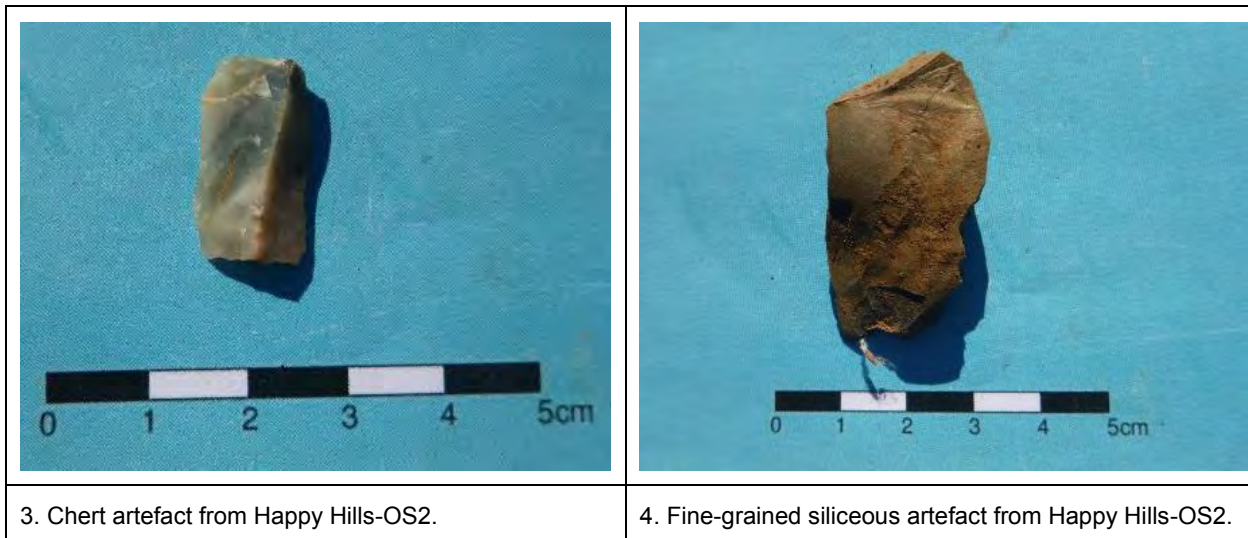


Table 5-22: Happy Hills-OS2. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Blade	Chert	Proximal fragment	Tertiary	2cm
Flake	Fine-grained siliceous	Longitudinal break	Tertiary	4cm

Happy Hills-OS3

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 268303E 6586677N

Location of Site: Happy Hills agricultural property, approximately 1.9km west of the Happy Hills main entrance gates on Rushes Creek Road, 1.6km west southwest of the more recent Happy Hills homestead, 560m southeast of a dam (**Figure 5-22** and **5-26**).

Description of Site: The site consists of four stone artefacts manufactured from volcanic and fine-grained siliceous materials (**Figure 5-27** and **Table 5-23**). The site is located on a gentle mid-slope within an exposed vehicle track. The GSE was approximately 70% with a high GSV of 80%. Soils consisted of redeposited sandy loam, with a slightly clayey consistency. Other stone observed at the site included gravels, ironstone and shale. Vegetation comprised dense grass and weeds, with adjacent cultivated paddocks. Disturbances included previous vegetation clearing, tractor/vehicle access, fencing and erosion. The site is located within a previously cultivated paddock, and as such, is assessed as having no potential surface deposits.

Figure 5-26: Location of Happy Hills-OS3 in relation to the Survey Area’s south-eastern boundary.

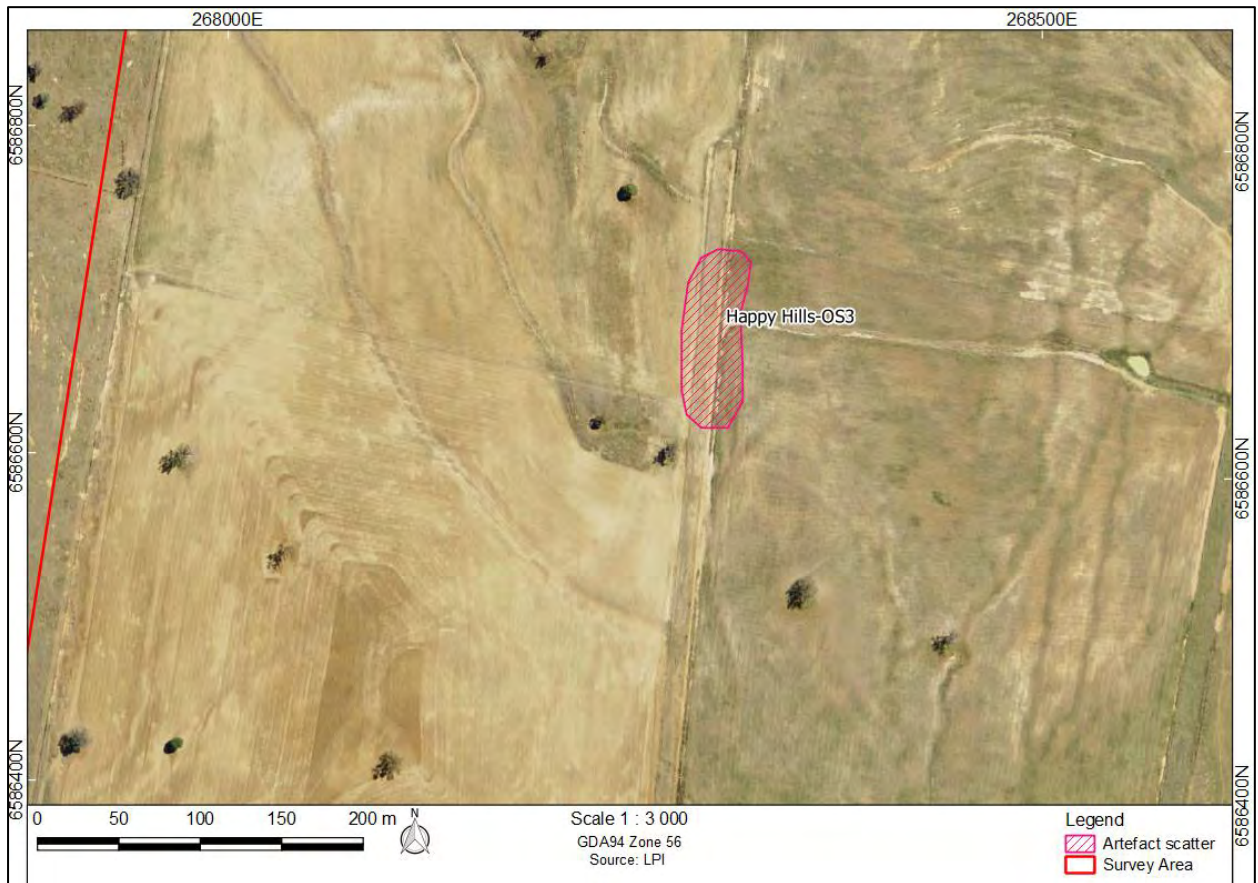
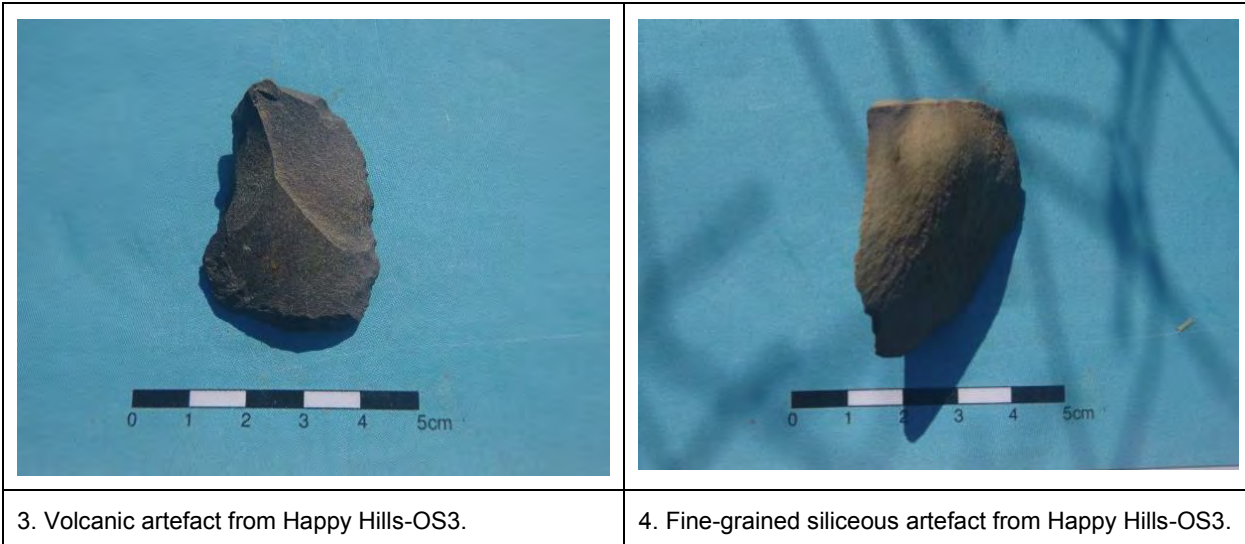


Figure 5-27: Happy Hills-OS3. View of site and selection of recorded artefacts.





3. Volcanic artefact from Happy Hills-OS3.

4. Fine-grained siliceous artefact from Happy Hills-OS3.

Table 5-23: Happy Hills-OS3. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Volcanic	Complete	Tertiary	4.5cm
Flake	Fine-grained siliceous	Complete	Tertiary	5cm

Bondah-OS1**Site Type:** Artefact scatter**GPS Coordinates:** GDA Zone 56 269358E 6590634N**Location of Site:** Bondah agricultural property, approximately 2.4km northwest of the Bondah main entrance gates on Rushes Creek Road, 670m north of Ski Gardens Road and 130m south of the Namoi River (**Figure 5-22** and **5-28**).**Description of Site:** The site consists of six stone artefacts manufactured from a fine-grained siliceous material (**Figure 5-29** and **Table 5-4**). The GSE was approximately 80% with a high GSV at 90%. Soils consisted of redeposited clayey loam. Other stone observed at the site consisted of shale and other siliceous material fragments; however, none were artefactual. Vegetation comprised a dense cover of weeds and grasses, with mature trees located in the surrounding areas. Disturbances included previous vegetation clearing, farming practices and fencing in the immediate vicinity, livestock grazing and active erosion. The site is located on a generally flat landform adjacent to the Namoi River. The site was identified on a narrow and exposed embankment, with a large ant nest in the south and generally thin A-Horizon soils. As such, the site has been assessed as having no potential for subsurface deposits.

Figure 5-28: Location of Bondah-OS1 and Bondah-OS2 in relation to the Survey Area and the Namoi River.

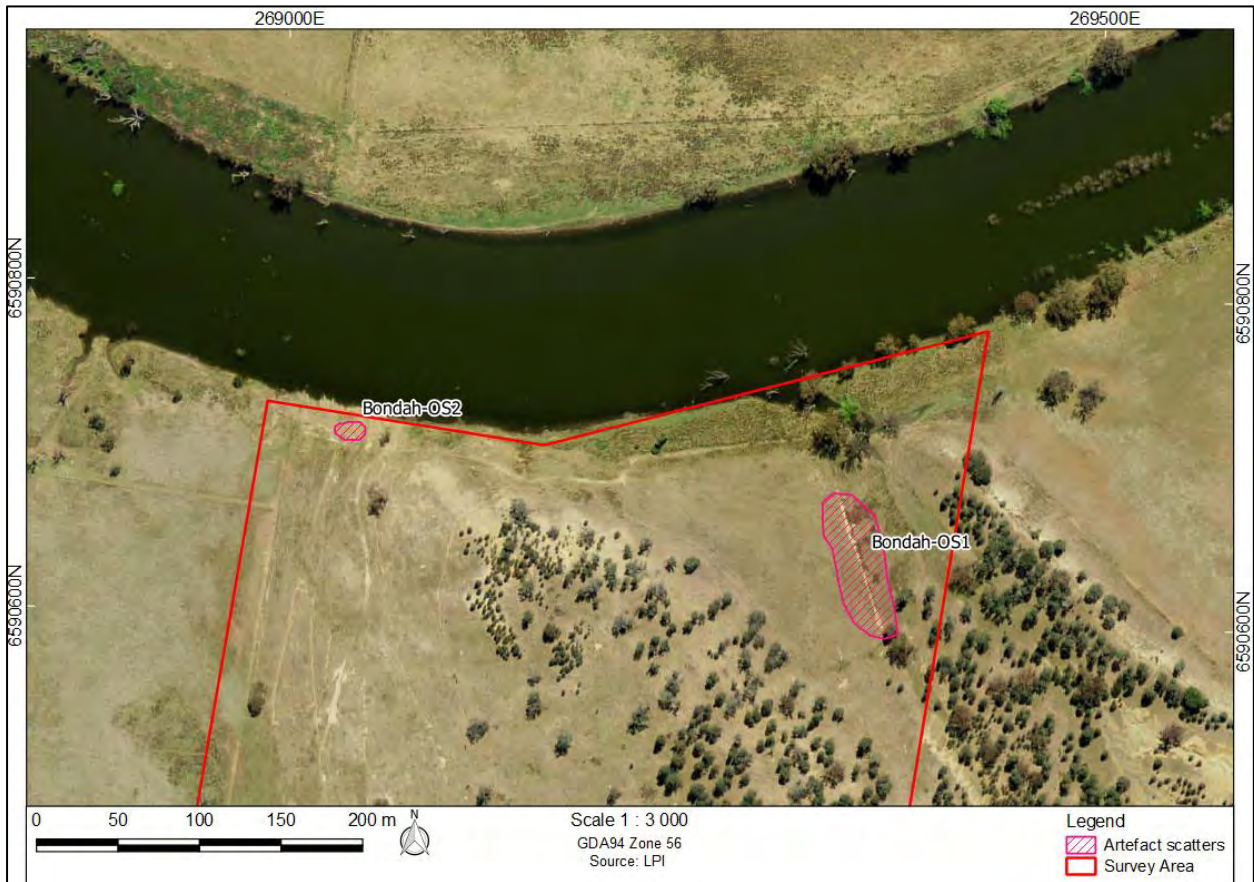
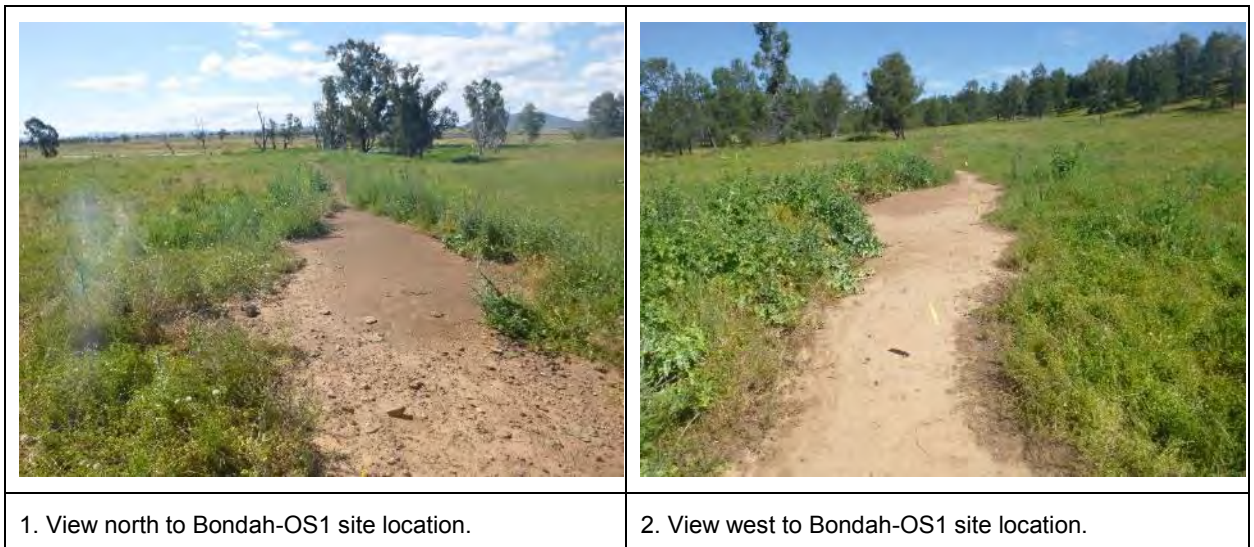


Figure 5-29: Bondah-OS1. View of site and selection of recorded artefacts.





	
3. Fine-grain siliceous artefact from Bondah-OS1.	4. Sample of fine-grained siliceous artefact from Bondah-OS1.

Table 5-24: Bondah-OS1. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Proximal fragment	Tertiary	2.5cm
Flake	Fine-grained siliceous	Complete	Tertiary	7cm

Bondah-OS2

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 269042E 6590711N

Location of Site: Bondah agricultural property, approximately 2.6km northwest of the Bondah main entrance gates on Rushes Creek Road, 780m north of Ski Gardens Road and 17m south of the Namoi River (**Figure 5-22** and **5-28**).

Description of Site: The site consists of four stone artefacts manufactured from chert, quartz and fine-grained siliceous material (**Figure 5-30** and **Table 2-25**). The site is situated on a gentle to moderately sloped creek bank. The GSE was approximately 60% with a high GSV of 80%. Soils consisted of a highly eroded A-Horizon, with minimal surface redeposit and a sparse layer of shallow pebbles. Vegetation comprised dried grasses and weeds, trees and shrubs had been previously cleared. Disturbances included previous vegetation and landform clearing, livestock grazing, nearby fencing and active erosion. As the A-Horizon was very thin, the site has been assessed as having no potential for subsurface deposits.

Figure 5-30: Bondah-OS2. View of site and selection of recorded artefacts.**Table 5-25: Bondah-OS2. Sample of recorded artefact attributes.**

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Proximal fragment	Tertiary	2.5cm
Flake	Fine-grained siliceous	Complete	Tertiary	7cm

Bondah-OS3

Site Type: Artefact scatter with PAD

GPS Coordinates: GDA Zone 56 269140E 6589451N

Location of Site: Bondah agricultural property, approximately 1.6km northwest of the Bondah main entrance gates on Rashes Creek Road, 1.2km south of the Namoi River and 420m south of Ski Gardens Road (**Figure 5-22** and **5-31**).

Description of Site: The site consists of 12 separate artefact location areas with artefacts manufactured from a variety of materials including fine-grained siliceous materials, silcrete, jasper, basalt and quartz (**Figure 5-32** and **Table 2-26**). The GSE varied from approximately 20% to 80%, variable depending on the level of erosion and extent of exposures. The GSV was generally high ranging between 80% and 95%. Soils consisted predominantly of redeposited sandy loam, exposed B-Horizon and with some scattered outcropping stone, generally observed as shale. The site is located at the confluence and terrace of two second order tributaries of the Namoi River. Vegetation comprised mature trees and shrubs which lined the creek and tributaries with dense grasses and weeds at a distance from creek banks. Disturbances included previous vegetation clearing, fence and dam construction, livestock grazing, general farming practices and active erosion. Areas of low GSV adjacent to exposures with A-Horizon soils were considered to have potential for additional subsurface material. Potential subsurface deposits are unlikely to contain *in situ* contexts and the artefact density is likely to be low. In addition to this, A-Horizon soils depths are likely to be around 10-15cm and stratified soil profiles are unlikely to be encountered.

Figure 5-31: Location of Bondah-OS3 to Bondah-OS5 in relation to the Survey Area.

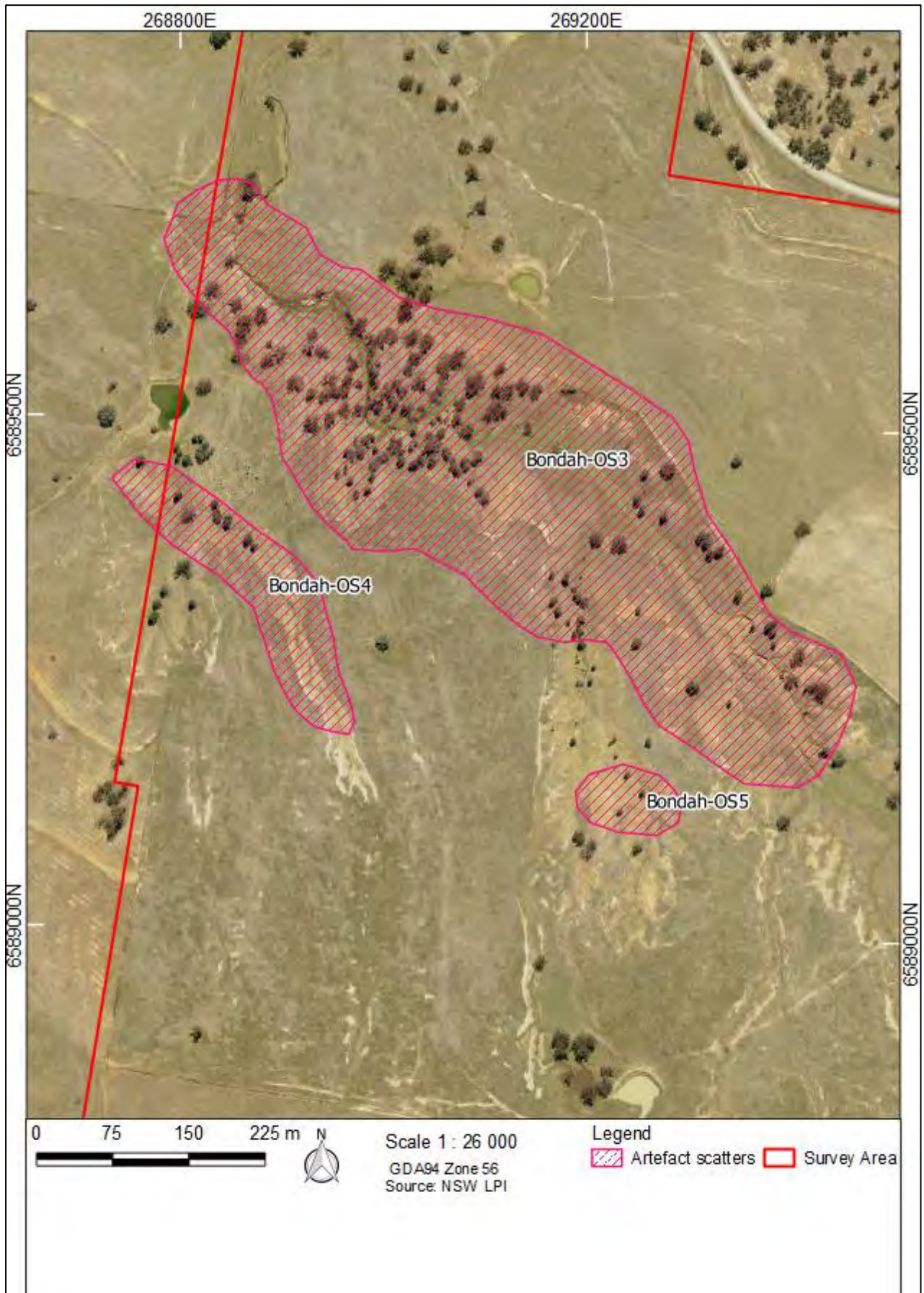


Figure 5-32: Bondah-OS3. View of site and selection of recorded artefacts.

	
<p>1. View north to northern end of Bondah-OS3 on creek bank.</p>	<p>2. Artefacts identified at northern end of Bondah-OS3.</p>
	
<p>3. View southeast across site cluster at Bondah-OS3.</p>	<p>4. Likely red jasper and fine-grained siliceous artefacts from Bondah-OS3.</p>
	
<p>5. Petrified wood artefact from Bondah-OS3.</p>	<p>6. View east to artefact cluster at Bondah-OS3.</p>

Table 5-26: Bondah-OS3. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Fine-grained siliceous	Complete	Tertiary	2cm
Flake	Mudstone	Complete	Tertiary	5cm
Flake	Volcanic	Complete	Tertiary	2cm
Flake	Volcanic	Complete	Tertiary	4cm
Flake	Mudstone	Complete	Tertiary	3.5cm
Flake	Mudstone	Complete	Tertiary	4cm
Flake	Volcanic	Complete	Tertiary	2cm
Flake	Mudstone	Complete	Tertiary	2.5cm
Flake	Volcanic	Proximal fragment	Tertiary	2.5cm
Flake	Mudstone	Complete	Secondary	4cm
Flake	Mudstone	Complete	Tertiary	3cm
Backed blade	Volcanic	Proximal fragment	Tertiary	3cm
Flake	Mudstone	Complete	Tertiary	3cm
Flake	Mudstone	Complete	Secondary	2cm
Flake	Chert	Complete	Primary	4cm
Backed flake	Volcanic	Complete	Tertiary	3cm
Flake	Quartz	Complete	Tertiary	2cm
Flake	Mudstone	Complete	Primary	2.5cm
Flake	Mudstone	Complete	Secondary	2.5cm
Flake	Jasper	Complete	Primary	3cm

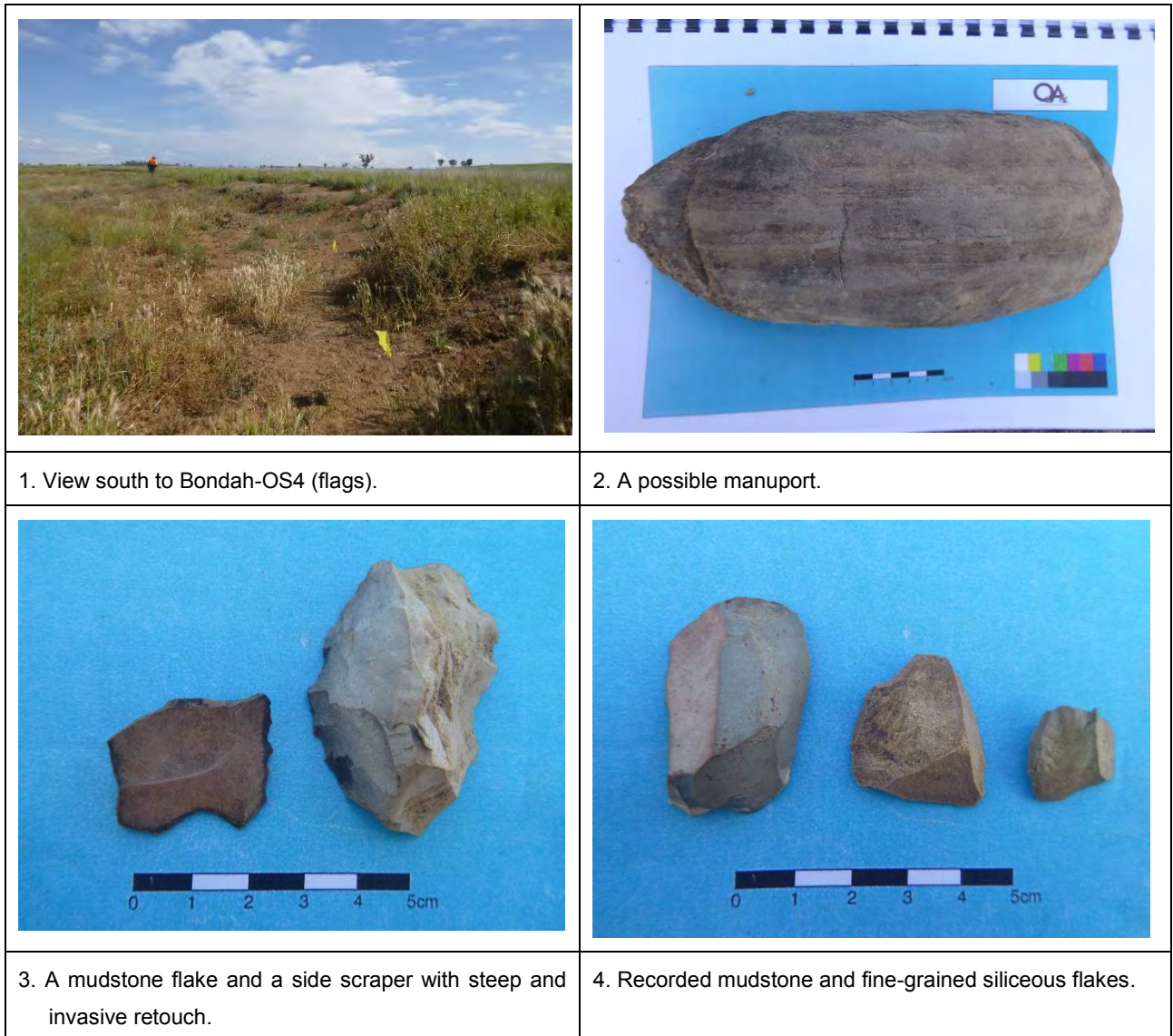
Bondah-OS4

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 268883E 6589353N

Location of Site: Bondah agricultural property, approximately 1.7km northwest of the Bondah main entrance gates on Rushes Creek Road, 1.6km northwest of the Bondah homestead, 1.4km south of the Namoi River and 640m south of Ski Gardens Road (Figure 5-22 and 5-31).

Description of Site: The site consists of more than 10 stone artefacts manufactured largely from fine-grained siliceous materials (Figure 5-33 and Table 2-27). Other material in the vicinity of the site comprised schist and ironstone fragments. A possible manuport was also recorded along the eroding bank of the tributary. The manuport did not display any signs of use from pounding or grinding. The GSE was approximately 20% with a GSV of 70%. Vegetation immediately surrounding the site comprised dense grass and weeds, while mature, native tree species are present to the north. Disturbances include previous partial clearing, livestock and erosion. Soils consisted of a thin layer of redeposited sandy loam which were heavily eroded along the banks of the tributary. As such, the site is assessed as having no potential for subsurface deposits.

Figure 5-33: Bondah-OS4. View of site and recorded artefacts.**Table 5-27: Bondah-OS4. Sample of recorded artefact attributes.**

Artefact type	Material	Integrity	Reduction	Size
Flake	Mudstone	Complete	Secondary	3cm
Manuport	Unkown	Complete	Primary	25cm
Flake	Mudstone	Complete	Tertiary	3cm
Flake	Mudstone	Complete	Tertiary	2.5cm
Flake	Mudstone	Proximal fragment	Tertiary	2cm
Flake	Mudstone	Complete	Secondary	2.5cm
Side scraper	Mudstone	Distal fragment	Tertiary	5cm
Flake	Fine-grained siliceous	Complete	Tertiary	4cm
Flake	Mudstone	Complete	Tertiary	3cm

Bondah-OS5

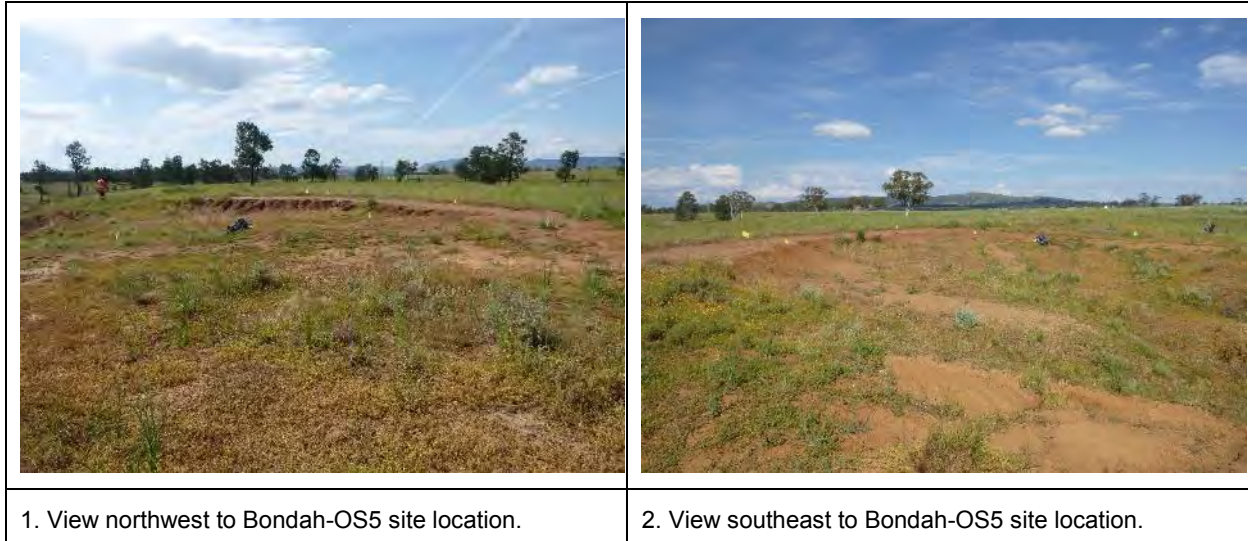
Site Type: Open camp site

GPS Coordinates: GDA Zone 56 269259E 6589134N

Location of Site: Bondah agricultural property, approximately 1.4km northwest of the Bondah main entrance gates on Rushes Creek Road, 1.3km northwest of the Bondah homestead, 1.5km south of the Namoi River and 630m south of Ski Gardens Road (**Figure 5-22** and **5-31**).

Description of Site: The site consists of 17 stone artefacts manufactured from basalt, chert, fine-grained siliceous materials and jasper (**Figure 5-34** and **Table 2-28**). The GSE was approximately 70% with a high GSV of 90%. Soils consisted of redeposited clayey loam and highly eroded B-Horizon where rill erosion was observed. Stone observed within the site mostly comprised scattered shale and quartz fragments. Vegetation comprised grasses and weeds with mature trees in the surrounding area, generally closer to ephemeral tributaries. Disturbances included previous clearing, livestock grazing and high gully erosion. As such, the site is assessed as having no potential for subsurface deposits.

Figure 5-34: Bondah-OS5. View of site and selection of recorded artefacts.





	
3. Red jasper artefacts identified at Bondah-OS5.	4. Chert and fine-grained siliceous artefacts from Bondah-OS5.

Table 5-28: Bondah-OS5. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Jasper	Complete	Tertiary	3cm
Flake	Jasper	Proximal fragment	Tertiary	2cm
Blade	Chert	Complete	Tertiary	6cm
Flake	Fine-grained siliceous	Complete	Tertiary	3cm

Bondah-OS6

Site Type: Open camp site

GPS Coordinates: GDA Zone 56 267419E 6588351N

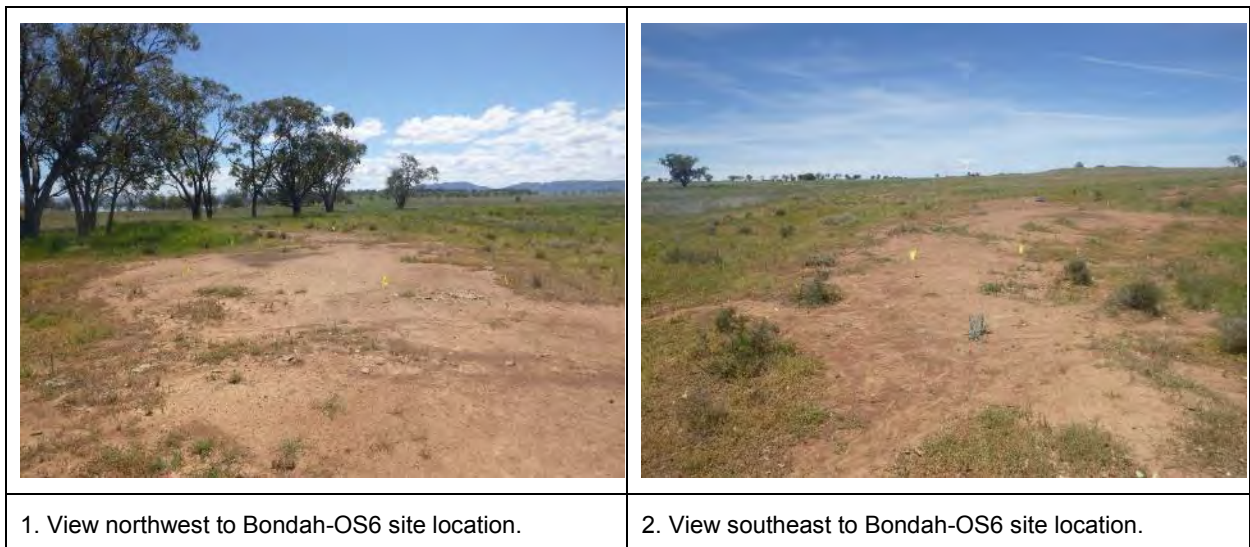
Location of Site: Bondah agricultural property, approximately 3.1km west southwest of the Bondah main entrance gates on Rushes Creek Road, 3km west southwest of the Bondah homestead, 690m east of Lake Keepit (**Figure 5-22** and **5-35**).

Description of Site: The site consists of nine stone artefacts manufactured from basalt, fine-grained siliceous material and chalcedony located on a gentle to moderately sloped creek bank (**Figure 5-36** and **Table 5-29**). The GSE was approximately 70% with a high GSV of 95%. A-Horizon soils at the site are thin and consist of an eroding and redeposited clayey loam. The artefacts appear to be within a secondary context and as such, are not considered to be associated with subsurface deposits. Stone observed within the site mostly comprised scattered shale and quartz fragments. Vegetation comprised grasses and weeds with mature trees lining the nearby Namoi River tributary. Disturbances included previous clearing, nearby fence and dam construction, livestock grazing and active erosion.

Figure 5-35: Location of Bondah-OS6.



Figure 5-36: Bondah-OS6. View of site and selection of recorded artefacts.





	
3. Chalcedony artefact recorded at Bondah-OS6.	4. Fine-grained siliceous and basalt artefacts from Bondah-OS6.

Table 5-29: Bondah-OS6. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Chalcedony	Complete	Tertiary	1.5cm
Flake	Fine-grained siliceous	Distal fragment	Tertiary	1.5cm
Blade	Basalt	Complete	Tertiary	2cm
Flake	Fine-grained siliceous	Complete	Tertiary	3cm

Bondah-OS7

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 267707E 6587821N

Location of Site: Bondah agricultural property, approximately 2.9km southwest of the Bondah main entrance gates on Ruses Creek Road, 2.8km southwest of the Bondah homestead, 2.6km west southwest of the Bondah infrastructure complex, 69m east of a dam along the southern bank of a drainage feature (**Figure 5-22 and 5-37**).

Description of Site: The site consists of two flakes manufactured from volcanic materials (**Figure 5-38 and Table 5-30**). The site comprises a large exposure with adjacent small exposures surrounded by dense grass. The GSE was approximately 70% with a high GSV of 80%. Soils consisted of redeposited sandy loam with a hardsetting, clayey base. Other surface stone at the site was predominantly schist fragments. Vegetation immediately surrounding the site comprised dense grass and weeds. Disturbances include previous partial clearing, livestock, fencing, dam construction and erosion. The artefacts are located within an actively eroding landform and as such, are not considered to be associated with subsurface deposits.

Figure 5-37: Location of Bondah-OS7 and Bondah-OS8 and a drainage feature.

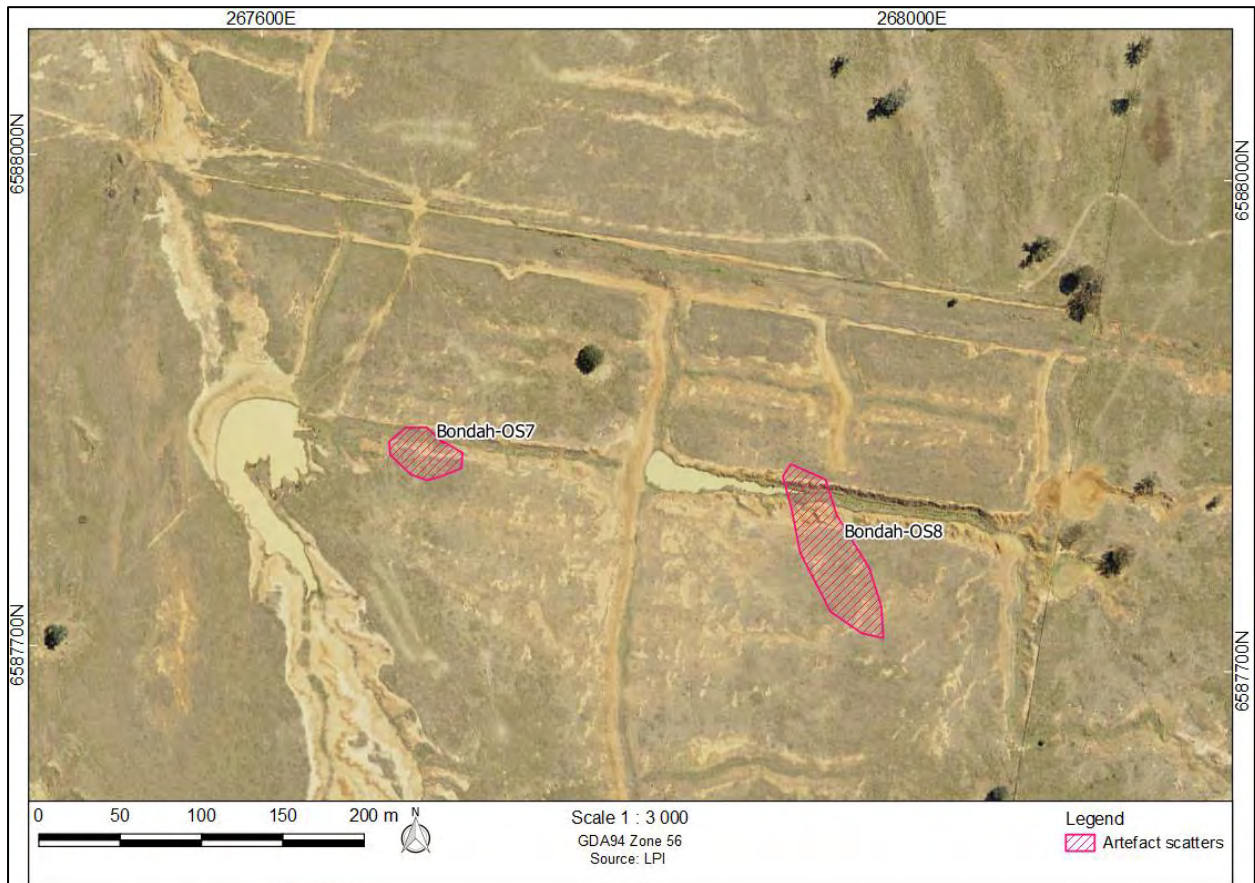
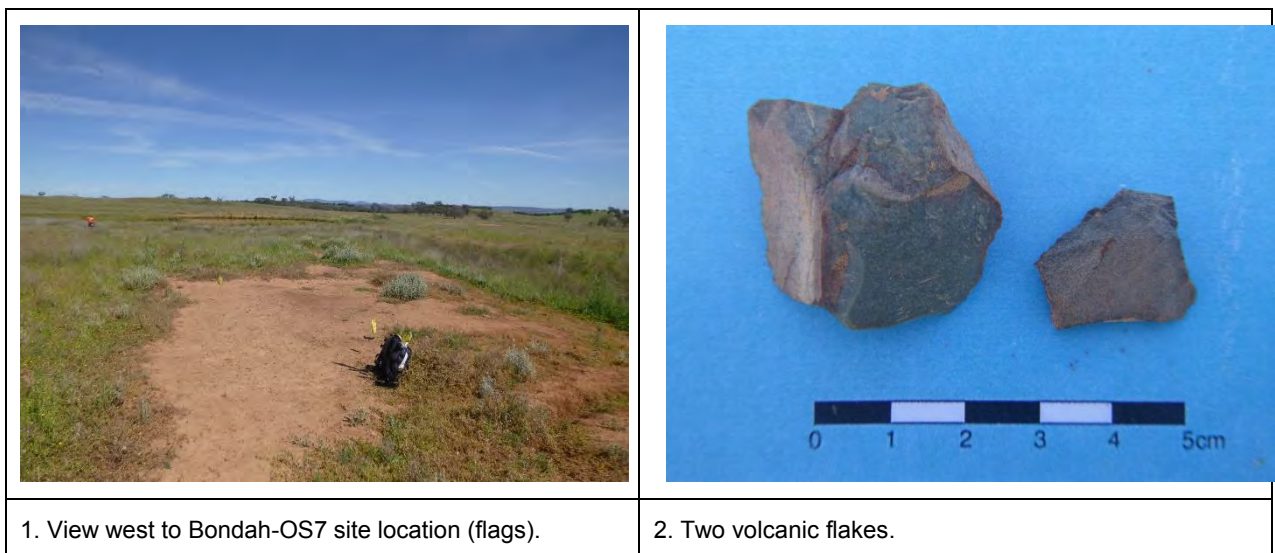


Figure 5-38: Bondah-OS7. View of site and recorded artefacts.



1. View west to Bondah-OS7 site location (flags).

2. Two volcanic flakes.

Table 5-30: Bondah-OS7. Sample of recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Volcanic	Complete	Secondary	3.5cm
Flake	Volcanic	Proximal fragment	Tertiary	2cm

Bondah-OS8

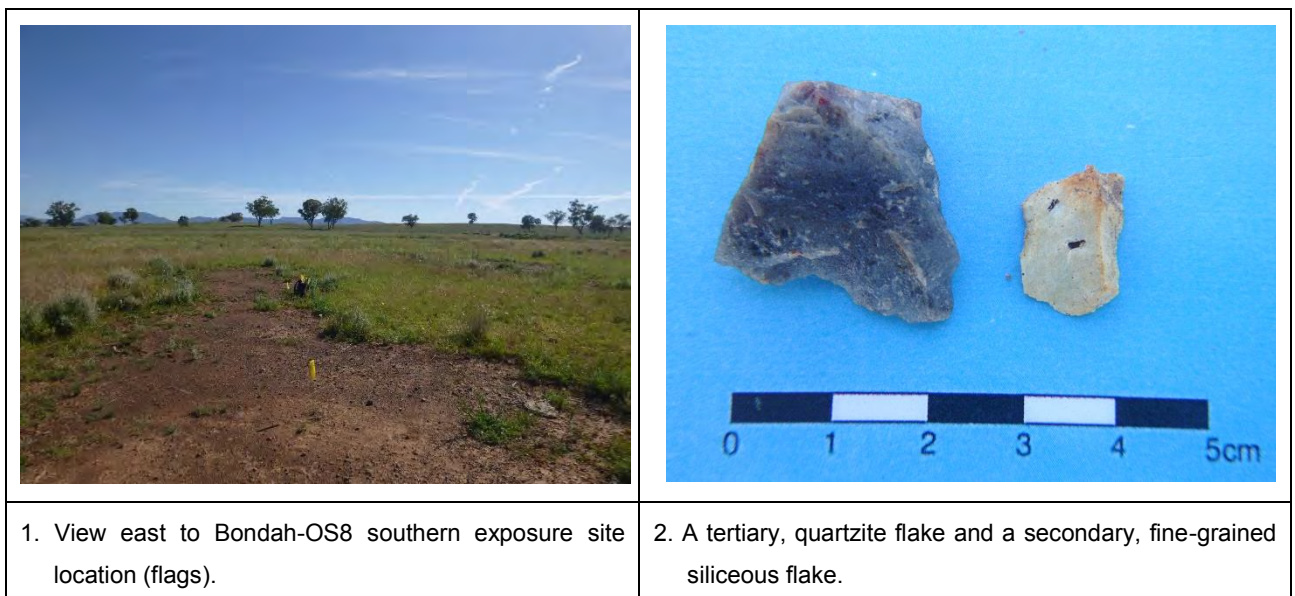
Site Type: Artefact scatter

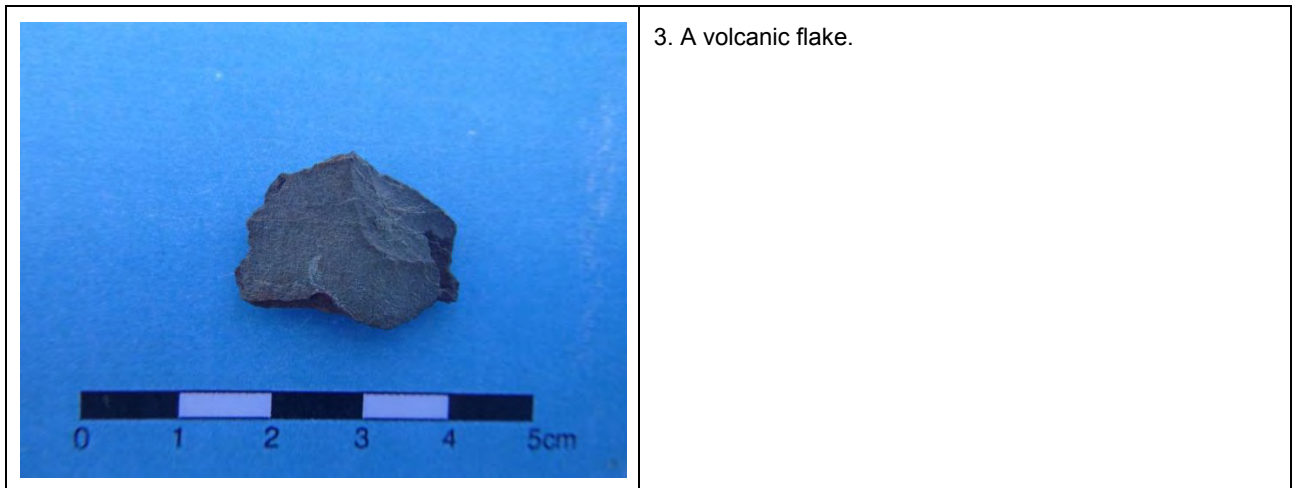
GPS Coordinates: GDA Zone 56 267956E 6587767N

Location of Site: Bondah agricultural property, approximately 2.6km southwest of the Bondah main entrance gates on Rushes Creek Road, 2.5km southwest of the Bondah homestead, 5m east of a dam on the northern and southern banks of a drainage feature (**Figure 5-22** and **5-37**).

Description of Site: The site consists of three flakes manufactured from a volcanic material, a fine-grained siliceous material and quartzite (**Figure 5-39** and **Table 5-31**). The site comprised two areas of exposure either side of the drainage feature which are surrounded by dense grass. The GSE was approximately 60% with a high GSV of 85%. Soils consisted of redeposited sandy loam. Other surface stone at the site was predominantly schist fragments from the underlying bedrock. Vegetation immediately surrounding the site comprised dense grass and weeds. Disturbances include previous partial clearing, livestock, fencing, dam construction and erosion. The artefacts are located within an actively eroding landform and as such, are not considered to be associated with subsurface deposits.

Figure 5-39: Bondah-OS8. View of site and recorded artefacts.





3. A volcanic flake.

Table 5-31: Bondah-OS8. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Volcanic	Complete	Tertiary	2.5cm
Flake	Fine-grained siliceous	Complete	Tertiary	1.5cm
Flake	Quartzite	Distal fragment	Tertiary	2.5cm

Bondah-OS9

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 267638E 658532N

Location of Site: Bondah agricultural property, approximately 5.7km southwest of the Bondah main entrance gates on Ruses Creek Road, 5.6km southwest of the Bondah homestead, 197m south of a dam along the eastern and western banks of a drainage feature (**Figure 5-22** and **5-40**).

Description of Site: The site is a low density artefact scatter consisting of two flakes manufactured from chert and mudstone (**Figure 5-41** and **Table 5-32**). The site comprises large areas of exposure on either side of an eroding drainage feature. The GSE was approximately 60% with a high GSV of 85%. Soils consisted of redeposited sandy loam. Other surface stone at the site was predominantly ironstone pebbles and schist fragments from the underlying bedrock. Vegetation immediately surrounding the site comprised dense grass and weeds. Disturbances include previous partial clearing, livestock and erosion. The artefacts are located within an actively eroding landform adjacent to a drainage and as such, are not considered to be associated with subsurface deposits.

Figure 5-40: Location of Bondah-OS9.

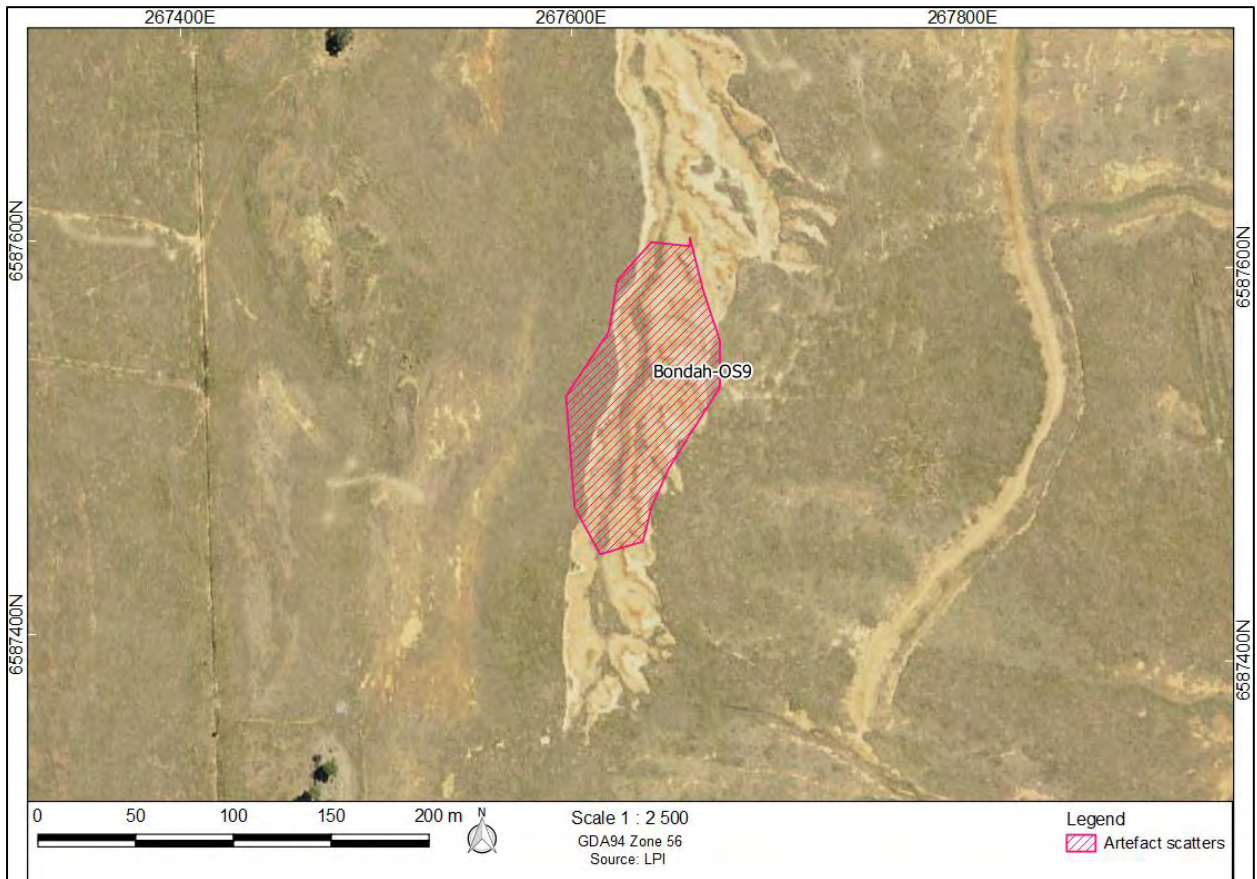
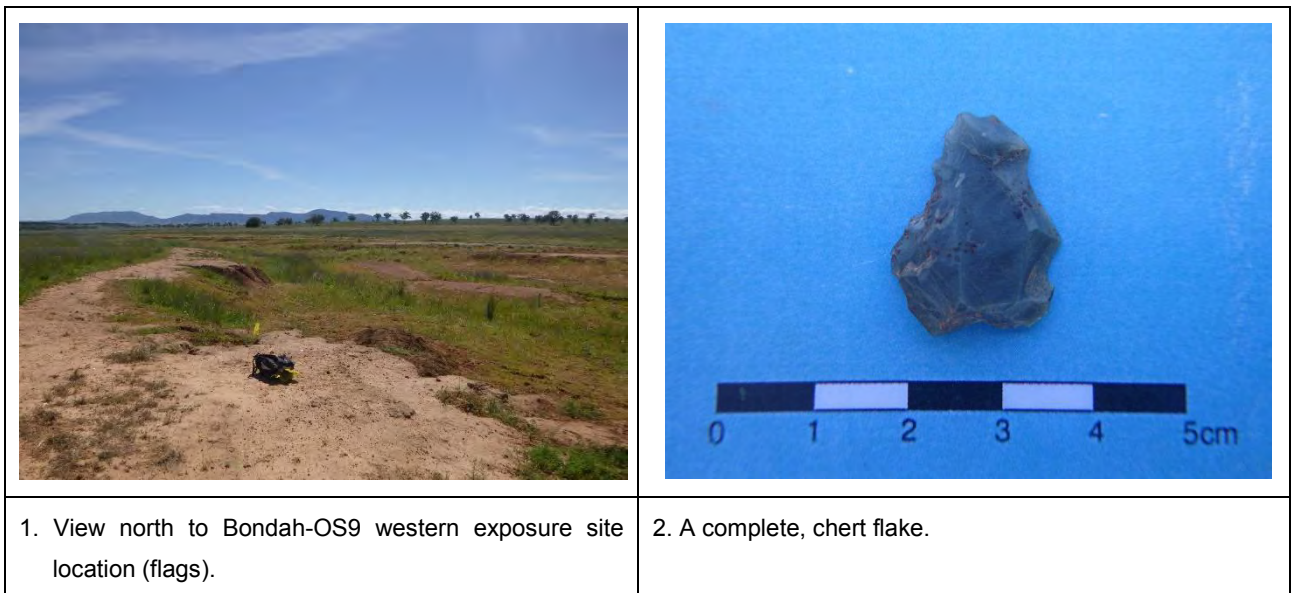
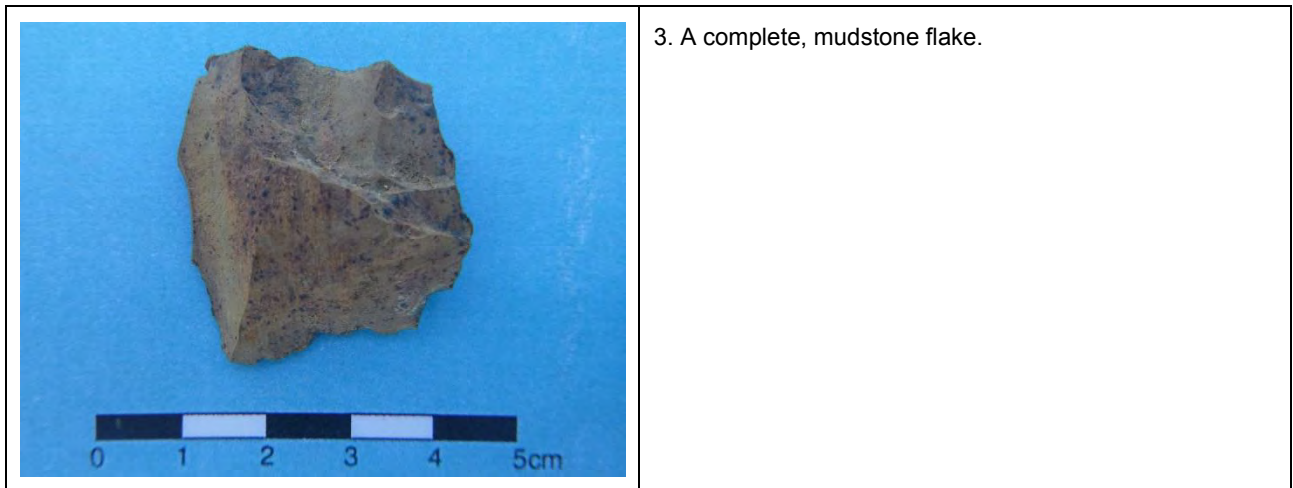


Figure 5-41: Bondah-OS9. View of site and recorded artefacts.





3. A complete, mudstone flake.

Table 5-32: Bondah-OS9. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Chert	Complete	Tertiary	2.5cm
Flake	Mudstone	Complete	Tertiary	4cm

Bondah-OS10

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 267505E 6587166N

Location of Site: Bondah agricultural property, approximately 3.3km southwest of the Bondah main entrance gates on Rushes Creek Road, 3.2km southwest of the Bondah homestead, 1.6km southeast of the Namoi River and at the base of an area of basalt outcropping (**Figure 5-22** and **5-42**).

Description of Site: The site consists of two flakes manufactured from mudstone recorded within an area of exposure (**Figure 5-43** and **Table 5-33**). The GSE was approximately 30% with a high GSV of 60%. Soils consisted of a thin layer of redeposited sandy loam. Despite outcropping volcanic material nearby, no artefacts manufactured from this material was noted. Vegetation immediately surrounding the site comprised dense grass and weeds while tree species are present among the outcropping rock. Disturbances include previous partial clearing, livestock and erosion. The A-Horizon soils at the site were noted as being very thin. As such, the site has been assessed as having no potential for subsurface deposits.

Figure 5-42: Location of Bondah-OS10 in relation to the southern boundary of the Survey Area.

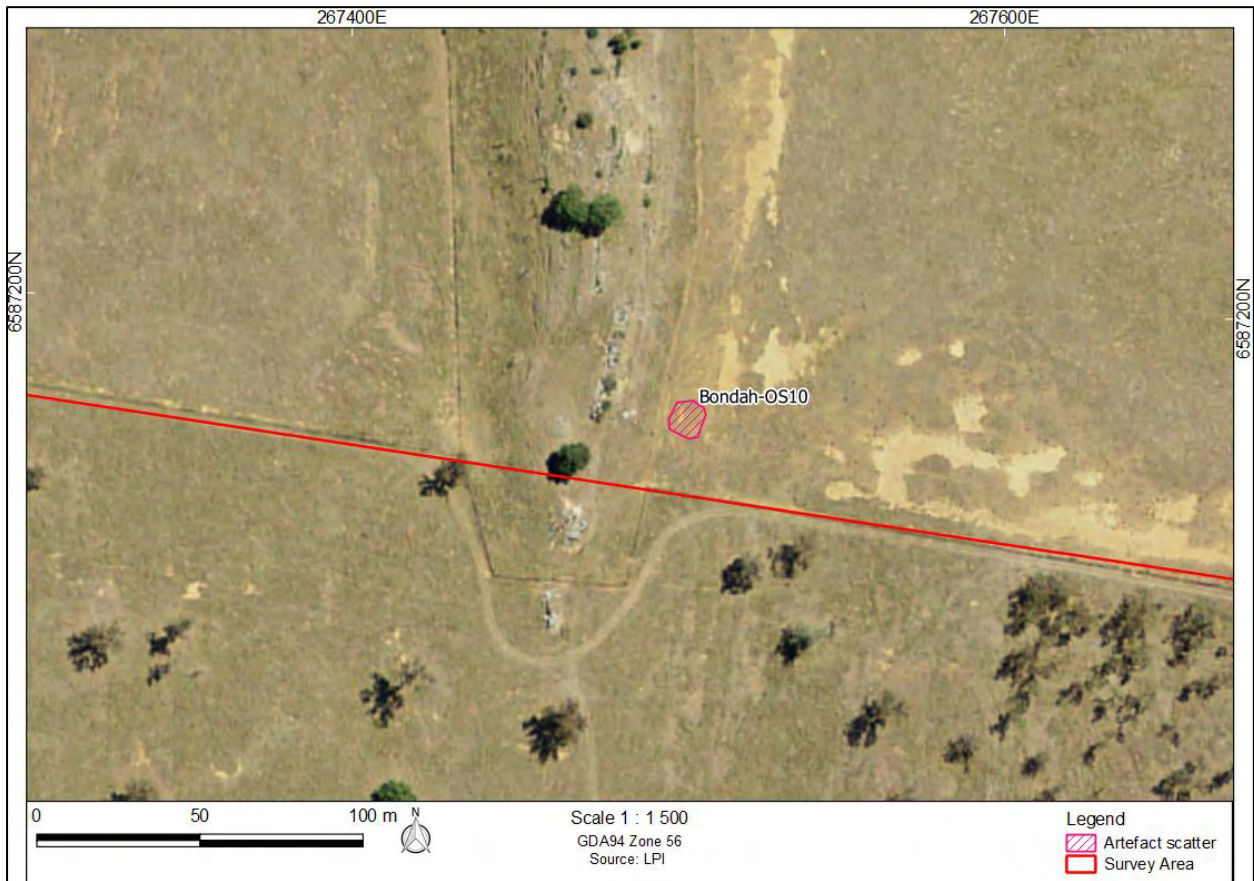
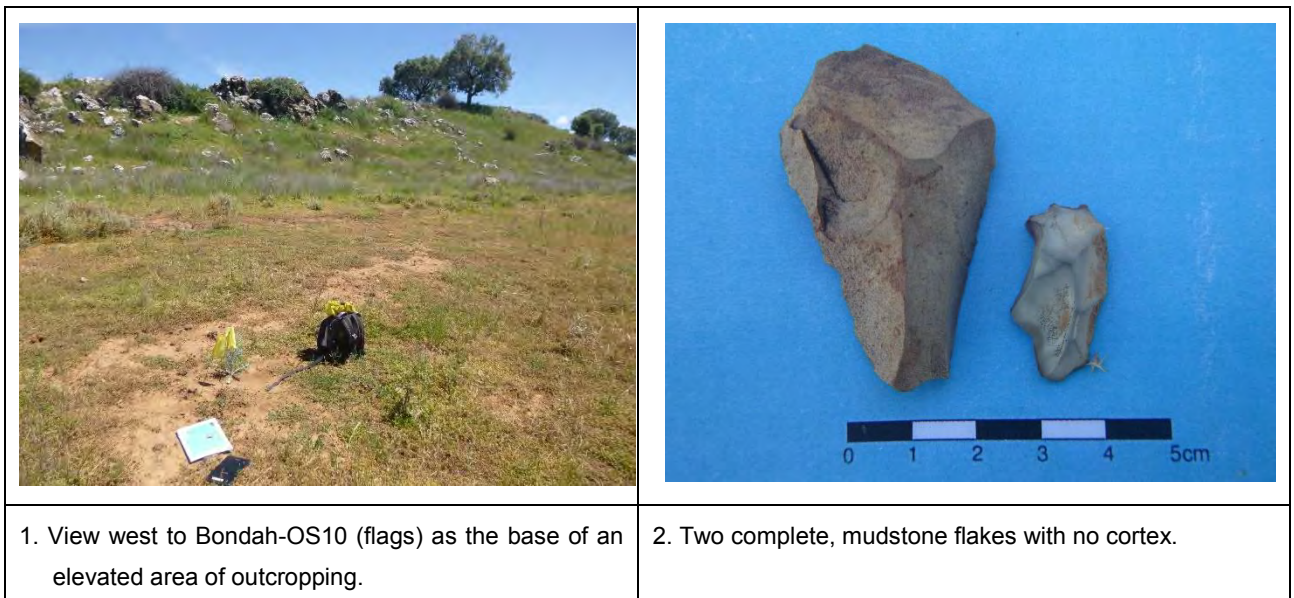


Figure 5-43: Bondah-OS10. View of site and recorded artefacts.



1. View west to Bondah-OS10 (flags) as the base of an elevated area of outcropping.

2. Two complete, mudstone flakes with no cortex.

Table 5-33: Bondah-OS10. Recorded artefact attributes.

Artefact type	Material	Integrity	Reduction	Size
Flake	Mudstone	Complete	Tertiary	5.5cm
Flake	Mudstone	Complete	Tertiary	3cm

Bondah-OS11

Site Type: Artefact scatter

GPS Coordinates: GDA Zone 56 267123E 6587441N

Location of Site: Bondah agricultural property, approximately 3.5km southwest of the Bondah main entrance gates on Rushes Creek Road, 3.4km southwest of the Bondah homestead, 1.1km southeast of Lake Keepit and 218m south east of a dam (**Figure 5-22** and **5-44**).

Description of Site: The site consists of two stone artefacts manufactured from a fine-grained siliceous material (one object was difficult to determine due to high percentage of cortex on the object) (**Table 5-34**). One of the objects appeared to have been deliberately shaped and sharpened to form a narrow edge and the other object was identified as a multiplatform, reduced core (**Figure 5-45**). Artefacts were situated within GSEs within a large previously cleared and cultivated paddock. Vegetation comprised surrounding pasture grasses and weeds, mature trees and shrubs were absent. The site is situated within a disturbed context that has been subject to previous vegetation clearing and cultivation, livestock grazing, and active erosion; therefore the site is not considered to be associated with any subsurface deposits.

Figure 5-44: Location of Bondah-OS11.



Figure 5-45: Bondah-OS11. View of site and recorded artefact.**Table 5-34: Bondah-OS11. Recorded artefact attributes.**

Artefact type	Material	Integrity	Reduction	Size
Worked stone	Unknown	Complete	Primary	9cm
Core (reduced)	Fine-grained siliceous	N/A	Tertiary	6cm

Bondah-H1

Site Type: Hearth

GPS Coordinates: GDA Zone 56 269169E 6589145N

Location of Site: Bondah agricultural property, approximately 1.2km northwest of the Bondah main entrance gates on Ruses Creek Road, 1.1km northwest of the Bondah homestead, 1.7km south of the Namoi River and 650m south of Ski Gardens Road (Figure 5-46).

Description of Site: The site consists one hearth comprised of heat fractured rocks, however, no evidence of burning or charcoal were evidence on the surface The hearth measures 65 centimetres (cm) x 47cm in an area of exposure (**Figure 5-47**). Vegetation immediately surrounding the site comprised sparse grass and weeds, while mature, native tree species are present to the north. Disturbances include previous partial clearing, livestock and erosion.

Figure 5-46: Location of the recorded hearth and scarred trees within the Survey Area.

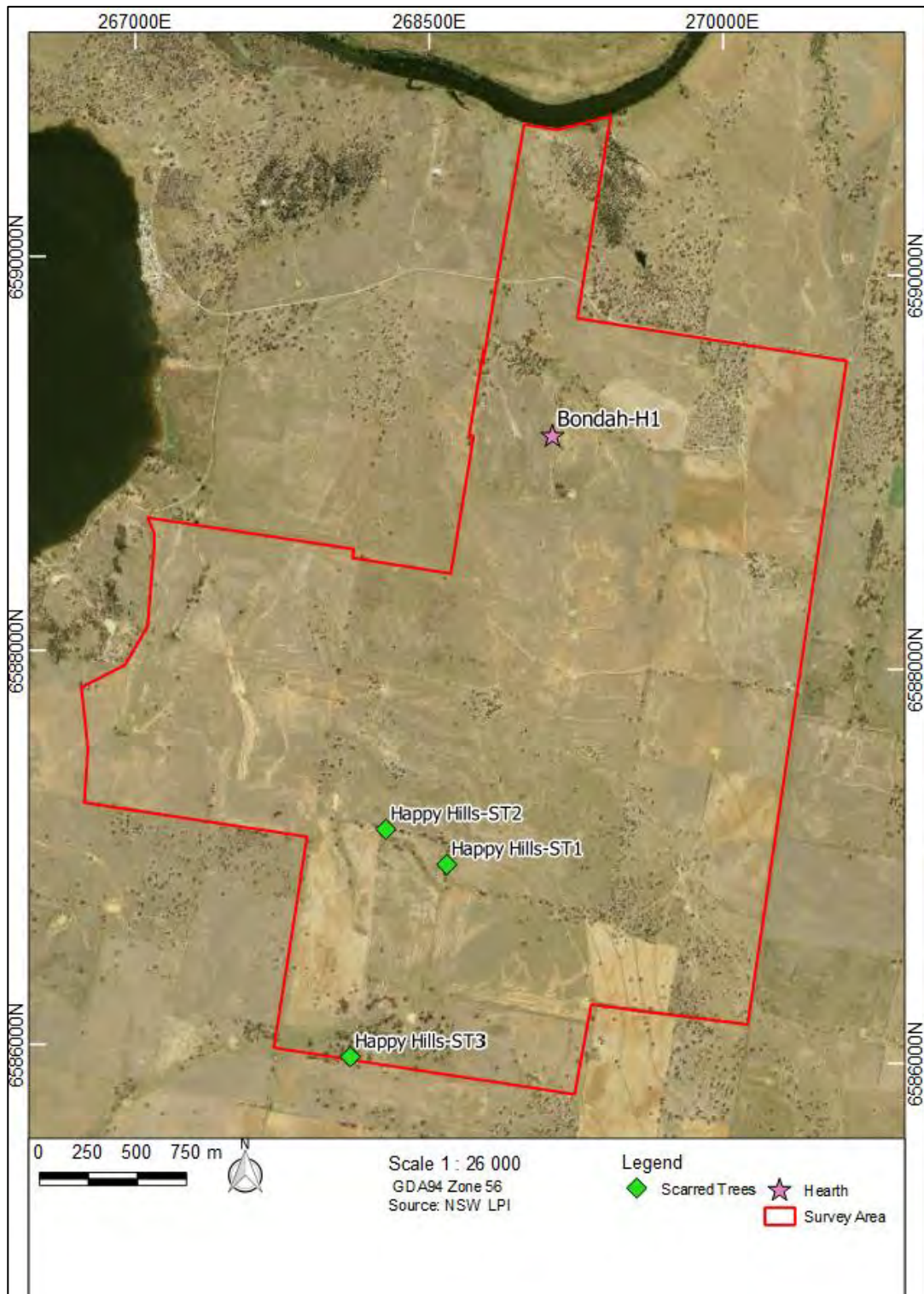
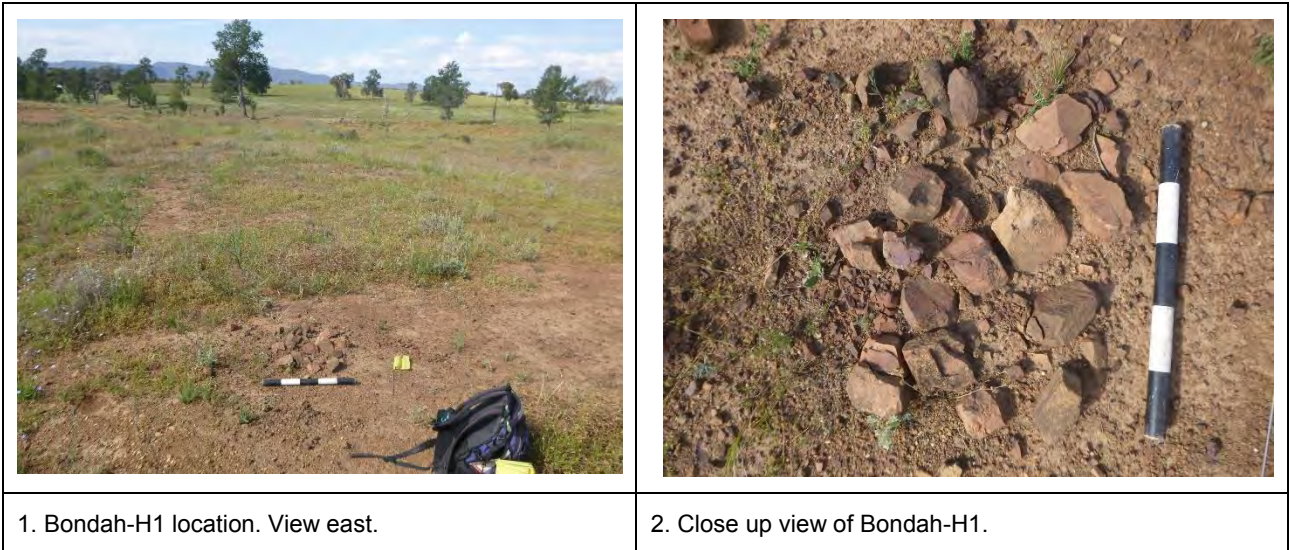


Figure 5-47: Bondah-H1. View of site and recorded hearth.**Happy Hills-ST1**

Site Type: Scarred tree

GPS Coordinates: GDA Zone 56 268684E 6586958N

Location of Site: Happy Hills agricultural property, approximately 1.6km west northwest of the Happy Hills main entrance gates on Rushes Creek Road, 1.2km west southwest of the more recent Happy Hills homestead and 2.5km southeast of Lake Keepit (**Figure 5-46**).

Description of Site: The site is located adjacent to an ephemeral first order tributary of Plain Creek on a mid to lower slope landform within a vegetated corridor between an existing ploughed paddock, access road and property boundary (**Figure 5-47** and **Table 5-35**). GSV in the site area was low at 5%. Pasture grasses were dense and few isolated trees observed in adjacent areas. Nearby disturbances included previous clearing, ploughing and cultivation in adjacent paddock, vehicle access, and fence construction.

Figure 5-48: Happy Hills-ST1. View of the scarred tree.**Table 5-35: Happy Hills-ST1 scarred tree attributes.**

Type of tree (gum; smooth bark; box; rough bark)	Box
Condition of tree (good, fair, dead)	Good
Scar Length (cm)	105
Scar Width (cm)	33
Scar Depth (cm)	10
Regrowth (cm)	20
Height of base above ground (cm)	120
Scar shape (Elongated, oval, irregular)	Oval
Orientation (direction of scar is facing)	SW
Condition of scar (good, fair, poor)	Good
Associated with artefacts/PAD	No

Happy Hills-ST2

Site Type: Scarred tree

GPS Coordinates: GDA Zone 56 268363E 6587137N

Location of Site: Happy Hills agricultural property, approximately 2.1km west northwest of the Happy Hills main entrance gates on Rushes Creek Road, 1.5km west northwest of the more recent Happy Hills homestead and 2.2km southeast of Lake Keepit (Figure 5-46).

Description of Site: The site is located to the southeast of a first order tributary of the Namoi River on a gentle mid slope, within a vegetated corridor between an existing ploughed paddock, access road and property boundary (Figure 5-49 and Table 5-36). GSV in the area was approximately 15%. Pasture grasses and isolated trees were observed in the surrounding area. Nearby disturbances included previous clearing, ploughing and cultivation in adjacent paddock, vehicle access, and fence construction.

Figure 5-49: Happy Hills-ST1. View of the scarred tree.



Table 5-36: Happy Hills-ST2 scarred tree attributes.

Type of tree (gum; smooth bark; box; rough bark)	Box
Condition of tree (good, fair, dead)	Good
Scar Length (cm)	140
Scar Width (cm)	38
Scar Depth (cm)	10
Regrowth (cm)	23

Height of base above ground (cm)	118
Scar shape (Elongated, oval, irregular)	Oval
Orientation (direction of scar is facing)	NW
Condition of scar (good, fair, poor)	Good
Associated with artefacts/PAD	No

Happy Hills-ST3

Site Type: Scarred tree

GPS Coordinates: GDA Zone 56 268207E 6585970N

Location of Site: Happy Hills agricultural property, approximately 2.1km southwest of the Happy Hills main entrance gates on Rushes Creek Road, 1.8km southwest of the more recent Happy Hills homestead and 2.5km northeast of Lake Keepit (**Figure 5-46**).

Description of Site: The site is located within a grassed paddock surrounded by a number of mature isolated trees on a lower slope landform (**Figure 5-50** and **Table 5-37**). GSV was very low at <5%. Nearby disturbances included previous vegetation clearing, fence construction, and livestock grazing and active erosion.

Figure 5-50: Happy Hills-ST3. View of the scarred tree.



1. View north to the scar from Happy Hills-ST3.



2. View of scarred tree and surrounds from Happy Hills-ST3.

Table 5-37: Happy Hills-ST3 scarred tree attributes.

Type of tree (gum; smooth bark; box; rough bark)	Box
Condition of tree (good, fair, dead)	Good
Scar Length (cm)	132
Scar Width (cm)	28
Scar Depth (cm)	12
Regrowth (cm)	25
Height of base above ground (cm)	48
Scar shape (Elongated, oval, irregular)	Oval and Elongated
Orientation (direction of scar is facing)	S
Condition of scar (good, fair, poor)	Fair
Associated with artefacts/PAD	No

5.5 PREVIOUSLY RECORDED ABORIGINAL SITE LOCATED

A search of the AHIMS database revealed that one previously recorded site is located 15m north of the Survey Area. AHIMS site #20-5-0091 is a scarred tree located along the northern road corridor of Ski Gardens Road.

The location of the previously recorded site was visited during the assessment in order to ground-truth its location and assess its current condition.

AHIMS #20-5-0091

Other Names: Ski Gardens Road Manila

Site Type: Culturally modified tree – scarred tree

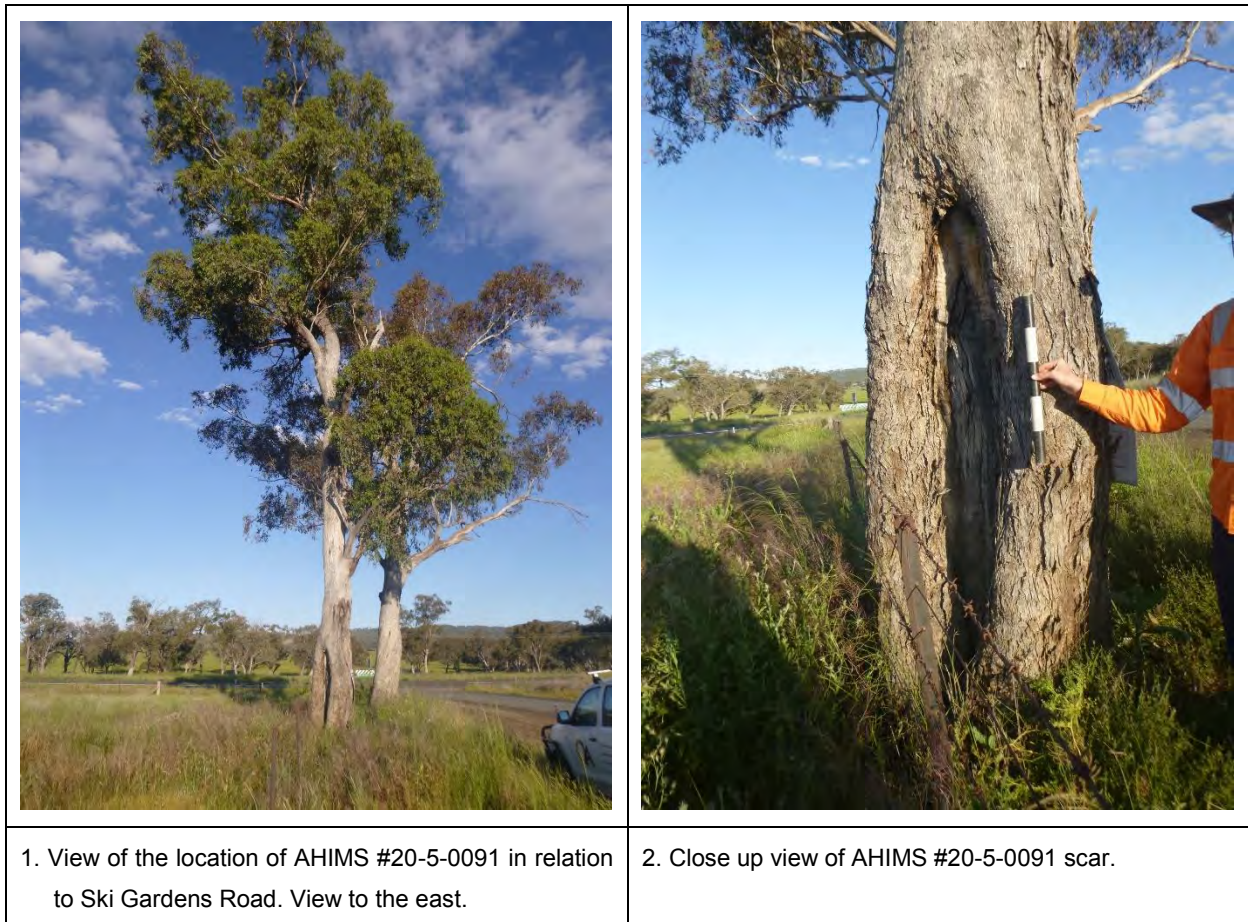
GPS Coordinates: GDA Zone 56 270637E 6589591N

Location of Site: AHIMS #20-5-0091 lies within the northern road corridor of Ski Gardens Road, approximately 65m west of the intersection of Ski Gardens Road and Rushes Creek Road (**Figure 5-51**). Site is located, at its closest, 207m southwest of Rushes Creek Road.

Description of Site: AHIMS #20-5-0091 consists of a box scarred tree displaying one cultural scar (**Figure 5-52** and **Table 5-38**). The tree is alive and the scar is in good condition. No additional regrowth was noted since its original recording in 2015.

Figure 5-51: Location of AHIMS site #20-5-0091 in relation to the Survey Area.



Figure 5-52: AHIMS #20-5-0091. View of tree and close up view of scar.**Table 5-38: AHIMS #20-5-0091 scar attributes.**

	Scar Attributes
Species	Box
Scar Length (cm)	128
Scar Width (cm)	85
Scar Depth (cm)	8
Regrowth (cm)	8
Scar Shape	Elongated
Orientation	North west
Condition of scar	Good

5.6 ABORIGINAL COMMUNITY INPUT

Nominated site officers from the TLALC and Gomeroi People NC2011/006 (C/- Sam Hegney; T/A Gomeroi Country Services Pty Ltd) were present during the field survey (**Section 2-3**). There were no objections to the manner in which the survey was implemented or completed. Overall, Aboriginal community representatives commented that the significance of the area was not directly related to significance of each site located within the Survey Area, but rather cultural recognition or their use of the land as a whole, particularly in relation to its proximity to Namoi River.

A number of other scarred trees were observed across the Survey Area, with a large majority of these displaying irregular scar shapes. The attending Aboriginal site officers agreed that all scars present on the trees were the result of natural trauma resultant from branch tears, and as such, it was agreed not to record them.

The site officer from TLALC raised concerns over the presence of a potential burial located along the tributary of the Namoi River in the north of the Survey Area, adjacent to Bondah-OS3. The location of the potential burial site was noted by the presence of a discrete manifestation of rocks. Following discussions between the representative and the archaeologists, it was deemed that the manifestation was a hearth (Bondah-H1) as opposed to a burial site. This was evidenced by the presence of heat fractured rocks and generally thin A-Horizon soils that would not have been suitable for a burial site.

5.7 DISCUSSION

5.7.1 Site types

The results of the survey conform closely to the predictive model (**Section 4.4**). The results from the current survey are:

- The survey recorded one hearth, three scarred trees, 14 artefact scatters and 17 isolated finds (**Section 5.4**).
- One previously recorded site is located in close proximity to the Survey Area. The location of this site was confirmed to be outside the Survey Area (**Section 5.5**).
- 97% of the newly recorded sites are either isolated finds or low density artefact scatters without associated archaeological deposits.
- As a result of the survey, only one site (Bondah-OS3) was assessed as having a likelihood to contain subsurface deposits, although these artefacts are likely to be at a low density.
- The absence of stone quarries and grinding grooves is attributable to the absence of suitable rock outcropping. While basalt outcropping was identified along the southern boundary of the Survey Area, there was no evidence to suggest use of the outcrop for stone procurement.
- The absence of freshwater middens may be attributed to small area of land adjacent to the Namoi River and a lack of suitable landforms for base camp activity.
- The crests and ridges contained no evidence of ceremonial sites, and if these had consisted of stone arrangements, it is likely they have been removed due to past land use.

In brief, the following characteristics can be examined for the recorded sites:

- Distribution of sites: The recording of previous Aboriginal sites shows a correlation between site size and distance to reliable water with larger, more complex, sites being located near reliable or semi-reliable water. The current assessment shows that the

largest site recorded (Bondah-OS3) was associated with the banks of a tributary of the Namoi River. While larger and more complex sites were predicted to occur adjacent to the Namoi River itself, the lack of complex sites may be attributed to the Survey Area's specific topography; specifically that mid-slope and upper slope landforms are present closer to the river and elevated terraces are lacking. The generally low artefact density of the remaining artefact scatters is reflective of the fact that the drainage across the majority of the Survey Area is unlikely to have provided reliable or semi-reliable water. Sites located away from water have a low artefact density and perhaps represent a single event rather than a site that has been used for camping and tool making over the long term.

- Site type: The regional and predictive model suggested that artefact scatters and isolated finds would be the most common site type recorded and this is supported by the survey results (**Section 4.3**). As the Survey Area contains mature, native vegetation in isolated stands, scarred trees were predicted possible to occur and three were recorded. Hearth sites were not predicted to be common within the Survey Area due to high levels of disturbance and a lack of previous recordings within the region, however, one hearth site was recorded.
- Artefact density: As only low artefact densities were recorded, this result accords with the regional model that sites in such landforms (i.e. largely distant from major waterways) will be of a low artefact density. This indicates Aboriginal use of all areas within the Survey Area; although the surviving archaeological record suggests that this was in a low intensity manner.
- Types of raw material: Regional studies show that the majority of sites will include basalt, mudstone, chert, quartz, chalcedony. All of these raw materials were recorded during the survey. Additional materials recorded include volcanics, hornfels, jasper and fine-grained siliceous materials.
- Artefact type: Most artefacts recorded were unmodified flakes and this also accords with the regional model. While some specialised tools such as backed flakes, backed blades, and scrapers were recorded, their numbers were low, as was the frequency of cores.

5.7.2 Landscape context

Within this archaeological context, the current landscape context of the Survey Area (**Section 3**) needs to be taken into account when discussing the site types recorded. The salient features of the landscape are:

- Topography, geology and soils
 - Over 17% of the Survey Area has mid-slope and upper slope landforms, and no Aboriginal sites were recorded within these landforms. As outlined in **Section 3.7**, sites were unlikely to be recorded in these landforms as they are not suitable for long-term occupation.
 - 71.7% of the Survey Area included flat and lower slope landforms which are conducive to longer-term occupation. This was reflected in the survey results with 34 of the 35 sites being recorded on these landforms and is consistent with the results presented by ERM (2002) near Lake Keepit.

- One site, an isolated find, was recorded on a crest landform adjacent to the Namoi River. No sites were recorded along the broad ridge in the south of the Survey Area.
- Soils are very erodible and there is widespread evidence of severe erosion in the past and more moderate erosion today. Erosion led to the identification of a number of sites, particularly in areas adjacent to waterways.
- Basalt outcropping was recorded in the south of the Survey Area, but there was no evidence to suggest the outcrops were utilised for stone procurement. Drainage lines comprised schist bedrock, a material deemed to be not appropriate for stone tool manufacture.
- Hydrology
 - The Survey Area has very limited portions of higher order waterways.
 - 30 of the recorded 35 sites are recorded within 200m of watercourses/drainage lines. The largest and most complex site (Bondah-OS3) is located along both banks of a tributary of the Namoi River.
- Previous disturbances
 - There has been a moderate to high level of previous disturbance to most of the Survey Area. There is evidence that the area has been subject to the widespread clearance of native vegetation and subject to sheet and gully erosion.

5.7.3 Representativeness, rarity and integrity

All values of the *Burra Charter* are considered when evaluating the significance of sites in the Survey Area. Significance assessment of open sites is extremely variable and dependent upon several factors relating to:

- Preservation: Whether the site has the potential for the presence of intact, sub-surface deposit, or whether disturbance (human: land surface impacts, or environmental: erosion, deflation) has reduced its integrity and thus its potential;
- Representativeness: Is this the type of site one may expect in this landscape? (relates back to the predictive model), i.e. do many such sites occur nearby?;
- Artefacts: Are there artefacts present (material, types or combinations thereof) that are rare in the area or unusual for that type of site?; and
- PADs: It is impossible to determine the scientific significance of PADs that do not have visible surface artefacts, as there is no site material or soil data to assess. Consequently, test excavation is required for such areas to investigate the presence, extent, nature and integrity of any possible site material such that their significance can be assessed.

The features of representativeness, rarity and integrity of archaeological sites within the Survey Area are discussed below.

Representativeness: As seen above, sites recorded during the survey such as isolated finds, artefact scatters and scarred trees are very representative of sites in the region that are located in landforms near water. In terms of site size, artefact density, raw materials and artefact types, the results of the survey neatly complement the archaeological context highlighted in **Sections 4.2 and 4.3**. **Sections 4.2 and 4.3** also highlight that hearths are not well represented in the region.

Rarity: In the past sites such as isolated finds and artefact scatters would not have been rare and on a state-wide scale, low density artefact scatters and isolated finds would remain the most common site type recorded. Although the sites recorded during this assessment are in no way remarkable, their presence alone, in albeit a much modified landscape, remains a memory of the past in a landscape that is fast changing (or has changed). Scarred trees are rarer today following large scale vegetation clearance and the fact that the site type will only remain extant within the landscape for the lifespan of the tree. Hearths are the rarest of the site types recorded within the Survey Area, and are rare at a regional level.

Integrity: The results of the survey conclude that the general site integrity is very low. As noted, the Survey Area has been subject to severe erosion in the past. 97% of newly recorded sites were assessed to have no associated archaeological deposits and are therefore surface manifestations and possibly, on an individual artefact level, displaced.

5.8 ASSESSMENT OF SIGNIFICANCE

5.8.1 Introduction

The appropriate management of cultural heritage items is usually determined on the basis of their assessed significance as well as the likely impacts of any proposed developments. Scientific, cultural and public significance are identified as baseline elements of significance assessment, and it is through the combination of these elements that the overall cultural heritage values of a site, place or area are resolved.

Social or Cultural Value

This area of assessment concerns the importance of a site or features to the relevant cultural group: in this case the Aboriginal community. Aspects of social value include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

Archaeological/Scientific Value

Assessing a site in this context involves placing it into a broader regional framework, as well as assessing the site's individual merits in view of current archaeological discourse. This type of value relates to the ability of a site to answer current research questions and is also based on a site's condition (integrity), content and representativeness.

The overriding aim of cultural heritage management is to preserve a representative sample of the archaeological resource. This will ensure that future research within the discipline can be based on a valid sample of the past. Establishing whether or not a site can contribute to current research also involves defining 'research potential' and 'representativeness'. Questions regularly asked when determining significance are: can this site contribute information that no other site can? Is this site representative of other sites in the region?

Aesthetic Value

This refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with the social values. It may consider form, scale, colour, texture and material of the fabric or landscape, and the smell and sounds associated with the place and its use (Australia ICOMOS 2013).

Historic Value

Historic value refers to the associations of a place with a historically important person, event, phase or activity in an Aboriginal community. Historic places do not always have physical evidence of their historical importance (such as structures, planted vegetation or landscape modifications). They may have 'shared' historic values with other (non-Aboriginal) communities.

Places of post-contact Aboriginal history have generally been poorly recognised in investigations of Aboriginal heritage. Consequently the Aboriginal involvement and contribution to important regional historical themes is often missing from accepted historical narratives. This means it is often necessary to collect oral histories along with archival or documentary research to gain a sufficient understanding of historic values.

5.8.2 Assessed Significance of the Recorded Sites

Social or Cultural Value

The assessment of cultural or social value concerns the importance of a site or features to the relevant cultural group – in this case the Aboriginal community. Aspects of social value include assessment of sites, items, and landscapes that are traditionally significant or that have contemporary importance to the Aboriginal community. This importance involves both traditional links with specific areas, as well as an overall concern by Aboriginal people for their sites generally and the continued protection of these. This type of value may not be in accord with interpretations made by the archaeologist: a site may have low archaeological value but high social value, or vice versa.

A copy of this ACHAR was sent to the RAPs on 29 August 2017 (**Appendix 1**). No feedback was received relating to the social or cultural value of the newly recorded sites. As such, for the purposes of assessing the potential impact to Aboriginal cultural heritage (**Section 5.10**), all recorded sites have been accorded high social and cultural values.

Archaeological/Scientific Value

The scientific significance of Happy Hills-IF1 to IF3; Bondah-IF1 to IF12; Happy Hills-OS1 to OS3; Bondah-OS1 and OS2; Bondah-OS4 to OS11 is assessed as low as all sites represent artefacts in secondary contexts. These sites are described as having low scientific / archaeological significance based on the following factors:

- Low density of artefacts;
- Few formal tool types;
- Located in areas where there has been an almost complete loss of A-Horizon soils by erosion;
- Widespread past and current erosion creating landform modification; and
- Not possible to determine the original or primary context of the recorded artefacts.

Bondah-OS3 exhibits slightly less disturbance when compared to the other sites recorded and is therefore assessed as having moderate scientific values as it is a low density artefact scatter with potential for subsurface archaeological deposits.

Happy Halls-ST1 to ST3 are representative examples of one of the region's most common site types. Due to the frequency of this site type within the region and locality, the archaeological significance of Happy Halls-ST1 to ST3 is somewhat reduced. Furthermore, none are associated with landforms displaying a high level of sub-surface archaeological potential. Nevertheless, the trees strengthen the evidence for a picture of widespread Aboriginal modification of trees throughout the region.

Bondah-H1 has been subject to erosion but is intact and has been assessed as having moderate to high archaeological potential. The assessment of value is based on the amount of information that may be gathered for further local and regional archaeological studies as the site could be subject to chronological dating.

Aesthetic Value

Happy Hills-IF1 to IF3; Bondah-IF1 to IF12; Happy Hills-OS1 to OS3; Bondah-OS1 to OS11 and Bondah-H1 have been assessed as having low aesthetic value. None of the Aboriginal sites recorded have significant aesthetic value as the integrity of the sensory landscape has been altered in historic and modern times. Additionally, the artefacts themselves are generally not remarkable.

Happy Hills-ST1 to ST3 have been assessed as holding low aesthetic value. Scars on trees are typically less difficult for the layperson to interpret than stone artefact remains, and the aesthetic value of a site is derived from its relationship to and position within the surrounding landscape.

These sites are located within areas previously cleared as a result of agriculture and/or development.

Historic Value

None of the Aboriginal sites recorded have an apparent direct relationship to known historical Aboriginal sites (such as missions or massacre sites). It is possible that the area saw some of the earliest contact between Aboriginals and non-Aboriginal settlers, however, none of the recorded Aboriginal sites display evidence that they constitute 'contact' or 'post-contact' Aboriginal sites. To that end, all recorded sites are assessed as having no historic value.

Table 5-39 summarises the significance assessment of sites recorded during this assessment.

Table 5-39: Significance assessment.

Site Name	Social or Cultural Value	Aesthetic Value	Historic Value	Archaeological / Scientific Value
Happy Hills-IF1	High	Low	Nil	Low: No associated subsurface deposits as the site is within a cropped paddock.
Happy Hills-IF2	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Happy Hills-IF3	High	Low	Nil	Low: No associated subsurface deposits as the site is within a cropped paddock.
Happy Hills-IF4	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF1	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF2	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF3	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF4	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF5	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF6	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF7	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF8	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF9	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF10	High	Low	Nil	Low: the artefact itself is of interest, as it is a tool, however, the site has been too modified by farming activities to have intact deposits, and therefore is not likely to yield further data about Aboriginal occupation.
Bondah-IF11	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF12	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Bondah-IF13	High	Low	Nil	Low: the artefact is not in situ and no associated archaeological deposits were identified.
Happy Hills-OS1	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed soils, making the likelihood of

Site Name	Social or Cultural Value	Aesthetic Value	Historic Value	Archaeological / Scientific Value
				subsurface deposits unlikely. Nearby exposures did not contain artefacts.
Happy Hills-OS2	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed soils, making the likelihood of subsurface deposits unlikely. Nearby exposures did not contain artefacts.
Happy Hills-OS3	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed soils, making the likelihood of subsurface deposits unlikely. Nearby exposures did not contain artefacts.
Bondah-OS1	High	Low	Nil	Low: does not present any unique characteristic, material or feature which would advance archaeological research in the region.
Bondah-OS2	High	Low	Nil	Low: does not present any unique characteristic, material or feature which would advance archaeological research in the region.
Bondah-OS3	High	Low	Nil	Moderate: This site has a diversity of stone artefacts. It is possible that there are intact subsurface deposits in the grass-covered areas adjacent to exposures, which may yield further data about Aboriginal occupation.
Bondah-OS4	High	Low	Nil	Low: does not present any unique characteristic, material or feature which would advance archaeological research in the region.
Bondah-OS5	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed soils, making the likelihood of subsurface deposits unlikely. Nearby exposures did not contain artefacts.
Bondah-OS6	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed and thin soils, making the likelihood of subsurface deposits unlikely.
Bondah-OS7	High	Low	Nil	Low: site is sparse and is situated on a landform with disturbed and thin soils, making the likelihood of subsurface deposits unlikely.
Bondah-OS8	High	Low	Nil	Low: the recorded artefacts display usage of the surrounding the drainage line but do not indicate extensive settlement or activity in the immediate vicinity.
Bondah-OS9	High	Low	Nil	Low: the recorded artefacts display usage of the surrounding the drainage line but do not indicate extensive settlement or activity in the immediate vicinity.
Bondah-OS10	High	Low	Nil	Low: does not present any unique characteristic, material or feature which would advance archaeological research in the region.
Bondah-OS11	High	Low	Nil	Low: does not present any unique characteristic, material or feature which would advance archaeological research in the region.
Bondah-H1	High	Low	Nil	Moderate to high: the site is intact, and has potential to advance archaeological research in the region through dating, should it ever be undertaken.
Happy Hills-ST1	High	Low	Nil	Low: site is well preserved and a good representation of a scarred tree, but is unlikely to yield further data.
Happy Hills-ST2	High	Low	Nil	Low: site is well preserved and a good representation of a scarred tree, but is unlikely to yield further data.
Happy Hills-ST3	High	Low	Nil	Low: site is well preserved and a good representation of a scarred tree, but is unlikely to yield further data.

5.9 LIKELY IMPACTS TO ABORIGINAL HERITAGE FROM THE DEVELOPMENT

Most activity associated with the construction of Development infrastructure involves some degree of surface disturbance and direct impact to the landscape. These footprints have been designed by the Proponent to avoid or minimise harm to as many Aboriginal sites as practicable.

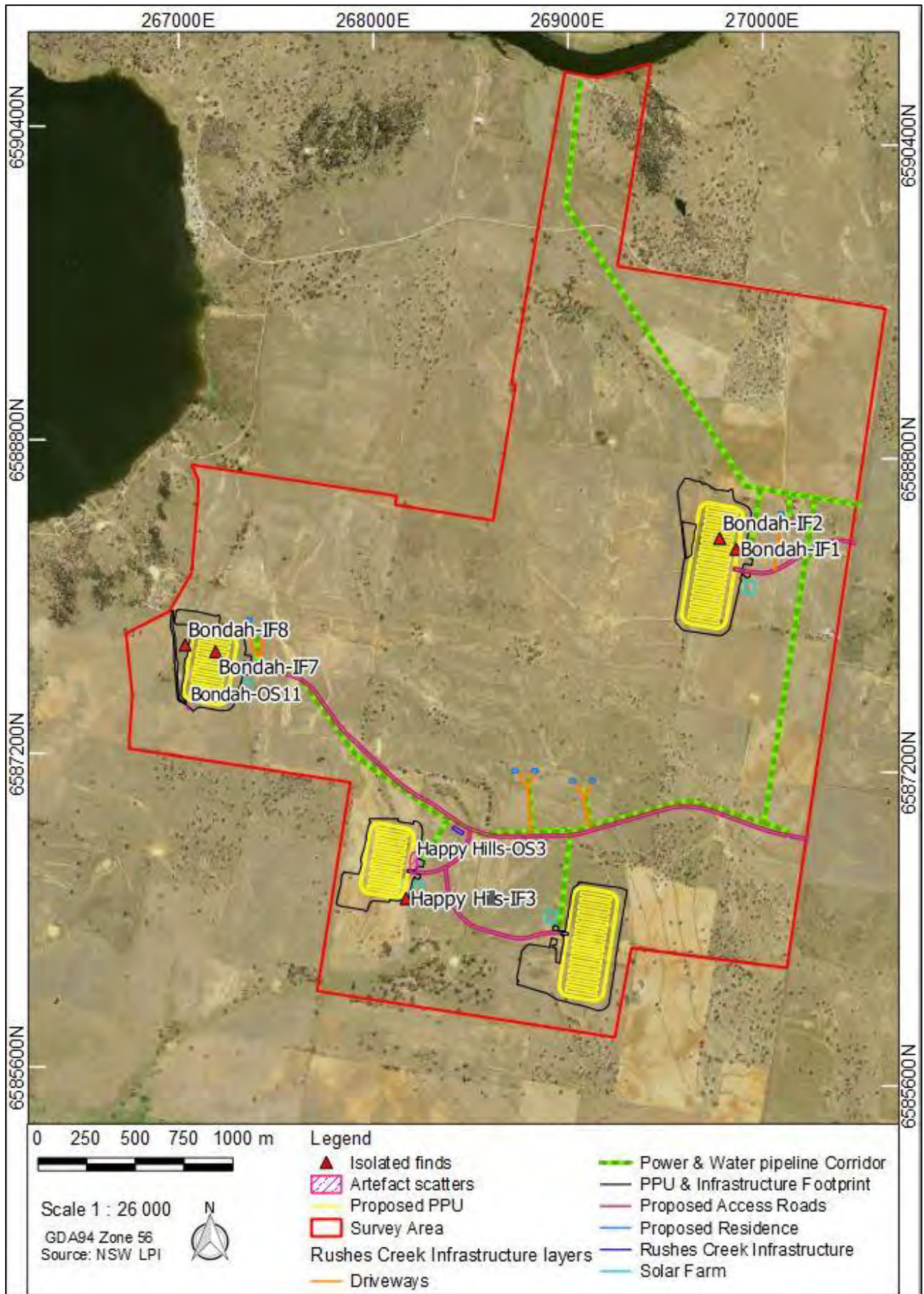
Of the 35 newly recorded sites (17 isolated finds, 14 artefact scatters, one hearth and three scarred trees), only seven (five isolated finds and two low density artefact scatters consisting of four artefacts and two artefacts per site) are within the impact footprint of Development infrastructure and are liable to be harmed by the Development (**Table 5-40** and **Figure 5-53**). The remaining 28 sites are outside of the impact footprint area but will require management measures to ensure they are not inadvertently impacted (**Section 6**).

Table 5-40: Impact assessment.

Site Name	Type of Harm (Direct/Indirect/None)	Degree of Harm (Total/Partial/None)	Type of Harm	Consequence of Harm (Total/Partial/No Loss of Value)
Happy Hills-IF1	None	None	N/A	None
Happy Hills-IF2	None	None	N/A	None
Happy Hills-IF3	Direct	Total	Proposed PPU	Total loss of value
Happy Hills-IF4	None	None	N/A	None
Bondah-IF1	Direct	Total	Proposed PPU	Total loss of value
Bondah-IF2	Direct	Total	Proposed PPU	Total loss of value
Bondah-IF3	None	None	N/A	None
Bondah-IF4	None	None	N/A	None
Bondah-IF5	None	None	N/A	None
Bondah-IF6	None	None	N/A	None
Bondah-IF7	Direct	Total	Proposed PPU	Total loss of value
Bondah-IF8	Direct	Total	Proposed PPU	Total loss of value
Bondah-IF9	None	None	N/A	None
Bondah-IF10	None	None	N/A	None
Bondah-IF11	None	None	N/A	None
Bondah-IF12	None	None	N/A	None
Bondah-IF13	None	None	N/A	None
Happy Hills-OS1	None	None	N/A	None
Happy Hills-OS2	None	None	N/A	None
Happy Hills-OS3	Direct	Total	Proposed PPU	Total loss of value
Bondah-OS1	None	None	N/A	None
Bondah-OS2	None	None	N/A	None
Bondah-OS3	None	None	N/A	None
Bondah-OS4	None	None	N/A	None
Bondah-OS5	None	None	N/A	None
Bondah-OS6	None	None	N/A	None
Bondah-OS7	None	None	N/A	None
Bondah-OS8	None	None	N/A	None

Site Name	Type of Harm (Direct/Indirect/ None)	Degree of Harm (Total/Partial/ None)	Type of Harm	Consequence of Harm (Total/Partial/No Loss of Value)
Bondah-OS9	None	None	N/A	None
Bondah-OS10	None	None	N/A	None
Bondah OS-11	Direct	Total	Proposed PPU	Total loss of value
Bondah-H1	None	None	N/A	None
Happy Hills-ST1	None	None	N/A	None
Happy Hills-ST2	None	None	N/A	None
Happy Hills-ST3	None	None	N/A	None

Figure 5-53: View of recorded sites to be impacted by the Development.



5.9.1 Ecological Sustainable Development Principles

Australia's *National Strategy for Ecologically Sustainable Development* (Ecologically Sustainable Development Steering Committee 1992) defines ecologically sustainable development (ESD) as:

...using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

The management and mitigation of Aboriginal sites involves consideration of ESD principles including cumulative impacts, the precautionary principle and the principle of intergenerational equity (OEH 2011: 12–13).

With regards to cultural heritage, the most important aspect of ESD is inter-generational equity whereby the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations. Similarly inter-generational equity maintains that places and items of cultural heritage value should be preserved for the education, enjoyment and use of future generations.

The Development adds to the cumulative impact on the region's Aboriginal cultural heritage as seven sites will be harmed. However, the heritage impact value of this loss is low as the seven sites consist of isolated finds and two low density artefact scatters. The Proponent has designed the impact footprint of the Development in order to avoid a large number of Aboriginal sites, particularly those sites deemed to have higher archaeological significance.

5.10 OVERALL VALUE OF POTENTIAL IMPACT ON HERITAGE ITEMS

A series of guidelines have been developed by the DP&E to quantify and standardise impact assessments (DP&E 2016). The rubric outlined in DP&E 2016 leads to all impacts being graded within the matrix shown in **Figure 5-54**. **Table 5-41** assesses each heritage item to arrive at a standardised 'value of impact'.

Figure 5-54: Potential impact to heritage items reference matrix.

		Significance of heritage object or place			
		Very high	High	Medium	Low
Degree of potential impact on heritage item	Total impact	Very high value	High value	Medium value	Low value
	High partial impact	High value	High value	Medium value	Low value
	Medium partial impact	Medium value	Medium value	Low value	Minimal value
	Minimal partial impact	Low value	Low value	Minimal value	Minimal value

Table 5-41: Overall value of potential impact on heritage item.

	Heritage item 1	Heritage item 2	Heritage item 3	Heritage item 4	Heritage item 5	Heritage item 6	Heritage item 7
Name or location of the heritage object or place	Bondah-IF1	Bondah-IF2	Happy Hills-IF3	Bondah-IF7	Bondah-IF8	Happy Hills-OS3	Bondah-OS11
Social or cultural value	2	2	2	2	2	2	2
Historical	0	0	0	0	0	0	0
Scientific	0	0	0	0	0	0	0
Aesthetic	0	0	0	0	0	0	0
Significance of heritage item	Low importance	Low importance	Low importance	Low importance	Low importance	Low importance	Low importance
Degree of impact (partial or full)	Full impact	Full impact	Full impact	Full impact	Full impact	Full impact	Full impact
Overall value of potential impact on heritage item	Low value	Low value	Low value	Low value	Low value	Low value	Low value
Reasoning behind scores	General disturbance at site; no associated artefacts or deposits.	General disturbance at site; no associated artefacts or deposits.	General disturbance at site; no associated artefacts or deposits.	General disturbance at site; no associated artefacts or deposits.	General disturbance at site; no associated artefacts or deposits.	General disturbance at site; very low artefact density. No associated deposits.	General disturbance at site; very low artefact density. No associated deposits.

As can be seen in **Table 5-41** the proposed impact to the recorded sites Bondah-IF1, Bondah-IF2, Happy Hills-IF3, Bondah-IF7, Bondah-IF8, Happy Hills-OS3, and Happy Hilla-OS11 has been evaluated as having a low value³. As such, the intergenerational loss arising from the Development is considered to be minimal and of low value. However, the management measures set out in **Section 6** will attempt to mitigate the loss of this heritage value.

³ It must be borne in mind that this statement is not a reflection that artefacts are considered to have a 'low value', rather that the loss of heritage value has a 'low value' when considered at a regional setting. It is accepted that the Aboriginal cultural heritage sites discussed within the report are part of the Aboriginal cultural landscape of the area, and that they are linked and collectively tell an important story about the Aboriginal use of the area. As a result, they are significant and valued by Aboriginal people and should ideally be protected. However, if they must be impacted, then the sites under discussion here have a 'low value' in that they can add little to our knowledge or understanding of this Aboriginal cultural landscape.

6 MANAGEMENT AND MITIGATION: ABORIGINAL HERITAGE

6.1 GENERAL PRINCIPLES FOR THE MANAGEMENT OF ABORIGINAL SITES

Appropriate management of cultural heritage items is primarily determined on the basis of their assessed significance as well as the likely impacts of the proposed development. **Section 5.8.2** and **Section 5.9** describe, respectively, the significance / potential of the recorded sites and the likely impacts of the development. The following management options are general principles, in terms of best practice and desired outcomes, rather than mitigation measures against individual site disturbance.

- Avoid impact by altering the Development or in this case by avoiding impact to a recorded Aboriginal site. If this can be done, then a suitable curtilage around the site must be provided to ensure its protection both during the short-term construction phase of development and in the long-term use of the area. If plans are altered, care must be taken to ensure that impacts do not occur to areas not previously assessed.
- If impact is unavoidable: An AHIP which is normally required for impacts to Aboriginal sites under the NPW Act are not necessary as the Development is being assessed under Part 4 Division 4.7 of the EP&A Act (SSD). This notwithstanding, the spirit of site protection and management in the face of impacts remains the same. In place of a permit under the NPW Act, a Statement of Commitments (SoC) in terms of heritage management is prepared. This SoC forms the basis for the Minister's approval which would usually contain one or more conditions, including a requirement for the preparation of an ACHMP, with which the Proponent would be required to operate in accordance with.

The ACHMP should include measures for site conservation, as well as detailing methods for the management of sites to be impacted. The management will depend on many factors including the assessed significance of the sites (**Section 5.8.2**). In certain instances, a site may have low archaeological, aesthetic, and historic values but moderate or high cultural value. In these cases, management is aimed to mitigate the loss of the cultural heritage values, rather than the loss of the scientific values. Sites of low scientific significance, such as an isolated find, could, from an archaeological perspective, be removed/destroyed with no further archaeological management being required. However, given the site's cultural value, further management in respect to these sites will be recommended here. For example, due to a site's cultural values, the local Aboriginal community may wish to collect or relocate artefacts, whether temporarily or permanently, and such management will form part of the ACHMP. The ACHMP will be developed in consultation between the Proponent, RAPs, OEH and DP&E.

6.2 MANAGEMENT AND MITIGATION OF RECORDED ABORIGINAL SITES

As a result of the current assessment 35 sites have been newly recorded within or adjacent to the impact footprint of the Development. Of these 35 sites, seven sites will be directly impacted by the Development and the remaining 28 will be avoided.

It is recommended that these sites be salvaged through the recording and collection of surface artefacts. This recommendation is made due to:

- The cultural value of these sites and their importance to the Aboriginal community;
- The nature of the potentially impacted sites (all are isolated finds or a low density artefact scatters consisting of four and two artefacts per site);
- Generally being located in areas with thin A-Horizon soils that preclude subsurface archaeological deposits;
- Being generally located in landforms of lower archaeological potential (i.e. in areas distant to reliable water);
- Being generally located in landforms with high previous disturbance from a range of factors including erosion and land use practices;
- The low archaeological values assigned to the sites preclude more intensive archaeological investigations; and
- Sites such as these have a very limited ability to further inform the community about the history and culture of the area. While any potential research questions are limited, some information can nevertheless be gained.

Table 6-1 sets out the recommended archaeological management of all sites within or adjacent to the impact footprint of the Development.

The recommended management specific to each site is detailed in **Section 6.3**.

Table 6-1: Management recommendations for sites within or adjacent to the impact footprint of the Development.

Site Name	Assessed scientific significance	Degree of harm	Management strategy
Happy Hills-IF1	Low	None	No management required. The site is located 425m east of a PPU.
Happy Hills-IF2	Low	None	No management required. The site is located 260m west of a PPU.
Happy Hills-IF3	Low	Total	Description and collection of surface artefact.
Happy Hills-IF4	Low	None	The site is located within 50m of the access road to the north. It should be permanently fenced with a 10m buffer during both the construction and operational phases of the Development. The fencing should be clearly visible and signed with 'Do Not Enter'.
Bondah-IF1	Low	Total	Description and collection of surface artefact
Bondah-IF2	Low	Total	Description and collection of surface artefact
Bondah-IF3	Low	None	No management required. The site is located 100m south of a PPU.
Bondah-IF4	Low	None	No management required. The site is located 470m northeast of the proposed water pipeline and powerline, and proposed access road.
Bondah-IF5	Low	None	The site is located within 30m northeast of the proposed access road. It should be permanently fenced with a 10m buffer during both the construction and operational

Site Name	Assessed scientific significance	Degree of harm	Management strategy
			phases of the Development. The fencing should be clearly visible and signed with "Do Not Enter".
Bondah-IF6	Low	None	No management required. The site is located 60m southwest of a proposed water pipeline and powerline.
Bondah-IF7	Low	Total	Description and collection of surface artefact
Bondah-IF8	Low	Total	Description and collection of surface artefacts.
Bondah-IF9	Low	None	No management required. The site is located 150m north of a proposed residence.
Bondah-IF10	Low	None	No management required. The site is located 200m northeast of a proposed residence.
Bondah-IF11	Low	None	No management required. The site is located 115m northeast of a proposed residence.
Bondah-IF12	Low	None	No management required. The site is located 155m east of the proposed water pipeline and powerline.
Bondah-IF13	Low	None	No management required. The site is located 600m southwest of the proposed water pipeline and powerline.
Happy Hills-OS1	Low	None	No management required. The site is located 540m south of a PPU.
Happy Hills-OS2	Low	None	No management required. The site is located 220m southeast of a PPU.
Happy Hills-OS3	Low	Total	Mapping, description and collection of surface artefacts.
Bondah-OS1	Low	None	No management required. The site is located 330m east of the proposed water pipeline and powerline.
Bondah-OS2	Low	None	The site is located within 50m of the proposed water pipeline and powerline to the southeast. It should be fenced with a 10m buffer during the construction phase of the Development. The fencing should be clearly visible and signed with "Do Not Enter".
Bondah-OS3	Moderate	None	The site is located 55m southwest of the proposed water pipeline and powerline to the northeast. It should be fenced along its eastern extents during the construction phase of the Development. The fencing should be clearly visible and signed with "Do Not Enter".
Bondah-OS4	Low	None	No management required. The site is located 670m west of the proposed water pipeline and powerline.
Bondah-OS5	Low	None	No management required. The site is located 425m west of the proposed water pipeline and powerline.
Bondah-OS6	Low	None	No management required. The site is located 530m north of a PPU.
Bondah-OS7	Low	None	No management required. The site is located 225m east of a proposed residence and 215m north of the proposed water pipeline and powerline.
Bondah-OS8	Low	None	No management required. The site is located 330m northeast of a proposed access road.
Bondah-OS9	Low	None	The site is located within 20m of a proposed access road to the north. It should be permanently fenced with a 10m buffer around the northern extent during both the construction and operational phases of the Development. The fencing should be clearly visible and signed "Do Not Enter".
Bondah-OS10	Low	None	No management required. The site is located 375m southeast of a proposed PPU.
Bondah-OS11	Low	Total	Mapping, description and collection of surface artefacts.
Bondah-H1	Moderate to high	None	No management required. The site is located 535m west of the proposed water pipeline and powerline.
Happy Hills-ST1	Low	None	No management required. The site is located 135m north of the proposed water pipeline and powerline.

Site Name	Assessed scientific significance	Degree of harm	Management strategy
Happy Hills-ST2	Low	None	No management required. The site is located 135m north of a proposed access road.
Happy Hills-ST3	Low	None	No management required. The site is located 750m southwest of a PPU.

6.3 MANAGEMENT PROCESS

6.3.1 Archaeological salvage: artefact collection

Stone artefact sites managed under this archaeological salvage will contribute to the research aim in that the sites will have surface artefacts mapped, catalogued, selectively photographed, collected and moved to safe-keeping.

It is envisioned that these investigations would include the following methodology although the final form of any investigation would be done in consultation with the RAPs.

Archaeological salvage: surface collection of artefacts

In order to fulfil the research aim, the following program is suggested:

- All visible artefacts at a site should be flagged in the field;
- The site should be photographed after flagging and before recording;
- All artefacts should have the following artefact information entered directly into a GPS unit, albeit one set up with all variable fields already entered to make the field recording job more efficient:
 - Location;
 - Artefact Class;
 - Artefact Type;
 - Size;
 - Reduction level;
 - Raw Material; and
 - Notes.
 - A selection of indicative and / or unusual artefacts from each site will be photographed;
 - A sketch plan of the site will be completed indicating zones for the surface collection of artefacts; and
 - Once all recording is complete, the artefacts will be collected according to site zones with artefacts from each zone being kept separate.

- Should the collection team encounter a human burial, all work should cease in the area and advice from authorities and RAPs (should the remains be Aboriginal) sought;
- The recording of the artefacts recovered will largely be completed in the field and this data would be incorporated into a report; and
- Analysis will attempt to answer the research aim which is to record a statistically valid artefact assemblage from across the Survey Area in order to better understand inter-site variations.

The sites recommended for archaeological salvage by means of surface collection are shown in **Table 6-1**.

7 RECOMMENDATIONS

Under Section 89A of the NPW Act it is mandatory that all newly-recorded Aboriginal sites be registered with OEH AHIMS. As a professional in the field of cultural heritage management it is the responsibility of OzArk to ensure this process is undertaken.

To this end it is noted that **35 Aboriginal sites** were recorded during the assessment.

The following recommendations are made on the basis of these impacts and with regard to:

- Legal requirements under the terms of the NPW Act whereby it is illegal to damage, deface or destroy an Aboriginal place or object without the prior written consent of OEH;
- The findings of the current investigations undertaken within the Survey Area; and
- The interests of the Aboriginal community.

Table 6-1 lists all sites that are likely to be impacted by the Development and tabulates the associated scientific values assessment and recommended archaeological management strategies.

As a consequence of the proposed impacts to Aboriginal cultural heritage sites within the Survey Area, the following archaeological recommendations are made in an effort to responsibly manage Aboriginal cultural heritage sites *in situ*, or where appropriate, mitigate the loss of cultural heritage at those sites within the impact footprint.

1. Should development consent for the Development be granted, archaeological management strategies to manage and mitigate the impact of the proposed works are set out in **Section 6**. All sites within the impact footprint for the Development should be salvaged by a surface collection of all visible artefacts (see **Section 6.3.1**).
2. The salvage works will include the mapping, analysis and collection of all surface artefacts at the affected sites. Results will be included in a report to preserve the data in a useable form.
3. All land-disturbing activities must be confined to within the assessed Survey Area. Should the parameters of the proposed work extend beyond the assessed area, then further archaeological assessment may be required.
4. Following development consent of the Development, an AHIP will not be required for impacts to cultural heritage, so long as the impact accords with the terms and conditions of the consent. Instead, mitigation to impacts on Aboriginal heritage (including the implementation of an unanticipated finds protocol and heritage site induction), would be managed through an ACHMP which is to be agreed to by the Proponent, RAPs, OEH and DP&E. The archaeological management recommendations within this report would normally be incorporated into the ACHMP that is usually formulated following development consent.

REFERENCES

- Apex Archaeology 2016 Apex Archaeology. 2016. *Blackjack Creek Flood Mitigation Project, Gunnedah: Due Diligence*. Report to Gunnedah Shire Council.
- Appleton 2002 Appleton, J. 2002. *The archaeological investigation of the site of a proposed Open Cut Coalmine and centred on the "Belmont" property, Wean Road, north of Gunnedah, Northern NSW*. Report prepared for R.W. Corkery & Co. Pty Ltd, on behalf of Whitehaven Coal Mining Limited.
- Appleton 2007 Appleton, J. 2007. *The archaeological investigation for sites of Indigenous cultural significance on Lot 2 DP 848920, Lincoln Street, Gunnedah, Northern NSW*. Report for Daracon Group on behalf of Mr R. Gallen.
- Appleton 2008 Appleton, J. 2008. The archaeological salvage of three open sites Under Part 3A approval Rocglen Coal Mine, north of Gunnedah, northern NSW. Report for Whitehaven Coal Mining Ltd.
- Australia ICOMOS 2013 International Council on Monuments and Sites 2013. *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance*, 2013.
- Boileau 2007 Boileau, J. 2007. *Thematic History of Nundle, Manilla and Barrana: Tamworth Regional Council Community Based Heritage Study*. Report to Tamworth Regional Council.
- BoM 2017 Bureau of Meteorology. 2017. www.bom.gov.au/
- Burke & Smith 2004 Burke, H. and Smith, C. 2004. *The Archaeologist's Field Handbook*, Blackwell, Oxford.
- DECCW 2010a Department of Environment, Climate Change and Water, Sydney (now OEH). *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*.
- DECCW 2010b Department of Environment, Climate Change and Water (now OEH). *Aboriginal Cultural Heritage Consultation Requirements for Proponents*. Department of Environment, Climate Change and Water, Sydney.
- DP&E 2016 Department of Planning and Environment. Guidelines for the Economic Assessment of Mining and Coal Seam Gas Proposals.
- Eardley 1999 Eardley, K. 1999. *A Foundation for Conservation in the Riverina Bioregion*. Unpublished Report. NSW National Parks and Wildlife Service, Hurstville.

- ERM 2002 Environmental Resources Management Australia. 2002. *Keepit Dam Interim Safety Works: Cultural Heritage Assessment*. Report to Department of Land and Water Conservation.
- Everick 2014 Everick Heritage Consultants. 2014. *Due Diligence Cultural Heritage Assessment: South Tamworth Rural Lands Master Plan, Goonoo, Goonoo Road Site, Tamworth, NSW*. Report to Tamworth Regional Council.
- Fison et al 1880 Fison, L; Howitt, A; and Morgan, L. 1880. *Kamilaroi and Kurnai: group-marriage and relationship by elopement, drawn chiefly from the usage of the Australian aborigine: also the Kurnai tribe, their customs in peace and war*. Aboriginal Studies Press for the Australian Institute of Aboriginal and Torres Strait Islander Studies, Canberra.
- Gammage 2011 Gammage, B. 2011. *The Biggest Estate on Earth: How Aborigines Made Australia*. Allen & Unwin.
- Gardner 1978 Gardner, W (1978 [1842–54]) "Productions and resources of the Northern and Western Districts of New South Wales". In I. McBryde (Ed), *Records of Times Past: Ethnohistorical essays on the culture and ecology of the New England Tribes*, pp239–246. Australian Institute of Aboriginal Studies, Canberra.
- Gaynor 1997 Gaynor, P. 1997. *Short accounts of the findings from the examination of Coonabarabran/Warrumbungle Aboriginal stone artefacts recovered the excavation of the Addendum Shenhua Watermark Project*. Unpublished manuscript held at Gunnedah Shire Library.
- Gorecki 1981 Gorecki, P. 1981. *Archaeological Survey of Authorisation 138, Gunnedah (NSW)*. Report for Gollin Wallsend Coal Company Limited.
- Gorecki et al 1984 Gorecki, P; Horton, D; Stern, N; and Wright, R. 1984. Coexistence of Humans and Megafauna in Australia: Improved Stratified Evidence. *Archaeology in Oceania*. Volume 19, Number 3: pp. 117–119.
- Gott 1983 Gott, B. 1983. Murnong - *Microseris scapigera*. *Australian Aboriginal Studies*, Issue 2.
- Haglund 1982 Haglund, L. 1982. *Archaeological investigations at Top and Bottom Rocks, Namoi Rocks, Namoi River, NSW*. Report to Vickery Joint Ventures Pty Ltd.
- Haglund 1984a Haglund, L. 1984. *Archaeological Survey, Coal Haulage Option Red Hill – Top Rocks – Trunk Road 72*. Report for Vickery Joint Venture.

- Haglund 1984b Haglund, L. 1984. *Archaeological Survey of Area Proposed for Coal Loader at Gunnedah, NSW*. Report to Gutteridge Haskins & Davey Pty Ltd.
- Haglund 1985 Haglund, 1985. *Archaeological investigations of areas that may be affected by proposed mining for coal in the Gunnedah area, New South Wales*. Report to Vickery Joint Venture.
- Haglund 1987 Haglund, 1987. *Archaeological investigations of locations along proposed haul road route west of Gunnedah, NSW*. Report to Vickery Joint Venture.
- Hamm 2005 Hamm, G. 2005. *Boggabri Coal Project: Aboriginal Cultural Heritage Assessment Report*. A report to Idemitsu Boggabri Coal Pty Limited.
- Hudson 2004 Hudson, S. 2004. *An archaeological survey of Porcupine Hill, Gunnedah*. Report for Red Chief Aboriginal Land Council, Gunnedah.
- Idriess 1953 Idriess, I. 1953. *The Red Chief: As told by the last of his tribe*, Angus and Robertson, Sydney.
- McAdam and Wilson 2000 McAdam, L; and Wilson, J. 2000. *The Tamworth Aboriginal Archaeological Site Study*. Report to Tamworth City Council.
- McBryde and Binns 1970 I. McBryde and R.A. Binns. 1970. Preliminary report on a petrological study of ground-edge artefacts from north-eastern New South Wales, Australia. *Proceedings of the Prehistoric Society* 1969/1970: 229–235.
- Mitchell 1939 Mitchell, T. 1839. *Three Expeditions into the Interior of Eastern Australia with Descriptions of the Recently Explored Region of Australia Felix and of the Present Colony of New South Wales*. Libraries Board of South Australia, Adelaide.
- Mitchell 2002 Mitchell, P. 2002. Descriptions for NSW (Mitchell) Landscapes, Version 2. Department of Environment & Climate Change. Available from: <http://www.environment.nsw.gov.au/resources/conservation/landscapesdescriptions.pdf>.
- Navin Officer 2003 Navin Officer Heritage Consultants. 2003. *Keepit Dam Upgrade Options Evaluation: Cultural Heritage Desktop Review*. Report to Parsons Brinckerhoff Australia.
- Navin Officer 2005 Navin Officer Heritage Consultants. 2005. *Keepit Dam Upgrade Options Comparison Report: Cultural Heritage Assessment*. Report to Parsons Brinckerhoff Australia.
- Navin Officer 2007 Navin Officer Heritage Consultants. 2007. *Keepit Dam Upgrade Cultural Heritage Assessment*. A Report to Parsons Brinckerhoff Pty Ltd.

- Niche 2013 Niche Environment and Heritage. 2013. *Proposed Intensive Livestock Industry Facility Aboriginal and Non-Aboriginal Heritage Due Diligence Assessment, near Manilla, NSW*. Report to Rostry Pty Ltd / PSA Consulting.
- NPWS 2003 National Parks and Wildlife Services. 2003. *The Bioregions of New South Wales – Their Biodiversity, Conservation and History*. NSW National Parks and Wildlife Service, Hurstville.
- NOW 2011 NSW Office of Water. 2011. *Water Resources and Management Overview, Namoi Catchment*.
- OEH 2011 Office of Environment and Heritage 2011. *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*.
- O'Rourke 1995 O'Rourke, M. 1995. *Raw Possum and Salted Pork: Major Mitchell and the Kamilaroi*. Plowpress.
- O'Rourke 1997 O'Rourke, M. 1997. *Kamilaroi lands: North-central New South Wales in the early 19th century*. Self-published.
- O'Rourke 2005 O'Rourke, M. 2005. *Sung for Generations: Tales of Red Kangaroo, War Leader of Gunnedah*. Self-published.
- OzArk 2010a OzArk Environmental & Heritage Management. 2010. *Aboriginal and non-Indigenous Heritage Assessment: Tamworth-Gunnedah Transmission Line 875 Dismantling*. Report to TransGrid.
- OzArk 2010b OzArk Environmental & Heritage Management. 2010. *Archaeological Test Excavation: Boonalla Cave, Boonalla Aboriginal Area, Gunnedah, NSW*. Report to National Parks and Wildlife Services.
- OzArk 2012 OzArk Environmental & Heritage Management. 2012. *Archaeological Excavations: Boonalla Cave (AHIMS # 20-4-0197), Boonalla Aboriginal Area, Gunnedah, NSW*. Report to National Parks and Wildlife Services.
- OzArk 2017 OzArk Environmental & Heritage Management. 2017. *Aboriginal Cultural Heritage Salvage Report: Aboriginal Heritage Impact Permit C0002532: #20-4-0278 AND #20-4-0279, Blackjack Creek, Gunnedah NSW*. Report to Gunnedah Shire Council.
- Purcell 2000 Purcell, P. 2000. *Aboriginal Cultural Heritage Assessment, Brigalow Belt South Bioregion (Stage 1)*. Project for Resource and Conservation Assessment Council.
- Thompson 1981 Thompson, P. 1981. *EIS for the proposed Vickery Coal Mine Project*. Kembla Coal and Cole Pty Ltd.

Tindale 1974

Tindale, N. 1974. Aboriginal Tribes of Australia: Their Terrain, Environmental Controls, Distribution, Limits, and Proper Names. Berkeley: University of California Press.

PLATES

Plate 1: View across a cleared paddock along a broad ridge. View to the west.



Plate 2: View along a tributary of the Namoi River and the flat land on either side.



Plate 3: View along a drainage on a mid-slope landform looking towards Lake Keepit.



Plate 4: View along an upper slope landform with no GSE.



Plate 5: View along a lower slope landform adjacent to a drainage line.



APPENDIX 1: ACHCRS

Log of Aboriginal community consultation

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
09-Aug-16	The Northern Daily Leader	Sheridan Baker (SB) spoke to Jenny at the classifieds- publish 6 days a week. Deadline is 12pm the day before- covers Gunnedah area as well.	phone
10-Aug-16	The Northern Daily Leader	SB sent advertisement for quote and proof	email
10-Aug-16	Office of The Registrar, ALRA	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	NTSCORP	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	Office of Environment & Heritage	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	National Native Title Tribunal	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	Tamworth Local Land Services	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	Tamworth Shire Council	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
10-Aug-16	Tamworth LALC	SB sent letter requesting information on interested parties - closing date 26 Aug 2016	email
11-Aug-16	The Northern Daily Leader	Advertisement Proof confirmed and paid. To go in the 12th August edition	phone
12-Aug-16	Tamworth Shire Council	SB received email from Lucy Walker suggesting contact be made with Fiona Snape - CEO of the Tamworth LALC	email
12-Aug-16	National Native Title Tribunal	Sheridan Baker (SB) received a response from the NNTT. Gomerioi People NC2011/006 (NTSCorp no long acts on this Groups behalf and said that the new legal representative is Sam Hegney) Sam Hegney 0417 470 343 6828 1649 mail@samhegney.com.au	email
17-Aug-16	Office of The Registrar	SB received email from Tabatha "I have searched the Register of Aboriginal Owners and the project area described does not appear to have Registered Aboriginal Owners pursuant to Division 3 of the Aboriginal Land Rights Act 1983 (NSW). "	email
22-Aug-16	The Northern Daily Leader	SB left message and sent email requesting tear sheet	phone/email
22-Aug-16	The Northern Daily Leader	SB received tear sheet	email
24-Aug-16	Tamworth LALC	SB sent letter of invitation to be a RAP on interested parties - closing date 10 Sept 2016	email
24-Aug-16	Gomerioi People NC2011/006	SB sent letter of invitation to be a RAP on interested parties - closing date 10 Sept 2016	email
24-Aug-16	Office of Environment & Heritage	SB spoke to Dimitri - request was sent to incorrect division of OEH. Tamworth is administered under North West.	phone
24-Aug-16	Office of Environment & Heritage	SB rang and spoke to Michelle Howarth - Dubbo. Michelle will organise stakeholder list this afternoon.	phone

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
24-Aug-16	Office of Environment & Heritage	SB sent through amended request for stakeholders through to Michelle	email
24-Aug-16	Office of Environment & Heritage	SB received stakeholder list. Stakeholders: Alison Sampson, AT Gomilaroi Cultural Consultancy, BJC Cultural Management, Brent Mathews, Brian Draper, Christine Archibold, Clifford Mathews, Coonabarabran LALC, DFTV Enterprises, Darrell Mathews, Gomeroi Murri Ganurr Yuuray Wadi Palinka, Hazel Collins, Jeff Matthews, John Matthews, Joshua Mathews, Justin Matthews, Kawul Cultural Services, Kevin Sampson, Len Waters, Lloyd Matthews, Lorraine Towney, Luke Cameron Cultural Management, Mavonia Welsh, ME Griffiths Cultural Management, Michelle Saunders, Mooki Plains Management, Mooki River Consultants, Muswellbrook Cultural Consultants, Natasha Rodgers, Nyakka Aboriginal Corporation, Paul Moodie, Richard Slater, Rick Slater, Rodney Mathews, Ron Smith, Rona Slater, Roslyn Smith, Scott Smith, T&G Culture Consultants, Tamworth LALC, Tania Matthews, Tracy Woltey, Wattaka Cultural Consultancy, Wiradjuri Interim Working Party.	email
24-Aug-16	Alison Sampson	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	AT Gomilaroi Cultural Consultancy	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	BJC Cultural Management	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Brent Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Brian Draper	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Christine Archibold	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Clifford Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Coonabarabran LALC	Did not send letter to Coonabarabran LALC as site area is within Tamworth LALC and not near Coonabarabran LALC area	mail
24-Aug-16	DFTV Enterprises	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Darrell Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Gomeroi Murri Ganurr Yuuray Wadi Palinka	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Hazel Collins	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Jeff Matthews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	John Matthews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Joshua Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Justin Matthews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Kawul Cultural Services	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Kevin Sampson	SB sent stage 1 community letter, closing date 10.9.16	mail

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
24-Aug-16	Len Waters	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Lloyd Matthews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Lorraine Towney	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Luke Cameron Cultural Management	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Mavonia Welsh	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	ME Griffiths Cultural Management	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Michelle Saunders	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Mooki Plains Management	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Mooki River Consultants	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Muswellbrook Cultural Consultants	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Natasha Rodgers	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Nyakka Aboriginal Corporation	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Paul Moodie	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Richard Slater	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Rick Slater	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Rodney Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Ron Smith	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Rona Slater	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Roslyn Smith	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Scott Smith	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	T&G Culture Consultants	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Tania Mathews	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Tracy Woltley	SB sent stage 1 community letter, closing date 10.9.16	mail
24-Aug-16	Wattaka Cultural Consultancy Service	SB sent stage 1 community letter, closing date 10.9.16	mail

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
24-Aug-16	Wiradjuri Interim Working Party	SB sent stage 1 community letter, closing date 10.9.16	mail
30-Aug-16	T&G Culture Consultants	SB received registration from Tony	phone
30-Aug-16	Richard Slater	SB received message on voice mail confirming registration. No return phone number	phone
05-Sep-16	BJC Cultural Management	SB received mail return to sender	mail
05-Sep-16	Tania Mathews	SB received mail return to sender	mail
05-Sep-16	Ron Smith	SB received mail return to sender	mail
06-Sep-16	DFTV Enterprises	SB received email registering as a RAP from Derrick Vale	mail
08-Sep-16	Gomery Cultural Consultants	David Horton called Philippa Sokol (PS) to register interest as a RAP for the project	Phone
08-Sep-16	AT Gomilaroi Cultural Consultancy	SB received email confirming registration	email
08-Sep-16	AT Gomilaroi Cultural Consultancy	SB emailed Aaron and confirmed registration	email
09-Sep-16	Wattaka Cultural Consultancy Service	SB received mail return to sender - not at this address	mail
12-Sep-16	Brian Draper	SB received a call from Brian registering interest	phone
12-Sep-16	T&G Culture Consultants	SB sent stage 2 letters - feedback closing date 12 October 2016	mail
12-Sep-16	Richard Slater	SB sent stage 2 letters - feedback closing date 12 October 2016	mail
12-Sep-16	DFTV Enterprises	SB sent stage 2 letters - feedback closing date 12 October 2016	email
12-Sep-16	Gomery Cultural Consultants	SB sent stage 2 letters - feedback closing date 12 October 2016	mail
12-Sep-16	Brian Draper	SB sent stage 2 letters - feedback closing date 12 October 2016	email
12-Sep-16	Tamworth LALC	SB rang and spoke to Tamworth LALC - change of email address. SB said she would send email to new address inviting to be a RAP	email
12-Sep-16	Tamworth LALC	SB emailed copy of invitation to be a RAP	email
12-Sep-16	Michael Long White Cockatoo Aboriginal Corporation	PS received call from Michael wishing to register expression of interest in the project	Phone
12-Sep-16	Tamworth LALC	PS received a call from Fiona Snape- Tamworth LALC, requesting for SB to call back	phone
13-Sep-16	Tamworth LALC	SB called and left a message with Leteisha to have Fiona call SB back	phone
13-Sep-16	Kawul Cultural Services	SB received letter RTS - Box closed	mail
13-Sep-16	Wiradjuri Interim Working Party	SB received letter RTS	mail
13-Sep-16	Tamworth LALC	SB received email from Fiona Snape confirming that they would like to be a RAP	phone
14-Sep-16	Gomeroi People NC2011/006	SB sent stage 2 letter	email
14-Sep-16	Tamworth LALC	SB sent stage 2 letter	phone
16-Sep-16	Gomeroi People NC2011/006	PS received call from Alf Priestly to register his interest in the project	Phone

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
16-Sep-16	Gomerai People NC2011/006	SB spoke to Alf Priestly. Alf confirmed the Gomerai People NC2011/006 registration in this project and also confirmed that the Gomerai Country Services Pty Ltd is the commercial arm of the NC group	phone
19-Sep-16	T&G Culture Consultants	SB sent updated information letter	mail
19-Sep-16	Richard Slater	SB sent updated information letter	mail
19-Sep-16	DFTV Enterprises	SB sent updated information letter	email
19-Sep-16	Gomery Cultural Consultants	SB sent updated information letter	mail
19-Sep-16	Brian Draper	SB sent updated information letter	email
19-Sep-16	Michael Long White Cockatoo Aboriginal Corporation	SB sent updated information letter	mail
19-Sep-16	Tamworth LALC	SB sent updated information letter	email
19-Sep-16	Gomerai People NC2011/006	SB sent updated information letter	mail/email
22.9.16	Tamworth LALC	SB received a call confirming interest in survey work. SB confirmed that survey work had been put back a bit. Fiona sent through email with LALC hourly rate.	email
3.10.16	Natasha Rodgers	PS received email from Natasha to confirm her expression of interest in the project was received. PS could not locate a registration of interest from Natasha. PS emailed Natasha the Stage 2 ACHCR letters for the project.	Email
4/10.16	Michelle Saunders	SB received mail RTS	mail
05-Oct-16	Gomerai People NC2011/006	SB rang Alf regarding fieldwork - mobile disconnected	phone
05-Oct-16	Gomerai People NC2011/006	SB rang Sam and left a message on his mobile to call back	phone
05-Oct-16	Gomerai People NC2011/006	SB rang Sam s land line spoke to Lisa- Lisa was going to get same to call SB back	phone
05-Oct-16	Gomerai People NC2011/006	SB rang and spoke to Alf. Alf will be available to perform site work 18,19,20 & 21 October 2016. Alf will not need accommodation	phone
05-Oct-16	Gomerai People NC2011/006	SB received a call from Sam saying that Alf was authorised to organise the site officers	phone
06-Oct-16	Gomerai People NC2011/006	SB received email from Natalie Walsh confirming that Richard Green will do the site work for the Tuesday and Wednesday, and Alf Priestly will do the Thursday Friday. Valid workers compensation CoC was attached	phone
06-Oct-16	Gomerai People NC2011/006	SB confirmed with email to Natalie Green, of an error in the letter of offer previously sent - Letter reissued with corrected dates	phone
06-Oct-16	Gomerai People NC2011/006	SB received email from Natalie with Richards number	phone
06-Oct-16	Tamworth LALC	SB had emails confirming site work and rates etc. Site officer confirmed by the LALC	email

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
06-Oct-16	Natasha Rodgers	SB received a call from Natasha Rodgers. Natasha wished to provide the following feedback on the methodology that would be constructed. 1. GPS points are taken and recorded wherever artefacts are found. 2. Artefacts, bush tucker and medicine are to be put back on country after they have been salvaged. 3. if shields and boomerangs are found then refer to Aboriginal community for preservation options. 4. if something significant is found that is non-perishable (i.e. axe head), it is to be reburied on country - for its preservation	mail
14-Oct-16	Natasha Rodgers	Stephanie Rusden (SR) received a call from Natasha asking about sending PL insurances for the fieldwork.	mail
14-Oct-16	Natasha Rodgers	SB called back and confirmed that PL was not necessary as field work had already been allocated.	mail
14-Oct-16	Natasha Rodgers	PS addressed and sent a response to the feedback received from Natasha on 6/10/16 with regards to the Stage 2-3 survey methodology.	email
14-Oct-16	-	SR received an anonymous call regarding the provision of feedback.	Phone
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB received email from Aaron requesting details of which RAPS have been engaged in the survey work.	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB sent email to Aaron that the offer had been made to the LALC and the NTC group	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB rang and left a message for Aaron to call back regarding stage 2 documentation	phone
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB received an email from Aaron raising concerns regarding the Gomeroi group and that the traditional custodians are being disadvantaged	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB received an email from Aaron stating that he had spoken to NTSCorp and that NTSCorp have "informed all mining companies that the applicants have been replaced and the change is going through supreme court in the next week. They no longer represent the nation and they are blatantly ignoring the legal process and our rights to replace them as the claimants."	email
14-Oct-16	National Native Title Tribunal	SB rang and spoke to NNTT and they confirmed that the current claimants group (C/- Sam Hegney) are still currently in place legally.	phone
14-Oct-16	National Native Title Tribunal	SB received a call from NNTT, informing that they have checked the details and that in early September the contact details were changed to C/- NTSCorp as the representing solicitors. The	phone

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
		also said that although there are changes being applied for this has not yet been put through the court and approved.	
14-Oct-16	National Native Title Tribunal	SB received email from Nicole Maher confirming changeover of contact details for the new applicants group even though the previous applicants are still in place	phone
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB rang and left a message for Aaron to call back regarding stage 2 documentation	phone
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB received email from Aaron asking for confirmation on RAPS and days offered	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB sent Aaron email apologising for the error of him not being in the stage 2 packages sent. SB attached stage 2 letter and update letter along with her most sincere apology. SB requested feedback on the methodology urgently as fieldwork was already organised.	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB received email from Aaron stating that he would be considering attending the assessment, even without pay.	email
14-Oct-16	Gomeroi People NC2011/006 C/- NTSCORP	SB spoke to NTSCorp and Mishka informed that although the other applicants are in place there has been a majority vote to remove other people from the group. It was confirmed that the obligation was to contact the NC claimant group which OzArk did. It would be good if a rep from the new applicants were able to attend	phone
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB sent email to Aaron informing of the information found out from both NTSCorp and NNTT, SB provided contacted details for both. SB invited Aaron to attend as a volunteer.	email
14-Oct-16	AT Gomilaroi Cultural Consultancy	SB rang and left a message to call back when able.	phone
17.10.16	AT Gomilaroi Cultural Consultancy	SB received email late Friday night. Aaron is very unhappy with the process and has asked OzArk to try to get this right and involve the correct groups. Aaron informed that there will be phone calls to OzArk on Monday from the new applicants and that some of the new applicants and community will be at attendance on site on Tuesday.	email
17.10.16	Gomeroi People NC2011/006 C/- NTSCORP	SB rang and asked for Mishka, Mishka is away. SB spoke to Sandy Chalmers, Sandy advised that he was unsure if they would be able engage due to legal reasons (changeover not yet approved).	email
17.10.16	Gomeroi People NC2011/006 C/-NTSCORP	SB rang and asked for Mishka, Mishka is away. SB spoke to Sandy Chalmers, Sandy advised that he was unsure if they would be able engage due to legal reasons (changeover not yet approved).	email

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
17-Oct-16	Gomeroid People NC2011/006 C/-NTSCORP	SB received a call from Sandy. Sandy confirmed that Aaron is part of the new claimant group (19 applicants), however he is not the representative for the group. Sandy confirmed that a meeting had previously been held when the new members were appointed and some previous members were voted off, however the members that were voted off by the majority - did not recognise this action. Sandy confirmed that they would respond if SB sent through an offer of fieldwork, and know believed that they legally would be able to engage if the members were wishing to.	phone
17-Oct-16	Gomeroid People NC2011/006	SB rang and left a message with the lady at his office for Sam Hegney to call back	email
17-Oct-16	Office of Environment & Heritage	SB called OEH and alerted him to the escalating issue. OEH confirmed that service provision is entirely independent of consultation and would alert the team to the matters arising. Phil thinks that Roger Maher will be managing this, he will let him know	phone
17-Oct-16	Gomeroid People NC2011/006	SB rang and left a message on his mobile to call back	phone
17-Oct-16	Veronica Talbott	SR received a call from Veronica who enquired about which newspaper the advertisement was placed in. SR said it was in the Tamworth paper the Northern Daily Liberal. SB advised this paper covers Gunnedah and Tamworth. Ms Talbott also highlighted the split in the Native Title Group and advised there may be people Tuesday morning on site. Ms Talbott also said she may wish to come and participate in the fieldwork on a voluntary basis.	phone
17-Oct-16	Veronica Talbott	SR called Veronica who advised she would like to be a RAP for the project. SR said she would add her as a late registration and send through the methodology however she would not receive the 28 days to review the methodology but can provide cultural values at any time. Ms Talbott said this was ok. SR also advised that a field officer position was being offered to the new Native Title Group today, however it is up to the representative to determine who will do the fieldwork.	phone
17-Oct-16	Veronica Talbott	SR sent Ms Talbott a copy of the original and updated methodology.	email
17-Oct-16	Gomeroid People NC2011/006	SB received a missed call on the voice mail from Sam Hegney	phone
17-Oct-16	Gomeroid People NC2011/006 C/- NTSCORP	SB sent letter of invitation for fieldwork on Thursday 20th and Friday 21st	email
17-Oct-16	Gomeroid People NC2011/006	SB sent email amending offer of fieldwork for the Tuesday 18th and Wednesday 19th ONLY. SB said she would inform Alf Priestley.	phone

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
17-Oct-16	Gomeroid People NC2011/006	SB called back Sam Hegney. Sam informed SB that they were the correct applicants, SB confirmed that the fieldwork offer was amended and that there were only 2 days on offer now. SB confirmed that service provision is separate from consultation	phone
17-Oct-16	Gomeroid People NC2011/006	SB rang and message went to 10 second voice mail. SB left a message to call back	phone
17-Oct-16	Gomeroid People NC2011/006	SB rang and spoke to Alf. SB informed of the change and that 2 days were being offered now instead of 4 days. SB confirmed the other 2 days being offered to the NTSCorp. Alf confirmed Richard would be there Tuesday and Wednesday. Alf was 'disappointed' however understands.	phone
17-Oct-16	AT Gomilaroi Cultural Consultancy	SB sent email to Aaron confirming that the offer had been split in to 2 portions and that it had been sent through to NTSCorp. For further follow-up re field work - he should contact NTSCorp	email
17-Oct-16	Gomeroid People NC2011/006	SB received a call from Alf asking if he could do the Thursday Friday instead. SB said that she had already sent the offer. It was done that way so as there was as much notice as possible.	phone
17-Oct-16	AT Gomilaroi Cultural Consultancy	SB received an email from Aaron with his Public Liability Insurance. Aaron provided the following feedback on the methodology. "There will need to be pits as it is a highly potential area and apart of the old river system prior to the dam being built."	email
17-Oct-16	AT Gomilaroi Cultural Consultancy	SB sent confirmation email thanking Aaron for his email and the feedback on the methodology.	email
17-Oct-16	AT Gomilaroi Cultural Consultancy	SB received email from Aaron stating that the process of splitting the work:"That is fair. I am happy with that outcome."	email
18-Oct-16	Gomeroid People NC2011/006 C/- NTSCORP	SB rang and answering service said that the office is close for internal procedures.	email
18-Oct-16	Gomeroid People NC2011/006 C/- NTSCORP	SB emailed Sandy requesting a response regarding the site work.	email
19-Oct-16	Gomeroid People NC2011/006 C/- NTSCORP	Sb received email from Sandy Chalmers confirming that he had passed on the offer of site work to the new claimants. Sandy has requested that the new claimants contact OzArk directly if interested in the work. All future correspondence regarding this claim group is to be sent to Hema Harihan and Grace Manning Davis (NTSCorp Strategic Development Unit)	email

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
19-Oct-16	Gomerioi People NC2011/006 C/- NTSCORP	SB received a call from Phil Duncan. Phil has received the invitation for fieldwork from Sandy and is talking on behalf of the whole new claimants (Phil will be the Chairperson when/if group is formally recognised by court). Phil informed SB that the group will not be able to send a site officer on fieldwork on this shorter notice. Phil understands that OzArk have done things proceed correctly, but would like to ensure that the working relationship in the future is more affective. Phil said he understood that this has all happened last minute and that the field work was already in progress. Phil said that he would not be taking this matter further. Phil supplied contact details and asked to be kept informed. Phil wanted it noted that an applicant of a NC group should not be doing any fieldwork, as it is a conflict of interest. Phil wanted this stated to Sam Hegney. SB confirmed with Phil that if the new claimants group were not taking up the fieldwork then that position would be reoffered to the original claimants group (via Sam Hegney), and that the nominated site officer would probably be Alf. SB said that OzArk has no right to determine who speaks for country and that we would accept the nominated site officer as put forward by the solicitor. Phil understood. Conversation was finished very amicably. SB said she would copy Phil in to the project documents going forward	phone
19.10.16	Gomerioi People NC2011/006 C/- NTSCORP	SB sent an email to Sandy thanking him for his time. SB informed Hema and Grace that Phil Duncan had called and that the new applicants were unable to have a site officer attend the fieldwork at this time. Phil also stated that he would not be taking this further at this time.	phone
19.10.16	Gomerioi People NC2011/006	SB rang Sam and left a message and sent email confirming that the offer of field work for Thursday Friday was again available and that SB would call Alf as the nominee for the group- as previously advised by Sam.	phone and email
19-Oct-16	Gomerioi People NC2011/006	SB rang both mobiles and left message for Alf to call urgently	phone
19./10/16	Gomerioi People NC2011/006	SB receive a phone call from Alf. Alf confirmed that he will be in attendance tomorrow and Frdiay for fieldwork. SB informed Alf that Richard only worked for 1.5 hours. SB said that those hours were also available. SB confirmed that the maximum total amount available was 4 days fieldwork, no additional.	phone
06-Jun-17	T&G Culture Consultants	SB sent update letter	mail
06-Jun-17	Richard Slater	SB sent update letter	mail
06-Jun-17	DFTV Enterprises	SB sent update letter	email
06-Jun-17	Gomery Cultural Consultants	SB sent update letter	mail
06-Jun-17	Brian Draper	SB sent update letter	email
06-Jun-17	Michael Long White Cockatoo Aboriginal Corporation	SB sent update letter	email
06-Jun-17	Tamworth LALC	SB sent update letter	email
06-Jun-17	Gomerioi People NC2011/006 c/- Sam Hegney	SB sent update letter	email
06-Jun-17	Gomerioi People NC2011/006 C/- NTSCORP	SB sent update letter	email

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
06-Jun-17	Natasha Rodgers	SB sent update letter	email
06-Jun-17	AT Gomilaroi Cultural Consultancy	SB sent update letter	email
06-Jun-17	Veronica Talbott	SB sent update letter	email
06-Jun-17	Michael Long White Cockatoo Aboriginal Corporation	SB received an automated email bounce back saying that it could not be received	email
06-Jun-17	Michael Long White Cockatoo Aboriginal Corporation	SB sent hardcopy of letter	email
07-Jun-17	Dolly Talbott	PS received call from Dolly asking about the site recorded during the field survey and the potential in the future to visit the sites. Dolly also asked if she could have a copy of a map showing the location of the new sites recorded. PS said she will find out further information and get back to her. PS called Dolly back and informed her that because the project/report isn't finished (as still waiting on impact data from the client), OzArk don't have approval to release such documents at this stage.	phone
29-Aug-17	T&G Culture Consultants	PS sent report and letter covering Stage 4. Closing date is 28 Sept 2017	mail
29-Aug-17	Richard Slater	PS sent report and letter covering Stage 4. Closing date is 28 Sept 2017	mail
29-Aug-17	DFTV Enterprises	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Gomery Cultural Consultants	PS sent report and letter covering Stage 4. Closing date is 28 Sept 2017	mail
29-Aug-17	Brian Draper	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Michael Long White Cockatoo Aboriginal Corporation	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Tamworth LALC	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Gomeroi People NC2011/006 c/- Sam Hegney	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Gomeroi People NC2011/006 C/- NTSCORP	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Natasha Rodgers	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	AT Gomilaroi Cultural Consultancy	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Veronica Talbott	PS sent link to report and letter covering Stage 4. Closing date is 28 Sept 2017	email
29-Aug-17	Michael Long White Cockatoo Aboriginal Corporation	PS received email bounce back	email
29-Aug-17	Michael Long White Cockatoo Aboriginal Corporation	PS resent email and letter to corrected email address	email
14-Sep-17	Donny calling from Tamworth LALC	PS received call from Donny via Tamworth LALC. Donny wanted to confirm the stage of the project and whether the development has happened yet? PS advised Donny that the project is still in the reporting stage and that the project will still need to go on public exhibition prior to	Phone

Aboriginal Consultation Log - Rushes Creek			
Date	Organisation	Comment	Method
		approval. PS told Donny that the reason it has taken so long to complete the report was due to the client and proponent developing the proposed route for pipeline and electrical infrastructure, predominately based on the results of our assessment and the environmental assessment. PS explained that the report has been sent out to the RAPs for review and comment.	

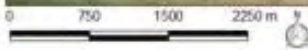
Stage 1 letter to agencies and Aboriginal community organisations



OzArk Environmental & Heritage Management Pty Ltd

ABN: 59 104 582 354

Project Site



Scale 1 : 36 000

Legend

Project Site

Location Map



Scale 1 : 350 000

Legend

Project Site

Initial stage 2/3 consultation letter (sent to: all RAPs)



14 September 2016

Members
 Tamworth Local Aboriginal Land Council
 C/- Fiona Snape
 PO Box 57
 Tamworth NSW 2340
admin@tamworthlalc.com.au
fiona@tamworthlalc.com.au

Re: Aboriginal Cultural Heritage Assessment for the proposed Rushes Creek Poultry Production Farm, Rushes Creek, Tamworth Local Government Area.

Dear Members,

Thank-you for your registration of interest to become a Registered Aboriginal Party (hereafter 'RAP') to be consulted over the proposed Rushes Creek Poultry Production Farm in Rushes Creek, Tamworth Local Government Area. The purpose of this letter is to present information to RAPs about the proposed project and to gather information from RAPs about the cultural significance of the Study Area. RAPs are also invited to comment on the Aboriginal archaeological assessment methodology outlined below. Your input is important and will be used, wherever possible, to improve the assessment of the Study Area.

OzArk Environmental & Heritage Management (OzArk) acknowledges that land was traditionally occupied by Aboriginal people, and we pay respect to Aboriginal beliefs, cultural heritage and the past and continued connection of Aboriginal people to the land. We also pay respect to post-contact experiences of Aboriginal people with attachment to the area.

Information about the Project

OzArk Environmental & Heritage Management (OzArk) have been engaged by SLR Consulting Limited on behalf of ProTen Tamworth Limited (ProTen; the Proponent) to complete an Aboriginal Cultural Heritage Assessment of the Project Area, which is located approximately 43 kilometres northwest of Tamworth and 33 kilometres northeast of Gunnedah in the New England North West region of New South Wales (NSW; **Figure 2** and **Figure 3**). The Project Area includes approximately 1008 hectares, including a number of land titles (**Table 1**).

Table 1: Schedule of land titles within the Project Area.

Lot	Deposited Plan (DP)	Tenure
Lot 1	DP 44215	Freehold
Lot 9	DP 84974 ¹	Freehold
Lot 1	DP 1086455	Freehold
Lot 1	DP 1108119	Freehold
Lot 1	DP 1132298	Freehold
Lot 26, 85, 86, 101, 118, 165, 166 and 171	DP 752169	Freehold
Lot 143	DP 752189	Freehold
Lot 1	DP 1132078	Freehold
Lot 1	DP 1141148	Freehold

The Proponent is seeking development consent to develop a large-scale intensive poultry broiler production farm (the Project). The Project is classified as State Significant Development (SSD) under the provisions of Part 4 of the *Environmental Planning and Assessment Act 1979* in accordance with the *State Environmental Planning Policy (State and Regional Development) 2011*.

The proposed development includes the construction and operation of a large-scale intensive poultry broiler production farm. The components of the proposed development are summarised in **Table 2**. The Development will comprise four individual farms (poultry production units), where broiler birds will be grown for human consumption (**Figure 4**). Each farm will comprise 16 tunnel ventilated fully-enclosed climate-controlled poultry sheds, with associated support infrastructure and staff amenities (**Figure 1** and **Figure 5**). Each shed will have the capacity to house 56,500 birds at any one time, equating to an individual farm population of up to 904,000 birds and a combined site population of 3.62 million birds.

Table 2: Summary of the proposed development.

Development characteristic	Proposed development
Purpose	Birds grown for human consumption
Number of individual farms	Four (Farms 1, 2, 3 and 4)
Number of poultry sheds per farm	16, each measuring 160 m long by 18 m wide by 4.2 m high (to roof ridge)
Type of poultry sheds	Tunnel-ventilated, fully-enclosed, climate-controlled
Maximum shed population	56,500 birds
Maximum farm population	904,000 birds
Maximum site population	3,616,000 birds
Maximum bird density within sheds	34 kilograms per square metre (kg/m ²)
Hours of operation	24 hours a day, 7 days a week
Production cycle length	Approximately 85 days, comprising a maximum bird occupation of 55 days and a cleaning phase of 10 days
Number of production cycles per year	On average, approximately 5.8

Figure 1: Example of poultry sheds from ProTen's Murrumbidgee Poultry Production Farm (Somerton, NSW).



In addition to the poultry shedding, the Development also includes:

- Eight new residences to house the farm managers;
- Water supply infrastructure to extract, transfer, treat and store water from the Namoi River via a water access licence;
- Upgrade and extension of electricity supply infrastructure;

- Upgrade of two existing vehicular access driveways from the adjoining Rushes Creek Road or the construction of two new access driveways from Rushes Creek Road and construction of internal access roads; and
- Various other infrastructure items to support the poultry production operation, including:
 - Staff amenities (office space, toilets and change rooms);
 - Dead bird chiller at the main entrance;
 - Material storage shed;
 - Chemical and field storage facilities;
 - Generators;
 - Workshops;
 - Wheel wash facilities;
 - Feed silos;
 - Water storage tanks;
 - Surface water management system (swale drains, table drains and detention dams).

The proposed Aboriginal archaeological assessment methodology

The archaeological methods utilised in the Aboriginal archaeological assessment will follow the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b). Standard archaeological field survey and recording methods will be employed (Burke and Smith 2004). A search of the Aboriginal Heritage Information Management System (AHIMS) database was conducted for the preliminary environmental assessment (SLR 2016). One Aboriginal site (20-5-0091; Ski Gardens Road Manila; modified tree, carved or scarred) exists within the Ski Gardens Road reserve adjoining the Project Area in the north (Figure 6). Background research will be undertaken prior to the field assessment in order to understand the regional archaeological context and to develop a predictive model for site locations.

Preliminary predictive modelling, based upon numerous archaeological studies in various environmental zones and contexts throughout Australia, indicates a high correlation between the permanence of a water source and the permanence and/or complexity of Aboriginal occupation. Site location is also affected by the availability of and/or accessibility to a range of other natural resources including: plant and animal foods; stone and ochre resources and rock shelters; as well as by their general proximity to other sites/places of cultural significance. Consequently, sites tend to be found along permanent and ephemeral water sources, along access or trade routes, and in areas that have good flora/fauna resources and appropriate topography (i.e. flat or gently sloping landforms) or shelter.

Generally, more durable materials such as stone artefacts, stone hearths, shell, and some bones remain preserved in the present-day landscape. However, these may not be found in their original depositional context due to: (a) the effects of wind and water erosion/transport over short and long time scales; and (b) the historical impacts of European farming practices including (e.g. grazing and cropping; land degradation associated with exotic pests such as goats and rabbits; and the installation of farm related infrastructure including water-storage, irrigation, utilities, roads, fences, stockyards and residential quarters).

As such, greater Aboriginal archaeological potential tends to exist on landforms within 200 metres of permanent and ephemeral water sources, along access or trade routes, and areas with suitable flora/fauna and shelter. Archaeological potential is reduced on landforms disturbed by erosion and historical impacts (e.g. farming and infrastructure installation).

OzArk Environmental & Heritage Management Pty Ltd

ABN: 59 104 582 354

During the field assessment, greater survey effort will be expended on landforms deemed to have greater Aboriginal archaeological potential. 'Full pedestrian survey' refers to systematic transects walked by surveyors spaced approximately 10 metres apart throughout the landform or area being surveyed. 'Targeted pedestrian survey' refers to transects walked by surveyors spaced approximately 10 metres apart that do not cover the entire landform or area.

As such, the field assessment will include:

- All impact areas (including farms, house blocks, water supply infrastructure routes, vehicle driveways, storage facilities, workshops, silo sites, etc.) will be covered by full pedestrian survey.
- Full pedestrian survey will occur in areas with minimal disturbance and good ground surface visibility within landforms possessing Aboriginal archaeological potential. A focus of the survey will be: raised areas within the Namoi River floodplain (e.g. point bar deposits and levees); areas within 200 metres of the Namoi River floodplain; areas within 200 metres of other major (e.g. Rashes Creek, Plain Gully and Milliwinah Gully) and ephemeral watercourses; and the flat or gently sloping crests and benches of all ridges, spurs and hills. **Figure 7** shows areas preliminarily identified for full pedestrian survey. These areas will be updated with the refinement of the predictive model, input from RAPs, and in accordance with field observations made during the assessment.
- Targeted pedestrian survey will occur in all other areas – i.e. areas more than 200 metres from watercourses; areas with poor ground surface visibility; landforms with low archaeological potential; and areas with significant prior disturbance.
- All trees impacted by the proposal and with the potential to contain Aboriginal scarring will be inspected.
- AHIMS site 20-5-0091 (Ski Gardens Road Manila; modified tree) will be located and assessed.
- Some areas may not be physically surveyed if RAPs and OzArk staff agree they are too disturbed, or possess very low likelihood of sites.]
- Requests for survey within areas of low archaeological potential and/or significant prior disturbance will be accommodated where there is consensus among RAPs, and where an explanation can be provided; where RAPs disagree, OzArk staff will attempt to accommodate these requests if feasible within project timelines.
- RAPs and OzArk staff will discuss whether impacts to sites can be avoided; where impacts cannot be avoided, specific management recommendations will be discussed.
- Areas outside of the Project Area will not be physically surveyed.

In the field, OzArk staff will identify, record and evaluate physical (i.e. archaeological) evidence. Site recording will capture all of the information required to complete current AHIMS site recording forms (e.g. site location, site boundary, site plan, representative photographs, artefact recording and feature recording). RAPs will participate in the survey, identifying Aboriginal objects, determining the cultural significance of Aboriginal objects and identifying cultural places or non-physical site types within the Study Area. OzArk staff understand that cultural knowledge may not be provided in some instances due to cultural sensitivities (e.g. men's and/or women's places). Under these circumstances, in order to assess the potential impacts, OzArk staff will need to be told, only in general terms, why a particular place is important, and what the significance of the impact will be. OzArk staff will liaise with RAPs on a case-by-case basis to determine how to record the location in a culturally sensitive manner. OzArk staff will ensure that field assessments are completed in the time budgeted, and emphasise that only the Study Area is to be assessed at all times.

OzArk Environmental & Heritage Management Pty Ltd

ABN: 59 104 582 354

Production of the Aboriginal cultural heritage assessment report

OzArk staff will prepare a draft Aboriginal cultural heritage assessment report based on the field survey, including comments from RAPs (if any have been provided) and RAP assessments of the cultural significance of the Study Area and any recorded sites. Critical timelines and milestones for the completion of the assessment and delivery of reports will adhere to the timeframes outlined in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRs; DECCW 2010a).

OzArk staff understand that RAPs may not want culturally sensitive information to appear in the report. In these cases, we will need to work together to communicate information to the Proponent in a way that is culturally sensitive. As such, it will be beneficial for discussions to take place between the OzArk staff members drafting the report and knowledge holders with respect to the communication of culturally sensitive information. The report will then be sent to the Proponent for review. Once approved for release, RAPs will be invited to review the draft report and provide formal comment within the ACHCR timeframes. Feedback will be incorporated into the final report and provided as an appendix for the determining authority to independently review. A copy of the final report will be provided to each stakeholder group prior to the Proponent submitting it to the relevant authorities.

Service provision by RAPs

An archaeological team comprising RAPs and OzArk staff will be assembled to undertake a physical survey of the Study Area over the four allocated days (provisionally scheduled from 11 to 14 October 2016). The logistics, team composition and number will be determined via discussions between OzArk staff, RAPs and the Proponent. All RAPs will be provided with opportunities to comment on the project, but only a limited number of RAP positions for field assessments will be available. Selection of service providers will emphasise knowledge holders and those able to speak for country within the Study Area. Each group must provide proof of valid and current workers compensation insurances prior to being formally offered a fieldwork position. Where such proof cannot be provided, the group may be referred to a third-party employer. Where more people than positions are available, a rostering system may be employed.

Feedback on the proposed methodology and on the cultural significance of the Study Area

OzArk is required to give you 28 days to review and provide feedback on the proposed Aboriginal archaeological assessment methodology. This period closes on **12th October 2016 at 5pm**. In addition, OzArk invites you to comment on the Aboriginal cultural heritage significance of the proposed Study Area, including:

- Any protocols that RAPs wish to be incorporated into the information gathering process and assessment methodology
- Any other matters, including issues or areas of cultural significance that might affect, inform or refine the assessment methodology.
- Any Aboriginal objects of cultural value to Aboriginal people in the Study Area.
- Any places of cultural value to Aboriginal people in the Study Area, including: places with social, spiritual and cultural value; historic places with cultural significance; and potential places/areas of historic, social, spiritual and/or cultural significance.
- Any protocols that RAPs wish to be implemented in the sourcing and holding of cultural information, including sensitive information, and information with restricting public access.
- Any management options, including how to avoid or mitigate harm and/or conserve Aboriginal objects or places.

OzArk Environmental & Heritage Management Pty Ltd
100/102-104 Victoria Road, Manilla NSW 2348
Tel: 02 6882 0118 Fax: 02 6882 0119
www.ozarkehm.com.au

We welcome this input to ensure Aboriginal cultural values are considered prior to the field assessment to ensure adequate preparation. Input is invited from representatives at any stage of the project.

Should you need any help supplying feedback or have any queries, please do not hesitate to contact our office (phone: 02 6882 0118; or email: enquiry@ozarkehm.com.au).

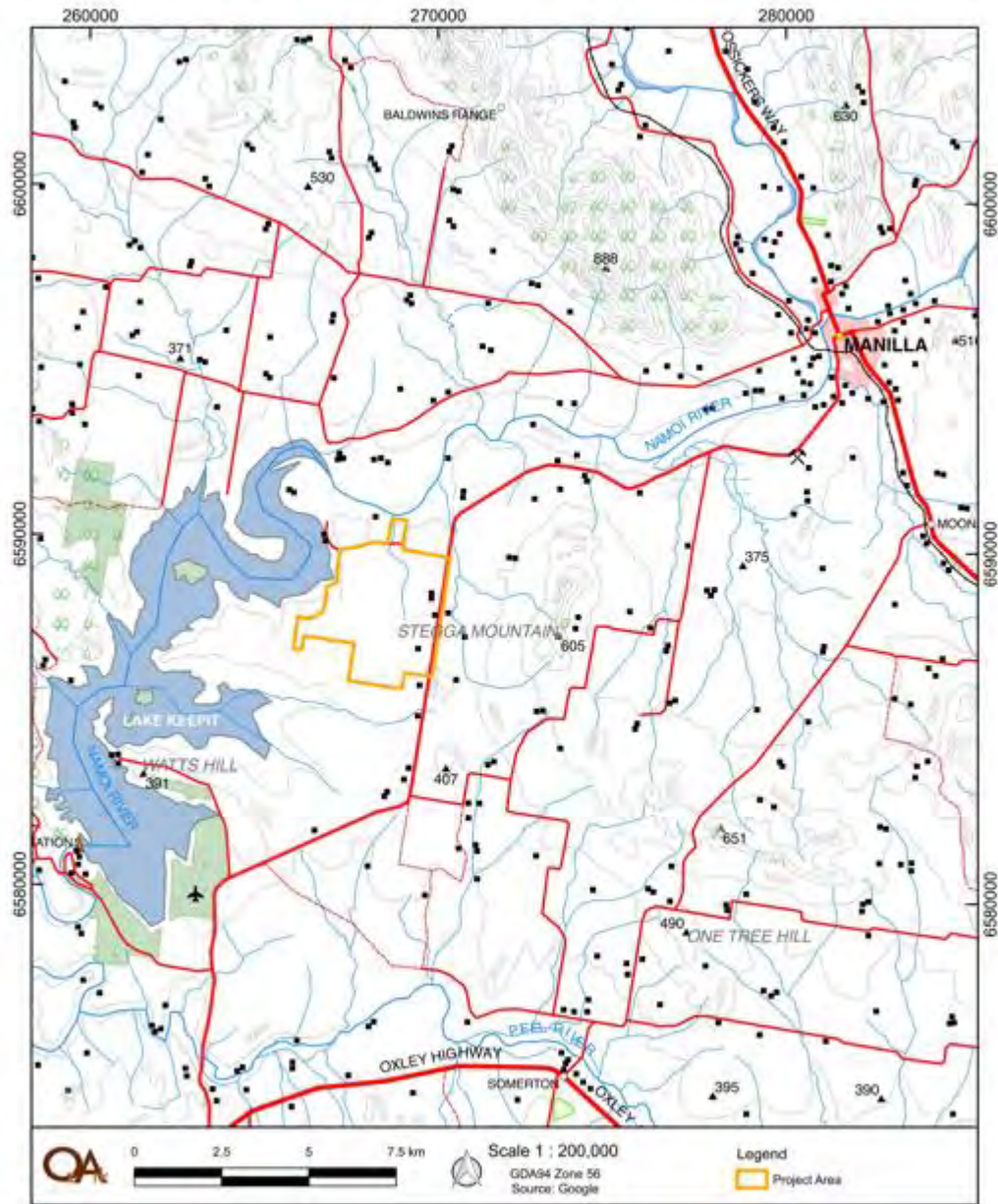
Kind regards,



Dr Chris Lovell

Senior Archaeologist

Figure 2: Map showing the location of the Project Area.



OzArk Environmental & Heritage Management Pty Ltd
ABN: 55 104 582 354

Figure 3: Map showing satellite imagery of the Project Area.



Figure 4: Map showing the location of farms within the Project Area.



Figure 5: Conceptual layout of farms (poultry production units).

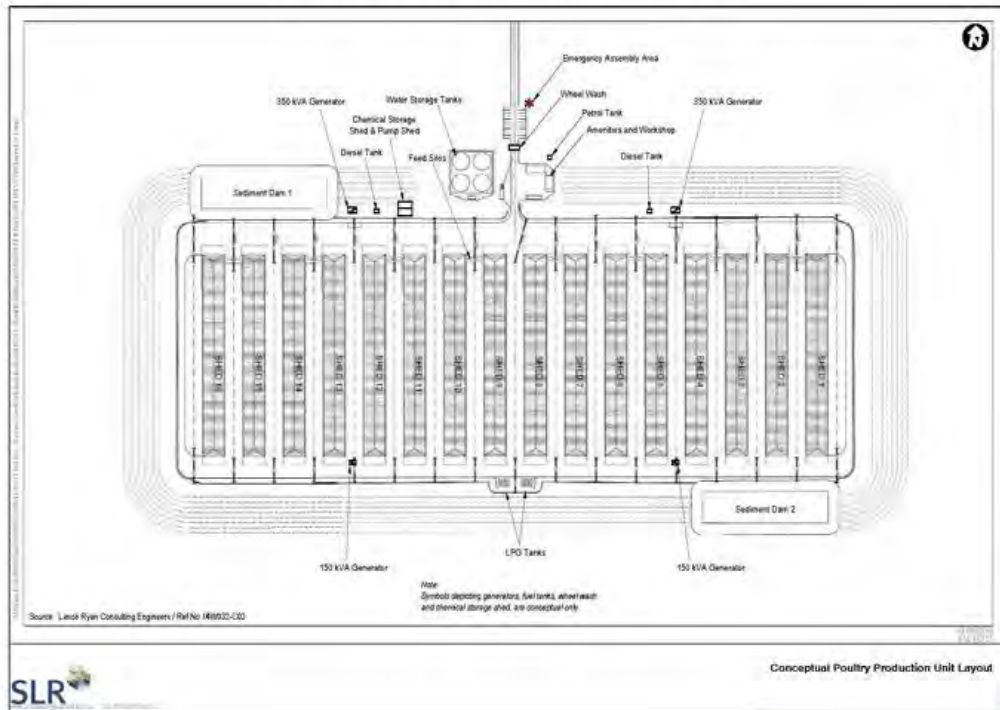
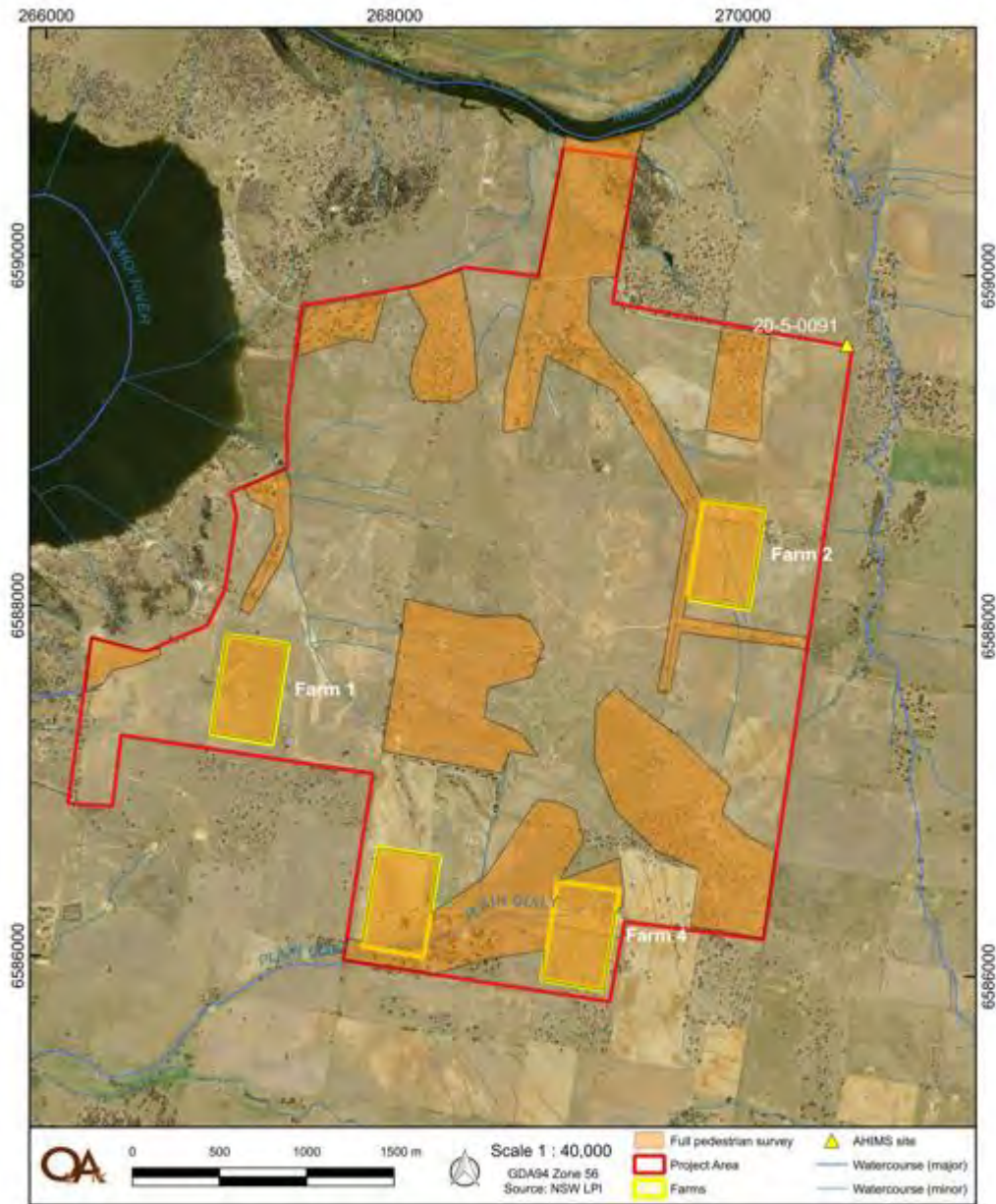


Figure 6: Map showing the location of AHIMS site 20-5-0091 (Ski Gardens Road Manila; modified tree) near the Project Area.



Figure 7: Map showing areas preliminarily identified for full pedestrian survey in relation to the Project Area and AHIMS site. All other areas will be assessed by targeted pedestrian survey.



References

Burke, Heather and Claire Smith

2004 *The Archaeologist's Field Handbook*. Sydney: Allen & Unwin.

DECCW

2010a *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*. Sydney: Department of Environment, Climate Change and Water NSW.

DECCW

2010b *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*. Sydney: Department of Environment, Climate Change and Water.

SLR

2016 *Preliminary Environmental Assessment: Rushes Creek Poultry Production Farm*. Report to: ProTen Tamworth Limited.

Stage 2/3 consultation update letter (sent to: all RAPs)



19th September 2016

Members
 Tamworth Local Aboriginal Land Council
 PO Box 57
 Tamworth NSW 2340
 admin@tamworthlalc.com.au
 fiona@tamworthlalc.com.au

Re: UPDATE - Aboriginal Cultural Heritage Assessment for the proposed Rushes Creek Poultry Production Farm, Rushes Creek, Tamworth Local Government Area.

Dear Members,

Thank-you for your participation as a Registered Aboriginal Party (hereafter 'RAP') to be consulted over the proposed Rushes Creek Poultry Production Farm in Rushes Creek, Tamworth Local Government Area. Your input is important and will be used, wherever possible, to improve the assessment of the Study Area and to ensure that Aboriginal cultural values are considered. Input is invited from representatives at any stage of the project.

The purpose of this letter is to present some updated information about the project, which replaces some information contained the previous letter, dated 12 September 2016.

OzArk Environmental & Heritage Management (OzArk) acknowledges that land was traditionally occupied by Aboriginal people, and we pay respect to Aboriginal beliefs, cultural heritage and the past and continued connection of Aboriginal people to the land. We also pay respect to post-contact experiences of Aboriginal people with attachment to the area.

Updated Project Area

The size of the Project Area has changed, and is now smaller than the area represented in the previous letter. The updated Project Area includes approximately 1008 hectares, including a smaller number of land titles (**Table 1**).

Table 1: Updated schedule of land titles within the Project Area.

Lot	Deposited Plan (DP)	Tenure
Lot 1	DP 44215	Freehold
Lot 1	DP 1108119	Freehold
Lot 1	DP 1132298	Freehold
Lot 26, 85, 88, 101, 118, 165, 166 and 171	DP 752189	Freehold
Lot 143	DP 752189	Freehold
Lot 1	DP 1132078	Freehold
Lot 1	DP 1141148	Freehold

Updated Survey Areas

The updated Project Area reduces the area of land requiring survey. As set out in the previous letter, the entire updated Project Area shall be assessed by pedestrian survey. The areas of higher archaeological potential shown in **Figure 5** of this letter are those areas that will be a focus of the assessment, as well as all areas where direct project impacts are planned (such as the indicative shed locations in **Figure 3** and areas along the western side of Rushes Creek Road where site access roads will be positioned). All other areas of the Project Area will also be subjected to pedestrian survey although in a targeted approach where all available exposures are investigated as well as a sufficient amount of each landform to allow the archaeological characteristics of that landform to be understood. Through this methodology it is expected that all landforms of archaeological potential are closely surveyed, while landforms of a lower archaeological potential are surveyed sufficiently to accurately determine the archaeological potential within each landform type. This will allow a comprehensive understanding of the overall archaeological potential of the Project Area to be achieved.

The updated Project Area is shown in **Figures 1 to 5**:

- **Figure 1** replaces **Figure 2** in the previous letter;
- **Figure 2** replaces **Figure 3** in the previous letter;
- **Figure 3** replaces **Figure 4** in the previous letter;
- **Figure 4** replaces **Figure 6** in the previous letter;
- **Figure 5** replaces **Figure 7** in the previous letter.

Should you need any help supplying feedback or have any queries, please do not hesitate to contact our office (phone: 02 6882 0118; or email: enquiry@ozarkehm.com.au).

Kind regards,

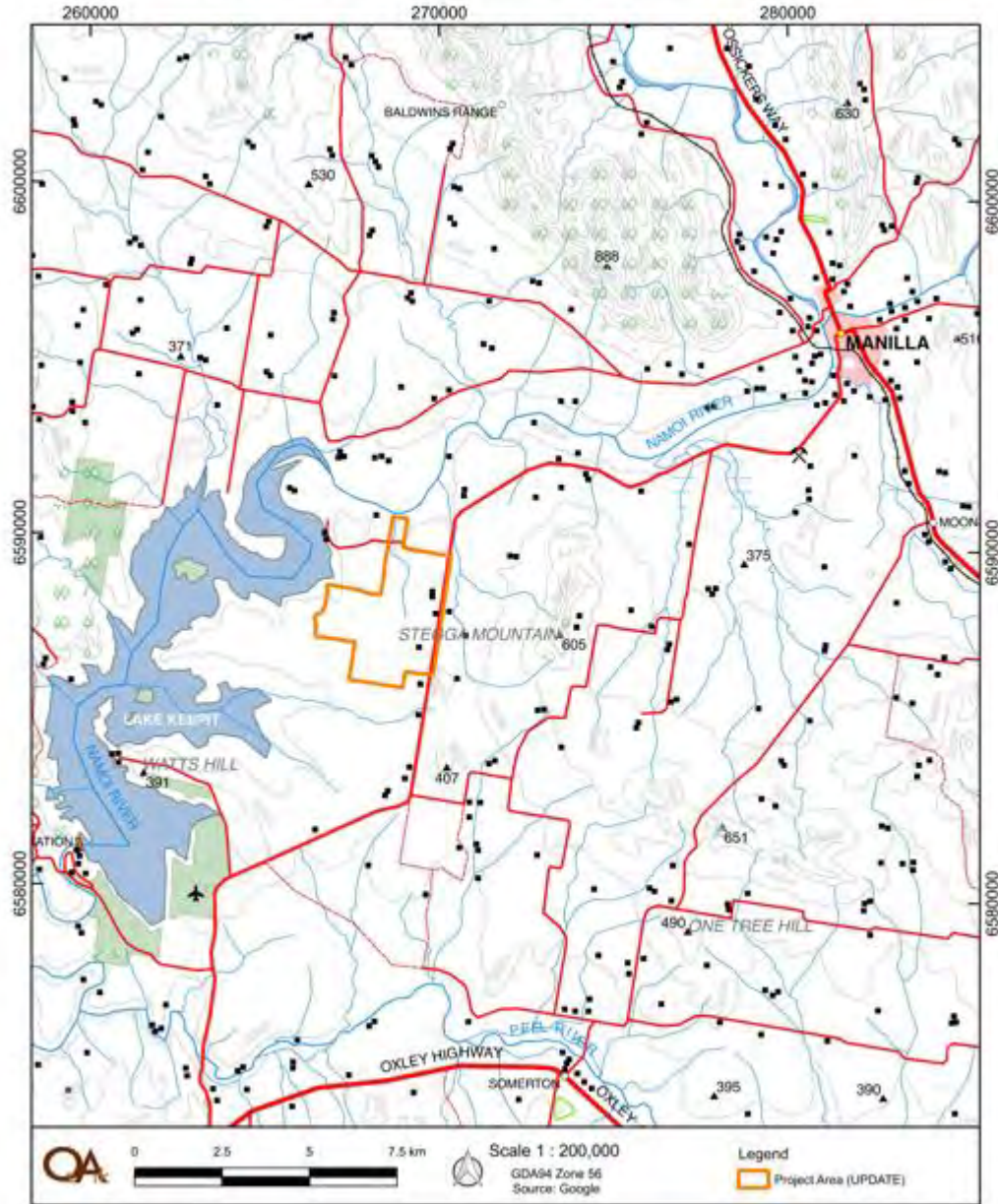


Dr Chris Lovell

Senior Archaeologist

OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 502 354

Figure 1: Map showing the location of the updated Project Area.



OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 582 354

Figure 2: Map showing satellite imagery of the updated Project Area.



Figure 3: Map showing the location of farms within the updated Project Area.

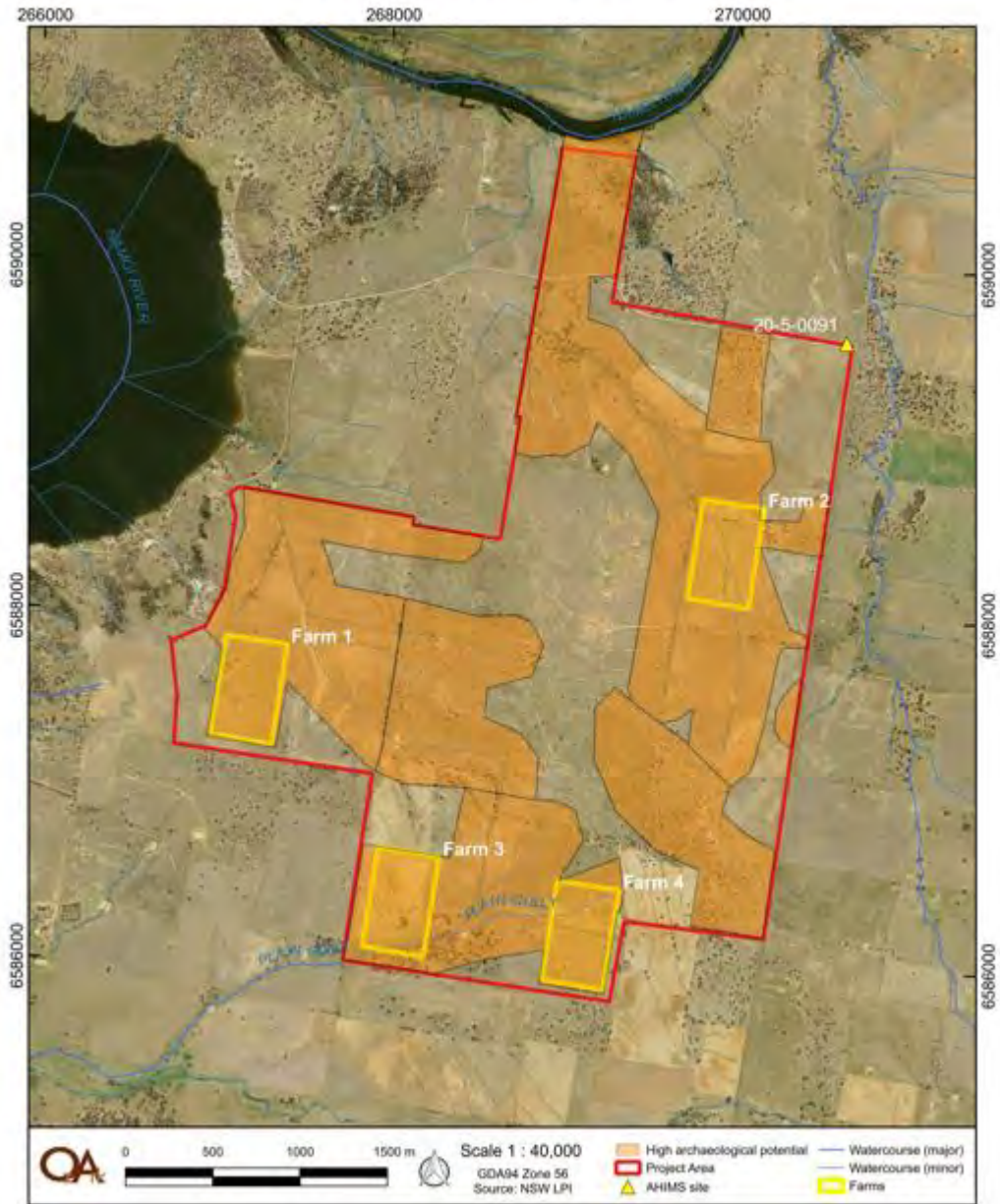


OzArk Environmental & Heritage Management Pty Ltd
ABN: 59 104 582 354

Figure 4: Map showing the location of AHIMS site 20-5-0091 (Ski Gardens Road Manila; modified tree) near the updated Project Area.



Figure 5: Map showing areas preliminarily identified as having high archaeological potential in relation to the updated Project Area and AHIMS site.



Stage 2/3 update 2 letter (sent to: all RAPs)

6th June 2017

Members
 Tamworth Local Aboriginal Land Council
 PO Box 57
 TAMWORTH NSW 2340

Dear Members

Re. Aboriginal Cultural Heritage Assessment for the proposed Rushes Creek Poultry Production Farm, Rushes Creek, Tamworth Local Government Area.

We wish to apologise for the lag in correspondence in regards correspondence, however we are currently awaiting a final impact footprint for the project.

What follows is a summary of the consultation process for this project prior to date and then a note about 'where to from here'.

Brief summary of previous consultation

As you are aware, in August 2016 OzArk commenced the *Aboriginal Cultural Heritage Consultation Requirements* for the proposed Rushes Creek Poultry Production Farm, Rushes Creek, [Tamworth Local Government Area](#).

Stage 1 commenced on 24 August 2016 with a closing date of 10 September 2016. As part of Stage 1 an advertisement was placed in the *Northern Daily Leader* on Friday 12 August 2016.

Stage 2/3 originally commenced on 14 September 2016 with a closing date of 12 October 2016. The Stage 2/3 package included the proposed field survey methodology for the project and requested feedback on the proposed methodology and on the cultural significance of the study area. An updated methodology was resent to all Registered Aboriginal Parties (RAPs) on 19 September 2016. The updated methodology presented some updated information about the project, which replaced some information contained the previous letter, dated 12 September 2016.

The field survey was completed over four days, 18 October – 21 October 2016. As a result a total of 35 Aboriginal sites were recorded. These sites included:

- One hearth;

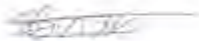
- Three scarred trees;
- 14 artefact scatters; and
- 17 isolated finds.

Consultation going forward

A draft Aboriginal Cultural Heritage Assessment Report will be issued for the project in the near future requesting your consideration, input and feedback. The report will be issued once a final impact footprint has been provided. This will include management for the sites recorded during the field survey.

Please do not hesitate to get in touch should you have any queries

Yours faithfully,



Stephanie Rusden

Archaeologist



OzArk Environmental & Heritage Management Pty Ltd

PO Box 2069 DUBBO 2830

P: 02 6882 0118; F: 02 6882 0630

stephanie@ozarkehm.com.au, www.ozarkehm.com.au

OzArk and staff respectfully acknowledge the Traditional Owners and Custodians of the country on which we work.

APPENDIX 2: AHIMS EXTENSIVE SEARCH RESULT

NSW Office of Environment & Heritage		AHIMS Web Services (AWS)				Your Ref/PO Number : 1470_Rushes Client Service ID : 248889				
SiteID	SiteName	Datum	Zone	Eastings	Northings	Contact	Site Status	SiteFeatures	SiteTypes	Reports
20-5-0053	NRA12: Borah Crossing 1	AGD	56	266950	6592700	Open site	Valid	Artefact : -, Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		
20-5-0054	NRA 13: Borah Crossing 2	AGD	56	266760	6592650	Open site	Valid	Modified Tree (Carved or Scarred) : -, Artefact : -		
	<u>Contact</u>							<u>Permits</u>		
20-5-0055	NRA14: Spring Creek	AGD	56	271050	6593150	Open site	Valid	Artefact : -		
	<u>Contact</u>							<u>Permits</u>		
52-5-0519	Keepit Dam Aboriginal Site 9 (RDA9)	AGD	56	264560	6590638	Open site	Valid	Artefact : 100		
	<u>Contact</u> T Russell							<u>Permits</u>		
20-4-0264	Dowe Scar Tree #2 Dowe 080610	AGD	56	260741	6590740	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u>							<u>Permits</u>		
20-4-0279	Dowe Artefact # 1 090610	AGD	56	260686	6589854	Open site	Valid	Artefact : 1		
	<u>Contact</u>							<u>Permits</u>		
20-5-0072	Dowe Scatter Artefacts 110610 #1	AGD	56	260952	6589303	Open site	Valid	Artefact : 4		
	<u>Contact</u>							<u>Permits</u>		
20-4-0280	Dowe Scar Tree #3 110610	AGD	56	260686	6589856	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u>							<u>Permits</u>		
20-5-0088	Keep it Cemetery	GDA	56	261768	6582392	Closed site	Valid	Burial : -		
	<u>Contact</u>							<u>Permits</u>		
20-5-0091	Sin Gardens Road Manilla	GDA	56	270637	6589591	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	<u>Contact</u>							<u>Permits</u>		
20-4-0054	Black Gully 1;	AGD	56	264100	6581900	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>							<u>Permits</u>		
20-4-0055	Black Gully 2;	AGD	56	264000	6581900	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	
	<u>Contact</u>							<u>Permits</u>		

Report generated by AHIMS Web Service on 12/10/2016 for Philippa Sokol for the following area at Datum :GDA, Zone : 56, Eastings : 259638 - 277136, Northings : 6578840 - 6596814 with a Buffer of 0 meters. Additional Info : Background data. Number of Aboriginal sites and Aboriginal objects found is 20
This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 2

NSW Office of Environment & Heritage		AHIMS Web Services (AWS)				Your Ref/PO Number : 1470_Rushes Client Service ID : 248889				
SiteID	SiteName	Datum	Zone	Eastings	Northings	Contact	Site Status	SiteFeatures	SiteTypes	Reports
20-5-0002	Beverly Station;	AGD	56	267000	6592000	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	
	<u>Contact</u>							<u>Permits</u>		
20-5-0016	Keepit 2;	AGD	56	263700	6580800	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>							<u>Permits</u>		
20-5-0017	Keepit 1;	AGD	56	263650	6580750	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>							<u>Permits</u>		
20-5-0018	Keepit 3;	AGD	56	263550	6580750	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>							<u>Permits</u>		
20-5-0019	Keepit 5;	AGD	56	264150	6580850	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>							<u>Permits</u>		
20-5-0020	Keepit 4;	AGD	56	263800	6580800	Open site	Valid	Artefact : -	Open Camp Site	
	<u>Contact</u>							<u>Permits</u>		
20-5-0021	Tokumbah Lookout;	AGD	56	260700	6580400	Open site	Valid	Stone Quarry : -, Artefact : -	Quarry	
	<u>Contact</u>							<u>Permits</u>		
20-5-0070	Keepit Dam Aboriginal Site 1 (KDA1)	AGD	56	263454	6588365	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	<u>Contact</u> Searle							<u>Permits</u>		

Report generated by AHIMS Web Service on 12/10/2016 for Philippa Sokol for the following area at Datum :GDA, Zone : 56, Eastings : 259638 - 277136, Northings : 6578840 - 6596814 with a Buffer of 0 meters. Additional Info : Background data. Number of Aboriginal sites and Aboriginal objects found is 20
This information is not guaranteed to be free from error omission. Office of Environment and Heritage (NSW) and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 2 of 2

Appendix I

Noise Impact Assessment (Global Acoustics 2018)



*ProTen Rushes Creek
Poultry Production
Complex*

*Noise Impact Assessment
January 2018*

*Prepared for
SLR Consulting Australia Pty Ltd*



Noise and Vibration Analysis and Solutions

Global Acoustics Pty Ltd
PO Box 3115 | Thornton NSW 2322
Telephone +61 2 4966 4333
Email global@globalacoustics.com.au
ABN 94 094 985 734

ProTen Rashes Poultry Production Complex

Noise Impact Assessment January 2018

Reference: 16285_R01

Report date: 6 July 2018

Prepared for

SLR Consulting Australia
PO Box 907
Hamilton NSW 2303

Prepared by

Global Acoustics Pty Ltd
PO Box 3115
Thornton NSW 2322



Prepared: Ryan Bruniges
Scientist (Acoustics)

QA Review: Tony Welbourne
Director

Global Acoustics Pty Ltd ~ Environmental noise modelling and impact assessment ~ Sound power testing ~ Noise control advice ~ Noise and vibration monitoring ~ OHS noise monitoring and advice ~ Expert evidence in Land and Environment and Compensation Courts ~ Architectural acoustics ~ Blasting assessments and monitoring ~ Noise management plans (NMP) ~ Sound level meter and noise logger sales and hire

Table of Contents

1 INTRODUCTION.....	1
1.1 Background.....	1
1.2 Site Layout.....	1
1.3 Project Overview.....	1
1.4 Terminology & Abbreviations.....	5
2 CRITERIA.....	6
2.1 Construction Criteria.....	6
2.2 Operational Criteria.....	7
2.3 Development Specific Noise Levels.....	8
2.4 Sleep Disturbance.....	8
2.5 Road Traffic Noise.....	9
3 METHODOLOGY.....	10
3.1 Noise Sensitive Receptors.....	10
3.2 Meteorology.....	12
3.3 Construction Noise.....	12
3.4 Operational Noise.....	13
3.4.1 Operational Noise Sources.....	13
3.4.2 Model Scenarios.....	14
3.5 Sleep Disturbance.....	15
3.6 Road Traffic Noise.....	15
3.7 Sound Power Levels.....	17
4 RESULTS.....	18
4.1 Construction Noise.....	18
4.2 Operational Noise.....	19
4.2.1 Scenario 1 – Worst-case Continuous Operation.....	19
4.2.2 Scenario 2 – Feed Silo Refilling.....	20
4.2.3 Scenario 3– Bird Collection.....	21
4.3 Sleep Disturbance.....	22
4.4 Road Traffic Noise.....	22

5 DISCUSSION.....	25
5.1 Construction Noise.....	25
5.2 Operational Noise.....	25
5.3 Sleep Disturbance.....	25
5.4 Road Traffic Noise.....	25
6 CONCLUSION.....	26
6.1 Summary.....	26
Appendices	
A SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS.....	27

1 INTRODUCTION

1.1 Background

Global Acoustics were engaged by SLR Consulting Australia (SLR), on behalf of ProTen, to carry out a noise impact assessment for the proposed Rushes Creek Poultry Production Complex (the Development), which is located approximately 43 km north-west of Tamworth and 33 km north-east of Gunnedah, in the New England North West Region of NSW. The proposal comprises the development of 54 tunnel-ventilated poultry sheds with a capacity to accommodate a site population of 3,051,000 broiler birds.

The primary purpose of this assessment is to determine potential noise at the nearest residential receptors to the Development Site, as per the Secretary's Environmental Assessment Requirements (SEARs). The relevant section of the SEARs relating to noise and vibration have been reproduced in Appendix A. This assessment has been based on plans and information provided by SLR.

1.2 Site Layout

The proposed Development is to be located on a rural property off Rushes Creek Road, approximately 43 km north-west of Tamworth and 33 km north-east of Gunnedah. The nearest privately owned receiver is approximately 975 metres from the nearest farm. The Development Site and the noise sensitive receptors (NSR) are shown in Figure 1. The dominant land use in the area is agriculture, farming and recreation.

1.3 Project Overview

The Development will consist of 4 poultry production units (PPU), including a total of 54 tunnel-ventilated poultry sheds with a capacity to accommodate 3,051,000 broiler birds.

The proposed number of sheds for each PPU are as follows:

- Farm 1 (north-western farm) – 10 sheds;
- Farm 2 (north-eastern farm) – 18 sheds;
- Farm 3 (south-western farm) – 10 sheds; and
- Farm 4 (south-eastern farm) – 16 sheds.

The production cycle comprises bird occupancy of approximately 55 days followed by a 10 day cleaning phase, with approximately 5.6 production cycles per year.

The Development will operate 24 hours per day, with all deliveries and maintenance generally scheduled during the hours of 7 am to 7 pm. Bird collection and removal would typically occur between 7 pm and 4 pm when it is cooler to minimise stress to the birds. Access to the Site will be via two new access driveways from Rushes Creek Road. There will typically be one day shift for farm workers commencing at 7 am and finishing at 4 pm.

The Development will include 54 sheds of dimensions 160m x 18m x 4.2m high. Each shed includes:

- Capacity for 56,500 birds/shed;
- Steel framed building;
- Cool room sandwich panel walls (two metal faces with a fully insulated core);
- Corrugated iron roof; and
- Fully-sealed concrete flooring.

The sheds will be fully-enclosed climate-controlled and tunnel-ventilated.

Each shed will include:

- 24 Eurome ventilation fans;
- Automatic feed and water lines with feed pans and water nipple drinkers spaced along the length of the shed; and
- External feed silos and water tanks to supply each shed.

Additional support infrastructure will include:

- Eight new residences to house the farm managers;
- Water supply infrastructure to extract, transfer, treat and store water from the Namoi River via a water access licence;
- Upgrade and extension of electricity supply infrastructure;
- Construction of two new access driveways from Rushes Creek Road and construction of internal access roads;
- A staff amenities facility at each farm (office space, toilets, change rooms);
- Dead bird chiller near the main entrance to the Development Site (for biosecurity reasons);
- One poultry shed floor bedding material storage shed;
- Chemical and fuel storage facilities at each farm;
- Bulk liquid petroleum gas (LPG) tanks at each farm;
- Generators at each farm (emergency use only);

- A workshop at each farm;
- A wheel wash facility at the entrance to each farm;
- Feed silos at each farm;
- Water storage tanks at each farm; and

Surface water management system at each farm (swale drains, table drains and detention dams).

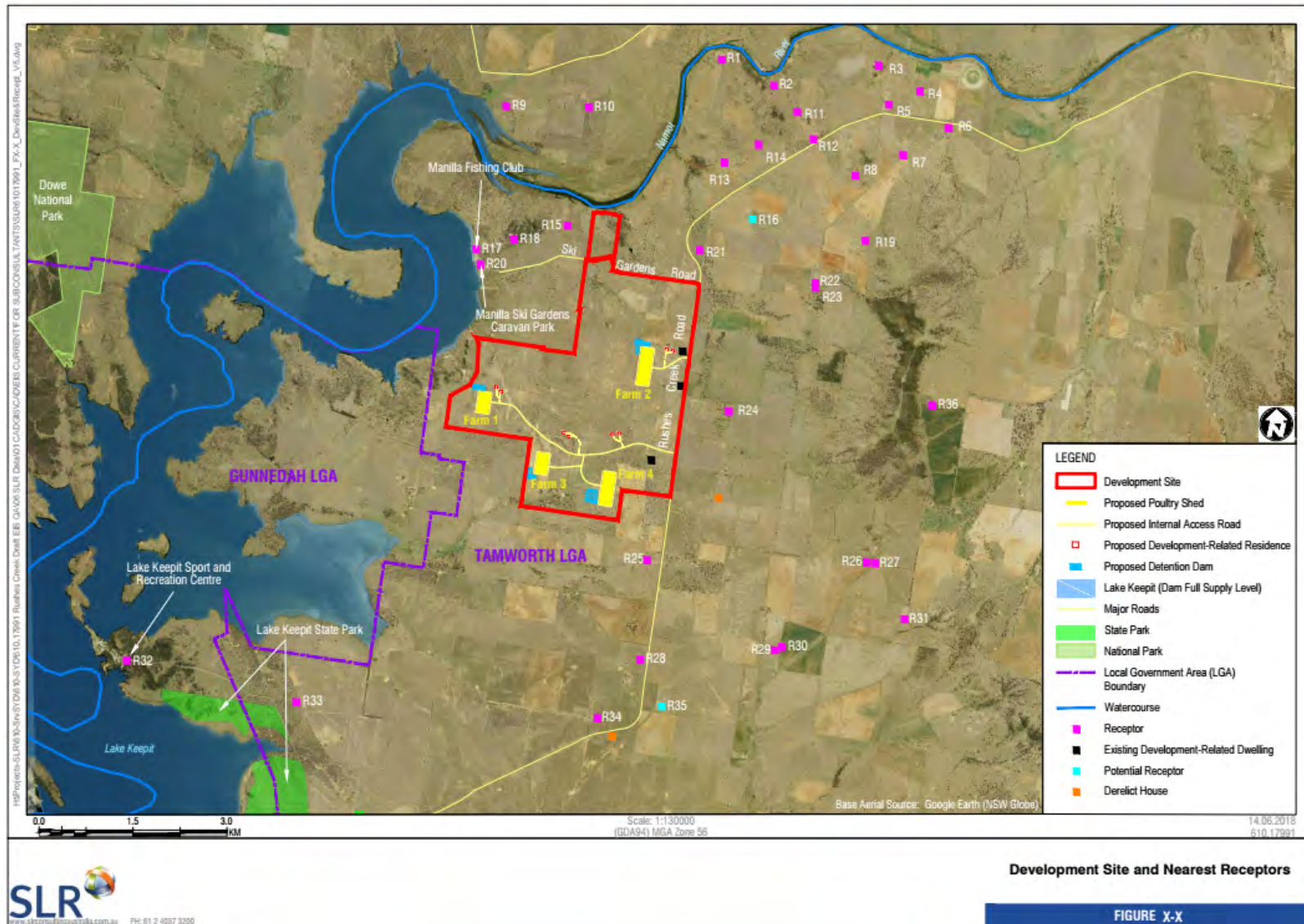


Figure 1: Development Layout and Noise Sensitive Receptors

1.4 Terminology & Abbreviations

Some definitions of terms and abbreviations, which may be used in this report, are provided in Table 1.

Table 1: TERMINOLOGY & ABBREVIATIONS

Descriptor	Definition
L _A	The A-weighted root mean squared (RMS) noise level at any instant
L _{A10}	The noise level which is exceeded for 10 percent of the time, which is approximately the average of the maximum noise levels
L _{A90}	The level exceeded for 90 percent of the time, which is approximately the average of the minimum noise levels. The L _{A90} level is often referred to as the “background” noise level and is commonly used to determine noise criteria for assessment purposes
L _{Aeq}	The average noise energy during a measurement period
dB(A)	Noise level measurement units are decibels (dB). The “A” weighting scale is used to describe human response to noise
SPL	Sound pressure level (SPL), fluctuations in pressure measured as 10 times a logarithmic scale, the reference pressure being 20 micropascals
SEL	Sound exposure level (SEL), the A-weighted noise energy during a measurement period normalised to one second
ABL	Assessment background level (ABL), the 10 th percentile background noise level for a single period (day, evening or night) of a 24 hour monitoring period
RBL	Rating background level (RBL), the background noise level for a period (day, evening or night) determined from ABL data
Hertz (Hz)	Cycles per second, the frequency of fluctuations in pressure, sound is usually a combination of many frequencies together
VTG	Vertical temperature gradient in degrees Celsius per 100 metres altitude. Generally estimated from wind speed and sigma theta data
SC	Stability Class. Estimated from wind speed and sigma theta data
Day	This is the period 7:00am to 6:00pm
Evening	This is the period 6:00pm to 10:00pm
Night	This is the period 10:00pm to 7:00am

2 CRITERIA

2.1 Construction Criteria

The EPA 'Interim Construction Noise Guideline' (ICNG) (July 2009) specifically relates to construction, maintenance and renewal activities.

The guideline specifies standard construction hours as:

- Monday to Friday, 7.00 am to 6.00 pm;
- Saturday, 8:00 am to 1:00 pm; and
- No construction work on Sunday and public holidays.

There are no specific criteria applicable to a qualitative assessment and calculation of construction related noise levels is not required. Instead, a check list should be completed which considers (but is not limited to) work practices, community consultation, alternative plant and equipment, on-site considerations, work scheduling and barriers. Qualitative assessment can be undertaken for short term construction projects, defined in the ICNG as those with duration of up to three weeks.

For major construction projects, a quantitative assessment is required, with comparison to relevant criteria. With a proposed 12 to 18 month construction timeline, this would be considered a major construction project. The criteria for work undertaken in the standard construction hours are:

- Noise affected limit, $L_{Aeq,15min}$ equal to background plus 10 dB; or
- Highly noise affected limit, $L_{Aeq,15min}$ 75 dB.

An L_{Aeq} criterion of background plus 5 dB is specified for work outside the standard construction hours.

Background noise monitoring was not undertaken as part of this assessment. It has been assumed that background levels may be less than L_{A90} 30 dB during all time periods, which is typical of a rural environment. In accordance with the EPA's Industrial Noise Policy (INP), where background levels are less than 30 dB, a default minimum RBL of 30 dB is adopted. On this basis, the noise affected limit becomes $L_{Aeq,15minute}$ 40 dB for construction work undertaken during standard construction hours. This is a conservative daytime construction criterion.

2.2 Operational Criteria

The Environment Protection Authority (EPA) NSW Industrial Noise Policy (INP) was published in 2000. The INP states that objectives for environmental noise are 'to account for intrusive noise and ... to protect the amenity of particular land uses'. To achieve these objectives, limits are specified where the 'intrusiveness criterion essentially means that the equivalent continuous (energy-average) noise level of the source should not be more than 5 decibels (dB) above the measured background level'. Amenity is protected by 'noise criteria specific to land use and associated activities'.

Applicable intrusiveness and amenity limits are derived independently. These are then compared to determine Development specific criteria.

The intrusiveness criterion is expressed as:

$$L_{Aeq,15\text{minute}} \leq RBL + 5$$

where the $L_{Aeq,15\text{minute}}$ is the L_{Aeq} noise level from the source, measured over 15 minutes and RBL is the rating background level. Where the RBL is less than $L_{A90} 30$ dB, a value of $L_{A90} 30$ dB can be adopted. The Development is in a quiet rural area with road traffic noise as the only real noise source. Because of this an L_{A90} of 30 dB has been assumed, which results in an $L_{Aeq,15\text{minute}}$ intrusiveness criterion of 35 dB.

An amenity criterion caps industrial noise levels. The Development Site is characterised as "rural" in accordance with definitions in the INP. Recommended amenity limits from the INP for residences in a rural area are shown in Table 2. It should be noted that these criteria apply for the energy average noise level over the entire period.

Table 2: STANDARD RURAL AMENITY CRITERIA

Period	Acceptable L_{Aeq} dB	Maximum L_{Aeq} dB
Day (7:00 am to 6:00 pm)	50	55
Evening (6:00 pm to 10:00 pm)	45	50
Night (10:00 pm to 7:00 am)	40	45

2.3 Development Specific Noise Levels

Table 3 summarises intrusiveness and amenity criteria that apply for day, evening and night periods. The lower of the two (intrusiveness or amenity) apply, where applicable, and is adopted as the Development specific noise level (DSNL).

Table 3: SUMMARY OF DEVELOPMENT SPECIFIC NOISE LEVELS

Period ¹	RBL ²	Intrusiveness Criterion L _{Aeq} dB	Acceptable Amenity Criterion L _{Aeq} dB	Development Specific Noise Level L _{Aeq} dB
Day	30	35	50	35
Evening	30	35	45	35
Night	30	35	40	35

Notes:

1. Day: 7:00 am 6:00 pm ~ Evening: 6:00 pm to 10:00 pm ~ Night: 10:00pm to 7:00 am; and
2. An RBL of 30 dB has been assumed for a rural environment.

2.4 Sleep Disturbance

EPA INP application notes provide guidance on setting sleep disturbance criteria. The application notes state that a review of sleep disturbance research included in the 'NSW Road Noise Policy' (RNP) concludes, "the range of results is sufficiently diverse that it was not reasonable to issue new noise criteria for sleep disturbance".

The application notes indicate a criterion based on the L_{A1,1minute} not exceeding background noise levels by more than 15 dB(A) can be used as a guide to identify the likelihood of sleep disturbance. This means that where this criterion is met, sleep disturbance is not likely, but where it is not met, a more detailed analysis is required. The detailed analysis should cover the maximum noise level, and, the number of occurrences during the night period.

As an initial assessment of sleep disturbance, a criterion of background (RBL) plus 15 dB has been adopted. Night period background noise levels are likely to be less than or equal to L_{A90} 30 dB. Therefore, a sleep disturbance criterion of L_{A1,1minute} 45 dB has been adopted for all NSR.

2.5 Road Traffic Noise

An assessment of additional road traffic associated with the operational activities has been considered. There will be additional vehicle movements resulting from the transport of various inputs and outputs to and from Site.

In 2011 the NSW state government department responsible for the environment (the then Department of Environment, Climate Change and Water) released the 'NSW Road Noise Policy' (RNP). The RNP outlines traffic noise criteria applicable to this Development. The policy applies different noise limits dependent upon the road category and type of Development/ land use. The criteria relevant to this assessment are detailed in Table 4.

Table 4: NSW GOVERNMENT TRAFFIC NOISE CRITERIA

Road Category	Type of Project/Land use	Day dB	Night dB
Freeway/arterial/ sub-arterial	Existing residences affected by additional traffic on existing freeways/arterial/sub-arterial roads generated by land use developments	L _{Aeq,15hour} 60 (external)	L _{Aeq,9hour} 55 (external)

3 METHODOLOGY

Acoustic modelling for road traffic, construction and operational noise sources was undertaken using CadnaA, noise prediction software developed by DataKustic. Modelling considers the height and location of each source and receiver and takes into account topography, meteorological effects, ground type, air absorption and barrier effects.

3.1 Noise Sensitive Receptors

The client provided details of thirty-six Noise Sensitive Receptors (NSR) (R1 to R36) for consideration in this assessment. Operational and construction noise impact were assessed at each receptor, with results from the nine most impacted NSR reported.

Noise impact from road traffic generated from this development was also assessed at each of the NSR (R1 to R36). Two additional receptors, R37 and R38, were identified for inclusion in the road traffic assessment. Both of these NSR are to the south of the Development on Rashes Creek Road. R37 and R38 represent the dwellings on DP755331 Lot121 and DP715365 Lot3 and are approximately 20 metres and 80 metres from Rashes Creek Road respectively. These two NSR are shown in Figure 2.



Figure 2: Noise Sensitive Receptors R37 and R38

3.2 Meteorology

Meteorological effects were calculated using the CONCAWE calculation methodology within the CadnaA software.

The INP states that only enhancing meteorological conditions with an occurrence of 30% or more in any time period, within any season need to be included in noise prediction calculations. A conservative approach has been undertaken assuming source to receiver winds of up to 3 m/s were prevailing conditions for each NSR and that temperature inversion conditions were a predominant feature of the area.

Neutral and enhancing meteorological conditions were considered for each construction and operational scenario. Gradient winds were assessed with a 3 m/s source to receiver wind and stability category D conditions. Temperature inversion conditions were assessed with a 2 m/s drainage flow wind and stability category F conditions. Table 5 details the meteorological conditions included in this assessment.

Table 5: PREVAILING METEOROLOGICAL CONDITIONS

ID	Temperature °C	Humidity %	Wind Speed m/s	Wind Direction degrees	Stability Class
Day/Evening/Night					
Neutral	10	70	0.0	-	D
Source to receiver gradient wind	10	70	3.0	Source to receiver	D
Inversion	10	70	2.0	180	F

3.3 Construction Noise

The construction period for the Development is expected to be approximately 16 months in total with the Development expected to be fully completed by mid-2019, subject to obtaining the necessary approvals. Construction activities during this time period include:

- Construction of the two vehicular access driveways from Ruses Creek Road and internal access roads;
- Site Preparation;
- Earthworks;
- Foundation and slab construction;
- Superstructure construction including portal frames, roofing, and cladding;
- Installation/upgrade of servicing infrastructure, including water, electrical and gas;

- Installation of associated equipment and silos;
- Construction of residential dwellings to house farm managers as well as an amenities facility encompassing office space, toilets and staff change rooms;
- Construction of workshops and other storage facilities;
- Construction of surface water management systems; and
- Landscaping.

Of these activities, Site preparation/earthworks and road construction are considered to represent the worst case for noise impact. These activities would likely involve use of the greatest amount of noise generating equipment.

Construction of the two vehicular access driveways have been modelled to represent worst case construction impact. This scenario includes a dozer, grader, excavator and dump truck operating at the North and South Site entrance at the intersection of Rashes Creek Road.

Whilst these tasks represent the worst case scenario for noise impact, it is important to note that they will not take place for the entire construction period. It is expected that upgrading the intersections will take 2 to 3 weeks.

3.4 Operational Noise

3.4.1 Operational Noise Sources

Primary potential noise sources associated with the operation of the Development include:

- Feed silo refill pump and auger;
- Heavy vehicle movements;
- Occasional tractor and other farm type machine and vehicle movements;
- Ventilation fans; and
- Bird delivery and collection using transport truck and forklift.

Ventilation fans have been identified as the primary continuous noise generating activity. Feed silo refill and bird delivery/collection have been identified as the primary intermittent noise generating activities. All of these sources have been modelled in this assessment.

Based on a site inspection and attended noise measurements at a similarly designed broiler production complex (ProTen Bective Complex, Tamworth NSW) water pumps, feed augers and heaters have not been

included in modelling. These sources were not audible above the ventilation fans and would not contribute to overall noise levels measured off site. As such they have not been included in this assessment.

The Site will be split into four farms (Farm 1 to 4), with each farm containing a number of sheds which are oriented East-West. Each shed will have 24 Eurome ventilation fans installed. 4 fans are distributed along the length of the shed and operate early in the production cycle when the birds are young. The remaining 20 fans per shed will be located on one end for tunnel ventilation. Farms 1 and 3 have 20 fans on the western end of each shed. Farms 2 and 4 have 20 fans on the eastern end of each shed. Later in the production cycle the 4 distributed fans switch off and tunnel ventilation begins. At this point the 20 fans operate to draw air in along the sides of the shed and over the birds. The fans operate automatically as required with more fans operating during warm weather and later in the production cycle when the birds require more cooling. 20 fans on each shed is the maximum that will operate at one time.

The worst-case continuous operation for the complex would be with 20 ventilation fans running on each shed. This amount of ventilation is likely to only be the case late in the production cycle during hot weather. Due to the staggering of the production cycle it is unlikely all sheds will require 20 fans running at the same time, however this has been modelled as a conservative worst-case scenario.

Feed silo refilling is an activity that would be evenly spread throughout the entire production cycle. This activity was assessed by considering one delivery truck and silo refill auger operating at each farm simultaneously. It is unlikely that silo refilling will occur at each farm simultaneously so this would be considered a worst-case impact. Each feed truck was assessed filling two feed silos in a 15 minute period.

Bird collection is expected to be the most intensive traffic generating activity as all vehicle movements occur in the last 4 weeks of the production cycle during the hours of 7 pm to 4 pm. Transport trucks would arrive and depart Site regularly during that period until bird collection is complete. Other operational noise sources such as ventilation fans, heat circulating fans, feed and water delivery systems for the sheds in question would not operate during bird collection. The placement of birds in each PPUP will be staggered so that bird collection will not be occurring concurrently for the entire Site.

A series of operational scenarios were developed to assess the various combinations of noise sources that would occur. Plant inclusions for each scenario are described in the following section.

3.4.2 Model Scenarios

Scenario 1 – Continuous Operation

This scenario models all 20 ventilation fans on each shed running continuously. During the production cycle the ventilation fans turn on automatically as required to maintain the required temperature. Only a few fans will be required early in the production cycle or during cooler conditions with all fans only typically being required late in the production cycle or during hot weather. This scenario therefore represents worst case operation.

Scenario 2 – Feed Silo Refilling

This scenario includes the continuous noise sources in Scenario 1 and feed silo refilling.

Scenario 3– Bird Collection

This scenario includes continuous operation of one forklift and one truck at each farm. Trucks have been modelled travelling to each farm along the access road and then left idling as the forklift loads the truck. As described above, other noise sources would not operate during bird collection.

3.5 Sleep Disturbance

Sleep disturbance criteria typically only apply to the night period, which is defined in the INP as 10 pm to 7 am. Sleep disturbance is generally caused by short duration noise sources that give rise to a significant increase in noise emission over and above general operational noise.

The primary noise generating activity that may cause sleep disturbance is bird collection, which is scheduled to occur when it is dark (during evening, night time and early morning periods).

Operational noise scenario 3 considered general noise emission resulting from operation of a collection truck and forklift at each farm. Short duration increases to noise emission may result from revving engines, or impact noise associated with loading the truck. An impact noise from one of the forklifts has been modelled with an L_{Max} sound power of 117 dB(A)/120 dB. This source has been included, in addition to the regular noise sources modelled in operational scenario 3.

3.6 Road Traffic Noise

RoadNet Pty Ltd has provided a road traffic assessment for the Development which includes existing traffic counts on roads surrounding the Development, and the predicted traffic generated by the Development. Road traffic assessments aim to determine impacts for the Development at the time of construction/operation (expected to be 2019) and in ten years time (2029).

The majority of movements generated by the Development will travel south to Tamworth on the Oxley Highway via Rashes Creek Road. All heavy vehicles accessing the Site will be directed to travel by this route, unless roads along the route are flooded. In such instances, alternative access for heavy vehicles and other traffic may be used. The impact from increased road traffic on Rashes Creek Road and the Oxley Highway have been considered in this assessment. In reference to the NSW Road Noise Policy the Oxley Highway would be considered an arterial road which connects the towns of Gunnedah and Tamworth. Rashes Creek Road connects the town of Manilla to the Oxley Highway, allowing through traffic to Gunnedah and Tamworth, and would be considered a sub-arterial road for the purpose of this assessment. Criteria from the RNP are outlined in Section 2.5.

Traffic generated by the Development is predicted to increase heavy vehicles on Oxley Highway by up to 8% and total traffic counts by up to 2%. Considering traffic generated by the Development is predicted to be evenly spread across the production cycle, this increase in traffic would likely cause an insignificant increase

in road traffic noise levels and is unlikely to be noticed. No further assessment of traffic noise impact for the Oxley Highway has been undertaken, however a detailed assessment of traffic on Rushes Creek Road has been prepared.

Road traffic counts from the RoadNet assessment have been used to predict increases to road traffic noise levels from additional traffic generated by the Development. Predicted road traffic counts for 2029 have been used to assess future noise impact. Existing Day (0700 – 22:00) and Night (22:00 – 07:00) period traffic counts for Rushes Creek Road were not included in the RoadNet assessment. Data from the Roads and Maritime Services (RMS) permanent monitoring station on the Oxley Highway (ID 6194) has been used to estimate Day and Night traffic counts on Rushes Creek Road.

Road traffic noise predictions were undertaken in CadnaA in accordance with Calculation of Road Traffic Noise (CoRTN) methodology development by the UK Department of Transport. For the purposes of this assessment $L_{Aeq,1hour}$ traffic noise levels have been assumed to be 3 dB lower than $L_{A10,1hour}$. This is a generally accepted relationship between L_{A10} and L_{Aeq} traffic noise levels for constant traffic flows, and it is expected that this may be conservative for lower traffic flows.

3.7 Sound Power Levels

Sound power data for noise sources were typically sourced from the Global Acoustics database of representative equipment. Where possible, sound power data from plant measured at similar facilities was adopted. Sound power for ventilation fans and feed silo refill pumps were previously measured at an existing and similar ProTen poultry complex (Bective) near Tamworth, NSW.

Sound power totals used in the noise models are shown in Table 6.

Table 6: SOUND POWER DATA FOR OPERATIONAL AND CONSTRUCTION SOURCES – $L_{Aeq,15minute}$ (dB)

Plant Item	L_W	L_{WA}
Operational Sources		
Ventilation fans (each)	100	87
Feed silo refill pump (5 minutes operation out of 15 minutes)	112	106
Delivery truck	106	97
Forklift	113	103
Construction Sources		
Grader	110	104
Dump truck	106	100
Excavator	108	105

4 RESULTS

4.1 Construction Noise

Table 7 presents construction model predictions for neutral and enhancing atmospheric conditions.

These levels represent worst-case impact at the nearest NSR due to roadworks construction and Site earthworks. No exceedance of the construction noise criterion is predicted.

Table 7: CALCULATED $L_{Aeq,15minute}$ CONSTRUCTION NOISE LEVELS (dB)

Receptor ID	Neutral	Source to Receiver wind	Inversion	Criterion	Exceedance
R15	<20	<20	<20	40	Nil
R16	20	25	25	40	Nil
R17	<20	<20	<20	40	Nil
R20	<20	<20	<20	40	Nil
R21	23	28	28	40	Nil
R22	<20	24	24	40	Nil
R23	<20	24	24	40	Nil
R24	30	35	30	40	Nil
R25	<20	20	<20	40	Nil

Note:

1. Results in bold type exceed the construction noise criterion (if applicable).

4.2 Operational Noise

4.2.1 Scenario 1 – Worst-case Continuous Operation

Table 8 presents operational Scenario 1 model predictions for neutral and enhancing atmospheric conditions.

These levels represent worst-case impact for continuously operating noise sources, and are indicative of day to day operational noise impact. No exceedance of the DSNL is predicted.

Table 8: CALCULATED $L_{Aeq,15minute}$ OPERATIONAL NOISE LEVELS - SCENARIO 1 (dB)

Receptor ID	Neutral	Source to Receiver wind	Inversion	Criterion	Exceedance
R15	<20	22	22	35	Nil
R16	<20	<20	<20	35	Nil
R17	20	24	24	35	Nil
R20	21	25	26	35	Nil
R21	23	28	28	35	Nil
R22	<20	<20	<20	35	Nil
R23	<20	<20	<20	35	Nil
R24	28	33	30	35	Nil
R25	28	33	28	35	Nil

Note:

1. Results in bold type exceed the operational noise criterion (if applicable).

4.2.2 Scenario 2 – Feed Silo Refilling

Table 9 presents operational Scenario 2 model predictions for neutral and enhancing atmospheric conditions.

These levels represent worst-case impact due to feed silo refilling, combined with worst-case continuous noise source operations. No exceedance of DSNL is predicted.

Table 9: CALCULATED $L_{Aeq,15minute}$ OPERATIONAL NOISE LEVELS - SCENARIO 2 (dB)

Receptor ID	Neutral	Source to Receiver wind	Inversion	Criterion	Exceedance
R15	22	26	26	35	Nil
R16	<20	<20	<20	35	Nil
R17	20	24	24	35	Nil
R20	22	26	26	35	Nil
R21	25	30	31	35	Nil
R22	<20	<20	<20	35	Nil
R23	<20	<20	<20	35	Nil
R24	29	34	32	35	Nil
R25	30	35	30	35	Nil

Note:

1. Results in bold type exceed the operational noise criterion (if applicable).

4.2.3 Scenario 3– Bird Collection

Table 10 presents operational Scenario 3 model predictions for neutral and enhancing atmospheric conditions.

These levels represent worst-case intermittent noise impact from Site during the night period. No exceedance of the DSNL is predicted.

Table 10: CALCULATED $L_{Aeq,15minute}$ OPERATIONAL NOISE LEVELS - SCENARIO 3 (dB)

Receptor ID	Neutral	Source to Receiver wind	Inversion	Criterion	Exceedance
R15	<20	<20	<20	35	Nil
R16	<20	<20	<20	35	Nil
R17	<20	<20	<20	35	Nil
R20	<20	<20	<20	35	Nil
R21	<20	<20	<20	35	Nil
R22	<20	<20	<20	35	Nil
R23	<20	<20	<20	35	Nil
R24	21	25	22	35	Nil
R25	23	27	23	35	Nil

Note:

1. Results in bold type exceed the operational noise criterion (if applicable).

4.3 Sleep Disturbance

Table 11 presents sleep disturbance model predictions for neutral and enhancing atmospheric conditions.

These levels represent worst-case sleep disturbance during bird collection. No exceedance of the sleep disturbance criterion is predicted.

Table 11: CALCULATED $L_{A1,1minute}$ SLEEP DISTURBANCE NOISE LEVELS (dB)

Receptor ID	Neutral	Source to Receiver wind	Inversion	Criterion	Exceedance
R15	<20	<20	<20	45	Nil
R16	<20	<20	<20	45	Nil
R17	<20	<20	20	45	Nil
R20	<20	20	21	45	Nil
R21	25	30	30	45	Nil
R22	<20	<20	<20	45	Nil
R23	<20	<20	<20	45	Nil
R24	30	35	33	45	Nil
R25	34	39	34	45	Nil

Note:

1. Results in bold type exceed the operational noise criterion (if applicable).

4.4 Road Traffic Noise

As discussed in Section 3.6 of this report, road traffic data supplied by RoadNet has been used for this assessment. The RoadNet reported existing 12 hour (06:00 – 18:00) traffic volume of 405 movements with 21% heavy vehicles on Rushes Creek Road at the Oxley Highway intersection.

Existing Day (0700 – 22:00) and Night (22:00 – 07:00) period traffic counts for Rushes Creek Road were not included in the RoadNet assessment. It has been assumed that the profile of traffic distribution across a 24 hour period is similar for Rushes Creek Road and the adjoining Oxley Highway. The average daily traffic profile from the Roads and Maritime Services (RMS) permanent monitoring station on the Oxley Highway (ID 6194) and RoadNet 12 hour Rushes Creek road traffic counts have been used to estimate Day and Night traffic counts on Rushes Creek Road.

Daily Traffic generated by the Development of 46 heavy vehicles and 26 light vehicles are predicted in the RoadNet report. The client has advised that heavy vehicles will be evenly distributed across the 24 hour period. Light vehicle moments will typically occur during normal AM and PM traffic peaks. For the purpose of this assessment it has been assumed that half of the AM light vehicle movements will occur before 07:00 (night period).

A summary of existing and generated road traffic movements on Rushes Creek Road are provided in Table 12.

Table 12: RUSHES CREEK ROAD EXISTING TRAFFIC AND PREDICTED TRAFFIC GENERATED BY THE DEVELOPMENT

Period	RoadNet Measured Traffic		Predicted Existing Traffic ²		Predicted Generated Traffic	
	Movements	HV %	Movements	HV %	Movements	HV %
12 hour	405	21	-	-	-	-
Day	-	-	439	21	48	60
Night	-	-	49	33	24	73

Note:

1. 12 hour period is 06:00 – 18:00, Day is 07:00 – 22:00 and night is 22:00 – 07:00; and
2. Current Day/Night period traffic counts estimated using RoadNet measured 12 hour counts and Oxley Highway RMS station (ID 6194) traffic profile.

L_{Aeq,period} levels have been predicted using traffic counts for existing traffic and traffic generated by the Development. Predicted road traffic noise levels compared to day and night period criteria are shown in Table 13.

Table 13: CALCULATED L_{Aeq,period} ROAD TRAFFIC NOISE LEVELS (dB)

Receptor ID	Criteria (Day/Night)	Predicted Existing Traffic Levels		Predicted Exceedance (Day/Night)	Predicted Existing Traffic & Development Traffic Levels		Predicted Exceedance (Day/Night)
		Day	Night		Day	Night	
		L _{Aeq,15hour}	L _{Aeq,9hour}		L _{Aeq,15hour}	L _{Aeq,9hour}	
R16	60/55	<20	<20	Nil/Nil	<20	<20	Nil/Nil
R21	60/55	<20	<20	Nil/Nil	<20	<20	Nil/Nil
R22	60/55	<20	<20	Nil/Nil	<20	<20	Nil/Nil
R23	60/55	<20	<20	Nil/Nil	<20	<20	Nil/Nil
R24	60/55	28	22	Nil/Nil	29	25	Nil/Nil
R25	60/55	35	30	Nil/Nil	36	32	Nil/Nil
R28	60/55	41	35	Nil/Nil	42	38	Nil/Nil
R29	60/55	<20	<20	Nil/Nil	20	<20	Nil/Nil
R30	60/55	<20	<20	Nil/Nil	20	<20	Nil/Nil
R34	60/55	34	28	Nil/Nil	35	31	Nil/Nil
R35	60/55	38	32	Nil/Nil	39	35	Nil/Nil
R37	60/55	53	47	Nil/Nil	54	50	Nil/Nil
R38	60/55	44	38	Nil/Nil	45	41	Nil/Nil

Note:

1. Results in bold type exceed the road traffic noise limits (if applicable).

Results in Table 13 show that the increase in traffic on Rushes Creek Road due to the Development will comply road traffic criteria at all NSR. Results show that with the addition of traffic from the Development will increase existing road traffic noise by 1-3 dB.

The RoadNet report predicts future daily traffic volumes on Rushes Creek Road to increase to increase to 615 vehicles by 2029, a 26% increase on the existing movements included in this assessment. This would equate to approximately a 1dB increase in road traffic noise levels. Predicted future noise levels will remain in compliance with limits outlined in the RNP.

5 DISCUSSION

5.1 Construction Noise

Model predictions presented in Section 4.1 indicate construction noise impacts due to roadworks and Site preparation earthworks would comply with the construction noise criterion at all NSR if they are undertaken during the daytime period.

5.2 Operational Noise

Model predictions presented in Section 4.2 indicate general day to day operations from continuous and intermittent noise sources would be less than the DSNL of 35 dB for daytime operations, and, night time operations with enhancing meteorological conditions.

This assessment is considered conservative as all 20 fans (per shed) would only be operational late in the production cycle, and they would unlikely be running during the evening and night period when it is cooler. Similarly, the intermittent impacts assessed in Scenario 2 and 3 are worst-case impacts that wouldn't be representative of general operations.

Predictions for continuous operation are higher than those predicted by bird collection due to the shielding provided by the sheds to the nearest NSR. Predictions during inversion conditions are generally lower than during source to receiver gradient winds as the drainage winds assumed for inversion conditions are away from the nearest NSR.

5.3 Sleep Disturbance

Model predictions presented in Section 4.3 indicate predicted sleep disturbance noise emissions comply with the adopted sleep disturbance criterion.

5.4 Road Traffic Noise

Traffic generated by the Development is expected to cause an imperceptible increase to traffic noise levels on the Oxley Highway. Traffic noise levels from traffic on Rashes Creek Road are predicted to comply with noise limits at all NSR included in this assessment.

6 CONCLUSION

6.1 Summary

A noise impact assessment has been undertaken to assess a proposed ProTen poultry operation at Rushes Creek, NSW. The assessment considered operational noise, construction noise, sleep disturbance, and road traffic noise.

Operation, construction, sleep disturbance and road traffic noise levels generated by the Development are predicted to comply with relevant noise criteria at all NSR.

Global Acoustics Pty Ltd

APPENDIX

A SECRETARY'S ENVIRONMENTAL ASSESSMENT REQUIREMENTS

DPE SEARs

- **noise and vibration** – including:
 - a quantitative noise and vibration impact assessment in accordance with the relevant EPA guidelines;
 - a description of all potential noise and vibration sources during construction and operation, including traffic noise along primary haulage routes; and
 - a description of noise and vibration monitoring, management and mitigation measures.

EPA SEARs

4 Noise and Vibration

In relation to noise, the following matters should be addressed (where relevant) as part of the EIS.

General

- 4.21. Construction noise associated with the proposed development should be assessed using the *Interim Construction Noise Guideline* (DECC, 2009).
<http://www.epa.nsw.gov.au/noise/constructnoise.htm>
- 4.22. Vibration from all activities (including construction and operation) to be undertaken on the premises should be assessed using the guidelines contained in the *Assessing Vibration: a technical guideline* (DEC, 2006). <http://www.epa.nsw.gov.au/noise/vibrationguide.htm>
- 4.23. If blasting is required for any reasons during the construction or operational stage of the proposed development, blast impacts should be demonstrated to be capable of complying with the guidelines

contained in *Australian and New Zealand Environment Council – Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC, 1990).
<http://www.epa.nsw.gov.au/noise/blasting.htm>

Industry

- 4.24. Operational noise from all industrial activities (including private haul roads and private railway lines) to be undertaken on the premises should be assessed using the guidelines contained in the *NSW Industrial Noise Policy* (EPA, 2000) and *Industrial Noise Policy Application Notes*.
<http://www.epa.nsw.gov.au/noise/industrial.htm>

Road

- 4.25. Noise on public roads from increased road traffic generated by land use developments should be assessed using the guidelines contained in the *Environmental Criteria for Road Traffic Noise* (EPA, 1999). <http://www.epa.nsw.gov.au/noise/traffic.htm>

Appendix J

**SEPP 33 - Preliminary Risk
Screening and
Hazard Assessment
(SLR Consulting Australia 2018c)**



SEPP 33 - PRELIMINARY RISK SCREENING & HAZARD ASSESSMENT

**Intensive Livestock Agriculture
Rushes Creek**

Prepared for:

ProTen Tamworth Pty Limited
PO Box 1746
North Sydney NSW 2060

SLR Ref: 610.16117.00300-R01
Version No: -v0.2
July 2018



PREPARED BY

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612
2 Lincoln Street
Lane Cove NSW 2066 Australia
(PO Box 176 Lane Cove NSW 1595 Australia)
T: +61 2 9427 8100 F: +61 2 9427 8200
E: sydney@slrconsulting.com www.slrconsulting.com

BASIS OF REPORT

This report has been prepared by SLR Consulting Australia Pty Ltd with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with ProTen Tamworth Pty Limited (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.

DOCUMENT CONTROL

Reference	Date	Prepared	Checked	Authorised
610.16117.00300-R01-v0.2	26 July 2018	Tom Overton	Craig Simpson	Craig Simpson
610.16117.00300-R01-v0.1	October 2016	Tom Overton	Nathan Redfern	

CONTENTS

1	INTRODUCTION.....	6
2	THE DEVELOPMENT.....	7
2.1	Overview.....	7
2.2	Separation Distances.....	8
2.3	Poultry Sheds.....	9
2.3.1	Overview.....	9
2.3.2	Tunnel Ventilation.....	10
2.4	Farm Managers Accommodation.....	10
2.5	Construction Activities.....	10
2.6	Services.....	11
2.6.1	Solar Power.....	11
2.6.2	Electricity.....	11
2.6.3	Gas.....	11
2.6.4	Water Supply.....	11
2.7	Traffic.....	12
2.8	Waste Management.....	12
2.9	Surface Water Management.....	13
2.10	Containment of Firefighting Water.....	15
3	SITE DESCRIPTION.....	16
3.1	Overview.....	16
3.2	Surrounding Residences and Land Use.....	16
4	PRELIMINARY RISK SCREENING.....	18
4.1	Hazardous Materials.....	18
4.2	Dangerous Goods Transport.....	20
4.3	Preliminary Screening Conclusions.....	21
5	HAZARD ASSESSMENT METHODOLOGY.....	22
5.1	Methodology.....	22
5.1.1	Hazard Identification.....	22
5.1.2	Hazard Analysis.....	22
5.1.3	Risk Evaluation and Assessment.....	23

CONTENTS

5.2	Assessment Criteria	23
5.2.1	Individual Fatality Risk Levels	23
5.2.2	Injury Risk Levels	23
5.2.3	Risk of Property Damage and Accident Propagation	24
5.2.4	Criteria for Risk Assessment to the Biophysical Environment	24
6	PRELIMINARY HAZARD ANALYSIS	25
6.1	Hazard Incident Identification	25
6.1.1	LPG	25
6.1.2	LPG Transportation	26
6.1.3	LPG Storage	27
6.2	LPG Risk Mitigation Strategies	30
6.3	Assessment Criteria Applicable to the Proposed Development Application	31
6.3.1	Heat-Flux Radiation Criteria	31
6.3.2	Explosion Over-Pressure Criteria	31
6.3.3	Toxic Exposure Criteria	31
6.3.4	Biophysical Environment Risk Criteria	32
6.4	Concluding Remarks	32
7	CONCLUSION	33
8	REFERENCES.....	34

DOCUMENT REFERENCES

TABLES

Table 1	Summary of Proposed Development	7
Table 2	Separation Distances	8
Table 3	Operational Waste Types, Classifications and Management	12
Table 4	Schedule of Land Titles	16
Table 5	Inventory of Hazardous Materials, Chemicals and Fuels	19
Table 6	Dangerous Goods Vehicle Movements*	20
Table 7	Risk assessment criteria for individual fatality risk	23
Table 8	Potential Hazardous Incidents	28

PHOTOS

CONTENTS

Plate 1	Example Poultry Sheds	9
Plate 2	Grassed Drains Between Poultry Sheds	14

1 Introduction

SLR Consulting Australia Pty Ltd (SLR) was engaged by ProTen Tamworth Pty Limited (ProTen) to assess the potential impacts of the proposed construction and operation of an intensive poultry broiler production farm, known as the Rushes Creek Poultry Production Farm (the Development), within a rural property in north-western New South Wales (NSW). The site location is provided in **Figure 1**.

This Preliminary Risk Screening and Hazard Assessment forms part of the supporting documentation for the Development Application (DA) in accordance with Secretary's Environmental Assessment Requirements (SEARs), which required the following in relation to "hazards and risk":

A preliminary risk screening completed in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive Development and Applying SEPP 33 (DoP 2011), with a clear indication of class, quantity and location of all dangerous goods and hazardous materials associated with the development; and

Should the preliminary screening indicate that the project is "potentially hazardous", a Preliminary Hazard Analysis must be prepared in accordance with Hazardous Industry Planning Advisory Paper No. 6 - Guidelines for Hazard Analysis (DoP, 2011) and the Multi-Level Risk Assessment (DoP, 2011).

The purpose of this report is to provide a screening assessment of the hazards associated with the storage of dangerous goods within the Development Site in accordance with the *State Environmental Planning Policy No. 33 – Hazardous and Offensive Development* (SEPP 33). The purpose of the initial SEPP 33 risk screening is to exclude from more detailed studies those developments which do not pose significant risk. Where SEPP 33 identifies a development as potentially hazardous and/or offensive, developments are required to undertake a Preliminary Hazard Analysis (PHA) to determine the level of risk to people, property and the environment at the proposed location and in the presence of controls.

If the risk levels exceed the criteria of acceptability and/or if the controls are assessed as inadequate, or unable to be readily controlled, then the development is classified as 'hazardous industry'. Where it is unable to prevent offensive impacts on the surrounding land users, the development is classified as 'offensive industry'.

A development may also be considered potentially hazardous with respect to the transport of dangerous goods. A proposed development may be potentially hazardous if the number of generated traffic movements (for significant quantities of hazardous materials entering or leaving the site) is above the cumulative annual or peak weekly vehicle movements. Table 2 in the document *Hazardous and Offensive Development Application Guidelines Applying SEPP 33* (DoP, 2011) outlines the screening thresholds for transportation.

This report presents information on hazardous materials, flammable substances, and compressed or liquefied petroleum gas stored or handled within the Development Site and/or transported to or from the Development Site, including any associated risk issues.

2 The Development

2.1 Overview

The Development comprises four poultry production units (PPUs), identified as Farms 1 to 4, where broiler birds will be grown for human consumption. Each farm will contain between 10 and 18 tunnel-ventilated fully-enclosed climate-controlled poultry sheds, which will each have the capacity to house 56,500 birds, along associated support and servicing infrastructure. The Development will comprise a total of 54 poultry sheds, housing a combined site population of 3,051,000 birds. The Development will employ 20 full-time equivalent employees, eight of whom will live on-site as farm managers / assistant farm managers.

The Development will be constructed and operated in accordance with current industry best practice standards, in particular the *RSPCA Approved Farming Scheme Standards – Meat Chickens* (RSPCA Australia 2013) and *Best Practice Management for Meat Chicken Production in NSW* (Department of Primary Industries 2012).

Figure 2 shows the conceptual layout of the Development, and **Table 1** contains a summary of the key development elements.

Table 1 Summary of Proposed Development

Development Characteristic	Proposed Development
Purpose	Birds grown for human consumption
Number of individual farms	Four (Farms 1, 2, 3 and 4)
Number of poultry sheds	Farm 1 – 10 sheds Farm 2 – 18 sheds Farm 3 – 10 sheds Farm 4 – 16 sheds Total – 54 sheds
Type of poultry sheds	Tunnel-ventilated, fully-enclosed, climate-controlled
Maximum shed population	56,500 birds
Maximum site population	3,051,000 birds
Hours of operation	24 hours a day, 7 days a week
Production cycle length	Approximately 65 days, comprising a maximum bird occupation of 55 days and a cleaning phase of 10 days
Number of production cycles per year	On average, approximately 5.6

In addition to the poultry shedding, the Development will comprise various support/serving infrastructure, including:

- Eight new residences to house the farm managers;
- Water, power (electricity and solar) and gas servicing infrastructure;
- Two new access driveways from Rushes Creek Road and internal access roads;

- A staff amenities and workshop facility at each farm, comprising office space, change rooms, toilets, workshop, chemical store and pump room);
- Two dead bird freezers located adjacent to the internal access roads near Rushes Creek Road;
- One poultry bedding material storage shed;
- Three generators at each farm (emergency use only);
- Vehicle wheel wash at the entrance to each farm;
- Feed silos at each farm; and
- Surface water management system at each farm (swale drains, table drains and detention dams).

The commercial activities associated with the Development will be largely confined to the four PPUs and internal access roads. It is intended that the land outside of the disturbance footprint within the Development Site will continue to be used for traditional agricultural production purposes under some form of lease or share farming arrangement.

Please refer to the Environmental Impact Statement (SLR 2018) (EIS) for further details regarding the operational procedures of the Development.

2.2 Separation Distances

Table 2 lists the minimum separation distances between the Development and notable surrounding features in the natural and built environments. The distances are approximate only and have been measured as the shortest distance between the edge of the nearest individual PPU (edge of the ring road) and edge of the feature being measured to.

Table 2 Separation Distances

Feature	Approximate Minimum Separation Distance (m)	Comments
Urban / residential area	11,860	Somerton to the southeast of Farm 4
Surrounding privately-owned residence	1,025	Dwelling (R25) to the southeast of Farm 4
Property boundaries	125	Development Site boundary to the east of Farm 4
Recreational land use	2,000	Manilla Ski Gardens Caravan Park to the north of Farm 1
Public road	585	Rushes Creek Road to the east of Farm 2
Between poultry farms (within the Site)	870	Between Farms 3 and 4
Other poultry farm	8,210	Glenara Park poultry breeder farm to the north-northwest of Farm 1
Natural waterways (creek, river)	2,260	Namoi River to the northwest of Farm 2
Other notable water features	790	Lake Keepit (full supply level) to the northwest of Farm 1

2.3 Poultry Sheds

2.3.1 Overview

Each farm will comprise between 10 and 18 poultry sheds (see **Table 1**), with a total of 54 sheds within the Development Site. The poultry sheds will be separated laterally within each farm by a distance of approximately 15 metres (m). A one-way circulation road (ring road) will be established around the perimeter of each farm to enable traffic to enter, exit and manoeuvre around the farm for loading-unloading and servicing activities in a forward direction. These roads will be constructed as all-weather rural-type roads able to carry the anticipated heavy vehicle movements.

It is understood that the poultry sheds would be considered “farm buildings” under the Building Code of Australia (BCA), meaning a Class 7 or 8 building. Design and construction will ensure compliance with the BCA.

Each shed will measure approximately 160 m long by 18.4 m wide, providing an area of approximately 2,944 square metres (m²). They will measure approximately 4.7 m to the ridge of the roof and approximately 2.6 m to under the eaves. The conceptual poultry shed design is illustrated on **Figure 3**. Plate 1 shows an example from another ProTen facility.



Plate 1 Example Poultry Sheds

Each shed will be constructed on a concrete slab using steel framework, colourbond or zincalume roofing and colourbond steel panel walls insulated with high thermal performing expanded polystyrene with fire-retardant (EPS-RF). The EPS panels will be encapsulated in aluminium channels which inhibit the oxygen supply to the EPS in the case of fire. Panels will be constructed to the requirements of AS1366.3 and tested against AS ISO 9705 Room Fire Test.

The sheds will have fully-sealed concrete flooring and will be surrounded by a 0.4 m high dwarf concrete bund wall to prevent rainwater and runoff entering the sheds and to allow for the controlled discharge of wash down water from the sheds.

A relatively thick layer of clean and fresh floor bedding material, such as soft wood shavings, rice hulls or chopped straw, will be spread over the floor of the sheds prior to the placement of day old chicks. Feed and water lines, will run the length of each poultry shed and will be automatically supplied by external silos and water storage tanks. Feed pans and water nipple drinkers (with drip cups) will be spaced along these lines at regular intervals so that the birds are never more than a few metres from food and water.

Additional shed features include front and rear access, external lighting over the loading-unloading, and will be fully computer controlled and alarm monitored.

The poultry shed bedding material will be stored in an enclosed shed within the Development Site well away from each of the PPUs (see **Figure 2**).

2.3.2 Tunnel Ventilation

The sheds will be fully-enclosed climate-controlled and tunnel-ventilated. Temperature sensors within the sheds will allow the ventilation to be adjusted as required. Heating, which is anticipated to be required for up to 21 days of each production cycle, will be provided by wall mounted LPG heaters.

The tunnel ventilation systems will be fully computer controlled and alarm monitored, with back-up power available via emergency standby generators.

2.4 Farm Managers Accommodation

The scale and 24-hour nature of the operation will necessitate eight farm managers to live on-site. On this basis, the Development includes the construction of eight new residential dwellings within the Development Site (see **Figure 2**).

2.5 Construction Activities

A construction program will be developed to cover the required civil, structural, electrical and building works. Construction will involve the erection of temporary buildings and facilities, including light and heavy vehicle access and parking areas, equipment storage compounds, diesel generators, diesel compressors, services and amenities.

It is anticipated that the construction program will span approximately 16 months. Construction activities will include:

- Site preparation, including erosion and sediment control, and earthworks;
- Construction of two new vehicular access driveways from Rushes Creek Road and internal access roads;
- Foundation and slab construction;
- Superstructure construction, including portal frames, roofing and cladding;
- Installation of associated plant and equipment, including feed silos and water tanks;
- Installation of the amenities facilities, workshops and other storage facilities;
- Construction of eight dwellings to house the farm managers;
- Installation of servicing infrastructure, including water, electrical and LPG;
- Installation of the surface water management system at each farm; and
- Site landscaping.

All construction activities will be undertaken during standard daytime construction hours, being:

- Monday to Friday - 7.00 am to 6.00 pm;
- Saturday - 8.00 am to 1.00 pm; and
- No audible construction work on Sundays and public holidays.

A Construction Environmental Management Plan (CEMP) will be developed for approval prior to commencing construction. It will include procedures for the management of surface water, soil, flora and fauna, dust, noise, traffic, Aboriginal heritage and waste.

2.6 Services

2.6.1 Solar Power

Solar panels will be installed at each PPU to generate clean renewable energy to power the PPUs and reduce dependency on reticulated electricity. Any surplus energy generated by the panels will be able to be fed into the electricity grid.

2.6.2 Electricity

While the PPUs will be serviced by power generated by the solar panels, the Development will use reticulated electricity to service any short-falls at each PPU, along with the farm managers' dwellings, dead bird freezers and water pump. The proposed alignment of electricity supply infrastructure within the Development Site, which will have a capacity of 11 kilovolts (kV), is shown on **Figure 2**.

Three emergency standby diesel generators will be installed at each PPU for the rare occasion when power from the electricity grid is lost. They will each have a maximum standby rating of 390 kilovolt-amps (kVA) and be contained in lockable acoustic enclosures with vertical air discharge.

2.6.3 Gas

Heating of the poultry sheds, which is anticipated to be required for up to 21 days of each production cycle for the brooding phase, will be provided by wall mounted gas heaters. LPG will be delivered to the Development Site in rigid tankers and stored at each farm in bulk tanks at the following volumes:

- Farm 1 – 38,250 litres (L) (45,000 L water capacity);
- Farm 2 – 57,375 L (67,500 L water capacity);
- Farm 3 – 38,250 L (45,000 L water capacity); and
- Farm 4 – 51,000 L (60,000 L water capacity).

These volumes will either be stored in multiple 7,500 L bulk tanks (water capacity) at each PPU or two to three larger size tanks at each PPU.

2.6.4 Water Supply

The operational water requirements of the Development will be serviced via the extraction of surface water from the Namoi River under the provisions of two water access licences (WALs) held by ProTen with a combined allocation of 437.2 units. The water will be treated as per the recommendations in the *National Water Biosecurity Manual – Poultry Production* (Department of Agriculture, Fisheries and Forestry, 2009).

If the water requirements of the Development cannot be met, for example during times of low flow or drought, this is a commercial risk for ProTen. If such a time presents itself several options will be available including the transfer of another WAL held by ProTen and/or reducing the operating capacity of the Development until the required water supply can be obtained.

The potable water requirements of the staff amenities at each PPU and the eight residences will be serviced via rainwater collection (tanks) from the roofs of the amenities buildings and residences. If water levels in the tanks become low due to an extended dry period, potable water will be trucked in as required.

Each PPU will have four 375 kilolitre (kL) water tanks providing a combined 1.5 megalitres (ML) of storage. This will enable each farm to store adequate supply to meet the requirements of the poultry shed ventilation systems and bird consumption for two days (as a contingency if the water supply infrastructure requires maintenance or repair). The tanks will be automatically filled from pressurised lines to remain near capacity at all times. Low level alarms will be fitted to the tanks at approximately two-thirds full capacity and will alarm if the water level drops below this point.

The water tanks at the four PPU will be interconnected and, therefore, able to provide additional water to each other if necessary. This water supply will also be available for firefighting purposes.

2.7 Traffic

The majority of traffic generated by the Development will travel between the Development Site and the poultry industry service facilities located on the western outskirts of Tamworth (hatchery, processing plant, rendering plant and feedmill) via the Oxley Highway.

It is estimated that there will be approximately 13,052 vehicles travelling to and from the Development Site annually, with 35% being light vehicles (car/ute/van) and the remaining 65% being heavy vehicles. With the exception of live bird removal, which may occur any time between 7:00 pm and 4:00 pm, all transport activities will occur during daylight hours.

2.8 Waste Management

Primary waste streams to be generated by the Development, along with their respective waste classifications under the *Waste Classification Guidelines Part 1: Classifying Waste* (EPA 2014) and intended reuse/recycling/disposal are listed in **Table 3**. There will not be any on-site stockpiling or disposal of waste materials.

Table 3 Operational Waste Types, Classifications and Management

Waste Type	NSW Classification	Reuse / Recycling / Disposal
General daily waste	General solid waste (putrescible and non-putrescible).	Disposal at landfill.
Empty chemical and fuel containers	Hazardous waste if containers were previously used to store Dangerous Goods (Class 1, 3, 4, 5 or 8) and from which residues have not been removed by washing or vacuuming. General solid waste (non-putrescible) if the containers have been cleaned by washing or vacuuming.	Offsite reuse, recycling or disposal at licensed facility. Empty chemical containers will be returned to the local supply company and/or Baiada for reuse, recycling or disposal. Alternatively a licensed contractor will be engaged to provide a chemical container pickup service for recycling, reuse or disposal. Any non-returnable chemical containers will be collected via the "drumMUSTER" program. (N.B. transport to comply with the <i>Australian Code for the Transport of Dangerous Goods by Road & Rail</i>)

Waste Type	NSW Classification	Reuse / Recycling / Disposal
Poultry litter	General solid waste (putrescible).	Offsite reuse for beneficial application on rural/agricultural land and/or off site treatment to produce a commercial product (i.e. value-added product). The litter will not be stockpiled or disposed of within the bounds of the Development Site under any circumstances. Furthermore, ProTen prefers not to see the spreading of litter within a 5 km radius of a poultry shed.
Dead birds	General solid waste (putrescible).	Dead birds will be collected from the poultry sheds on a daily basis and stored in an on-site freezer prior to transport off site for treatment at Baiada's Oakburn Rendering Plant to produce tallow and poultry offal meal (i.e. value-added products).
Sewage (from staff amenities and residences)	Liquid waste	Treated and disposed of via on-site aerated wastewater treatment systems (one at each residence and farm) installed and operated in accordance with relevant standards/guidelines and Council approvals.
Green waste	General solid waste (non-putrescible)	Composting and/or direct reuse on site.
Tyres	Special waste	Offsite recycling or disposal at licensed facility.
Air and oil filters and rags	General solid waste (non-putrescible)	Offsite recycling or disposal at licensed facility.
Batteries	Hazardous waste	Offsite recycling.
Light bulbs / fluorescent tubes	Hazardous waste	Offsite recycling.
Mass bird mortalities	General solid waste (putrescible)	Various options exist for the disposal of bird carcasses and fomites in the event of an emergency animal disease. Refer to the EIS (SLR 2018).

2.9 Surface Water Management

The poultry development will be a largely dry operation, with no effluent generated as a result of the poultry-rearing process itself. The main operational water sources from the Development will be:

- Wash down water from within the poultry sheds at the end of each 9.3 week production cycle (approximately 5.6 times per year);
- Rainfall runoff from the shed roofs; and
- Rainfall runoff from the ground surfaces around the poultry sheds and additional improvements.

The poultry sheds will be blown and swept (i.e. dry cleaning practices) before being washed using high-pressure low-volume sprays, sanitised and disinfected.

An engineered surface water management system will be installed at each farm to provide long-term structural controls to mitigate the impact of surface water runoff throughout the life of the Development. Each system will be designed to capture the runoff from 200 mm of rainfall, which is equivalent to the depth of rainfall for a 1% annual exceedance probability (AEP), 72-hour event.

Clean water diversions comprising a deflection bank and swale drain will be installed around the upstream sides of each of the four farms to convey clean water run-off around the poultry sheds and prevent this water from entering the controlled surface water management system.

Each poultry shed will be surrounded by a 0.4 m high dwarf concrete bund wall to prevent rainwater and runoff entering the sheds and to allow for the controlled discharge of wash down water from the sheds. The concrete bunds will have strategically located seepage holes to convey excess wash down water from the sheds into grassed swales between each of the sheds. Rainfall runoff from the shed roofs and from some of the surrounding surfaces will also be directed into the grassed swales.



Plate 2 Grassed Drains Between Poultry Sheds

The swales will be designed to allow infiltration of the water into the topsoil for effective nutrient uptake by the grass, which will be regularly slashed to promote continued growth. During heavy rainfall events, excess water from the grassed swales will be conveyed via underground pipes under the farm ring road and in to a table drain around the perimeter of the farm. The construction of the perimeter table drain will ensure that all rainfall runoff from the ground surfaces surrounding the sheds will be contained within the controlled surface water management system.

The perimeter table drain will convey the water to a detention dam designed to capture the stormwater runoff from inside the farm environs (i.e. all area inside the upstream diversion drains) for a depth of rainfall of approximately 200 mm, which is equivalent to the depth of rainfall for a 1% AEP, 72 hour event.

ProTen has committed to reusing the captured water for regular irrigation of the planted vegetation screens at each PPU. Based on the design volumes of the detention dams and the water reuse strategy, there should not be any off-site discharge from the dams.

2.10 Containment of Firefighting Water

The primary fire suppression method will be the use of water supplied fire hose. There will be no use of foam or other chemical suppressants, with the exception of the portable fire extinguishers. The potential for contaminated water to be generated is considered to be limited.

As outlined above, the detention dam at each PPU has been designed to capture all runoff generated from inside the farm environs (i.e. all area inside the upstream diversion drains) for a depth of rainfall of approximately 200 mm, which is equivalent to the depth of rainfall for a 1% AEP, 72 hour event. On this basis, any firefighting water runoff at a PPU would enter the controlled surface water management system and be captured in the detention dam. Subsequent treatment of the water can occur within the detention dam if deemed necessary.

As addressed in **Section 4**, only minor quantities of chemicals and fuels will be stored at each PPU. These volumes would be easily diluted with the application of water during a fire and within the controlled surface water management system. LPG, diesel and petrol will be stored separately and removed from each other and also removed from other chemicals. Diesel and petrol will be stored in separate bunded areas at each PPU with a minimum bund volume of 110% and no other flammable materials stored in the vicinity. Chemical spill kits will be held on-site.

3 Site Description

3.1 Overview

The Development Site is located within a rural area known as Rushes Creek approximately 43 kilometres (km) northwest of Tamworth and 33 km northeast of Gunnedah in the New England North West region of NSW (see **Figures 1 and 2**) and the Tamworth LGA. **Table 4** lists the various land titles within the Development Site.

Table 4 Schedule of Land Titles

Lot	Deposited Plan (DP)	Tenure
Lot 1	DP 44215	Freehold
Part Lot 1	DP 1108119	
Lot 1	DP 1132298	
Lots 26, 85, 86, 101, 118, 165, 166 and 171	DP 752169	
Part Lot 143	DP 752189	
Lot 1	DP 1132078	
Lot 1	DP 1141148	
Untitled parcel of land traversing through Lot 171 DP 752169		Council public road (unformed)

Rushes Creek Road, which is a sealed two-lane rural road, forms the Development Site's eastern boundary and connects the Site to the Oxley Highway (NSW State Route B56) between Somerton and Carroll and also to Manilla Road (also known as Fossickers Way) (NSW State Route B95) at Manilla. The Oxley Highway provides a connection to Tamworth, being the area's major centre and home to the various poultry industry service facilities required to support the Development.

The Namoi River is located to the north of the Development Site and Lake Keepit is located to the west and southwest of the Site. The topography of the Development Site ranges between around 325 and 410 metres Australian Height Datum (m AHD). The visual amenity is that of a rural property that has been significantly modified by historic land clearing and long-term agricultural production activities.

3.2 Surrounding Residences and Land Use

The surrounding neighbourhood is also primarily characterised by traditional agricultural production, along with recreational activities around Lake Keepit, including:

- Manilla Ski Gardens Caravan Park and Manilla Fishing Club (caravan park and camping ground), which is located approximately 2 km from the nearest PPU;
- Lake Keepit Sport and Recreation Centre (cabins, conference centre, recreational facilities), which is located approximately 7 km from the nearest PPU;
- Lake Keepit Soaring Club (gliding facilities, clubhouse, cabins), which is located over 8 km from the nearest PPU; and
- Inland Waters Holiday Park (caravan park, cabins, camping ground, recreational facilities), which is located over 9 km from the nearest PPU.

There are three foreshore areas around Lake Keepit that have been designated as a State Park (the Lake Keepit State Park).

The nearest populated areas (see **Figure 1**) are Somerton, approximately 12 km to the southeast, and Manilla, approximately 13 km to the northeast.

The Development Site has a relatively low density of surrounding privately-owned residences, with the nearest identified on **Figure 2**. The nearest residence is identified as R25, which is located off Rushes Creek Road approximately 1,025 m southeast of the nearest proposed PPU.

Receptor symbols have been added to **Figure 2** to represent the Manilla Ski Gardens Caravan Park, Lake Keepit Sport and Recreation Centre, Lake Keepit Soaring Club and the Inland Waters Holiday Park.

4 Preliminary Risk Screening

Preliminary risk screening of the Development is required under SEPP 33 to determine the need for a Preliminary Hazard Analysis (PHA). The preliminary screening assesses the storage of specific dangerous goods classes that have the potential for significant off-site effects. Specifically, the assessment involves the identification of classes and quantities of all dangerous goods to be used, stored or produced on site with respect to storage depot locations as well as transported to and from the Development Site.

4.1 Hazardous Materials

The only chemicals and fuels that will be used at the Development will be for the following purposes:

- LPG, diesel and petrol for power and equipment requirements;
- Sanitation products used in the poultry sheds during the cleaning phase at the end of each production cycle;
- Sanitation products for the wheel wash facilities and foot baths;
- Water treatment agents;
- Pest and vermin control products (when necessary); and
- Weed control products (when necessary).

Chemicals will be purchased from a local chemical supply company and/or delivered to the Site by Baiada. It is the usual practice for chemicals to be delivered only a few days prior to the commencement of the cleaning phase in order to minimise on-site chemical storage requirements and time.

The amenities and workshop building at each PPU comprises a vented chemical store room for the storage of the relatively small volumes of chemicals required for sanitisation/disinfection, water treatment, weed control and pest control purposes. Copies of the Safety Data Sheet (SDS) for each stored chemical will be kept within the chemical store or office at each PPU. Spill kits will also be maintained within the chemical store at each PPU.

The aboveground LPG storage tanks will be installed and maintained to comply with the requirements of *AS/NZS 1596:2014 The Storage and Handling of LP Gas* and the diesel and petrol tanks will be stored within bunded areas with a minimum bund volume of 110% of the volume of the largest single stored volume within the bund.

Table 5 provides a summary of the hazardous materials, chemicals and fuels to be stored at the Development Site. The storage locations at each PPU for these materials are shown on **Figure 3**. **Table 5** also compares the storage quantity at each PPU against the storage screening threshold in Table 3 and Figure 9 of *Applying SEPP 33* (DoP, 2011).

The dangerous goods to be stored on the site have been grouped into their respective Australian Dangerous Goods (ADG) classes. If more than one packaging group (PG) was present in an ADG class it was assumed that the total amount for that class was the more hazardous PG.

Table 5 Inventory of Hazardous Materials, Chemicals and Fuels

Substance	Hazardous Class	UN No.	HAZCHEM Code	Total Storage at each PPU	Threshold Quantity	SEPP 33 Threshold Screening
LPG	Class 2.1	1075	2YE	Farm 1 – 38,250 L (38.25 m ³) Farm 2 – 57,375 L (57.38 m ³) Farm 3 – 38,250 L (38.25 m ³) Farm 4 – 51,000 L (51.00 m ³)	16 m ³ (above ground storage)	Above
Diesel	Class C1	3082	3Z	Each PPU - 4,000 L (2 x 2,000 L tanks)	100,000 L	Below
Petrol	Class 3 (PG II)	1203	3YE	Each PPU – 700 L (1 x 700 L tank) (0.52 tonnes)	4 tonnes	Below
Sodium Hypochlorite (10-30%) (bleach, disinfectant)	Class 8 (PG III)	1791	2X	Each PPU – 400 L (2 x 200 L drums)	25 tonnes (PG II)	Below
Chlorine dioxide (water supply treatment)	Class 8 (PG II)	1789	2R	Each PPU – 240 L (8 x 30 L drums)		
Microgard 755N or Micro-4 (sanitiser)	Class 9	3082	-	Each PPU – 25 L (1 x 25 L drum)	10,000 L or kg	Below
Goal (herbicide)	Class 9	3082	2X	Each PPU - 10 L (1 x 10 L drum)		
Agri-Quat (disinfectant, sanitiser)	N/A	-	-	Each PPU – 50 L (2 x 25 L drums)	N/A	N/A
Ditrac (rodenticide)	N/A	-	-	Each PPU - 20 kg (1 x 20 kg container)	N/A	N/A
Glister (herbicide)	N/A	1950	-	Each PPU – 20 kg (1 x 20 kg container)	N/A	N/A
Unicide (sanitiser)	N/A	-	-	Each PPU – 100 L (1 x 100 L drum)	N/A	N/A
Unicide d (sanitizer)	N/A	-	-	Each PPU - 100 L (1 x 100 L drum)	N/A	N/A
Roundup (Glyphosate, herbicide)	N/A	-	-	Each PPU - 25 L (1 x 25 L drum)	N/A	N/A

- Denotes normal fire extinguishing procedures and equipment are appropriate and chemical will not react with the firefighting material.
- * Each PPU is located a minimum of 870 m apart therefore the storage for each PPU has been considered on their own and not as one facility.

Each of the chemicals listed in **Table 5** without a hazard class are not considered hazardous and have therefore not been discussed further in this study.

The quantities of diesel, petrol, sodium hypochlorite, chlorine dioxide, Microgard and Goal are minor quantities well below the respective screening thresholds and are considered not to present a hazard risk. These fuels/chemicals will be located in dedicated storage areas in appropriately secured, sealed and banded facilities at each PPU. LPG, diesel and petrol will be stored separately away from other materials and each other. On this basis, these fuels and chemicals have not been considered further in this study.

Applying SEPP 33 (DoP, 2011) clearly states “If combustible liquids of class C1 are present on site and are stored in a separate bund or within a storage area where there are no flammable materials stored they are not considered to be potentially hazardous.” Diesel, which is a Class C1 material, will be stored within bunded areas with a minimum bund volume of 110% of the volume stored and there will be no flammable materials stored in the vicinity.

The total quantities of LPG to be stored at each PPU are above the 16 m³ (~16,000L water capacity) screening threshold set in *Applying SEPP 33 (DoP, 2011)* and above the Safe Work Australia manifest quantity of 5,000 L. As a result, the Development may be considered potentially hazardous with respect to the quantity of LPG to be stored at each PPU.

4.2 Dangerous Goods Transport

A proposed development may be deemed potentially hazardous if generated traffic movements for certain dangerous goods are above the thresholds in Table 2 of *Applying SEPP 33 (DoP, 2011)*. The maximum weekly vehicle movements for the delivery of dangerous goods to the Development Site are provided below in **Table 6**. Note that the annual levels directly reflect the weekly vehicle movements.

Table 6 Dangerous Goods Vehicle Movements*

ADG Class	Materials	Maximum DGs Vehicle Movements (per week)	Load Type (relevant to the facility)	SEPP 33 Threshold Vehicle Movements (per week)	SEPP 33 Threshold Minimum Quantity (per load)	SEPP 33 Threshold Level Findings
2.1	LPG	1-2	Bulk	>30	2 tonnes	Above (in regards to quantity per load only)
3	Petrol	<1	Bulk	>45	3 tonnes	Below
C1	Diesel	< 1	Bulk	N/A	N/A	Below
8	Sodium hypochlorite & chlorine dioxide	<1	Packages	>30	5 tonnes	Below

Note: Assumes each dangerous good class is transported separately. Note that LPG is only used at each PPU for a period of up to 21 days during each production cycle. Outside this time LPG will not be used at that PPU.

* Information provided by ProTen

While the number of vehicle movements for the delivery of LPG is well-below the screening threshold, the quantity of LPG to be delivered per load will likely be greater than screening threshold of 2 tonnes (equivalent to approximately 3.92 m³). As a result, the Development may be considered potentially hazardous with respect to the transport of LPG.

The vehicle movements for the transport of other dangerous goods to the Development Site and quantities per delivery are all below the respective screening thresholds.

4.3 Preliminary Screening Conclusions

The SEPP 33 screenings for the storage and transport of dangerous goods indicates that the Development may be considered potentially hazardous due to the quantities of LPG to be stored at each PPU and transported to the Development Site.

On this basis, a PHA has been determined necessary to assess the level of risk to people, property and the environment as a result of the storage and transport of LPG.

5 Hazard Assessment Methodology

The hazard analysis and quantified risk assessment approach developed and recommended in the *Hazardous Industry Planning Advisory Paper No. 4 Risk Criteria for Land Use Safety Planning* (DoP, 2011b) (HIPAP 4) relies on a systematic and analytical approach to the identification and analysis of hazards and the quantification of off-site risks to assess risk tolerability and land use safety implications. HIPAP advocates a merit-based approach, with the level and extent of analysis being appropriate to the hazards present.

5.1 Methodology

The procedures adopted by this study for assessing hazardous impacts involve the following steps:

- Step 1: Hazard identification;
- Step 2: Hazard analysis (consequence and probability estimations); and
- Step 3: Risk evaluation and assessment against specific criteria.

The following sections of the report discuss the hazard identification and analysis process as prescribed in HIPAP.

5.1.1 Hazard Identification

This is the first step in the risk assessment. It involves the identification of all theoretically possible hazardous events as the basis for further quantification and analysis. This does not in any way imply that the hazard identified or its theoretically possible impact will occur in practice. Essentially, it identifies the particular characteristics and nature of hazards to be further evaluated in order to quantify potential risks.

To identify hazards, a survey of operations was carried out to isolate the events which are outside normal operating conditions and which have the potential to impact outside the boundaries of the Site. In accordance with HIPAP 4, these events do not include occurrences that are a normal part of the operation cycles of the Site but rather the atypical and abnormal, such as the occurrence of a significant liquid spill during product transfer operations.

5.1.2 Hazard Analysis

After a review of the events identified in the hazard identification stage and the prevention/protection measures incorporated into the design of the Development, any events which are considered to have the potential to result in impacts off-site or which have the potential to escalate to larger incidents are carried to the next stage of analysis.

Consequence Estimation

This aspect involves the analysis and modelling of the credible events carried forward from the hazard identification process in order to quantify their impacts outside the boundaries of the Site. In this case these events typically include explosion, fire fume, dispersion/propagation and their potential effects on people and/or damage to property.

Probability Likelihood Estimation

The likelihood of an incident occurring is determined by adopting probability factors derived from published data.

5.1.3 Risk Evaluation and Assessment

The risk analysis includes the consequences of each hazardous event and the frequencies of each initiating failure. The results of consequence calculations (radiation and overpressure contours, and toxic exposure levels) together with the probabilities and likelihood's estimated are then compared against the accepted criteria, as specified by the Department of Planning and Environment (DPE) applicable for the Site. Whether it is considered necessary to conduct the predictions would depend on the probabilities and likelihood estimated and if the risk criteria are exceeded.

5.2 Assessment Criteria

5.2.1 Individual Fatality Risk Levels

The following paragraphs are reproduced from HIPAP 4 relating to individual fatality risk levels:

"People in hospitals, children at school or old-aged people are more vulnerable to hazards and less able to take evasive action, if need be, relative to the average residential population. A lower risk than the one in a million criteria (applicable for residential areas) may be more appropriate for such cases. On the other hand, land uses such as commercial and open space do not involve continuous occupancy by the same people.

The individual's occupancy of these areas is on an intermittent basis and the people present are generally mobile. As such, a higher level of risk (relative to the permanent housing occupancy exposure) may be tolerated. A higher level of risk still is generally considered acceptable in industrial areas".

The risk assessment criteria for individual fatality risk are presented below.

Table 7 Risk assessment criteria for individual fatality risk

Land Use	Risk Criteria x 10 ⁻⁶
Hospitals, schools, etc	0.5
Residential	1
Commercial	5
Sporting and active open space	10
Industrial	50

5.2.2 Injury Risk Levels

Injury risk levels from HIPAP 4 are stated below for heat of radiation:

- Incident heat flux radiation at residential areas should not exceed 4.7 kW/m², at frequencies of more than 50 chances in a million per year.
- Incident explosion overpressure at residential areas should not exceed 7 kPa, at frequencies of more than 50 chances in a million per year.

The requirements for toxic exposure are stated as follows:

- Toxic concentrations in residential areas should not exceed a level that would be seriously injurious to sensitive members of the community following a relatively short period of exposure at maximum frequency of 10 in a million per year.
- Toxic concentrations in residential areas should not cause irritation to the eyes or throat, coughing or other acute physiological responses in sensitive members of the community over a maximum frequency of 50 in a million per year.

Please note that a risk hazard assessment only examines events that are considered to have the potential for significant off-site consequences.

5.2.3 Risk of Property Damage and Accident Propagation

HIPAP 4 indicates that siting of a hazardous installation must account for the potential for propagation of an accident causing a “domino” effect on adjoining premises. This risk would be expected within an industrial estate where siting of hazardous materials on one Site may potentially cause hazardous materials on an adjoining premises to further develop the size of the accident.

The criteria for risk to damage to property and of accident propagation are stated as follows:

- Incident heat flux at neighbouring potentially hazardous installations or at land zones to accommodate such installations should not exceed a risk of 50 in a million per year for the 23 kW/m² heat flux level.
- Incident explosion overpressure at neighbouring potentially hazardous installations, at land zoned to accommodate such installations or at nearest public buildings should not exceed a risk of 50 in a million per year for the 14 kPa explosion overpressure level.

5.2.4 Criteria for Risk Assessment to the Biophysical Environment

HIPAP 4 indicates that siting of potentially hazardous developments also needs to consider the risk from accidental releases into the biophysical environment. Acute and chronic toxicity impacts are considered to be of most relevance.

The assessment of the ultimate effects from toxic releases into the natural ecosystem is difficult, particularly in the case of atypical accidental releases. Consequence data is limited and factors influencing the outcome variable and complex. In many cases, it may not be possible or practical to establish the final impact of any particular release. Because of such complexity, it is inappropriate to provide generalised criteria to cover any scenario. The acceptability of the risk will depend upon the value of the potentially affected zone or ecosystem to the local community and wider society.

The suggested criteria for sensitive environmental areas relate to the potential effects of an accidental release or emission on the long-term viability of the ecosystem or any species within it and are expressed as follows:

- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the effects or consequences of the more likely accidental emissions may threaten the long-term viability of the ecosystem or any species within it; and
- Industrial developments should not be sited in proximity to sensitive natural environmental areas where the likelihood or probability of impacts that may threaten the long-term viability of the ecosystem or any species within it is not substantially lower than the existing background level threat to the ecosystem.

6 Preliminary Hazard Analysis

6.1 Hazard Incident Identification

Sections 3.1 and **3.2** provide details on the surrounding land uses and potential receptors that may be affected in a hazard event. Following a review of neighbouring properties a series of potentially hazardous events or scenarios have been identified. Each event or scenario has been discussed in detail and the need for a further quantitative analysis considered.

The following potential hazards could not be eliminated through first review and require further examination.

- LPG Fire

This scenario is discussed below.

6.1.1 LPG

The proposed development will have LPG tanks for the heating of the poultry sheds and are required to be at quantities classified as an industrial or commercial site. At each PPU there will be LPG storage consisting of up to nine 7,500 L (water capacity) bulk tanks or potentially two to three larger sized bulk tanks (ProTen is working with the LPG supplier, Elgas, in relation to storage design). As listed in **Section 2.6.3**, the storage volumes at each PPU will range between 38,250 L (45,000 L water capacity) and 57,375 L (67,500 L water capacity). The maximum combined storage of LPG within the Development Site will be 184,875 L.

The LPG total storage will be separated into four areas with associated PPUs, which are separated by a minimum distance of 870 m. Whilst each individual PPU LPG store (above ground) will exceed the SEPP 33 Threshold Level Quantity, the location and installed equipment will meet the requirements of AS/NZS 1596:2014 *The storage and handling of LP Gas*.

AS1596 requires the installation and maintenance of number of safety features for LPG plant and equipment specifically designed to reduce the overall risk of operations. The correct operation and maintenance of this equipment has been assumed as part of the likelihood assessments.

The location of the above-ground storage shall comply with the following requirements for ventilation and access and set up:

- (a) Above-ground storage tanks shall be in the open air, outside buildings.
- (b) Nearby construction, fences, walls, vapour barriers, or the like shall permit free access around and cross-ventilation for the tank.
- (c) The minimum distance between adjacent tanks will be the same as the diameter of the largest tank installed.

Table 6.1 *Location of Above-Ground Storage Tanks* from AS/NZS 1596:2014 (below) shows the minimum allowable distances from the LPG installation at each PPU to a public place and a protected place. In this case the nearest public place is the property boundaries at a distance of 125m and the nearest onsite protected place, the chicken shed, will be located 20m from the LPG storage tanks.

Each LPG storage facility is significantly further than the minimum distances required by AS/NZS 1596:2014, which as set out in Table 6.1 below is 10m from a public place and 17m from a protected place.

TABLE 6.1
LOCATION OF ABOVE-GROUND STORAGE TANKS

1	2	3	4
Capacity of the tank kL	Minimum distance to an adjacent LP Gas tank m	Minimum distance from the tank to a public place, or a railway line m	Minimum distance from the tank to a protected place m
≥0.5	Diameter of the largest tank	1.5	1.5
1		2	3
2		4 (3)	6 (4.5)
5		5 (3.5)	8 (5)
8		6 (4)	10 (6)
10		7	11
15		8	14
20		9	15
50		10	17
100		11	20
200		12	25
500		22	45

In addition it should be noted that the design and layout of the LPG storage facilities at the proposal development is being designed by the LPG supplier, Elgas.

6.1.2 LPG Transportation

The LPG storage areas are separated by a minimum distance of around 870 m between each PPU. Each PPU will contain up to nine 7,500 L (water capacity) bulk LPG storage tanks or two to three larger sized bulk tanks. As listed in **Section 2.6.3**, the storage quantities at each PPU will range between 38,250 L (45,000 L water capacity) and 57,375 L (67,500 L water capacity).

The LPG requirement is limited to around 56 deliveries annually, equating to just over 1 delivery each week on average.

SLR has been advised that rigid tankers will be undertaking LPG deliveries. This will limit the amount of LPG that can be delivered at any one time. Each delivery would be undertaken in tankers ranging in size between 4 tonnes and 12 tonnes.

Whilst the quantity of LPG to be transported per load to the Site will likely exceed the SEPP 33 threshold of 2 tonnes, the number of deliveries will be 1 to 2 per week, the deliveries will be undertaken in a sparsely populated area and rigid vehicles will be used limiting the capacity of LPG transported. On this basis, further consequence analysis for transport risks is not considered necessary.

6.1.3 LPG Storage

The technical and management safeguards required in place for LPG systems are self-evident and readily implemented as part of safety engineering.

Table 8 provides an assessment of potential hazard incidents and the controls required to reduce risks to an acceptable level.

Table 8 Potential Hazardous Incidents

Facility/ Event	Cause/ Comment	Possible results/ Consequences	Prevention/ Protection Requirements to Reduce Risks to Acceptable Level
Rupture of gas line	Failure of pipe or connection	Leak/release of LPG to atmosphere resulting in ignition	<p>Installations must comply with AS/NZS 1596:2014, specifically Sections 3, 5, 6, 8, 11, 12 & 13.</p> <p>The outflow of gas must be controlled in accordance with Section 5 AS/NZS 1596:2014</p> <p>Appropriate compliant safety shut down and isolation valves will be installed (Sections 5.3 and 6.7 AS/NZS 1596:2014).</p> <p>Ensure that all inspections, testing and maintenance is in accordance with Section 11.5 AS/NZS 1596:2014.</p> <p>Separation distances are to be maintained as identified in AS/NZS 1596:2014.</p> <p>Appropriate hazard area classification is accordance with AS/NZS 60079.10.1 (Zone 2 hazard area within the space from ground level to 1m vertically above the tank and laterally to a distance of 6m for an 8kL tank (Table ZA.6.5.2.1 AS/NZS 60079.10.1:2009)). All electrical equipment used as part of the installation will comply with AS3000.</p> <p>Fire safety systems will be installed and/or available in accordance with Section 13 AS/NZS 1596:2014 (.</p> <p>Ensure appropriate staff are trained in how to use firefighting equipment. Appropriate fire drills are conducted to ensure the emergency plan works.</p>
Leak during tank filling	Rupture of filling pipe, overfilling tanks, over pressure of lines.	Leak of LPG to atmosphere resulting in ignition	<p>Installations must comply with AS/NZS 1596:2014, specifically Sections 3, 5, 6, 8, 11, 12 & 13.</p> <p>Tank filling requirement must comply with Section 6.6 AS/NZS 1596:2014</p> <p>Appropriate compliant safety shut down and isolation valves will be installed (Sections 5.3 and 6.7 AS/NZS 1596:2014). If direct connection filling hose and coupling must be of the type which prevents the escape of more than 0.1L if liquid during disconnection</p> <p>Fire-sensing elements of the emergency shutdown system shall be located so as to sense and respond to a fire at the filling or loading connection.</p> <p>Ensure that all inspections, testing and maintenance is in accordance with Section 11.5 AS/NZS 1596:2014. Separation distances are to be maintained as identified in AS/NZS 1596:2014.</p> <p>Appropriate hazard area classification is accordance with AS/NZS 60079.10.1 (Zone 2 hazard area within the space from ground level to 1m vertically above the tank and laterally to a distance of 6m for an 8kL tank (Table ZA.6.5.2.1 AS/NZS 60079.10.1:2009)). All electrical equipment used as part of the installation will comply with AS3000.</p> <p>Fire safety systems will be installed and/or available in accordance with Section 13 AS/NZS 1596:2014.</p> <p>Ensure appropriate staff are trained in how to use firefighting equipment. Appropriate fire drills are conducted to ensure the emergency plan works.</p>

Facility/ Event	Cause/ Comment	Possible results/ Consequences	Prevention/ Protection Requirements to Reduce Risks to Acceptable Level
Tank failure	Overpressure of tank, due to adjacent fire Tank failure due to corrosion	Leak of LPG to atmosphere resulting in ignition	<p>Installations must comply with AS/NZS 1596:2014, specifically Sections 3, 5, 6, 8, 11, 12 & 13.</p> <p>The tank must be made of steel and comply with the requirements AS/NZS 1200</p> <p>Ensure that all inspections, testing and maintenance is in accordance with Section 11.5 AS/NZS 1596:2014. Separation distances are to be maintained as identified in AS/NZS 1596:2014.</p> <p>Automatic fill shutoff when tank has reached capacity in accordance with Section 6.6 AS/NZS 1596:2014.</p> <p>Appropriate hazard area classification is accordance with AS/NZS 60079.10.1 (Zone 2 hazard area within the space from ground level to 1m vertically above the tank and laterally to a distance of 6m for an 8kL tank (Table ZA.6.5.2.1 AS/NZS 60079.10.1:2009)). All electrical equipment used as part of the installation will comply with AS3000.</p> <p>Fire safety systems will be installed and/or available in accordance with Section 13 AS/NZS 1596:2014.</p> <p>Ensure appropriate staff are trained in how to use firefighting equipment. Appropriate fire drills are conducted to ensure the emergency plan works.</p> <p>See fire exposure protection assessment for more details</p>

6.2 LPG Risk Mitigation Strategies

The LPG storage areas are separated by a minimum distance of around 870 m between each PPU. Each PPU will contain up to nine 7,500 L (water capacity) bulk LPG storage tanks or two to three larger sized bulk tanks. As listed in **Section 2.6.3**, the storage quantities at PPU will range between 38,250 L (45,000 L water capacity) and 57,375 L (67,500 L water capacity). While the combined storage at each PPU (above ground) will exceed the SEPP 33 threshold level quantity (see **Table 5**), the location and installed equipment will meet the requirements of AS/NZS 1596:2014 *The storage and handling of LP Gas*.

The requirements of AS/NZS 1596:2014 regarding the handling of a fire emergency involving LPG storages are based on the following elements:

- I. Rapid evaluation of the nature of the fire is imperative.
- II. If it is an adjacent fire in some other structure or material, then the problem is whether the heat radiation to the tank is sufficient to require remedial action.
- III. If gas is escaping the priority tasks are to prevent escalation, to stabilize, then to terminate. The twin needs are to shut off the gas flow and, in the meantime, to cool any areas that may need it.
- IV. If stability can be achieved, there is nothing wrong with letting the gas burn if it is doing no harm, even to the extent of burning off all the stored gas if this is the safest thing to do.
- V. If the situation appears to be escalating, evacuation needs to be considered. The required distance for evacuation will vary with the size of the tank.
- VI. Spray systems can protect against incident radiation, but should not be relied upon to cope with a concentrated flame impingement.

Fire protection provisions are intended to fulfil two distinct functions. The first is firefighting, to control and extinguish any fire that might occur. The other is heat protection, to protect tanks and auxiliary fittings from overheating from a nearby fire. The same fire protection equipment is used for both functions.

Firefighting The requirements for firefighting are based on the surroundings and less on the need of the LPG installation, as a gas fire is most often terminated by stopping the gas flow, and almost never by extinguishing the fire. So the extent of the firefighting equipment depends on the needs of the whole of the site and not just that of the LPG storage. The actual LPG installation may not require a great deal of firefighting equipment if the engineering fire safety requirements of this Standard are in place. Any associated buildings and the like will need to have firefighting equipment to comply with building regulations and this should be counted as an important part of the overall protection of the site, including the LPG installation.

Heat protection Heat protection is essential when there is a fire risk that could present a significant threat of heat radiation to the tank. The need for heat protection also depends on the surrounding structures, hazards and activities rather than the quantity of LPG or the size of the containers.

Where an above-ground storage tank is located in a Class B site (as identified in Figure 13.1 AS/NZS 1596:2014) in relation to a protected place or public place (which for this Site the nearest protected place is a poultry shed closer than 100 m from the LPG tanks), the firefighting requirements for the whole of the site shall be determined from an evaluation of the needs and the available facilities of the particular site, conducted on the basis of the following principles:

- a. For all other tank installations, at least a hose reel installation in accordance with Clause 13.7.2 shall be available for the tank.
- b. Where the capacity of an individual tank or a group of tanks exceeds 50 kL, the installation shall be assessed for heat protection. A Fire Safety Study should be undertaken following development consent for approval prior to commencing construction.

Clause 13.7.2:

- Hose reels shall comply with AS/NZS 1221 and shall be installed in accordance with AS 2441.
- The water supply to a hose reel may be provided by any available on-site reticulated water supply system or from any form of storage system provided that the hose reel is able to deliver at least **0.33 L/s**. Where the supply is from a storage system the duration shall be at **least 15 minutes**.
- The number and location of hose reels shall be such as to ensure that a hose nozzle will reach every point in an area bounded by a line around and 5 m distant from any tank and tanker standing area.
- Maintenance shall be in accordance with AS 1851-2012.

Section 2.6.4 provides details on the supply and availability of water for the site.

It is noted that the water storage tanks at each PPU will be located around 300 m from the LPG tanks. This will ensure that the water supply will not be compromised in an emergency, but can present an issue with the distance to the tanks (the fire service may not hold 300 m of hose). This would need to be considered in the Fire Safety Study undertaken following development consent for approval prior to commencing construction.

6.3 Assessment Criteria Applicable to the Proposed Development Application

In accordance with HIPAP 4, the following is a discussion of the risk assessment criteria that shall be applied to the proposed development application.

6.3.1 Heat-Flux Radiation Criteria

The Fire Safety Study to be undertaken for approval prior to commencing construction would include further consequence analysis of an incident involving heat radiation from a fire from neighbouring sites.

6.3.2 Explosion Over-Pressure Criteria

The Fire Safety Study to be undertaken for approval prior to commencing construction would include further consequence analysis of an incident involving explosion over pressure from a fire on-site.

6.3.3 Toxic Exposure Criteria

The Development does propose to store chemicals at quantities to be classified as an industrial or commercial site. However the sodium hypochlorite and chlorine dioxide total storage will be separated into four areas (i.e. the PPU's) a minimum of 870 m apart. Furthermore the individual storages at each PPU will be below the SEPP 33 threshold level quantities.

Consequently, a consequence analysis of an incident involving toxic gas emissions from a fire on-site is not considered necessary.

6.3.4 Biophysical Environment Risk Criteria

The Development proposes to store notable volumes of dangerous goods, in the form of sodium hypochlorite and chlorine dioxide. This may tend to generate toxic releases in the event of a large spill, however the total storage will be separated into four areas (i.e. the PPU's) approximately 870 m apart. Furthermore the individual storages at each PPU will be below the SEPP 33 threshold level quantities.

Consequently, a further consequence analysis of an incident involving toxic releases into the biophysical environment is not considered necessary.

6.4 Concluding Remarks

The storage and use of LPG on site is unlikely to cause any risk, significant or minor, to the community. However it is recommended that a Fire Safety Study be undertaken following development consent for approval prior to commencing construction.

There is a requirement to ensure that LPG is stored and used correctly on site and with compliance with *AS/NZS 1596:2014 The Storage and Handling of LP Gas* there is only a low risk to the site users.

7 Conclusion

The Development does not propose to store or use large quantities of dangerous goods, with the exception of LPG, which will be used for the purpose of heating the poultry sheds. The quantity of LPG to be stored at each PPU is above the threshold quantity in *Applying SEPP 33* and above manifest quantities. As such, a preliminary hazard assessment was included as part of this report.

The Preliminary Hazard Analysis has found that the operation of the Development will meet the criteria laid down in HIPAP 4 and would be unlikely to cause any risk, significant or minor, to the community. However it is recommended that a Fire Safety Study be undertaken following development consent for approval prior to commencing construction.

Above-ground LPG storage tanks will be installed and maintained to comply with the requirements of *AS/NZS 1596:2014 The Storage and Handling of LP Gas* and separation distances identified will be maintained. The design and layout of the LPG storage facilities at the proposal development is being designed by the LPG gas supplier, Elgas.

Other spill, fire and incident events are not likely to extend beyond the boundary of the Development Site, with the exception of a major facility fire where, regardless of the type of operation there will always be a risk of potentially harmful smoke plumes downwind. In the majority of large fires the buoyant nature of a smoke plume means any potentially harmful materials are rapidly dispersed. Any firefighting water can be managed on site without release into the wider environment.

It is considered that the operations of the Development with the safeguards stipulated would not cause significant off site risks. Whilst the Development is considered to be a hazardous development given the quantity of LPG stored at each PPU, this is easily managed with compliant construction and availability of incident management strategies. Furthermore the surrounding area is lightly populated with the closest residence approximately 1,025 m from the nearest PPU and the nearest population centre, Somerton, approximately 12 km from the nearest PPU.

It is the conclusion of this PHA that the Development is expected to meet all the requirements stipulated by the DPE and hence would not be considered, with suitable engineering and design controls in place, to be an offensive or hazardous development on site or would not be impacted by any hazardous incidents from adjoining facilities off site. However it is recommended that a Fire Safety Study be undertaken following development consent for approval prior to commencing construction.

8 References

AS 2441 – 2005, Installation of fire hose reels

AS/NZS 1596:2014 The storage and handling of LP Gas

Commonwealth Government, 2011, Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Number 7).

Department of Planning NSW (2011) *Applying SEPP 33 – Hazardous and Offensive Development Application Guidelines*

Department of Planning NSW (2011) *Hazardous Industry Planning Advisory Paper No. 1 – Emergency Planning Guidelines*

Department of Planning NSW (2011) *Hazardous Industry Planning Advisory Paper No. 2 – Fire Safety Study Guidelines*

Department of Planning NSW (2011) *Hazardous Industry Planning Advisory Paper No. 4 - Risk Criteria for Land Use Safety Planning*

Department of Planning NSW (2011) *Hazardous Industry Planning Advisory Paper No. 6 – Guidelines for Hazard Analysis*

Department of Urban Affairs & Planning, 1994, State Environmental Planning Policy No. 33-Hazardous and Offensive Development, New South Wales Government.

ASIA PACIFIC OFFICES

BRISBANE

Level 2, 15 Astor Terrace
Spring Hill QLD 4000
Australia
T: +61 7 3858 4800
F: +61 7 3858 4801

MACKAY

21 River Street
Mackay QLD 4740
Australia
T: +61 7 3181 3300

ROCKHAMPTON

rockhampton@slrconsulting.com
M: +61 407 810 417

AUCKLAND

68 Beach Road
Auckland 1010
New Zealand
T: +64 27 441 7849

CANBERRA

GPO 410
Canberra ACT 2600
Australia
T: +61 2 6287 0800
F: +61 2 9427 8200

MELBOURNE

Suite 2, 2 Domville Avenue
Hawthorn VIC 3122
Australia
T: +61 3 9249 9400
F: +61 3 9249 9499

SYDNEY

2 Lincoln Street
Lane Cove NSW 2066
Australia
T: +61 2 9427 8100
F: +61 2 9427 8200

NELSON

5 Duncan Street
Port Nelson 7010
New Zealand
T: +64 274 898 628

DARWIN

5 Foelsche Street
Darwin NT 0800
Australia
T: +61 8 8998 0100
F: +61 2 9427 8200

NEWCASTLE

10 Kings Road
New Lambton NSW 2305
Australia
T: +61 2 4037 3200
F: +61 2 4037 3201

TAMWORTH

PO Box 11034
Tamworth NSW 2340
Australia
M: +61 408 474 248
F: +61 2 9427 8200

NEW PLYMOUTH

Level 2, 10 Devon Street East
New Plymouth 4310
New Zealand
T: +64 0800 757 695

GOLD COAST

Ground Floor, 194 Varsity Parade
Varsity Lakes QLD 4227
Australia
M: +61 438 763 516

PERTH

Ground Floor, 503 Murray Street
Perth WA 6000
Australia
T: +61 8 9422 5900
F: +61 8 9422 5901

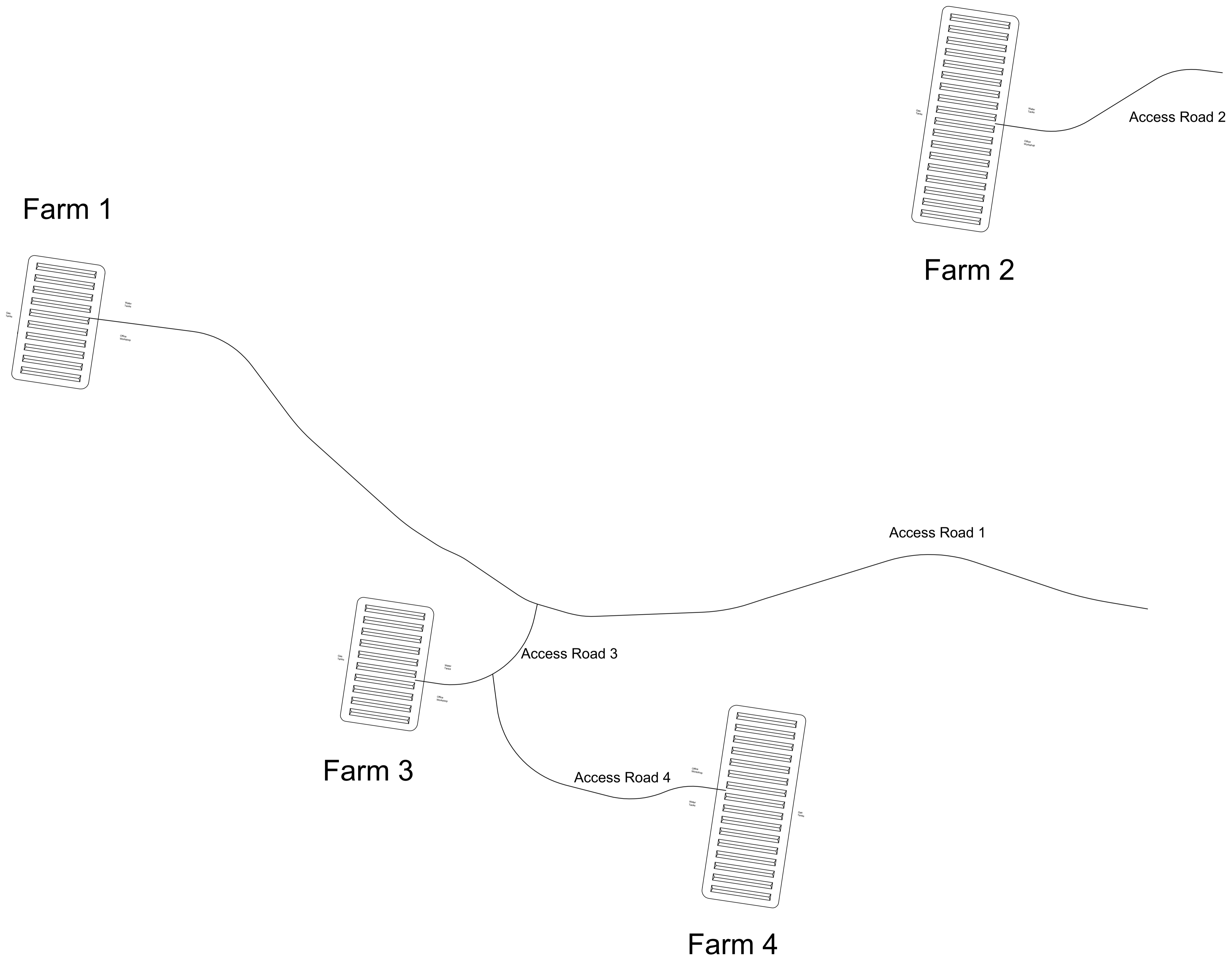
TOWNSVILLE

Level 1, 514 Sturt Street
Townsville QLD 4810
Australia
T: +61 7 4722 8000
F: +61 7 4722 8001

Appendix K

**Preliminary Civil Engineering
Design Drawings
(Lance Ryan Consulting Engineers)**

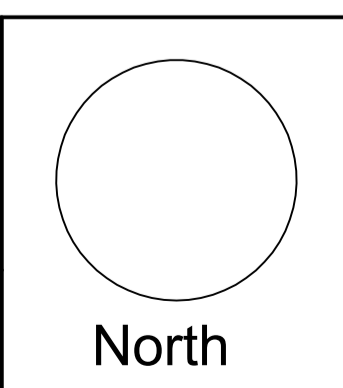




Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



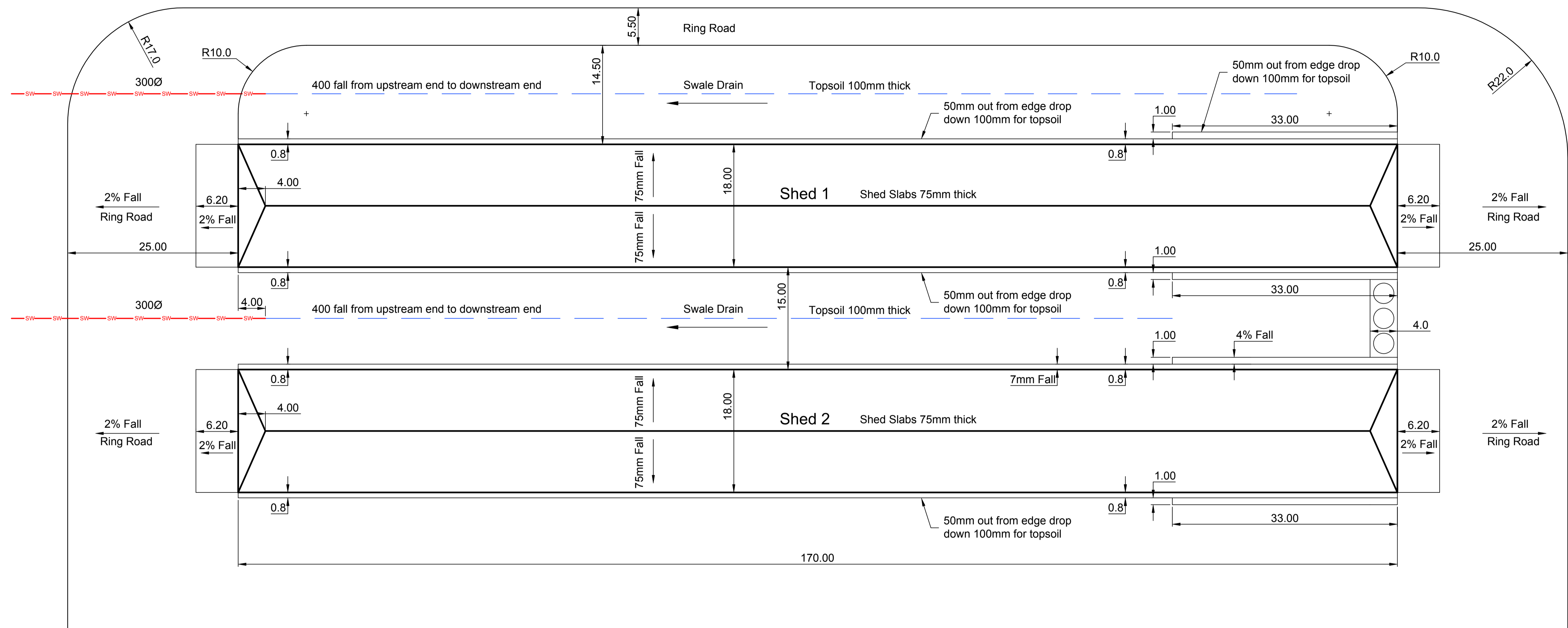
LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lancevryan@gmail.com

Project ProTen Poultry Sheds Rushes Creek Tamworth	Client ProTen	Architect / Project Manager ProTen
---	------------------	---------------------------------------

Drawing Title Cover Sheet	Scales 1:1250	Client Project No.
Project Number 17W003	Dwg. No. C00	Sheet 00 of 43
		Revision 1



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



North

LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

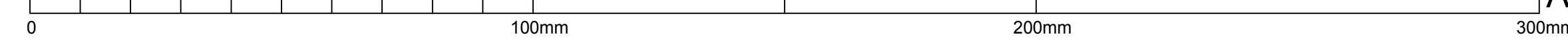
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

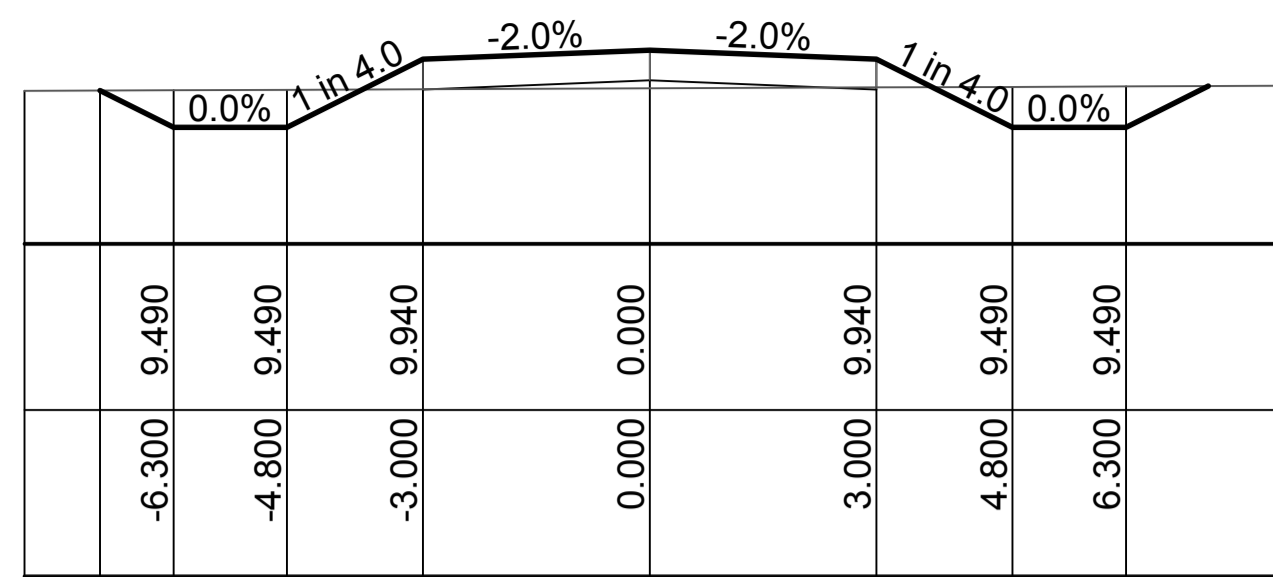
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

Drawing Title Typical Shed Setout	
Scales NTS	
Client Project No.	
Project Number 17W003	Dwg. No. C01
Sheet 01 of 44	Revision 2

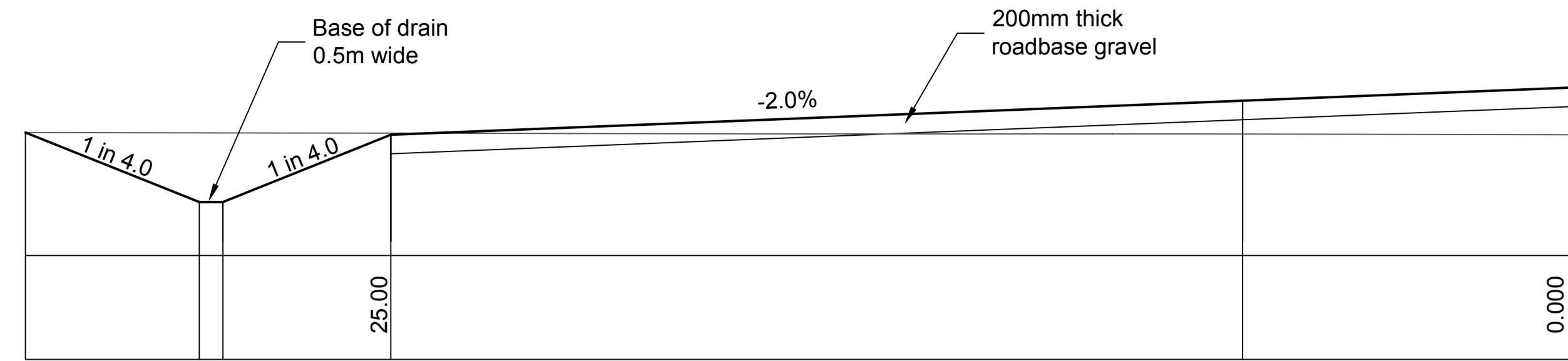
A1 SHEET



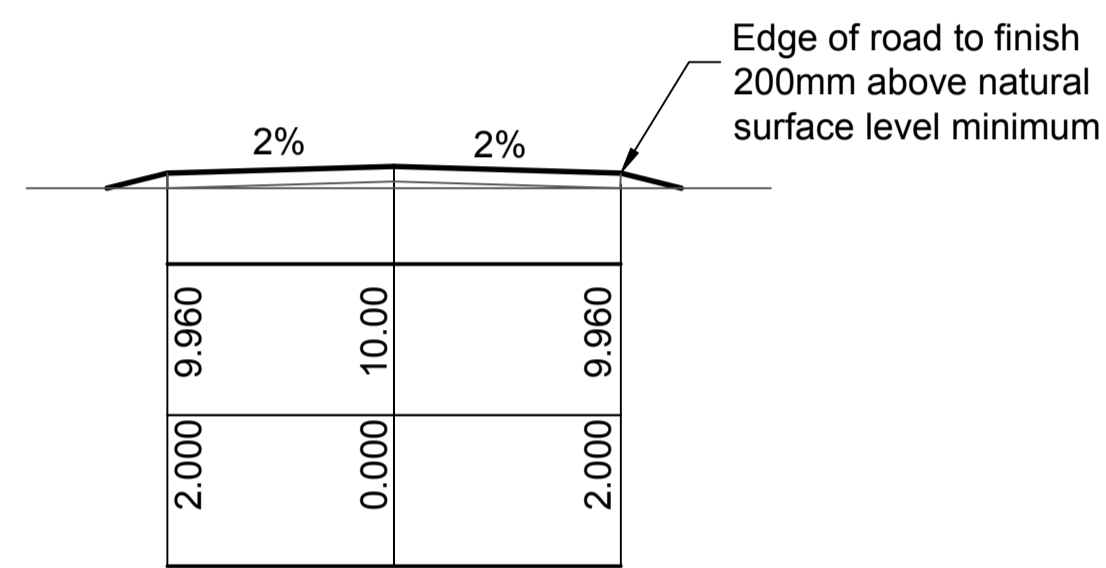


Typical Road Cross for all Internal Access Roads

Pavement to consist of 200mm of Road base Gravel.

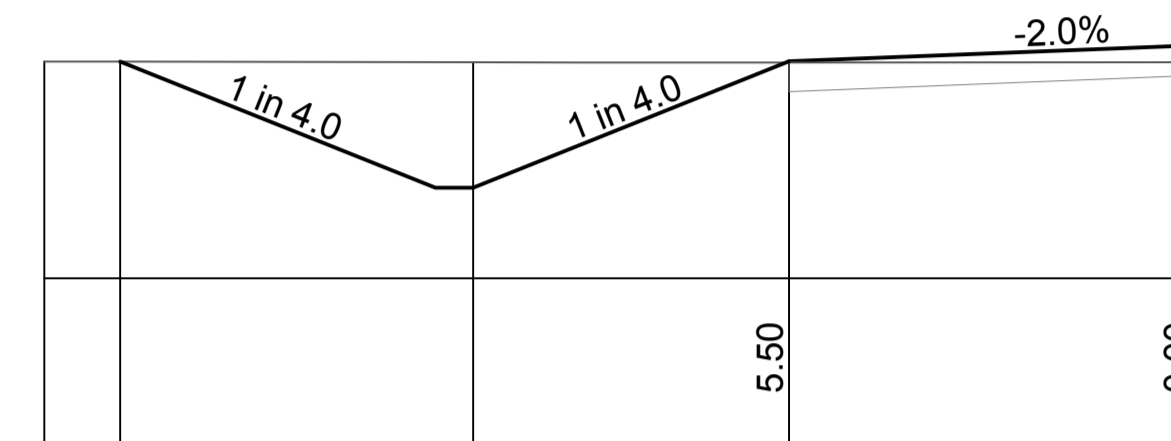


TYPICAL CROSS SECTION RING ROAD AT FRONT

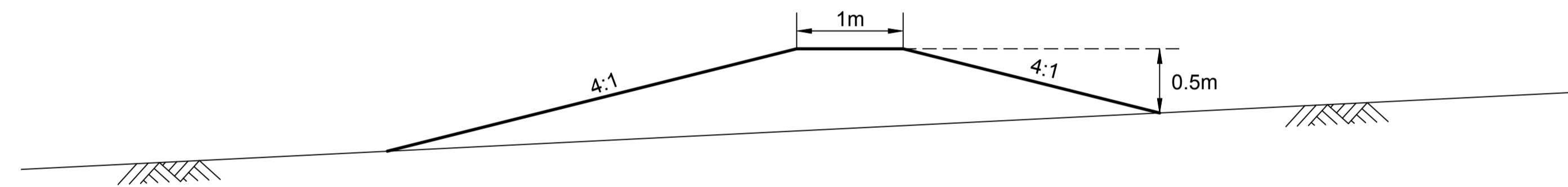


Scale Horizontal 1:100 Vertical 1:100

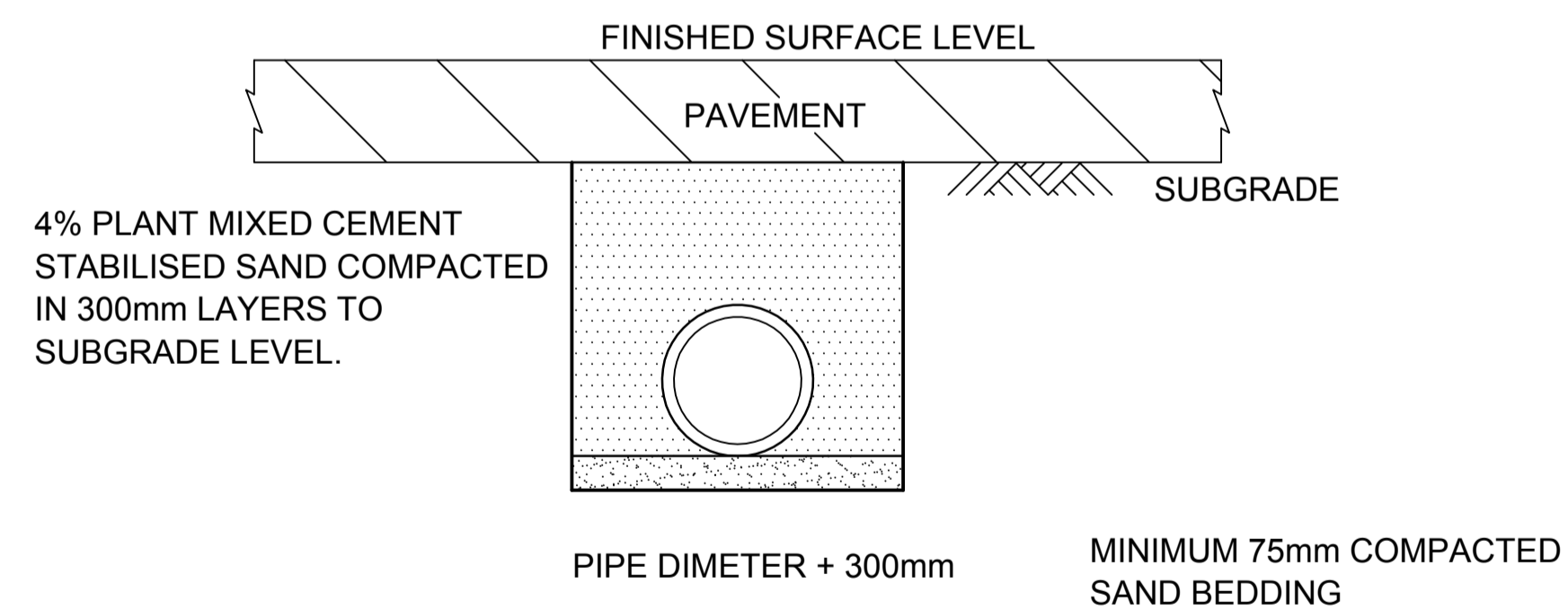
Typical Road Cross Section to Houses



TYPICAL CROSS SECTION RING ROAD AT BACK

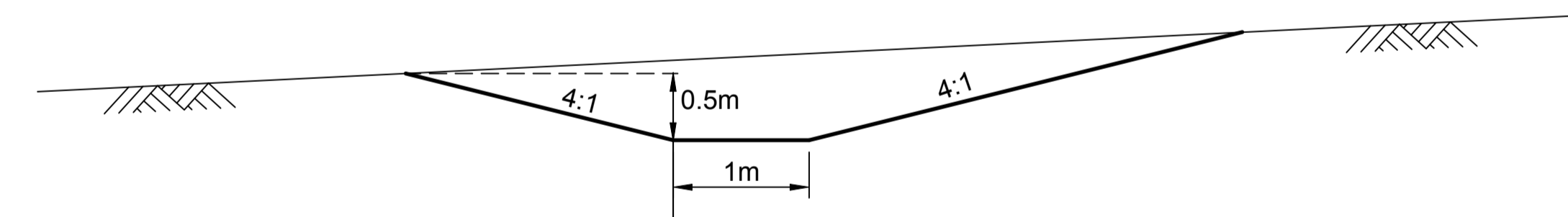


Typical Deflection Bank

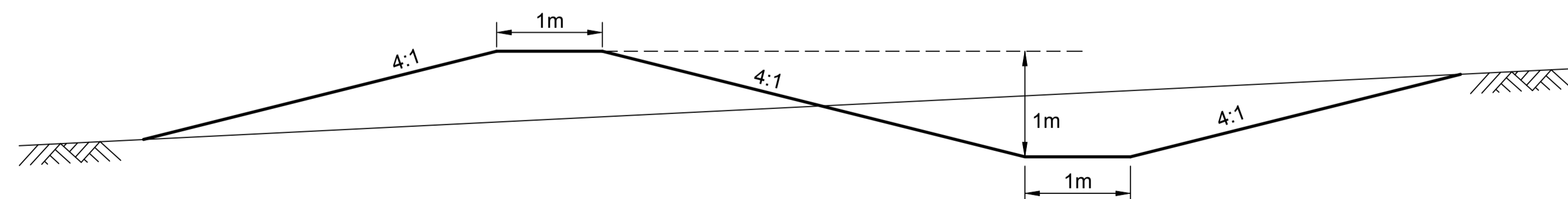


STORMWATER UNDER ROADS

SCALE 1:20



Typical Swale Drain



Typical Swale Drain / Deflection Bank

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.

LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

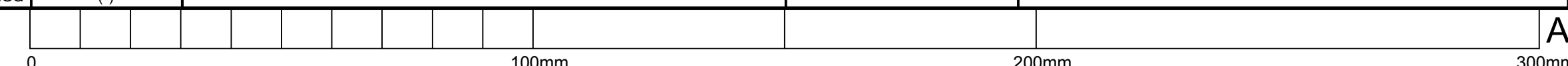
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

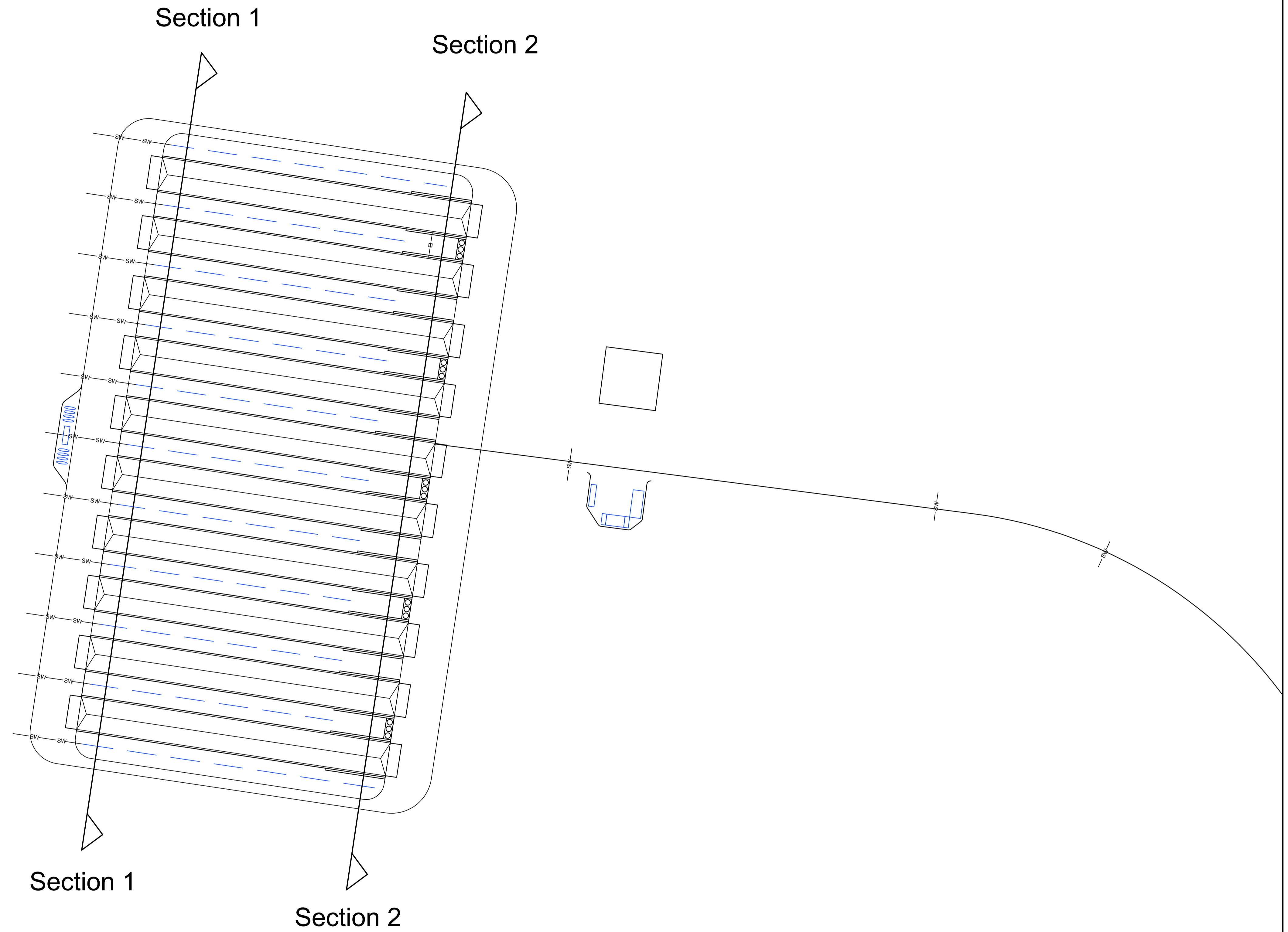
Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title Typical Details		Client Project No.	
Scales 1:500		Sheet 02 of 42	
Project Number 17W003	Dwg. No. C02	Revision 2	



A1 SHEET



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



North

LRCE

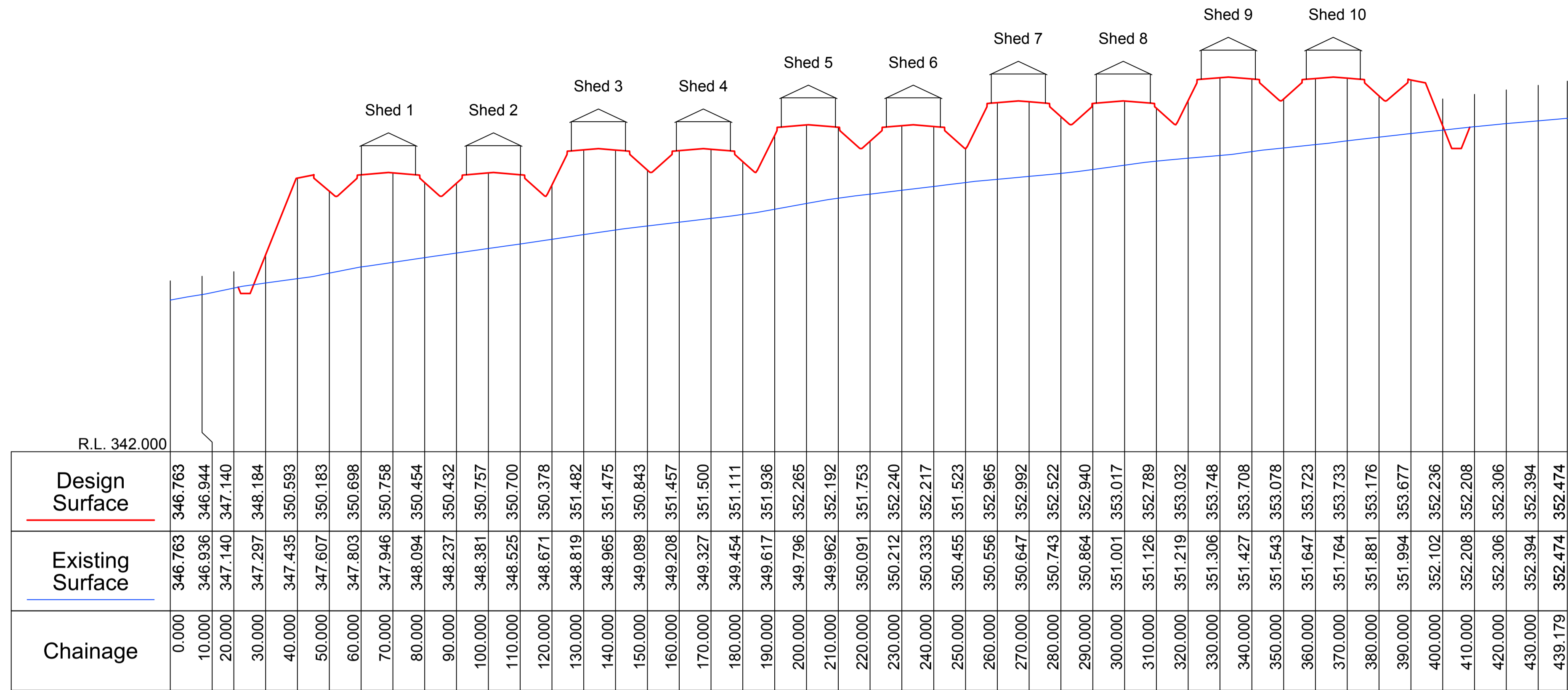
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

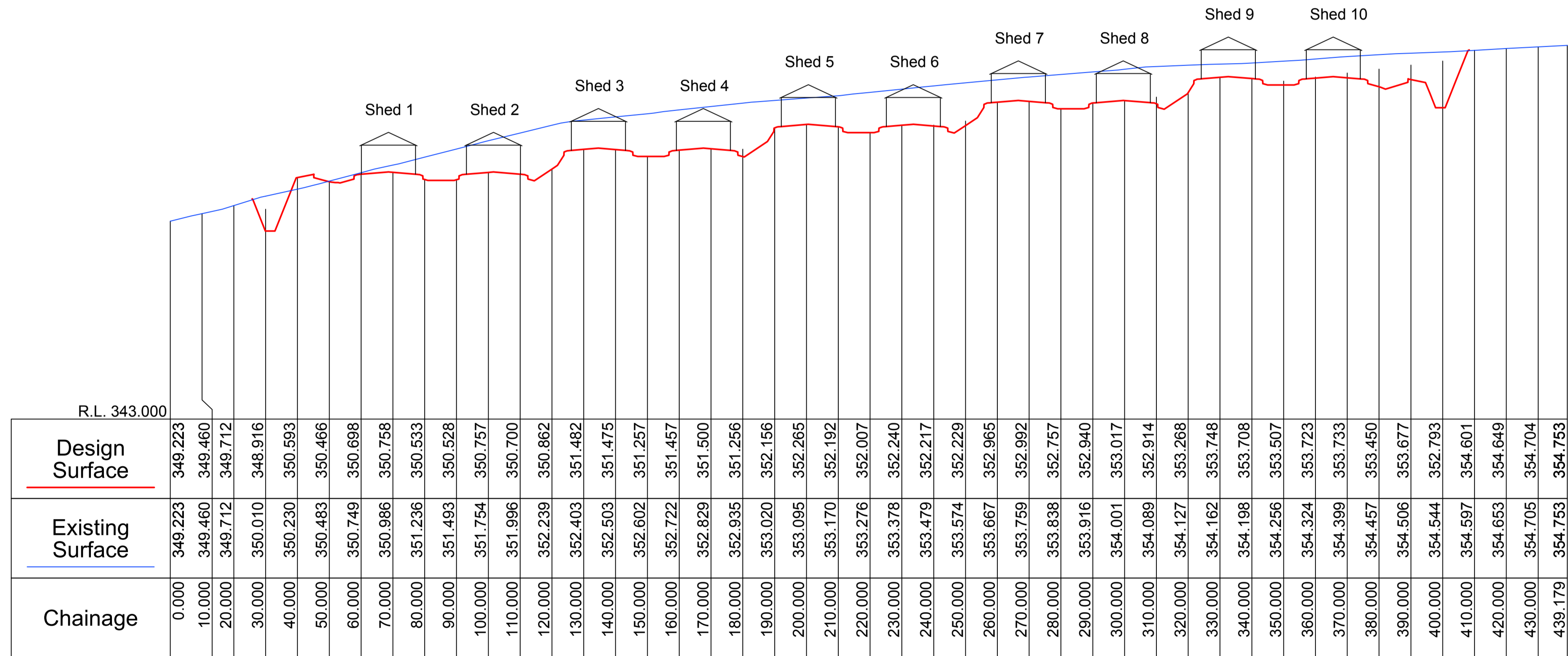
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

Drawing Title Farm 1 Sections Plan	
Scale 1:1250	Client Project No.
Project Number 17W003	Dwg. No. C03
Sheet 03 of 44	Revision 2



SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

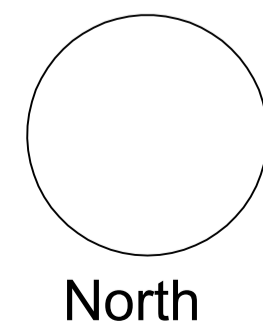


SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 886
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Farm 1 Sections

Scales
H1:1000, V1:100

Project Number
17W003

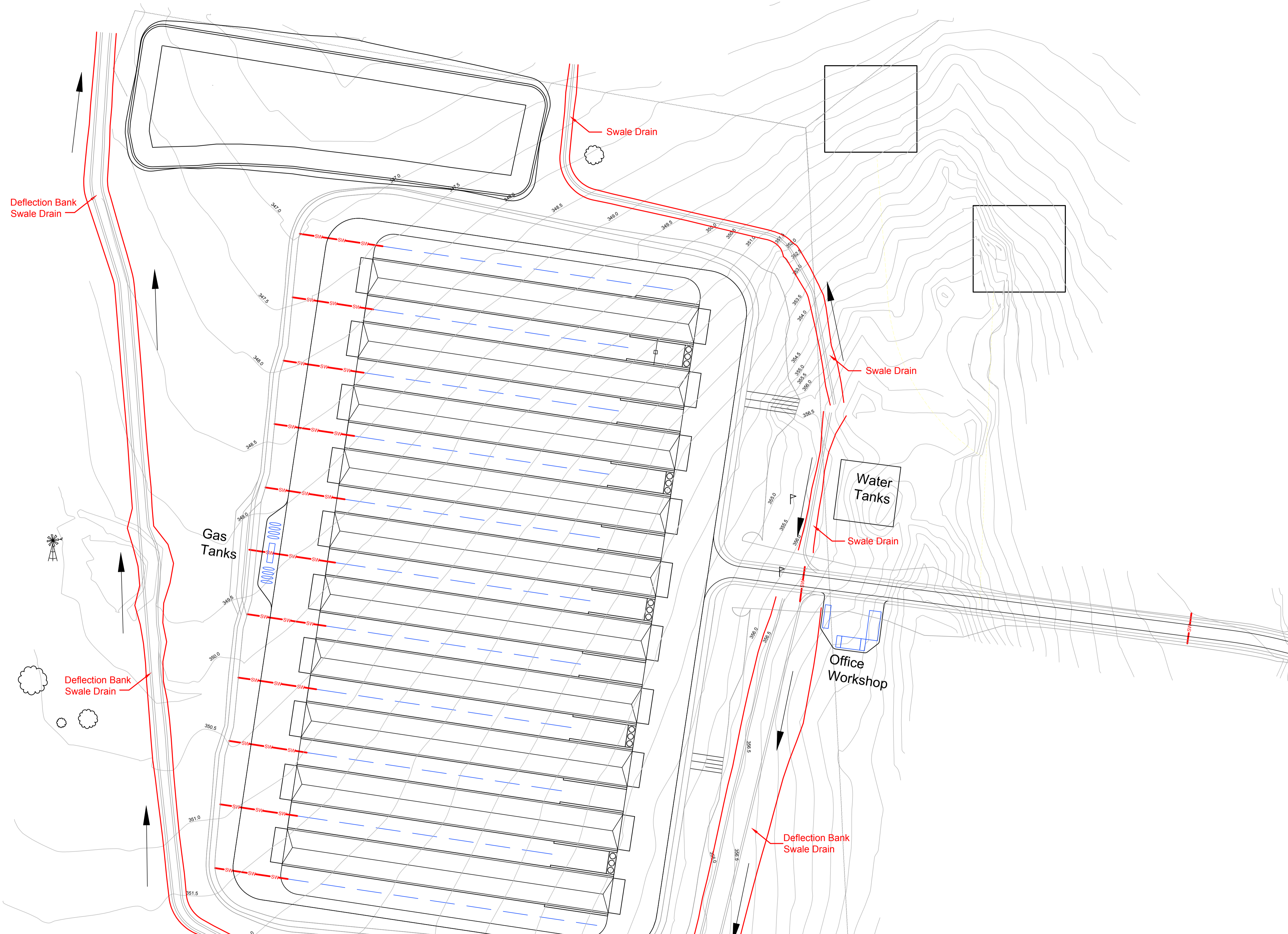
Dwg. No.
C04

Sheet
04 of 44

Revision
2

A1 SHEET

0 100mm 200mm 300mm



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

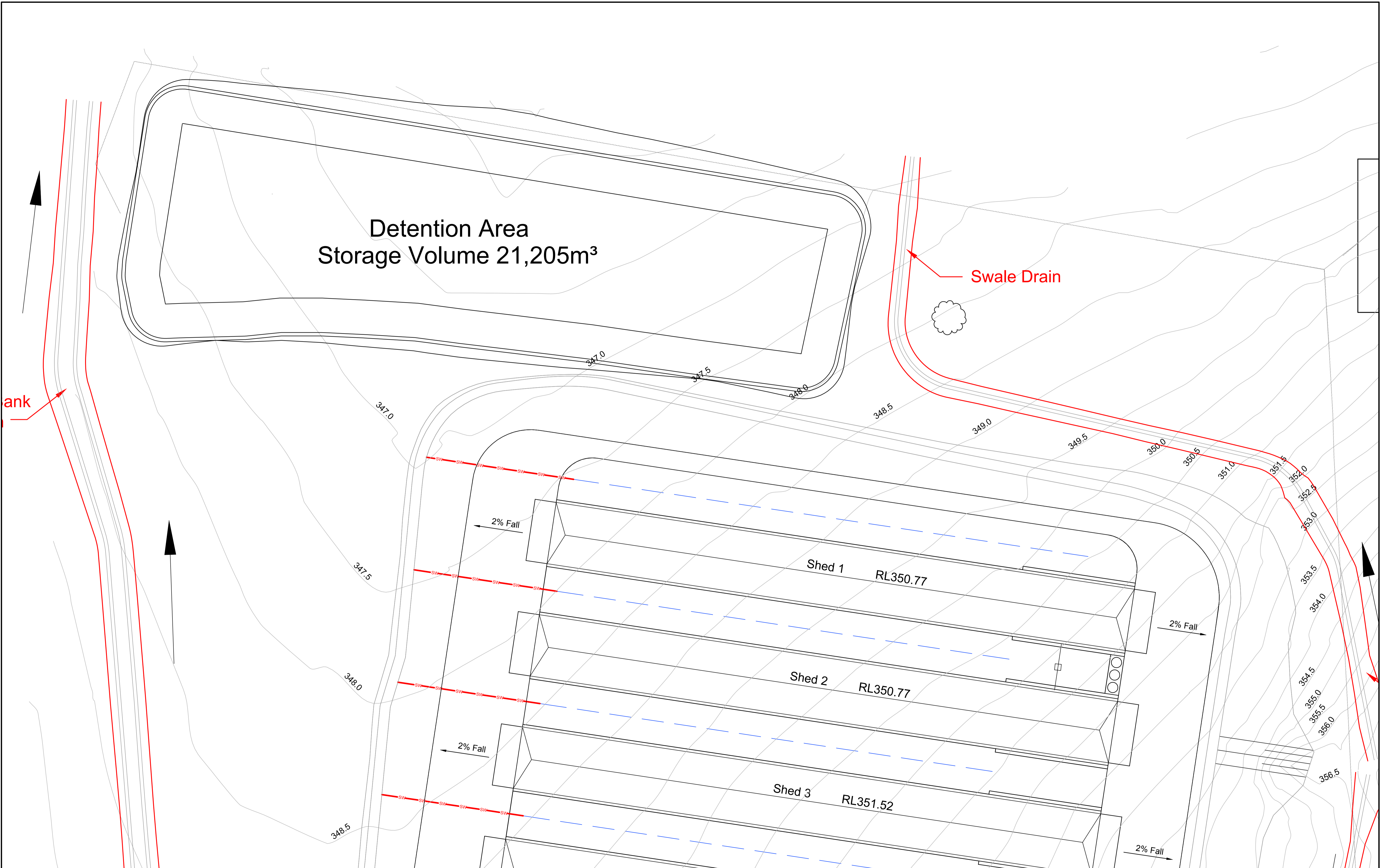
Copyright
 This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
 It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
 Unauthorised use of this drawing is prohibited

* Drawing Status
 Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.


LRCE
 Lance Ryan Consulting Engineers Pty Ltd
 Consulting Engineers Planners & Managers
 A.B.N. 53 631 529 091
 52 Johnston Street,
 WAGGA WAGGA NSW 2650
 P.O. Box 7
 WAGGA WAGGA NSW 2650
 Ph: 02 6921 1877
 Mob: 0429 037 956
 Fax: 02 6921 7415
 Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

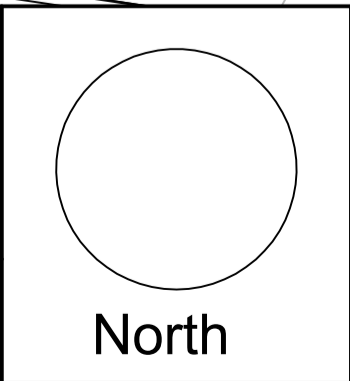
Drawing Title Farm 1	
Scales 1:1000	
Client Project No.	
Project Number 17W003	Dwg. No. C05
Sheet 05 of 44	Revision 2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
 This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
 It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
 Unauthorised use of this drawing is prohibited

* Drawing Status
 Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
 Lance Ryan Consulting Engineers Pty Ltd
 Consulting Engineers Planners & Managers
 A.B.N. 53 631 529 091

52 Johnston Street,
 WAGGA WAGGA NSW 2650
 P.O. Box 7
 WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
 Mob: 0429 037 995
 Fax: 02 6921 7415
 Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Client ProTen	Architect / Project Manager ProTen
---	------------------	---------------------------------------

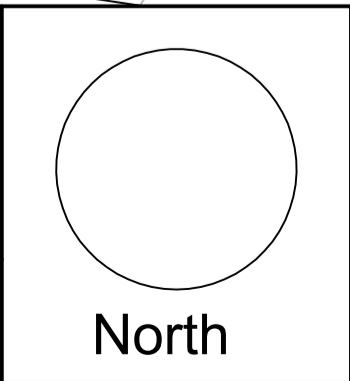
Drawing Title Farm 1	Scales 1:500	Client Project No.
Project Number 17W003	Dwg. No. C06	Sheet 06 of 44
		Revision 2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 996
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Farm 1

Scales
1:500

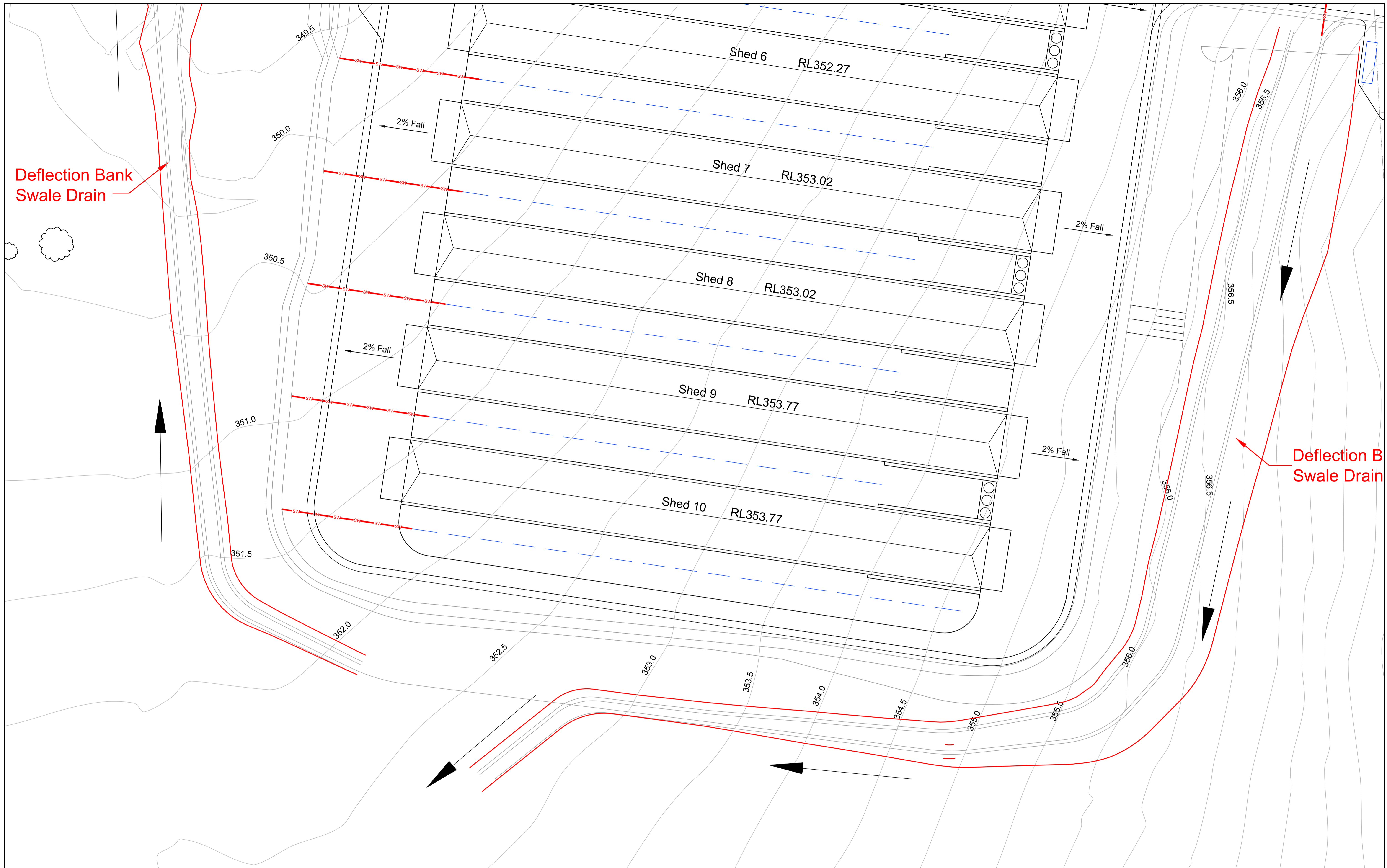
Client Project No.

Project Number
17W003

Dwg. No.
C07

Sheet
07 of 44

Revision
2



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

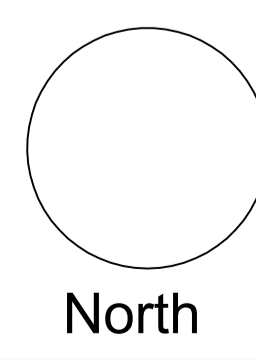
Drawing Title Farm 1	
Scale 1:500	Client Project No.
Project Number 17W003	Dwg. No. C08
Sheet 08 of 44	Revision 2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
 This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
 It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
 Unauthorised use of this drawing is prohibited

* Drawing Status
 Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.

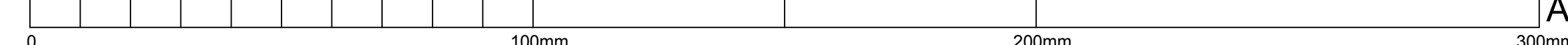


LRCE
 Lance Ryan Consulting Engineers Pty Ltd
 Consulting Engineers Planners & Managers
 A.B.N. 53 631 529 091

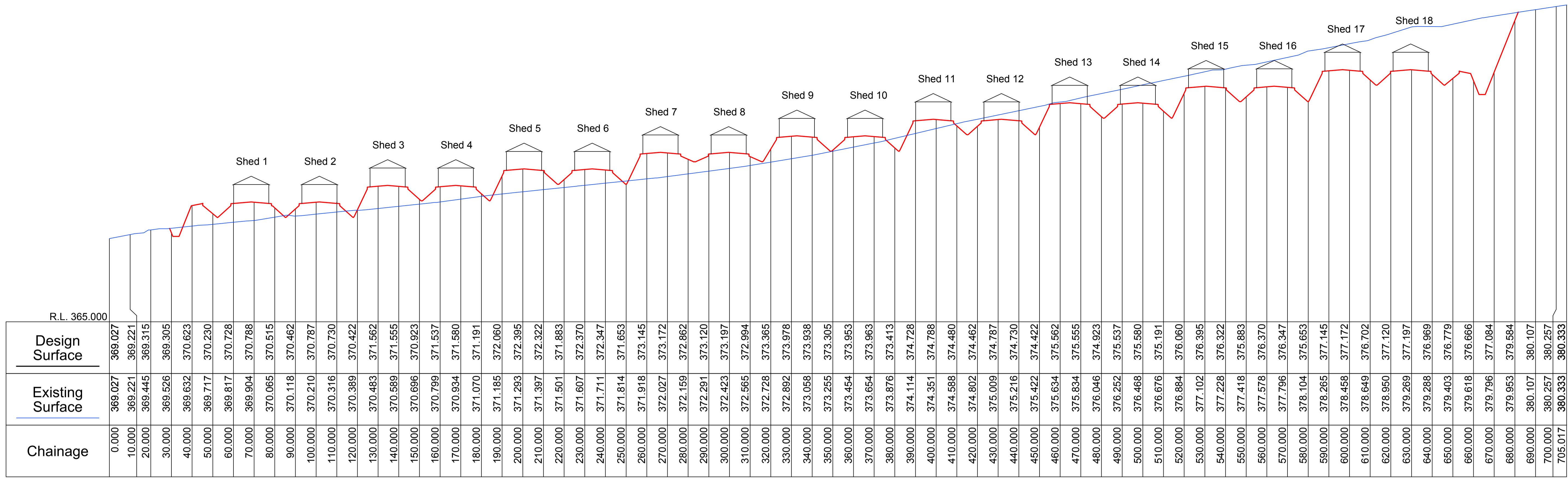
52 Johnston Street,
 WAGGA WAGGA NSW 2650
 P.O. Box 7
 WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
 Mob: 0429 037 995
 Fax: 02 6921 7415
 Email: lance@lrce.com.au

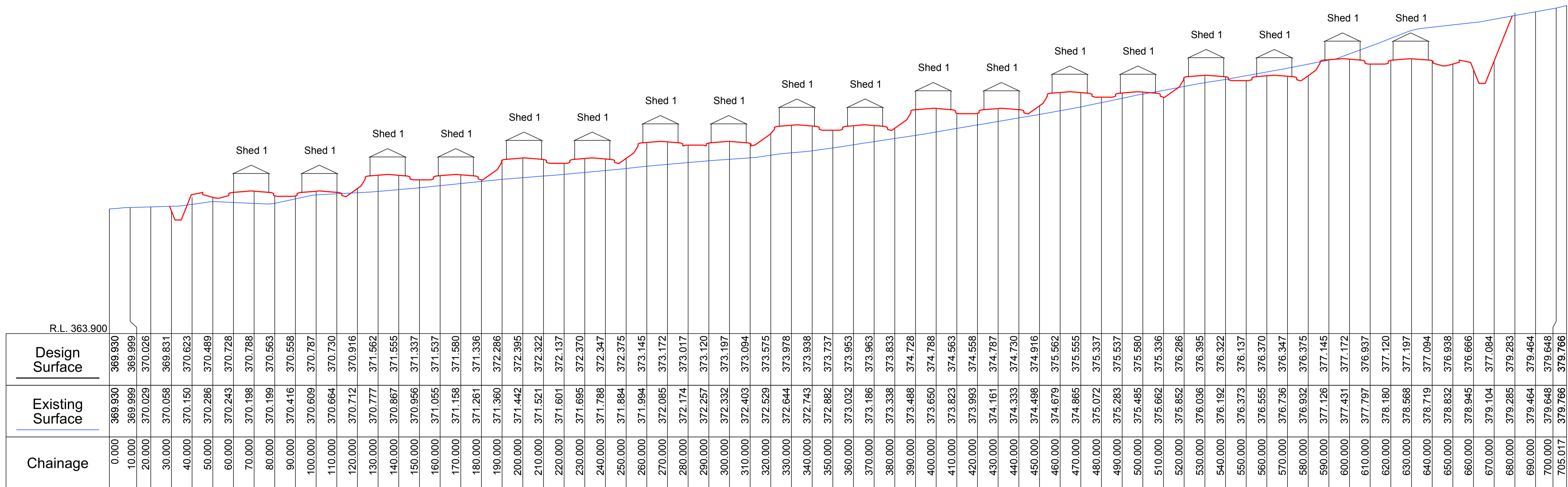
Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Farm 2 Sections Plan
Client ProTen	Scales NTS
Architect / Project Manager ProTen	Client Project No.
Project Number 17W003	Dwg. No. C09
Sheet 09 of 44	Revision 2



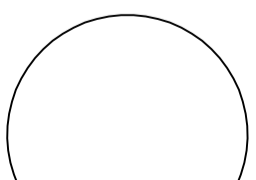

A1 SHEET



SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

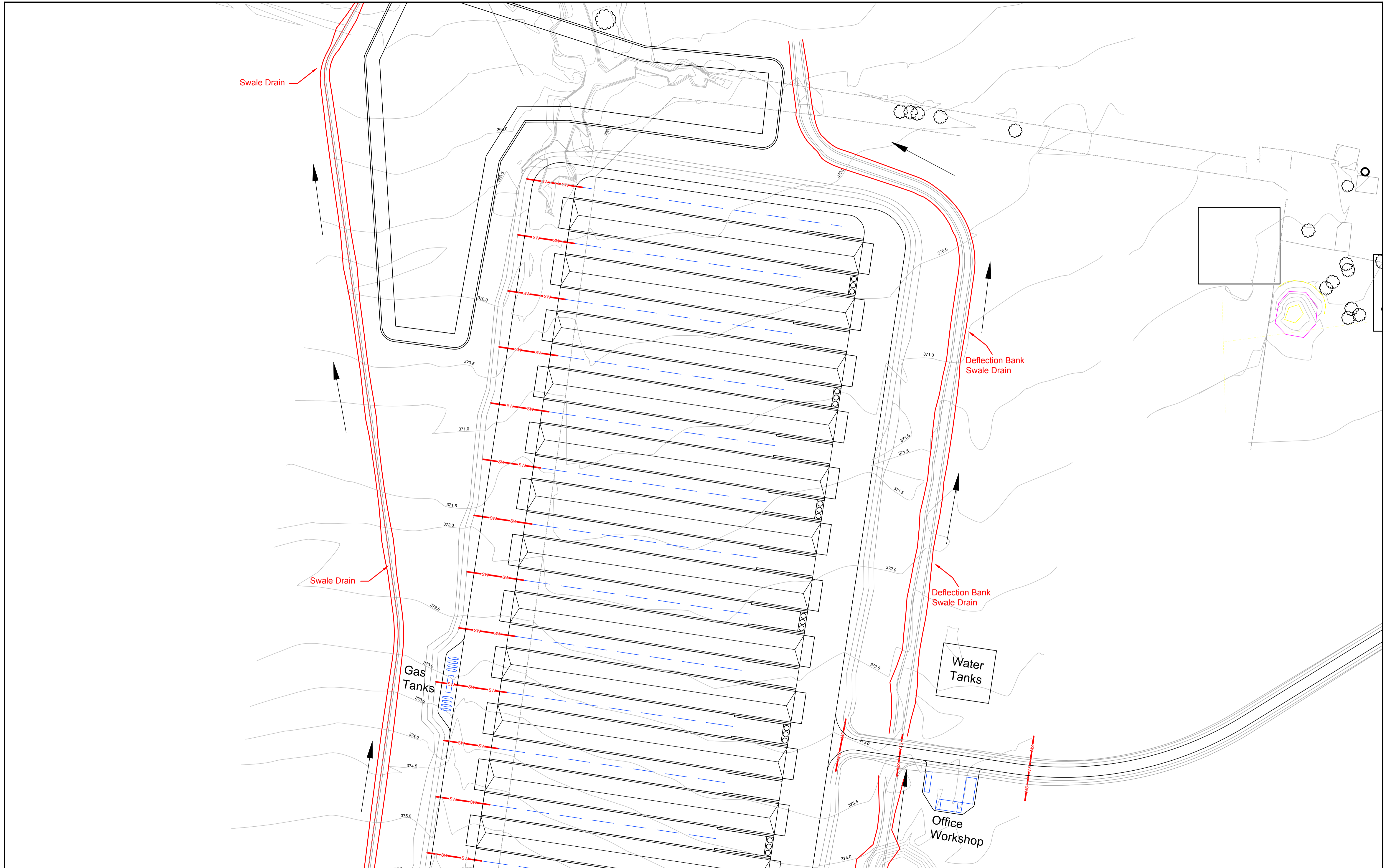


SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

Copyright This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission. Unauthorised use of this drawing is prohibited		 North		 Lance Ryan Consulting Engineers Pty Ltd Consulting Engineers Planners & Managers A.B.N. 53 631 529 091 52 Johnston Street, WAGGA WAGGA NSW 2650 P.O. Box 7 WAGGA WAGGA NSW 2650 Ph: 02 6921 1977 Mob: 0429 037 956 Fax: 02 6921 7415 Email: lance@lrce.com.au		Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Farm 2 Sections		
2 Issued for Information - Road 3 and 4 Amended 1 Issued for Information						Client ProTen Architect / Project Manager ProTen		Scales H1:1000, V1:100		Client Project No.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)	Project Number 17W003	Dwg. No. C10	Sheet 10 of 44	Revision 2

A1 SHEET

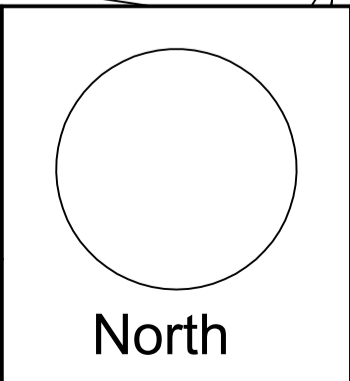
0 100mm 200mm 300mm



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
 This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
 It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
 Unauthorised use of this drawing is prohibited

* Drawing Status
 Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



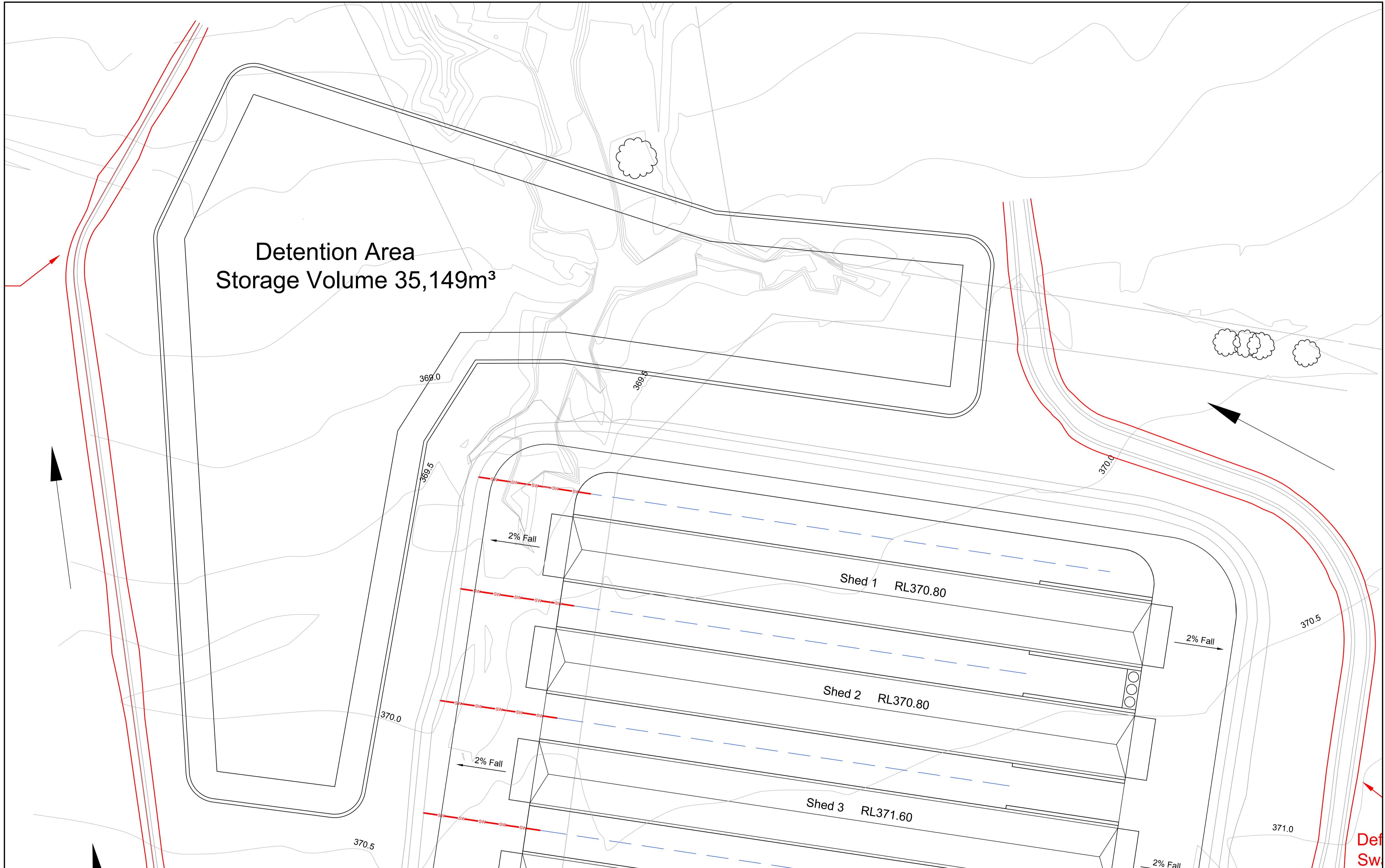
LRCE
 Lance Ryan Consulting Engineers Pty Ltd
 Consulting Engineers Planners & Managers
 A.B.N. 53 631 529 091

52 Johnston Street,
 WAGGA WAGGA NSW 2650
 P.O. Box 7
 WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
 Mob: 0429 037 995
 Fax: 02 6921 7415
 Email: lancevryan@gmail.com

Project ProTen Poultry Sheds Rushes Creek Tamworth	Client ProTen	Architect / Project Manager ProTen
---	------------------	---------------------------------------

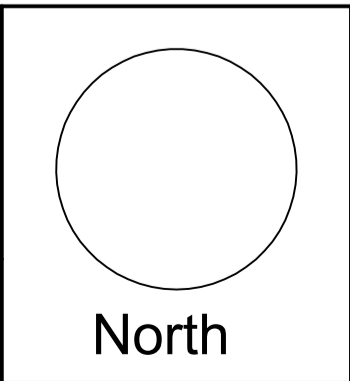
Drawing Title Farm 2	Scales 1:1000	Client Project No.
Project Number 17W003	Dwg. No. C11	Sheet 11 of 44
		Revision 2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

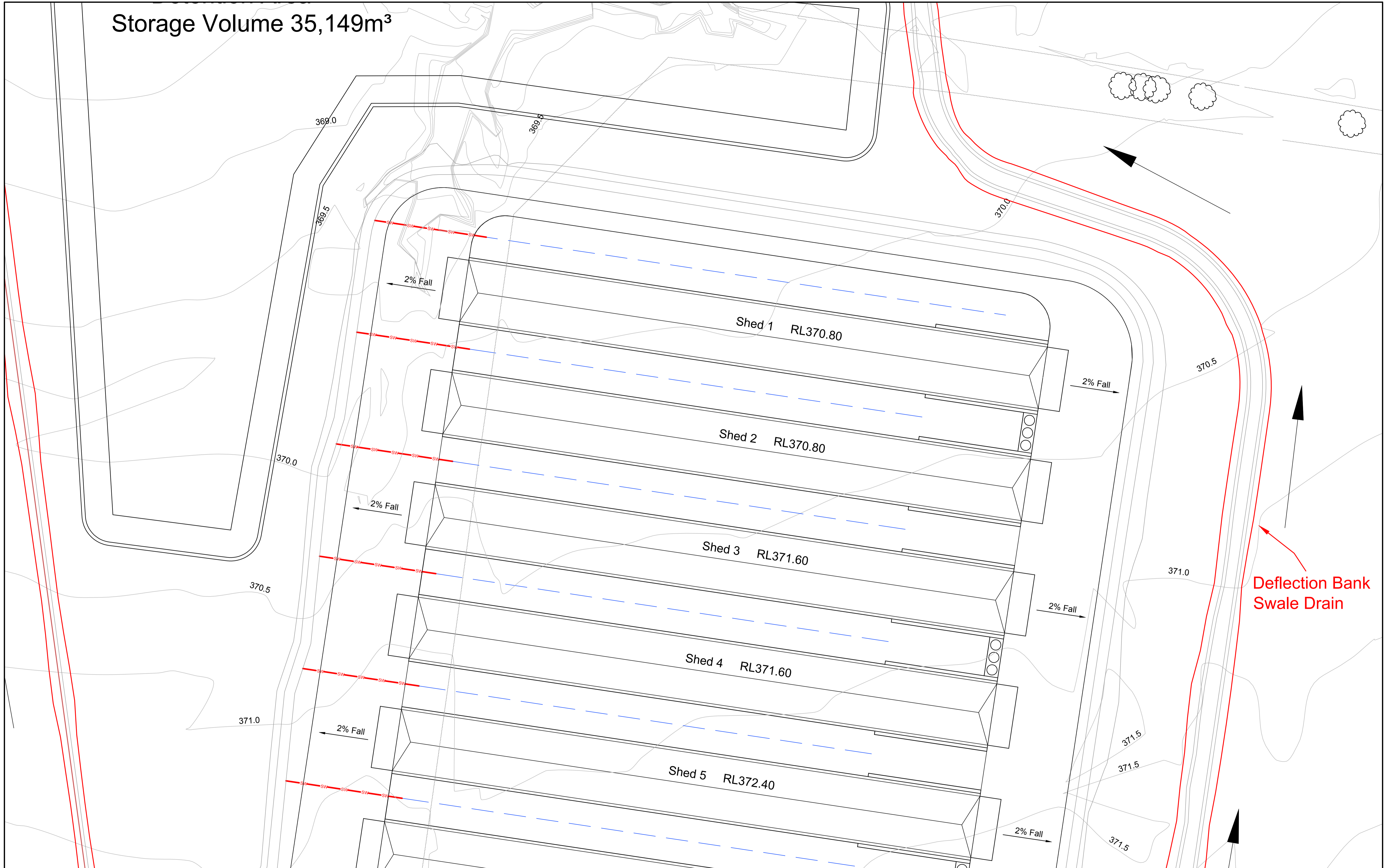
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Client ProTen	Architect / Project Manager ProTen
---	------------------	---------------------------------------

Drawing Title Farm 2	Scales 1:500	Client Project No.
Project Number 17W003	Dwg. No. C12	Sheet 12 of 44
		Revision 2

Storage Volume 35,149m³



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

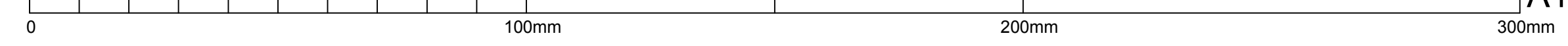
Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

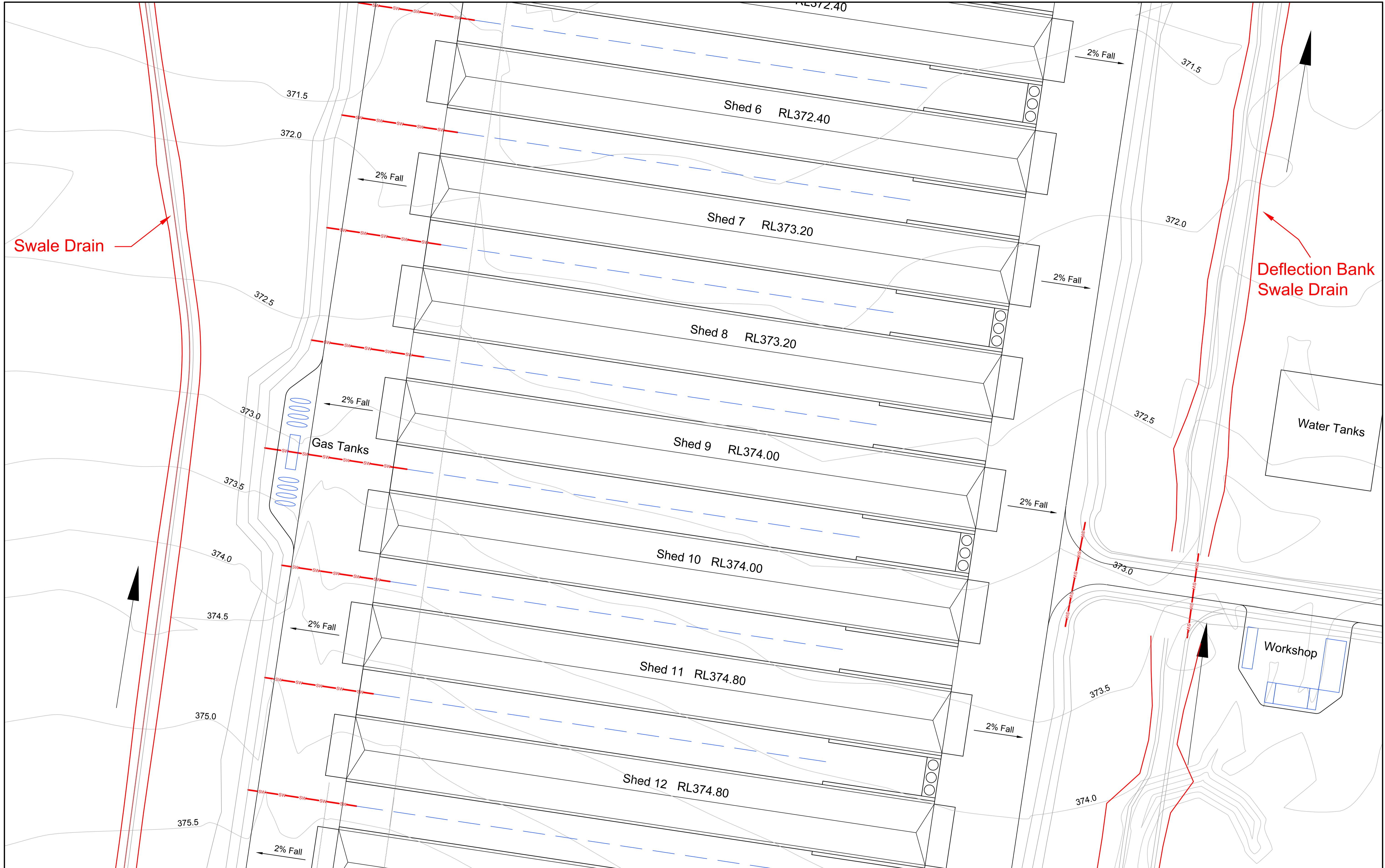
Client
ProTen

Architect / Project Manager
ProTen

Drawing Title Farm 2		Client Project No.	
Scales 1:500		Sheet 13 of 44	
Project Number 17W003	Dwg. No. C13	Revision 2	

A1 SHEET





Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Farm 2

Scales
1:500

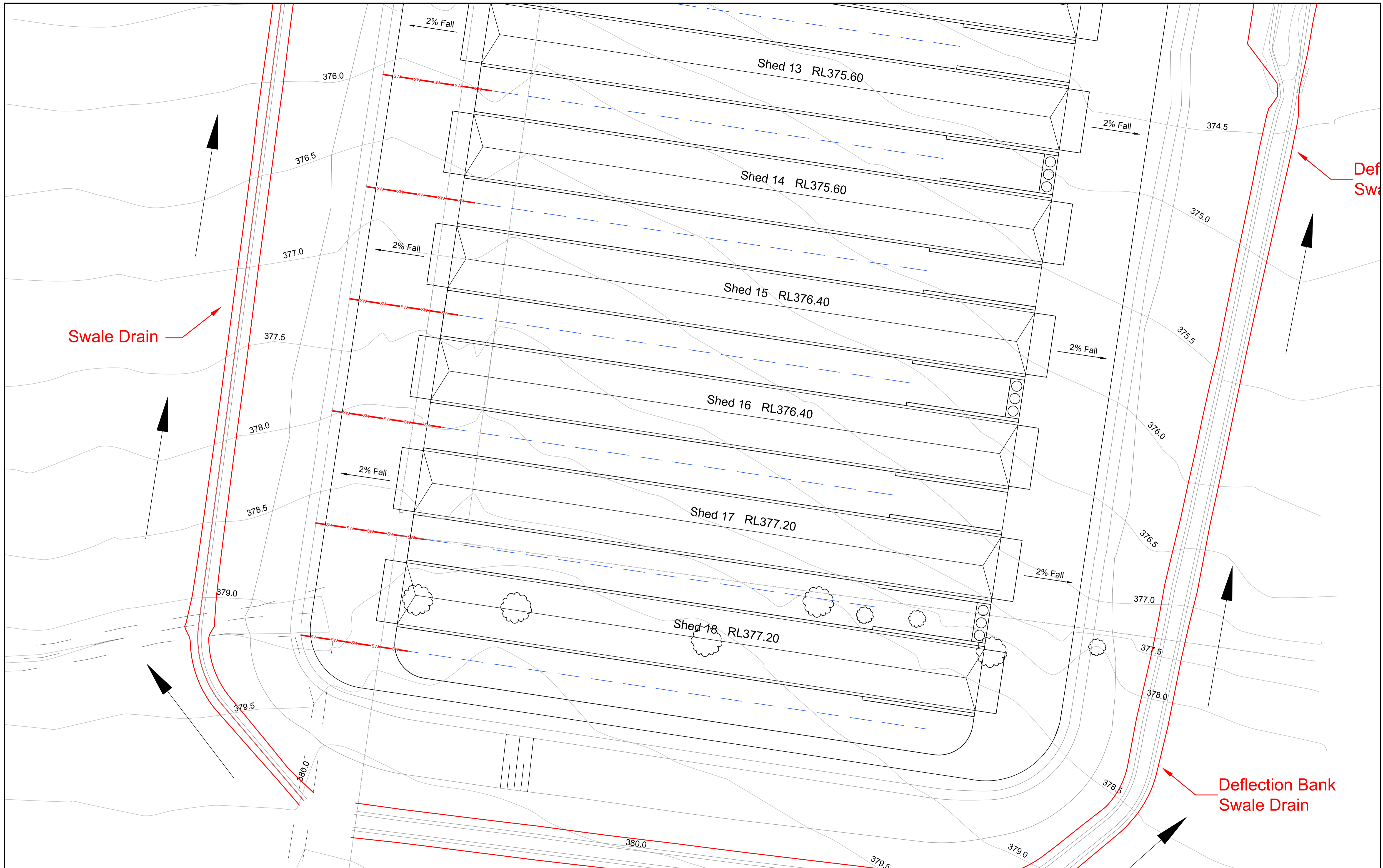
Client Project No.

Project Number
17W003

Dwg. No.
C14

Sheet
14 of 44

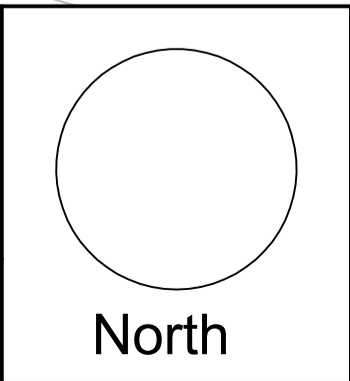
Revision
2



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

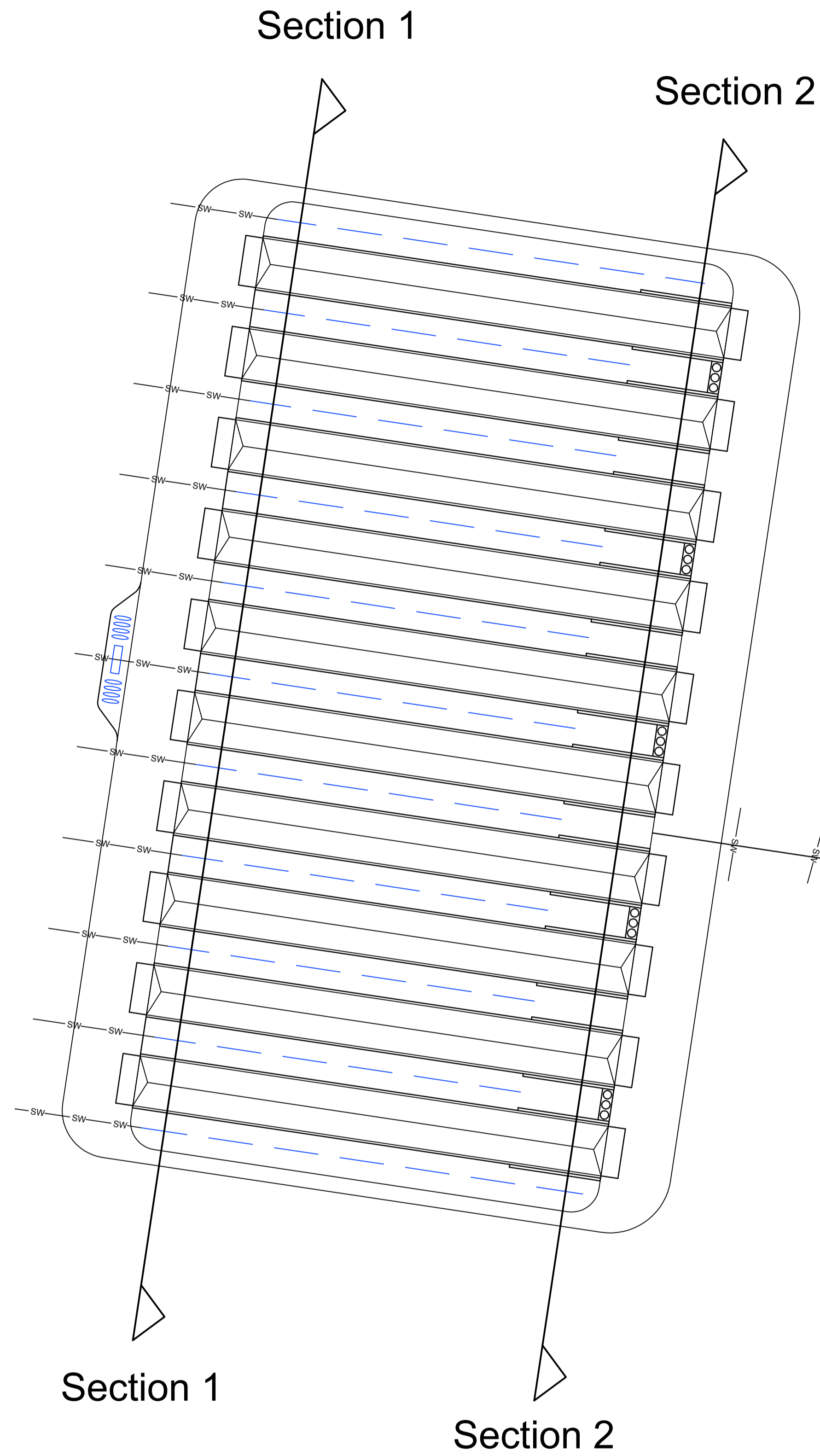
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lancevryan@gmail.com

Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Farm 2
Client ProTen	Architect / Project Manager ProTen

Scale 1:500	Client Project No.
Project Number 17W003	Dwg. No. C15
Sheet 15 of 44	Revision 2

A1 SHEET





Revision	Amendment or reason for issue	Issue date	Drawn by	Designed & checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
 This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
 It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
 Unauthorised use of this drawing is prohibited

* Drawing Status
 Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



North

LRCE

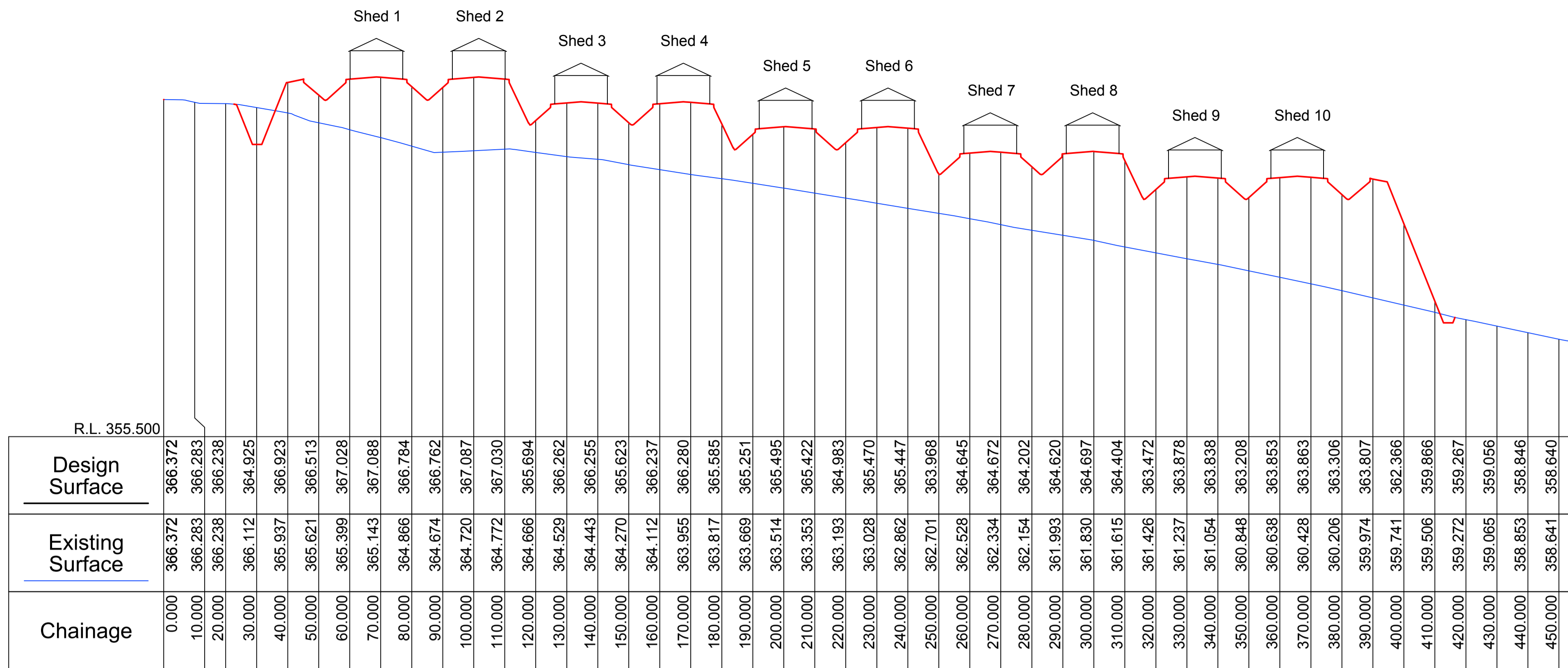
Lance Ryan Consulting Engineers Pty Ltd
 Consulting Engineers Planners & Managers
 A.B.N. 53 631 529 091

52 Johnston Street,
 WAGGA WAGGA NSW 2650
 P.O. Box 7
 WAGGA WAGGA NSW 2650

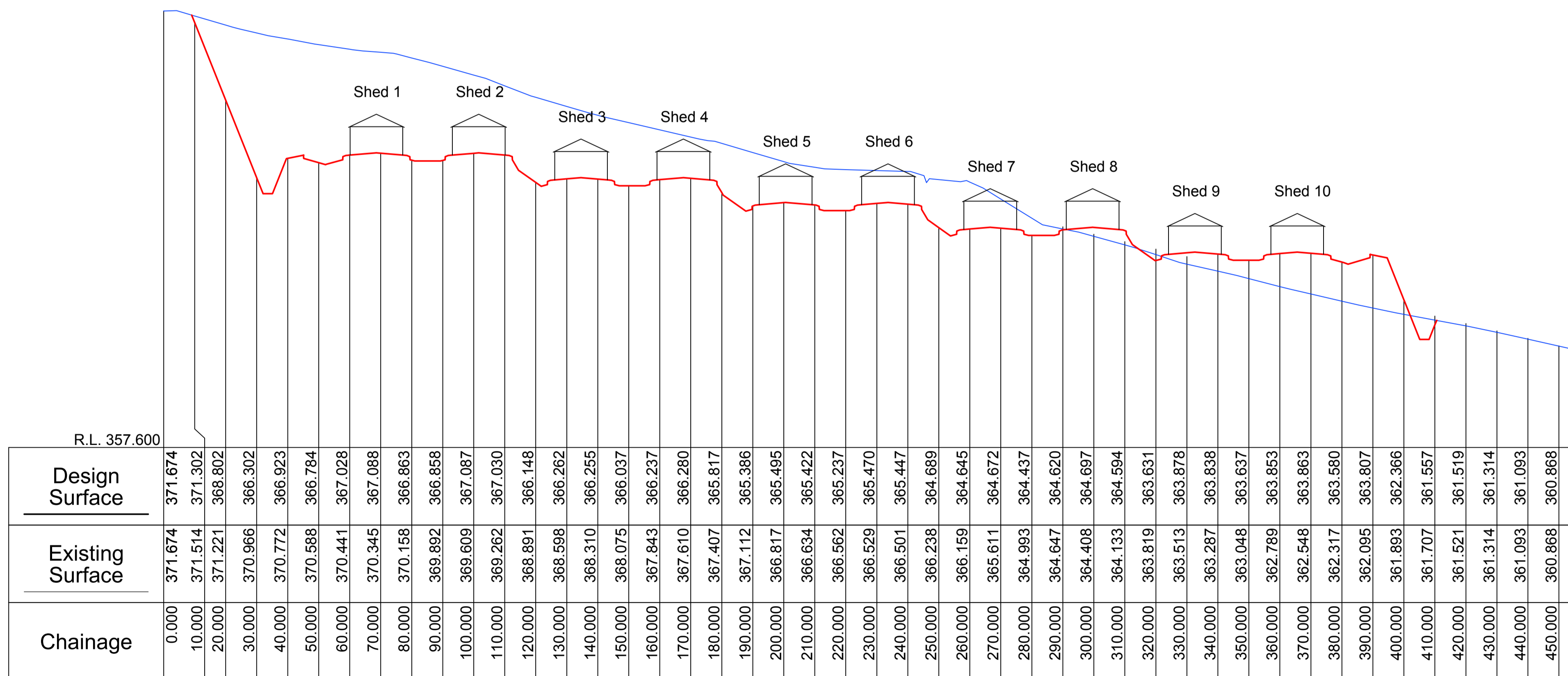
Ph: 02 6921 1877
 Mob: 0429 037 995
 Fax: 02 6921 7415
 Email: lance@lrce.com

Project ProTen Poultry Sheds Rushes Creek Tamworth	Client ProTen	Architect / Project Manager ProTen
---	------------------	---------------------------------------

Drawing Title Farm 3 Sections Plan		Client Project No.
Scale 1:1250	Project Number 17W003	Dwg. No. C16
Sheet 16 of 44	Revision 2	



SCALES: HORIZONTAL 1:1000 VERTICAL 1:100



SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



North

LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

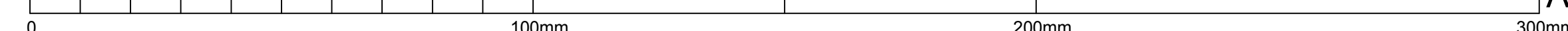
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

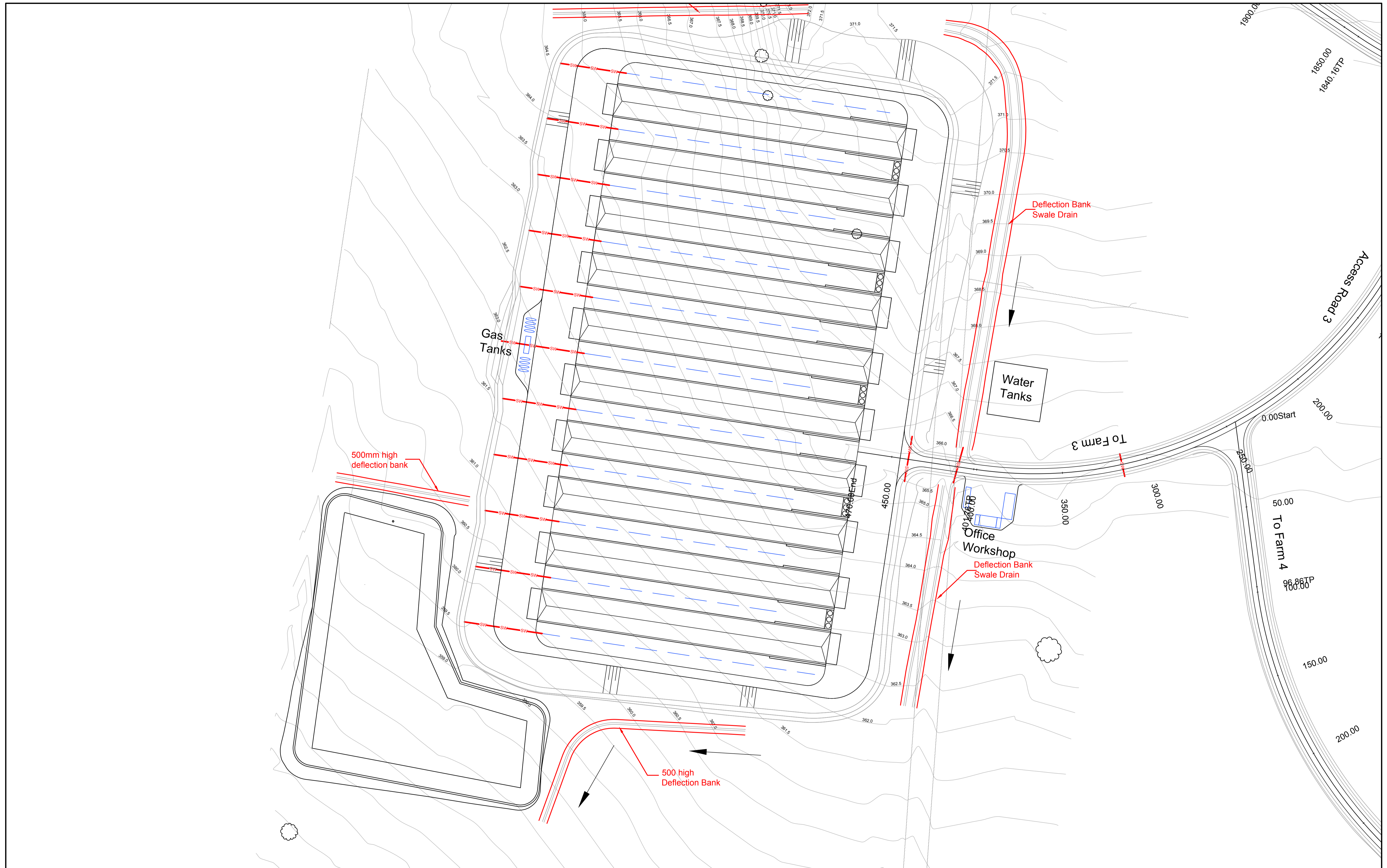
Ph: 02 6921 1877
Mob: 0429 037 866
Fax: 02 6921 7415
Email: lancew@lancew.com

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	Architect / Project Manager ProTen

Drawing Title Farm 3 Sections	
Client Project No.	
Project Number 17W003	Dwg. No. C17
Sheet 17 of 44	Revision 2

A1 SHEET

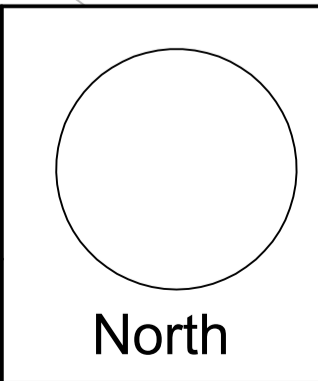




Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



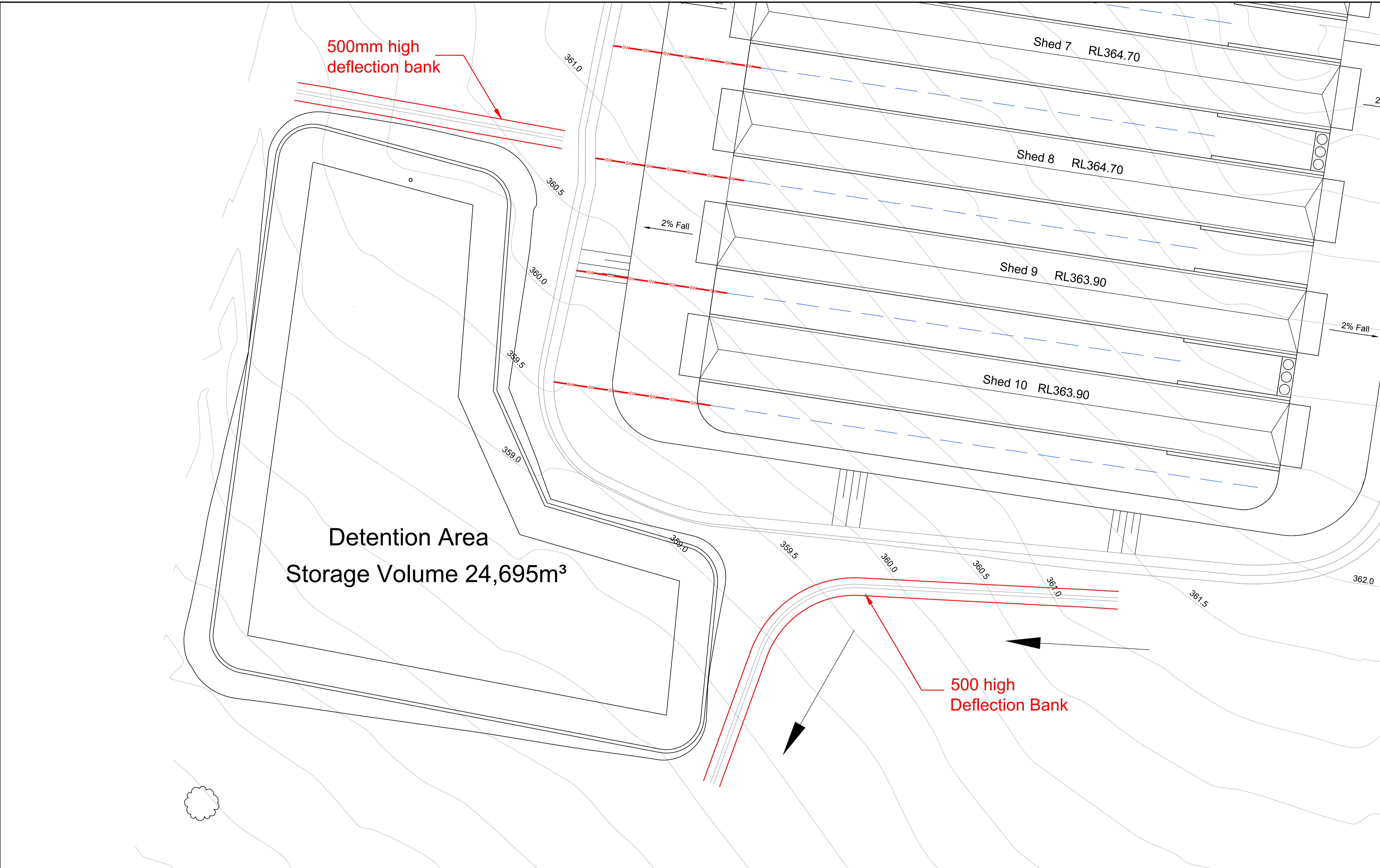
LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 032 956
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

Drawing Title Farm 3		Scales 1:1000		Client Project No.	
Project Number 17W003	Dwg. No. C18	Sheet 18 of 44	Revision 2		



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.

LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

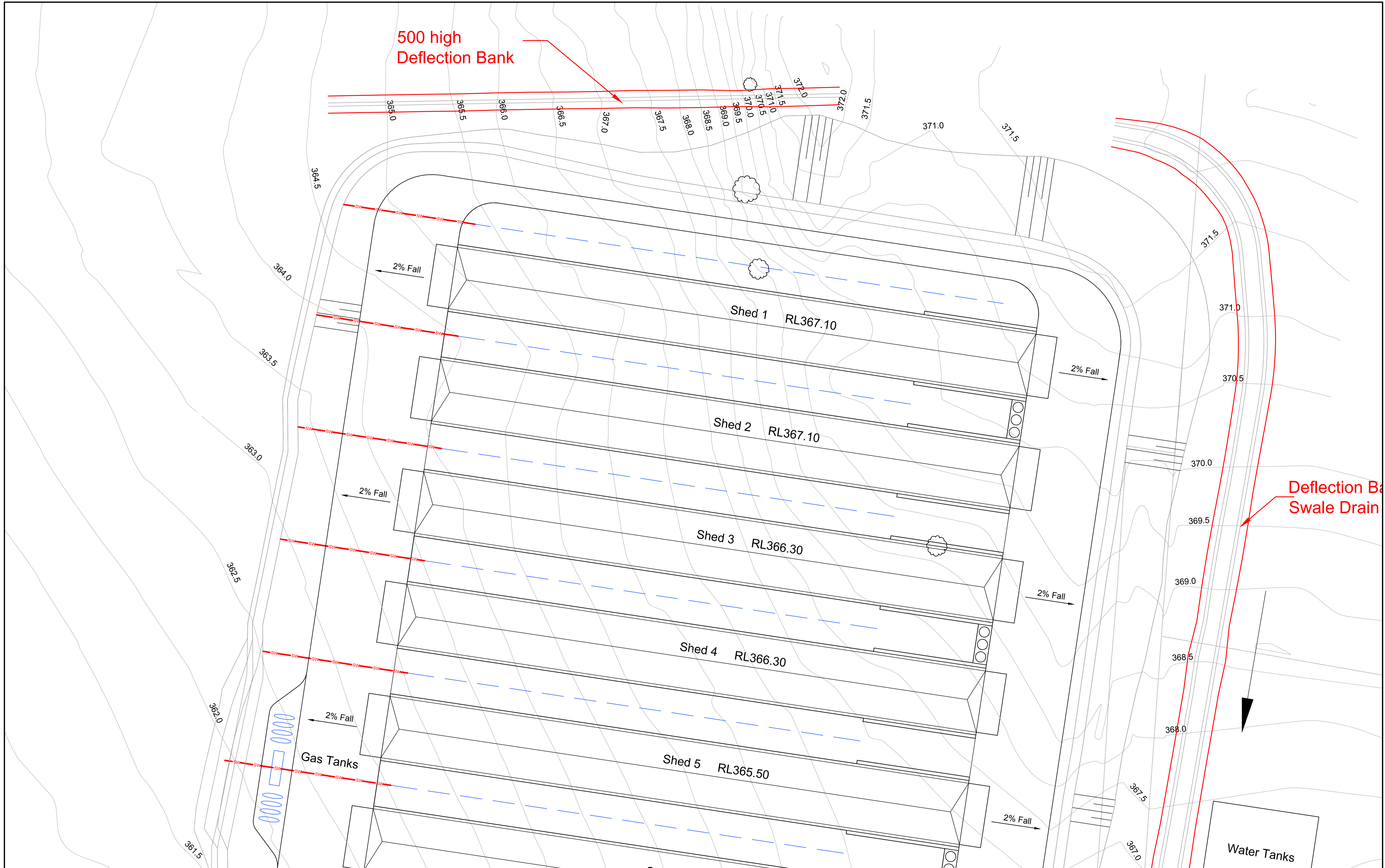
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen

Architect / Project Manager
ProTen

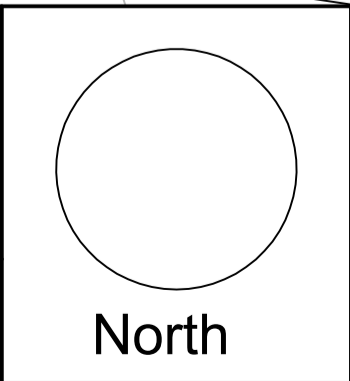
Drawing Title Farm 3		Client Project No.	
Scales 1:500		Sheet 19 of 44	
Project Number 17W003	Dwg. No. C19	Revision 2	



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 996
Fax: 02 6921 7415
Email: lance@lrce.com.au

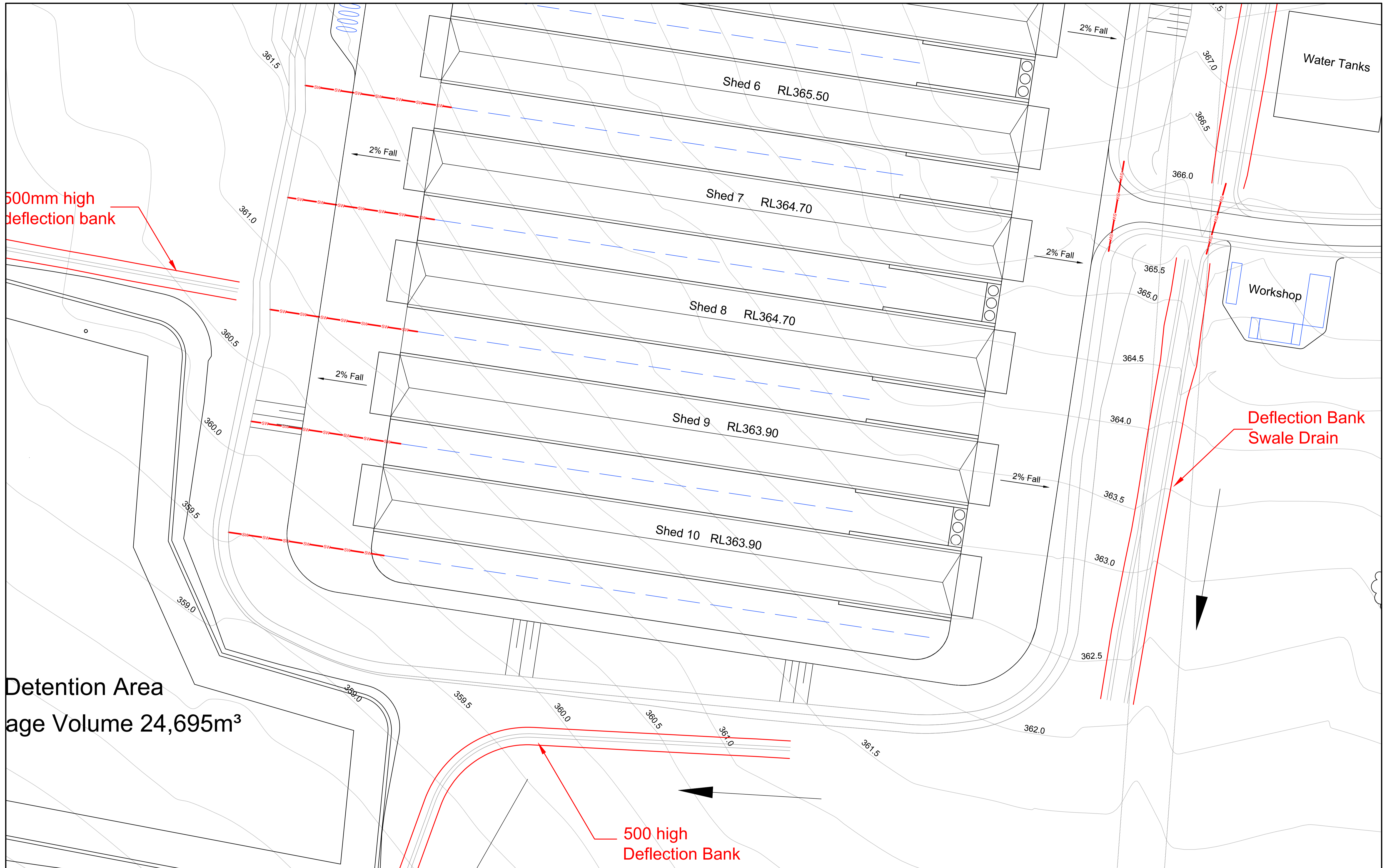
Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title		Scales		Client Project No.	
Farm 3		1:500			
Project Number	Dwg. No.	Sheet	Revision		
17W003	C20	20 of 44	2		

A1 SHEET

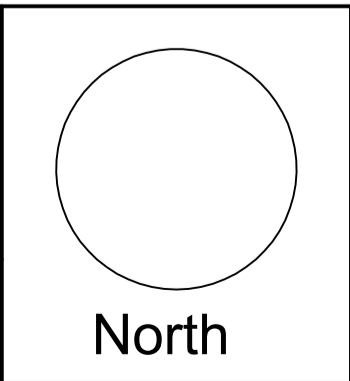




Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



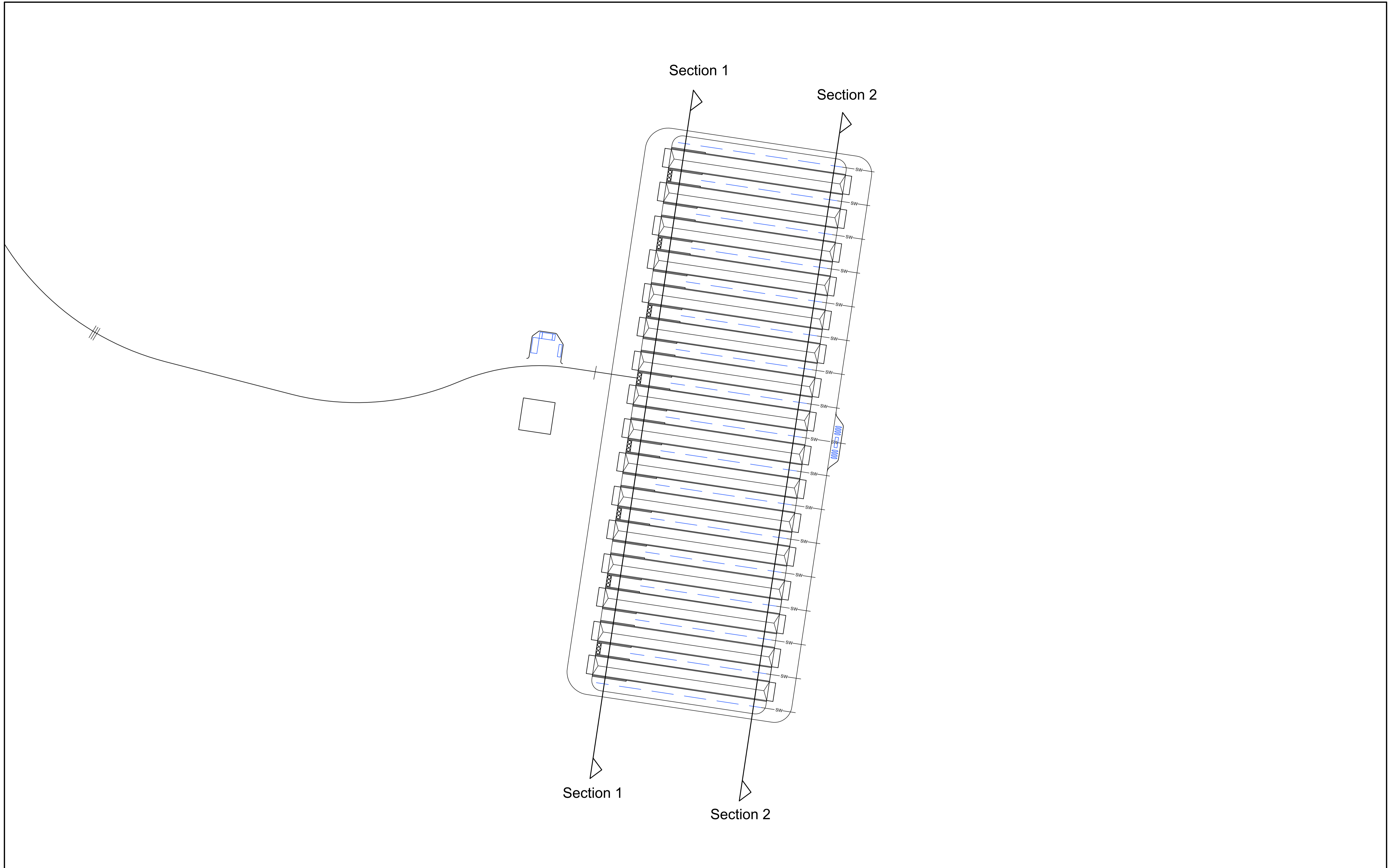
LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

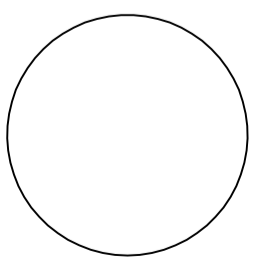
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Farm 3	
Client ProTen		Scales 1:500	
Architect / Project Manager ProTen		Project Number 17W003	Dwg. No. C21

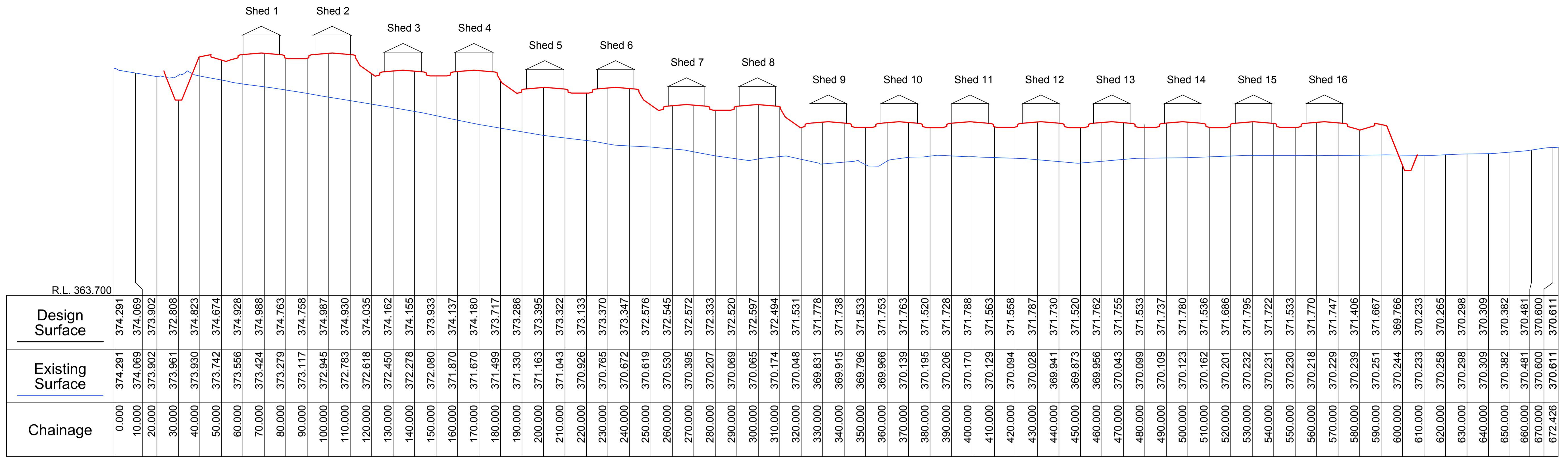
Client Project No.		Sheet 21 of 44	Revision 2
--------------------	--	-------------------	---------------



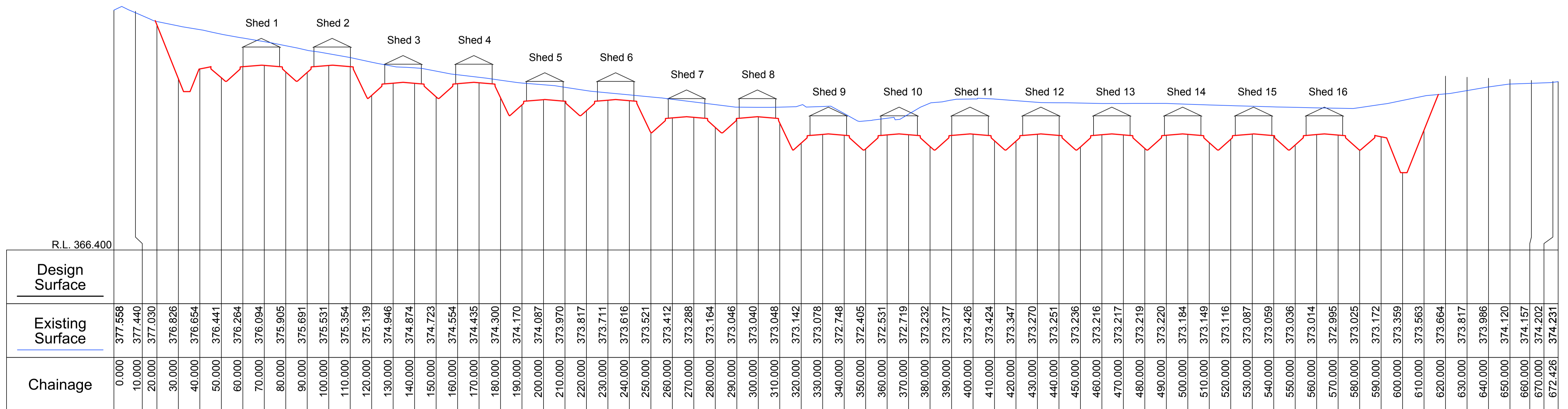
								Copyright This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission. Unauthorised use of this drawing is prohibited		 North	LRCE Lance Ryan Consulting Engineers Pty Ltd Consulting Engineers Planners & Managers A.B.N. 53 631 529 091 52 Johnston Street, WAGGA WAGGA NSW 2650 P.O. Box 7 WAGGA WAGGA NSW 2650 Ph: 02 6921 1877 Mob: 0429 037 995 Fax: 02 6921 7415 Email: lance@lrce.com.au	Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Farm 4 Sections Plan	
Revision		Amendment or reason for issue		Issue date		Drawing completed by		Designed & dwg. checked by				Verified by X = Not verified		Issue authorised (*)	
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.							Scales NTS			
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.							Client ProTen		Project Number 17W003	
												Architect / Project Manager ProTen		Dwg. No. C22	
														Sheet 22 of 44	
														Revision 2	

0 100mm 200mm 300mm

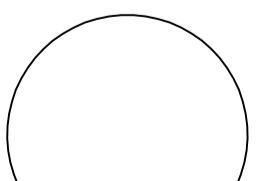

A1 SHEET



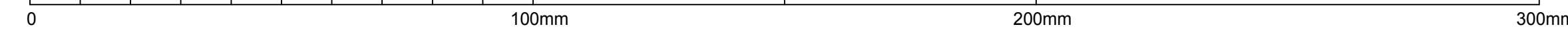
SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

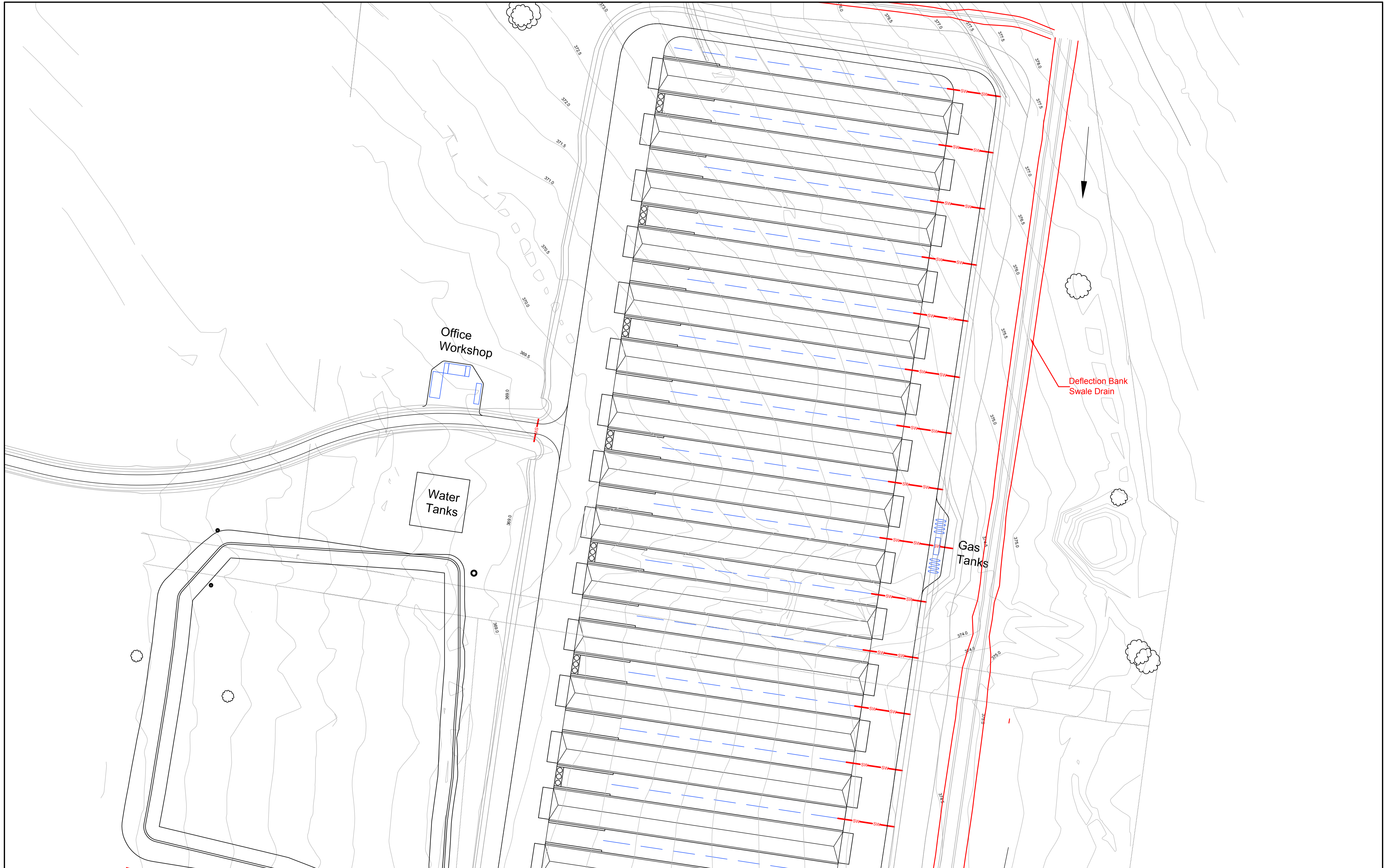


SCALES: HORIZONTAL 1:1000 VERTICAL 1:100

						Copyright This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission. Unauthorised use of this drawing is prohibited		 North	 LRCE Lance Ryan Consulting Engineers Pty Ltd Consulting Engineers Planners & Managers A.B.N. 53 631 529 091 52 Johnston Street, WAGGA WAGGA NSW 2650 P.O. Box 7 WAGGA WAGGA NSW 2650 Ph: 02 6921 1977 Mob: 0429 037 986 Fax: 02 6921 7415 Email: lance@lrce.com.au	Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Farm 4 Sections	
2 Issued for Information - Road 3 and 4 Amended		23.08.2018		L.V.R.		L.V.R.				Client ProTen		Scales H1:1000, V1:100	
1 Issued for Information		15.05.2018		L.V.R.		L.V.R.		Architect / Project Manager ProTen		Project Number 17W003		Dwg. No. C23	
Revision		Amendment or reason for issue		Issue date		Drawing completed by		Designed & dwg. checked by		Verified by		Issue authorised (*)	
												Sheet 23 of 44	
												Revision 2	

A1 SHEET

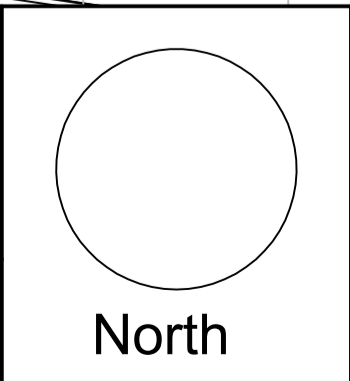




Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

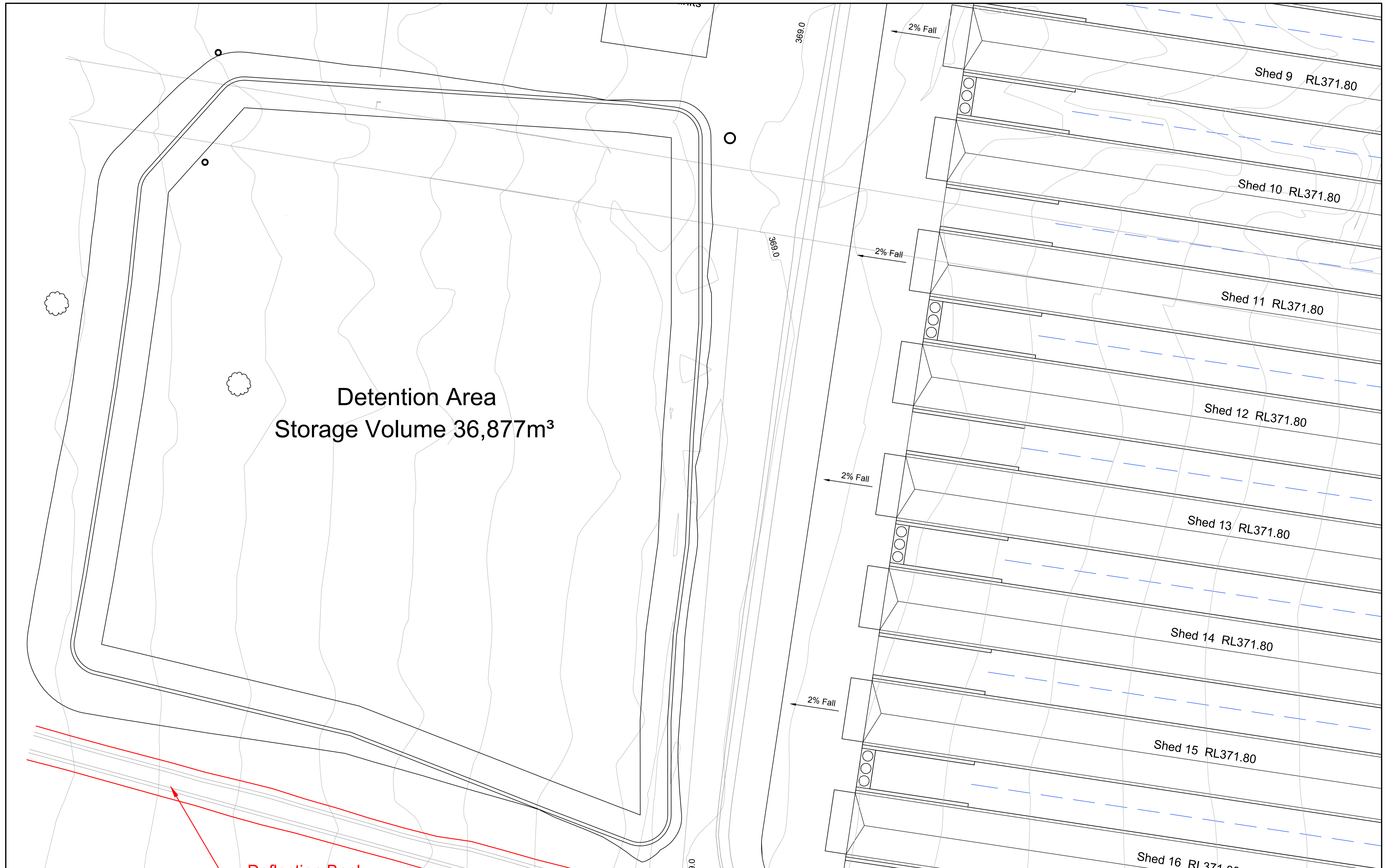
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Farm 4
Client ProTen	Scales 1:1000
Architect / Project Manager ProTen	Client Project No.
	Project Number 17W003
	Dwg. No. C24
	Sheet 24 of 44
	Revision 2

A1 SHEET

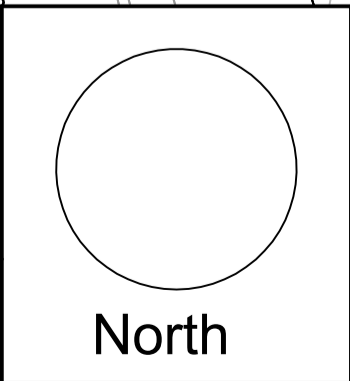
0 100mm 200mm 300mm



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Farm 4

Scales
1:500

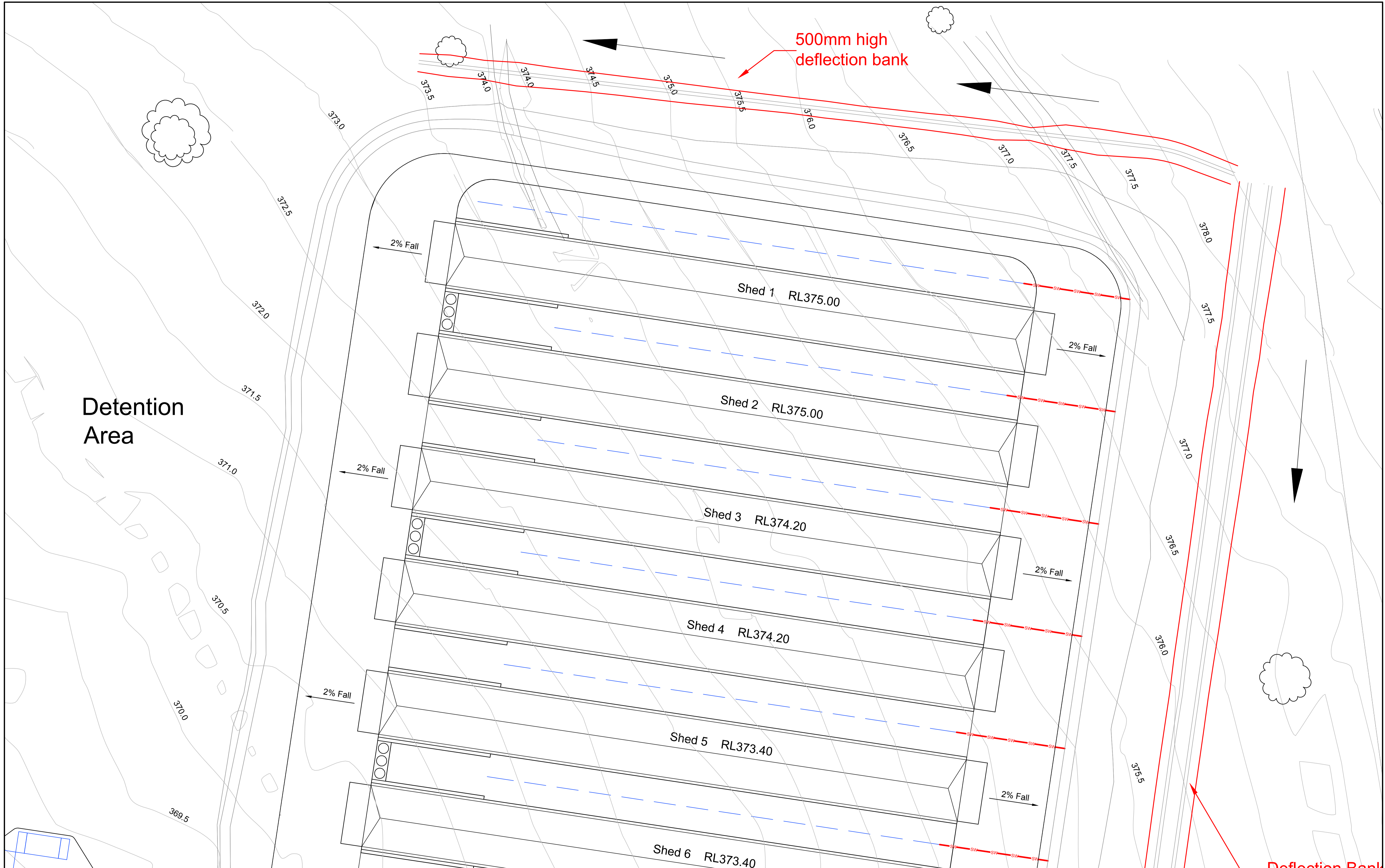
Client Project No.

Project Number
17W003

Dwg. No.
C25

Sheet
25 of 44

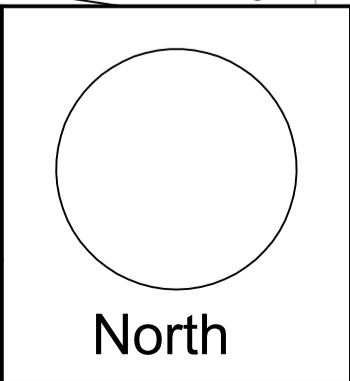
Revision
2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



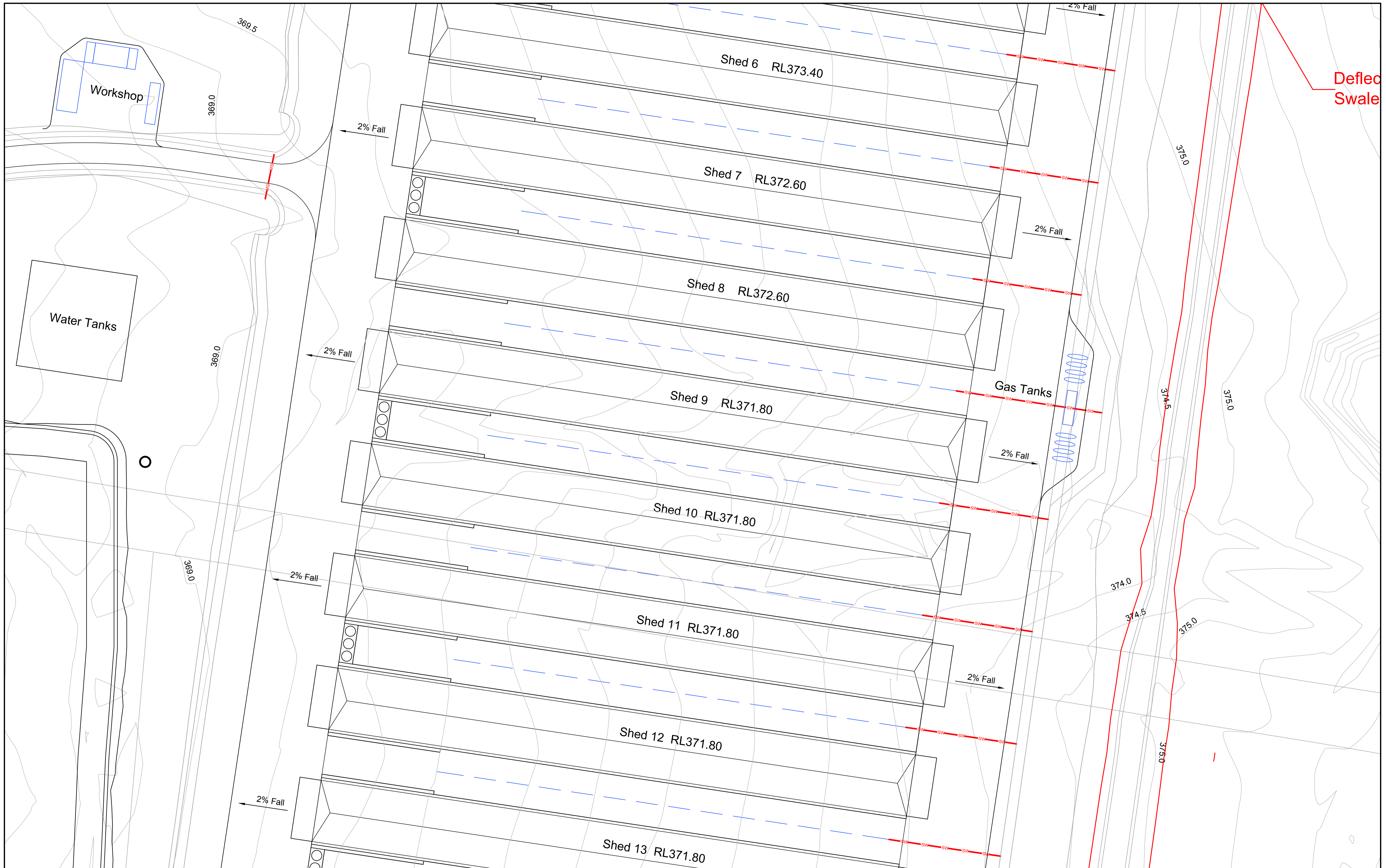
LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Farm 4
Client ProTen	Architect / Project Manager ProTen

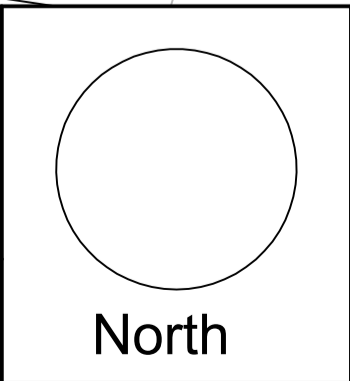
Scales 1:500	Client Project No.
Project Number 17W003	Dwg. No. C26
Sheet 26 of 44	Revision 2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Farm 4

Scales
1:500

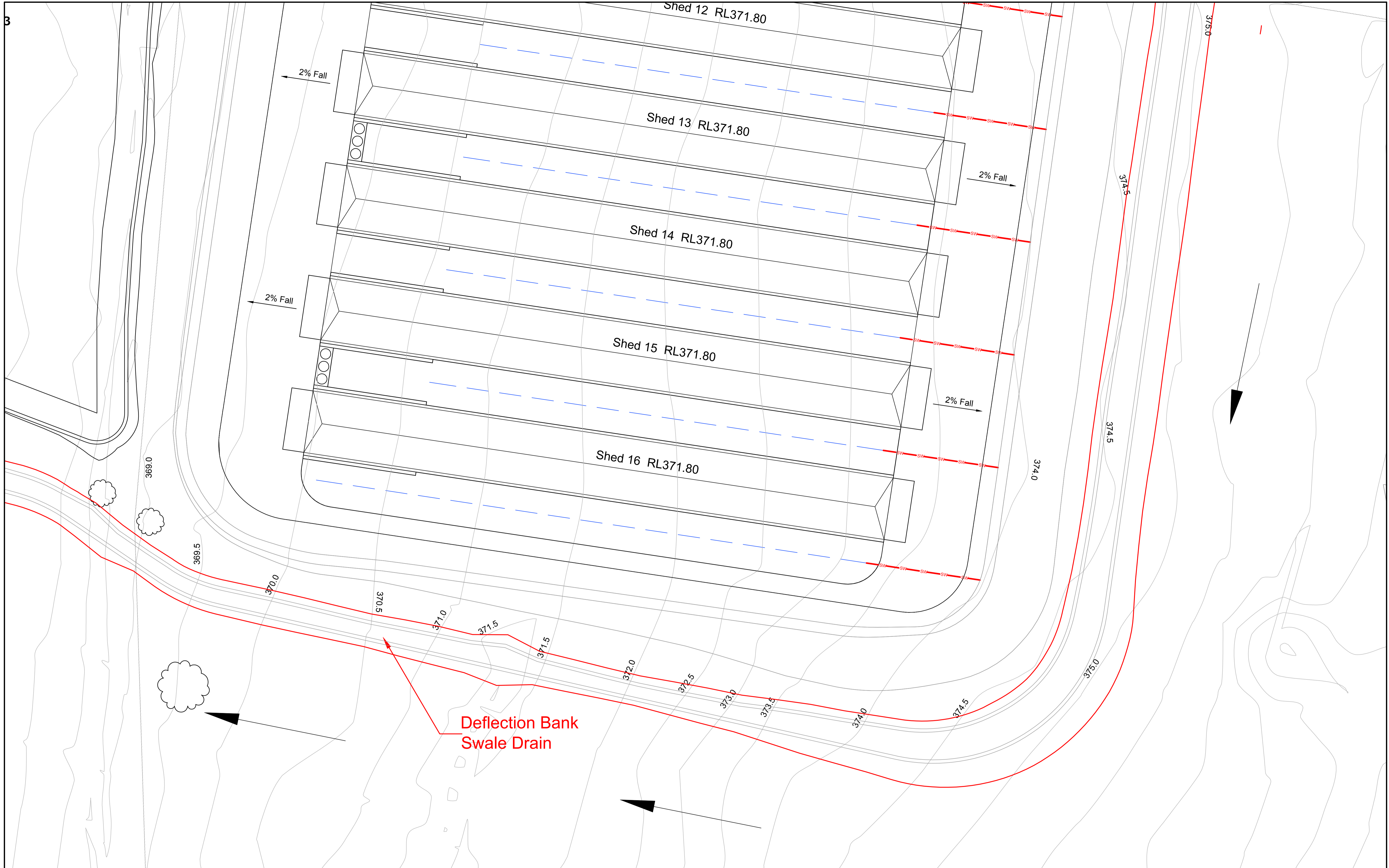
Client Project No.

Project Number
17W003

Dwg. No.
C27

Sheet
27 of 44

Revision
2



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

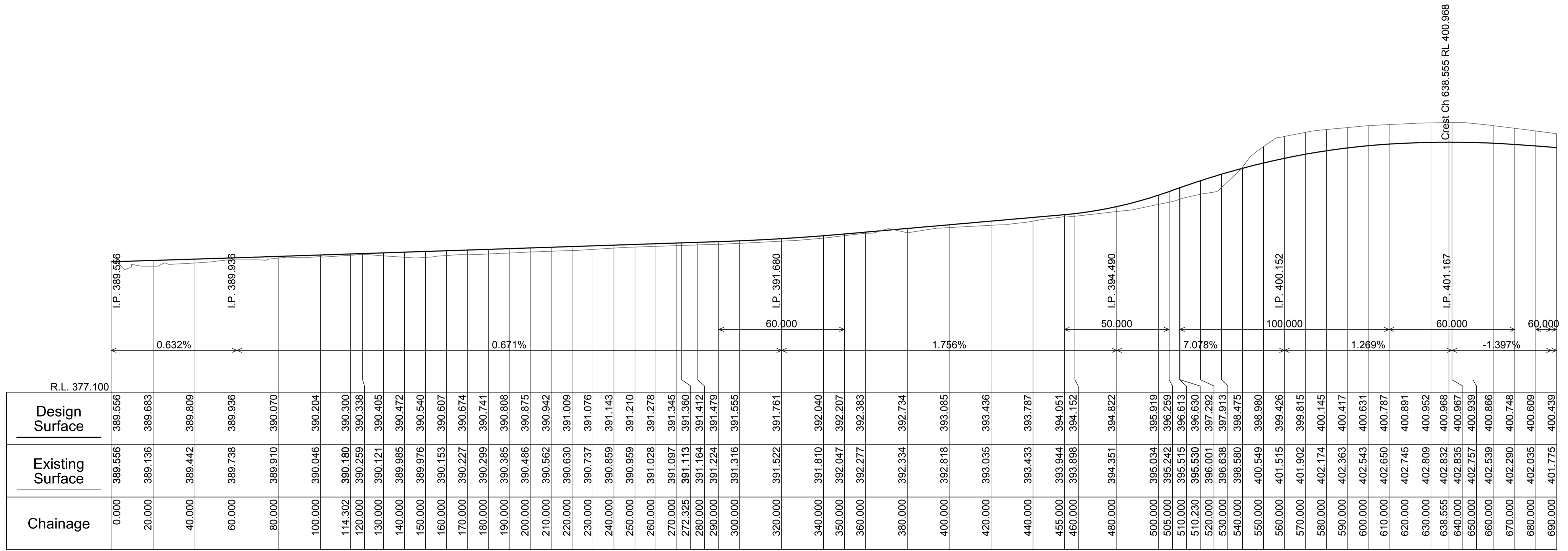
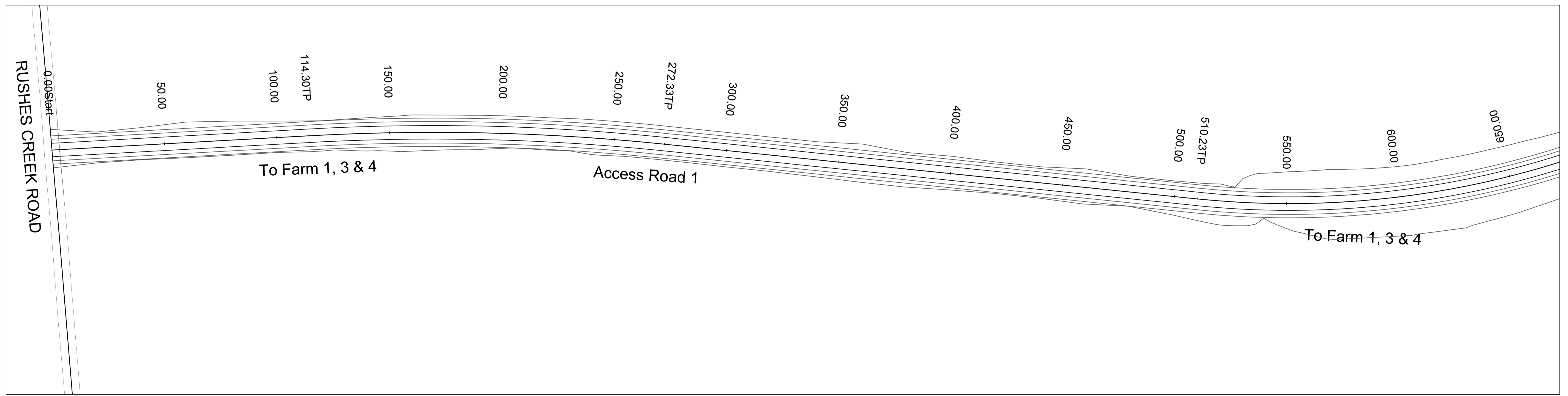
Ph: 02 6921 1977
Mob: 0429 037 996
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen

Architect / Project Manager
ProTen

Drawing Title Farm 4		Client Project No.	
Scales 1:500		Sheet 28 of 44	
Project Number 17W003	Dwg. No. C28	Revision 2	



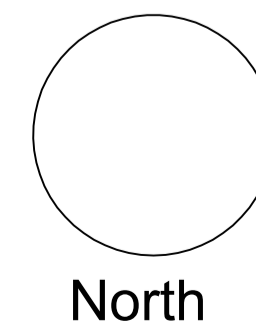
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 1 From 0.000 to 690.000

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 966
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

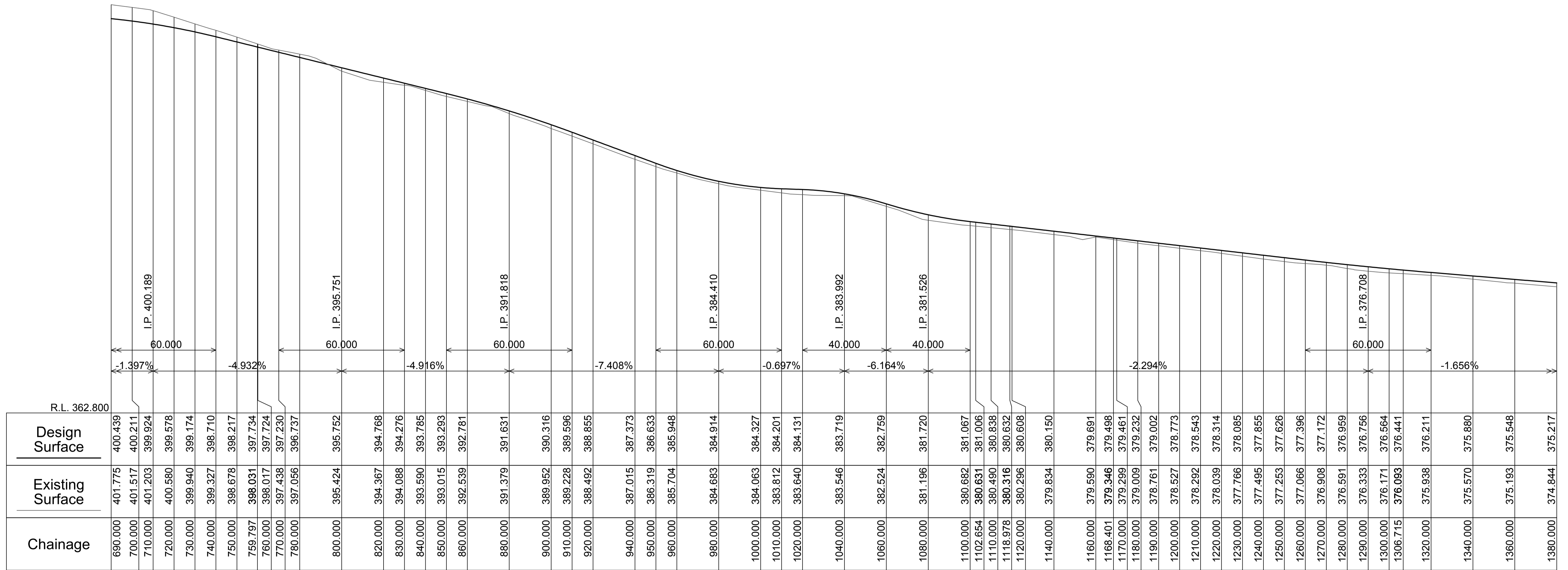
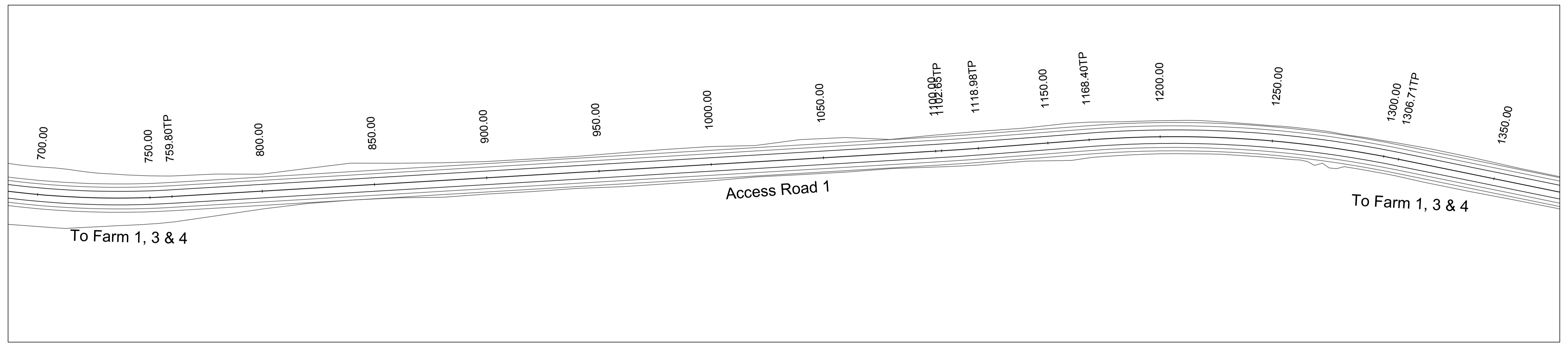
Drawing Title
Access Road 1
Plan and Longsections

Scales
H:1000, V1:200

Project Number 17W003	Dwg. No. C29	Sheet 29 of 44	Revision 2
--------------------------	-----------------	-------------------	---------------

A1 SHEET

0 100mm 200mm 300mm



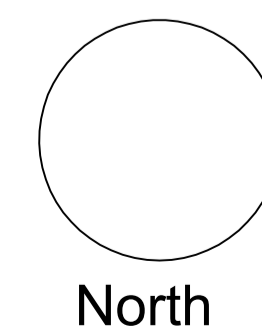
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 1 From 690.000 to 1380.000

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 866
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

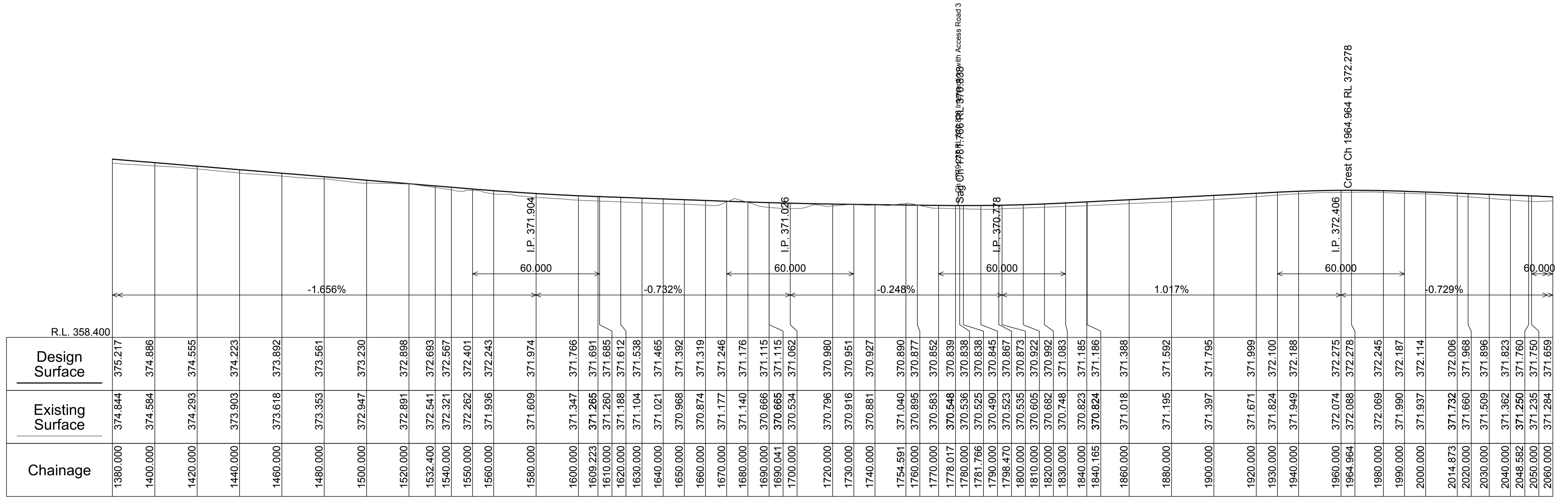
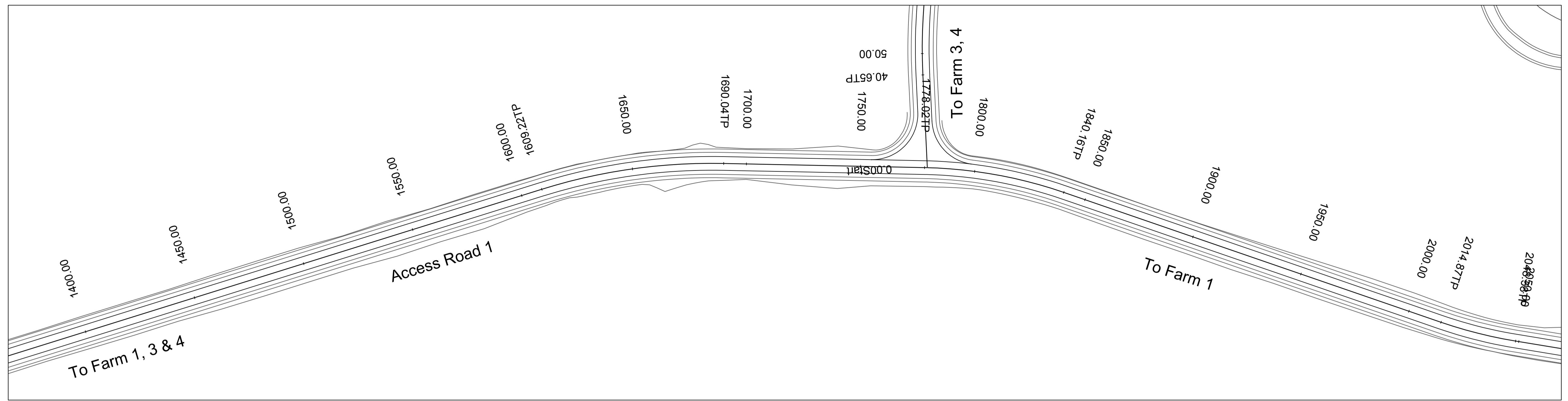
Drawing Title
Access Road 1
Plan and Longsections

Scales
H:1000, V1:200

Project Number 17W003	Dwg. No. C30	Sheet 30 of 44	Revision 2
--------------------------	-----------------	-------------------	---------------

A1 SHEET

0 100mm 200mm 300mm



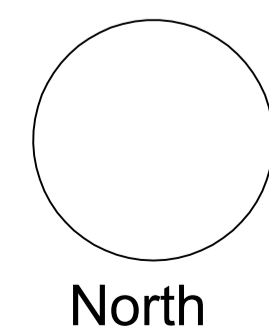
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 1 From 1380.000 to 2060.000

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnson Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mo: 0429 037 966
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

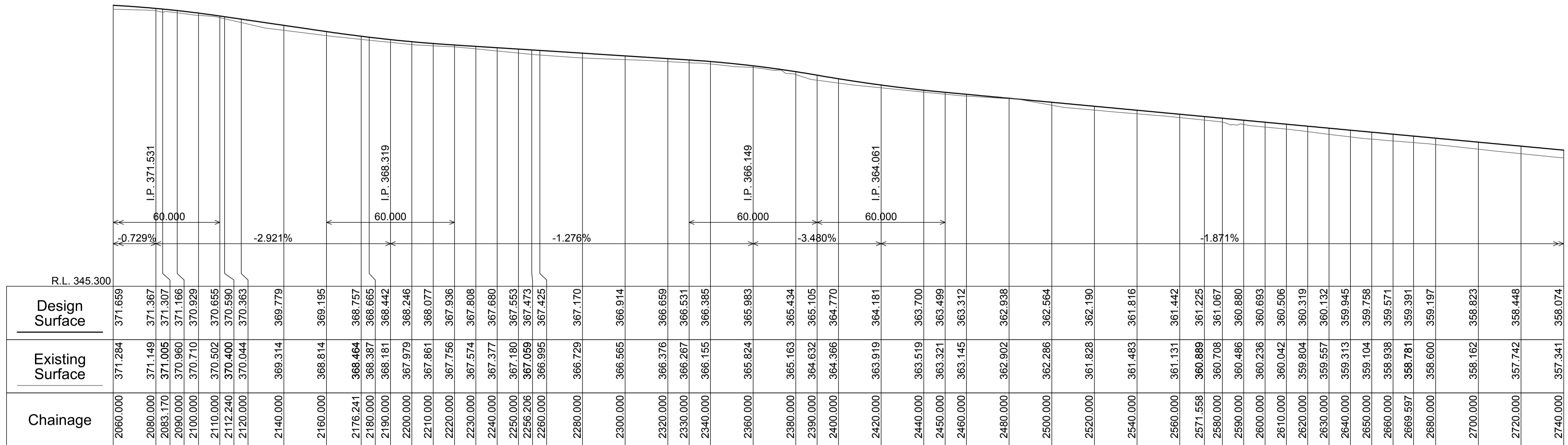
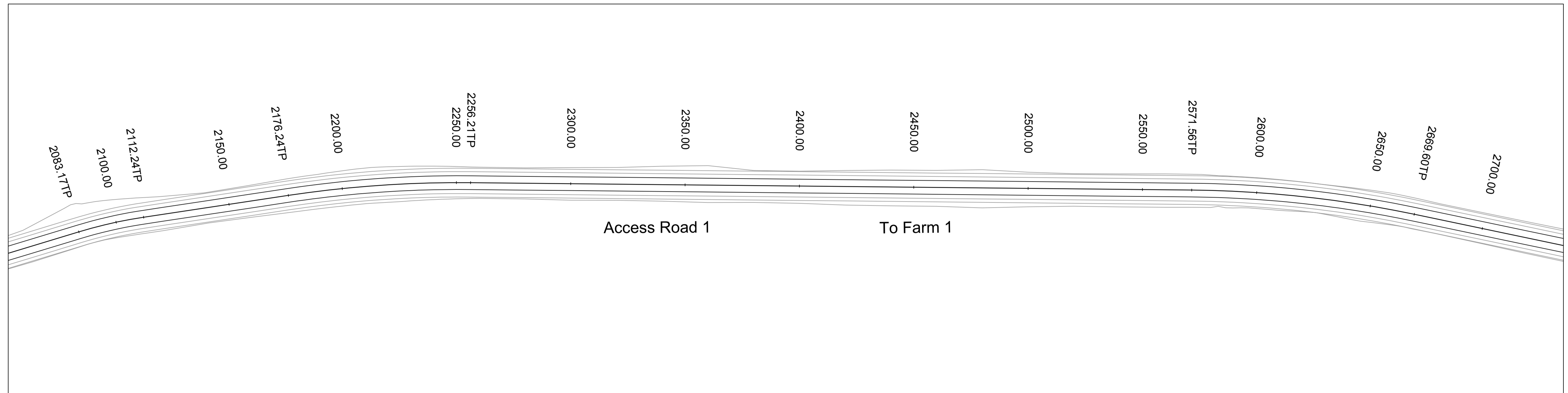
Drawing Title
Access Road 1
Plan and Longsections

Scales
H:1000, V1:200

Client Project No.
Project Number
17W003
Dwg. No.
C31
Sheet
31 of 44
Revision
2

A1 SHEET

0 100mm 200mm 300mm



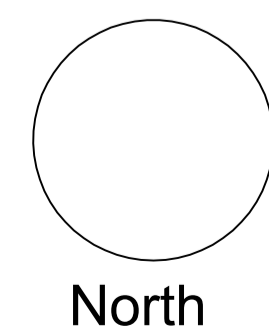
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 1 From 2060.000 to 2740.000

Revision	Amendment or reason for issue	Issue date	Drawn by	Checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 966
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

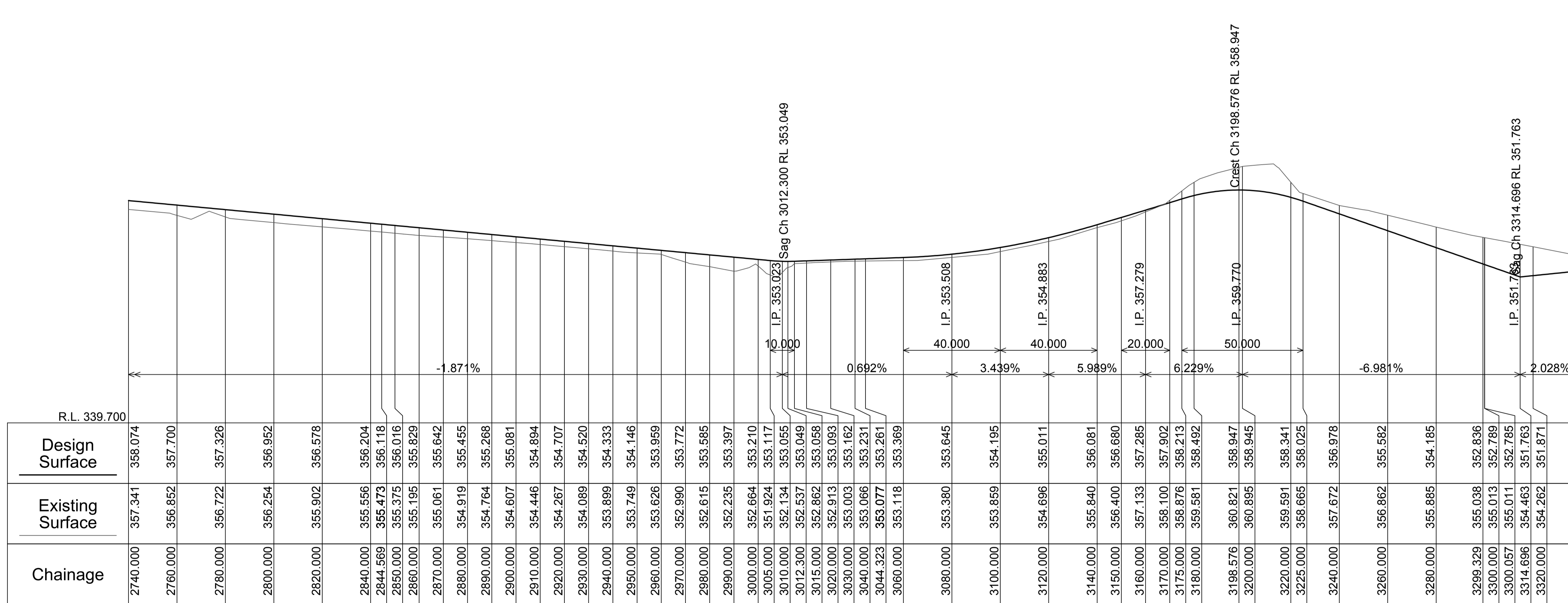
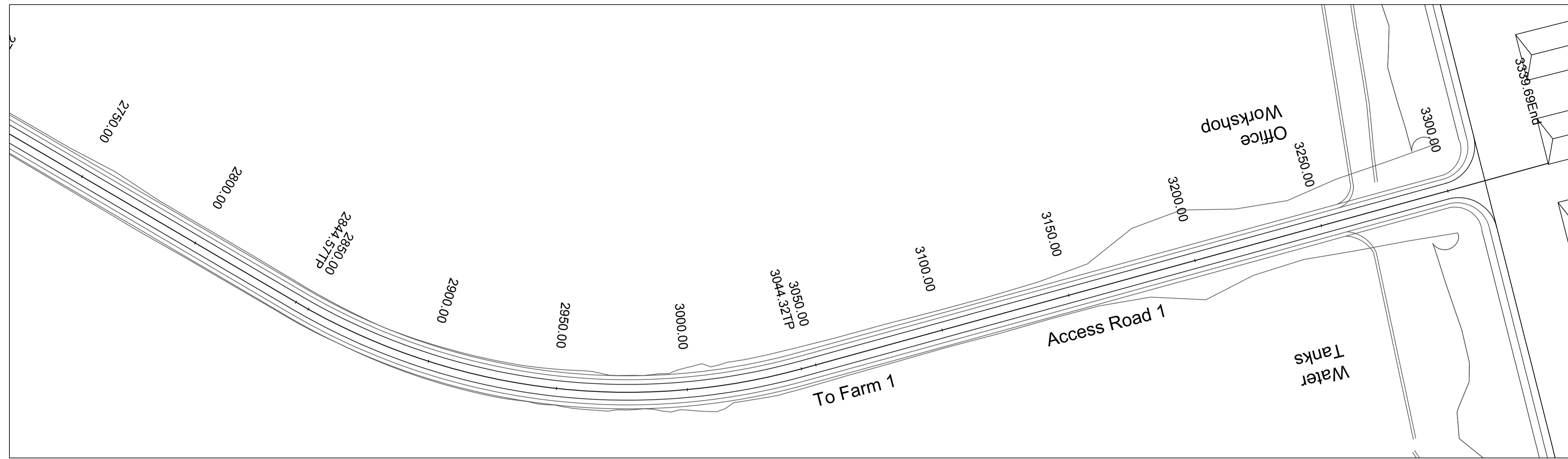
Drawing Title
Access Road 1
Plan and Longsections

Scales
H:1000, V1:200

Client Project No.
Project Number
17W003
Dwg. No.
C32
Sheet
32 of 44
Revision
2

A1 SHEET

0 100mm 200mm 300mm



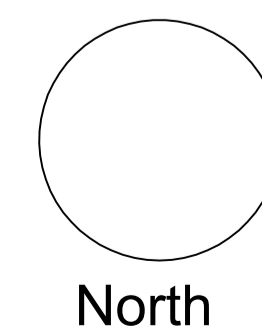
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 1 From 2740.000 to 3339.691

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 866
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

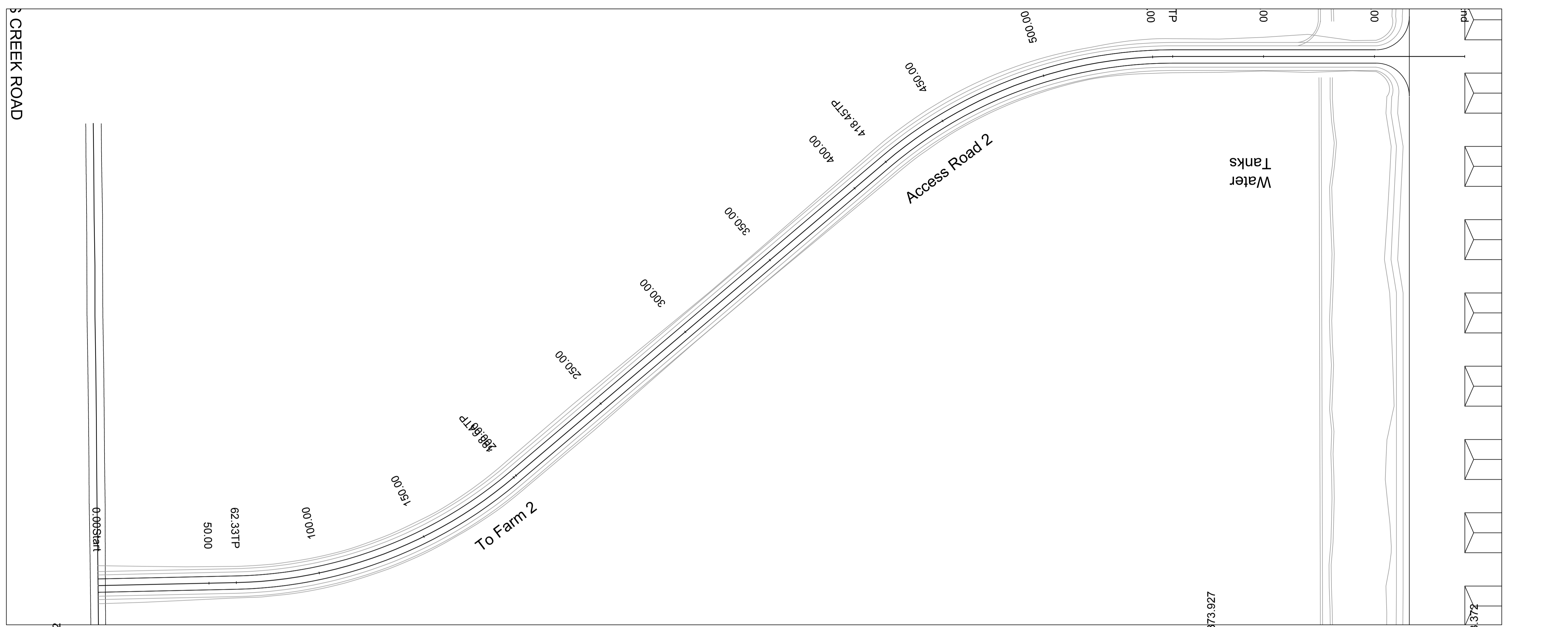
Drawing Title
Access Road 1
Plan and Longsections

Scales
H:1000, V1:200

Project Number 17W003	Dwg. No. C33	Sheet 33 of 44	Revision 2
--------------------------	-----------------	-------------------	---------------

A1 SHEET

0 100mm 200mm 300mm



Chainage	Existing Surface	Design Surface
0.000	372.365	372.365
2.964	372.267	372.267
11.748	372.146	372.216
13.181	372.152	372.212
14.248	372.157	372.214
16.748	372.168	372.238
20.000	372.182	372.285
40.000	372.326	372.575
60.000	372.534	372.864
61.823	372.559	372.891
62.326	372.566	372.895
70.000	372.651	372.962
80.000	372.688	373.049
90.000	372.814	373.136
100.000	372.883	373.223
110.000	372.950	373.310
120.000	373.025	373.398
130.000	373.139	373.485
140.000	373.221	373.572
150.000	373.292	373.659
160.000	373.359	373.746
161.793	373.370	373.762
170.000	373.409	373.765
180.000	373.434	373.770
190.000	373.461	373.774
198.637	373.481	373.778
200.000	373.480	373.779
220.000	373.508	373.788
240.000	373.545	373.796
260.000	373.489	373.805
280.000	373.415	373.814
300.000	373.342	373.823
320.000	373.297	373.832
340.000	373.342	373.841
360.000	373.410	373.850
380.000	373.478	373.859
400.000	373.547	373.868
418.446	373.611	373.876
420.000	373.617	373.877
430.000	373.609	373.881
440.000	373.589	373.886
450.000	373.601	373.890
460.000	373.616	373.894
470.000	373.623	373.899
480.000	373.623	373.903
490.000	373.615	373.908
500.000	373.600	373.912
510.000	373.577	373.917
520.000	373.547	373.921
530.000	373.597	373.926
531.220	373.606	373.926
533.511	373.622	373.927
540.000	373.666	373.923
546.220	373.695	373.911
550.000	373.699	373.900
559.070	373.645	373.863
560.000	373.638	373.858
561.220	373.629	373.852
580.000	373.491	373.751
600.000	373.374	373.643
620.000	373.398	373.536
640.000	372.988	373.428
648.954	373.013	373.380
650.707	373.016	373.373
651.956	373.018	373.372
653.954	373.020	373.375
658.954	373.027	373.415
660.000	373.029	373.429
665.707	373.036	373.500
680.000	372.930	373.786
690.697	372.848	374.000

SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 2 From 0.000 to 690.697

2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

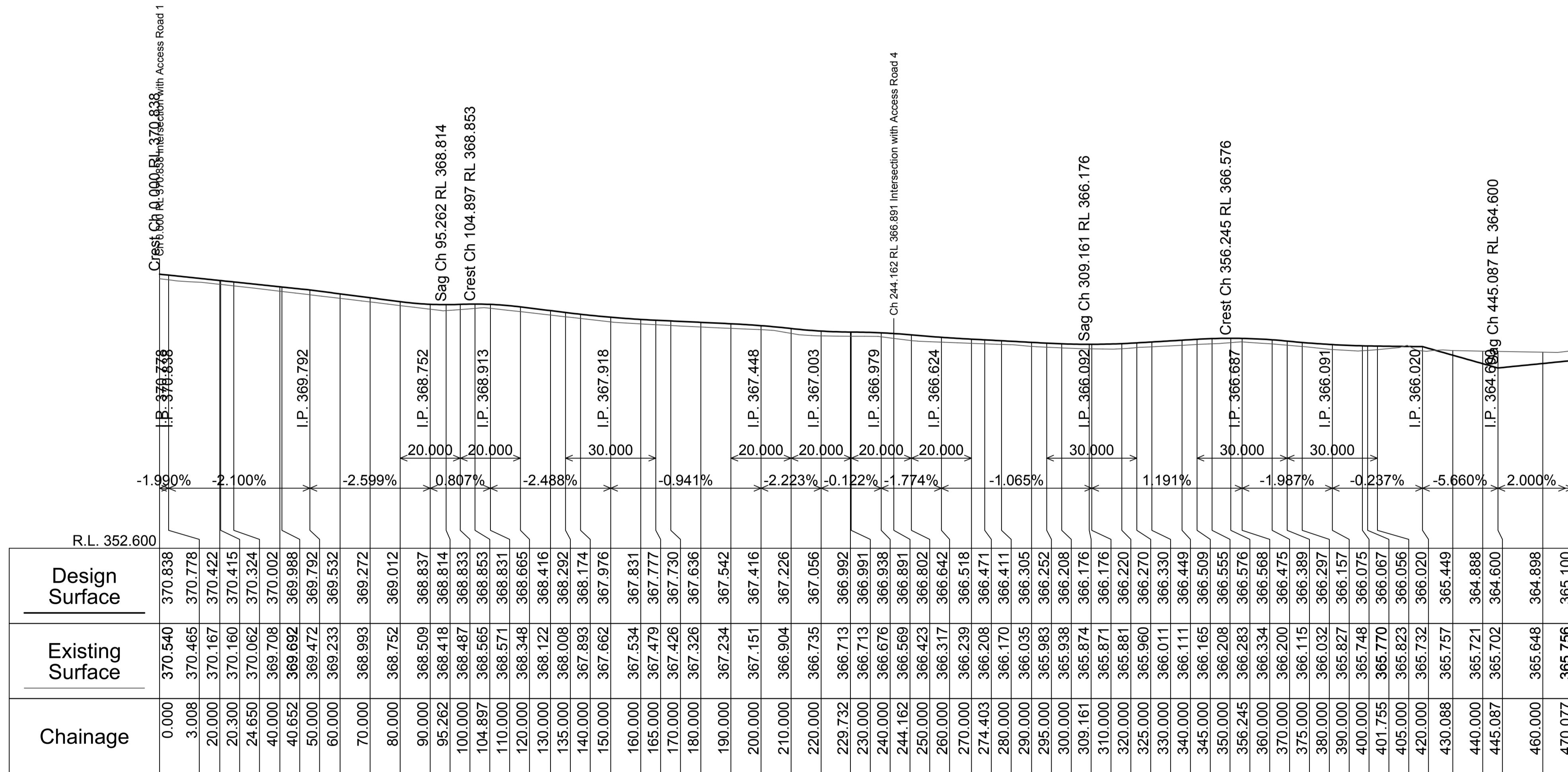
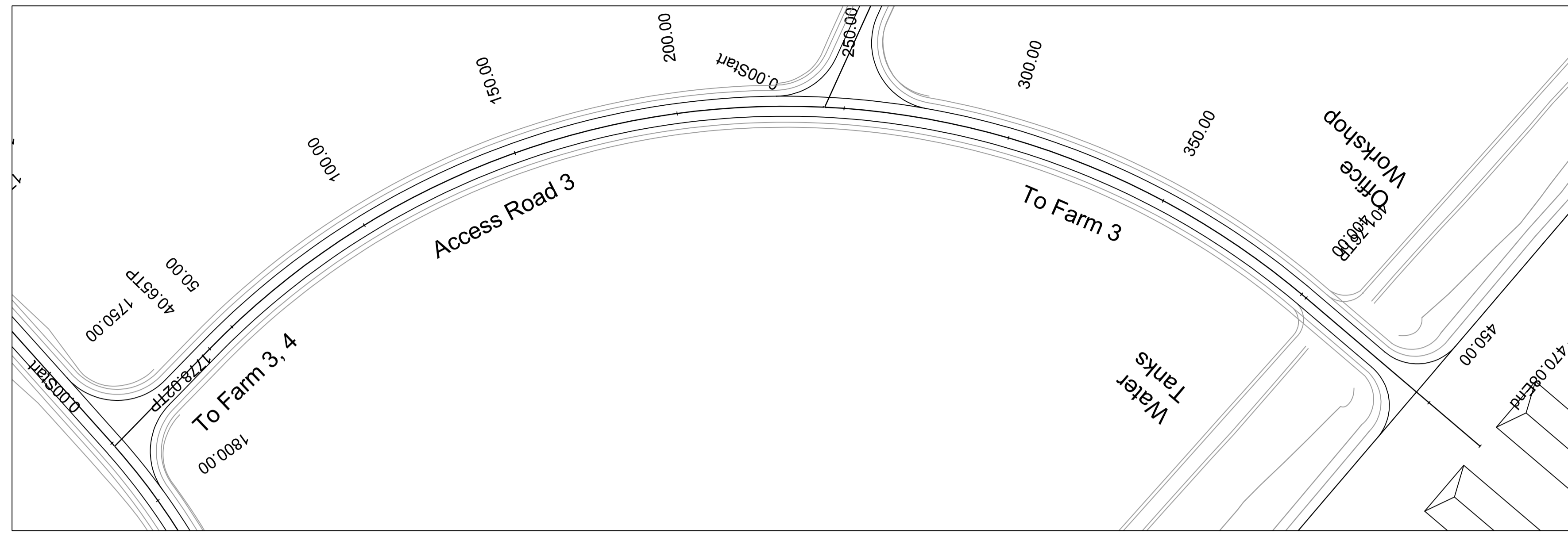
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 966
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Access Road 2 Plan and Longsections	
Client ProTen	Architect / Project Manager ProTen	Scales H:1000, V:1200	Client Project No.
Project Number 17W003	Dwg. No. C34	Sheet 34 of 44	Revision 2

A1 SHEET





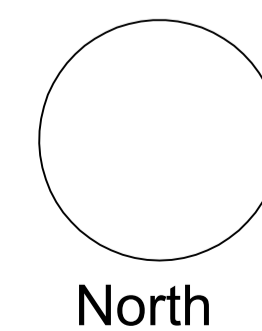
SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 3 From 0.000 to 470.077

2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 866
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Access Road 3
Plan and Longsections

Scales
H:1000, V1:200

Project Number
17W003

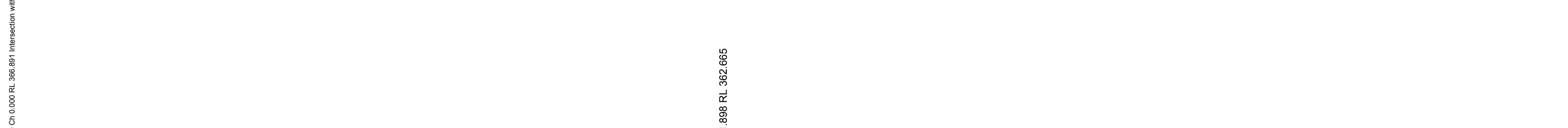
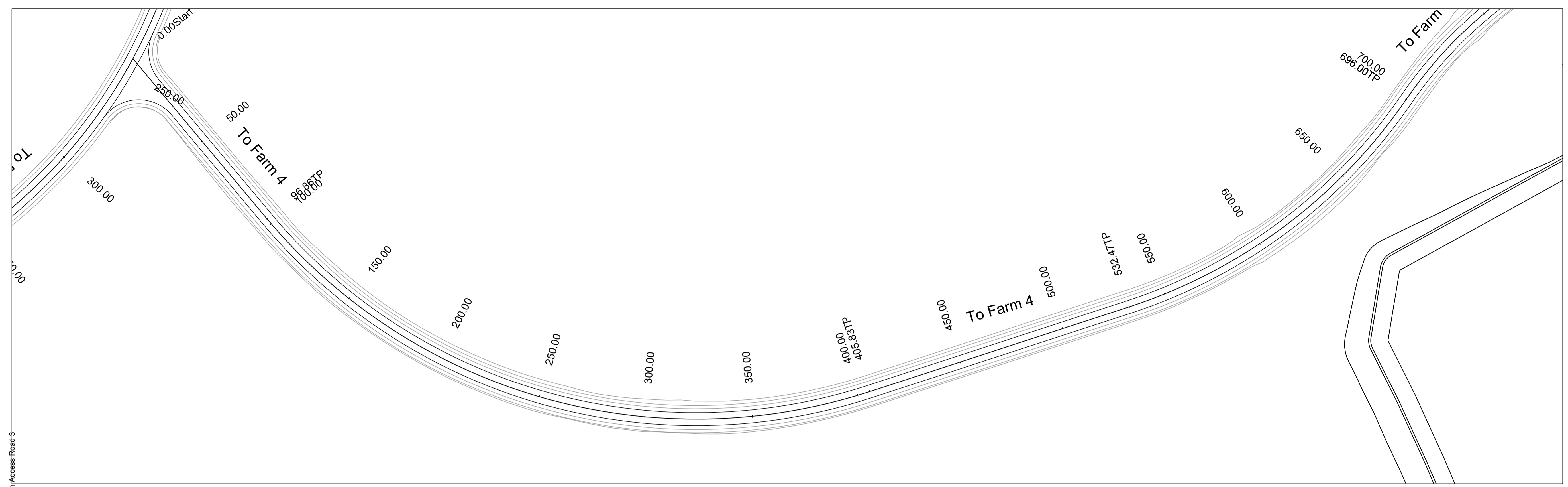
Dwg. No.
C35

Sheet
35 of 44

Revision
2

A1 SHEET

0 100mm 200mm 300mm



Chainage	Existing Surface	Design Surface
0.000	366.569	366.891
3.224	366.456	366.815
15.103	366.112	366.526
20.000	365.967	366.406
31.636	365.698	366.122
40.000	365.531	365.919
60.000	365.134	365.431
70.000	364.846	365.128
80.000	364.527	364.852
90.000	364.322	364.632
96.861	364.210	364.499
100.000	364.167	364.439
110.000	363.957	364.246
115.000	363.824	364.149
120.000	363.719	364.058
130.000	363.613	363.904
140.000	363.512	363.789
145.000	363.464	363.746
150.000	363.417	363.708
160.000	363.327	363.632
170.000	363.242	363.556
180.000	363.163	363.480
190.000	363.089	363.404
200.000	363.021	363.328
205.000	362.989	363.290
210.000	362.959	363.254
220.000	362.903	363.195
230.000	362.871	363.154
235.000	362.859	363.140
240.000	362.855	363.128
250.000	362.839	363.104
260.000	362.775	363.080
270.000	362.668	363.056
280.000	362.692	363.032
285.000	362.706	363.019
290.000	362.722	363.003
300.000	362.672	362.941
310.000	362.576	362.843
315.000	362.467	362.780
320.000	362.422	362.722
330.000	362.364	362.666
331.898	362.378	362.665
340.000	362.438	362.691
345.000	362.476	362.734
350.000	362.516	362.786
360.000	362.600	362.892
370.000	362.689	362.997
380.000	362.763	363.103
390.000	362.882	363.208
400.000	362.986	363.313
405.832	363.049	363.375
420.000	363.203	363.524
440.000	363.421	363.735
460.000	363.638	363.945
480.000	363.856	364.156
500.000	364.074	364.367
517.475	364.264	364.551
520.000	364.291	364.578
532.475	364.427	364.717
540.000	364.510	364.807
547.475	364.595	364.900
550.000	364.625	364.932
560.000	364.744	365.059
570.000	364.867	365.186
580.000	364.994	365.313
590.000	365.125	365.440
600.000	365.342	365.567
610.000	365.437	365.694
620.000	365.569	365.821
630.000	365.699	365.948
635.000	365.762	366.011
640.000	365.799	366.080
650.000	365.880	366.246
660.000	366.044	366.451
665.000	366.181	366.568
670.000	366.324	366.687
680.000	366.643	366.907
690.000	366.820	367.101
695.000	366.902	367.188
696.002	366.918	367.205
700.000	366.995	367.273
710.000	367.177	367.441
720.000	367.347	367.610

SCALES: HORIZONTAL 1:1000 VERTICAL 1:200

Access Road 4 From 0.000 to 720.000

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



North

LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 866
Fax: 02 6921 7415
Email: lancevryan@gmail.com

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen

Architect / Project Manager
ProTen

Drawing Title
Access Road 4
Plan and Longsections

Scales
H:1000, V1:200

Client Project No.

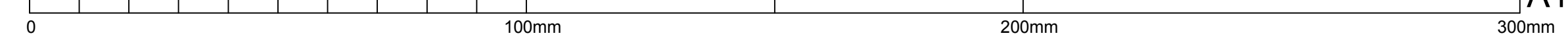
Project Number
17W003

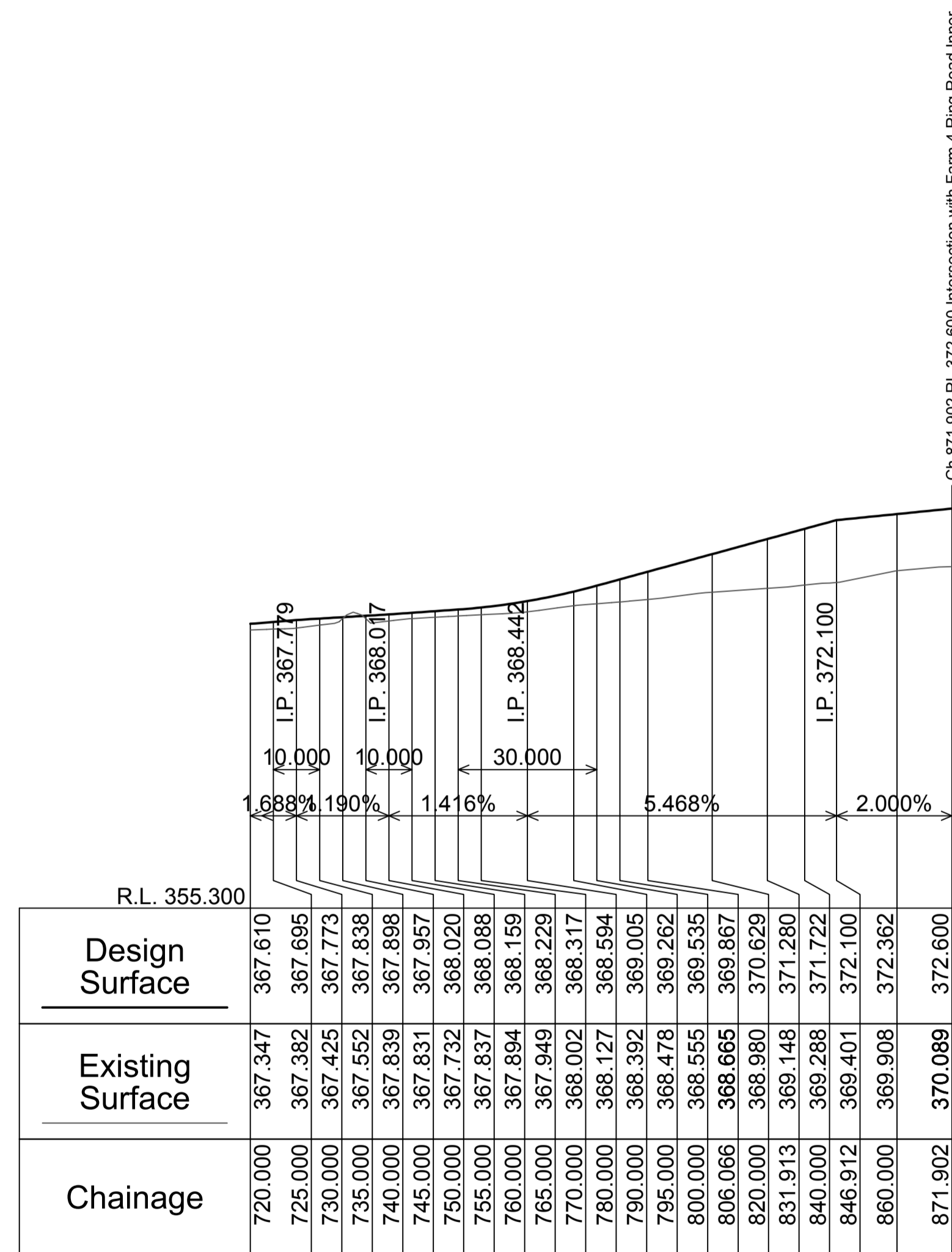
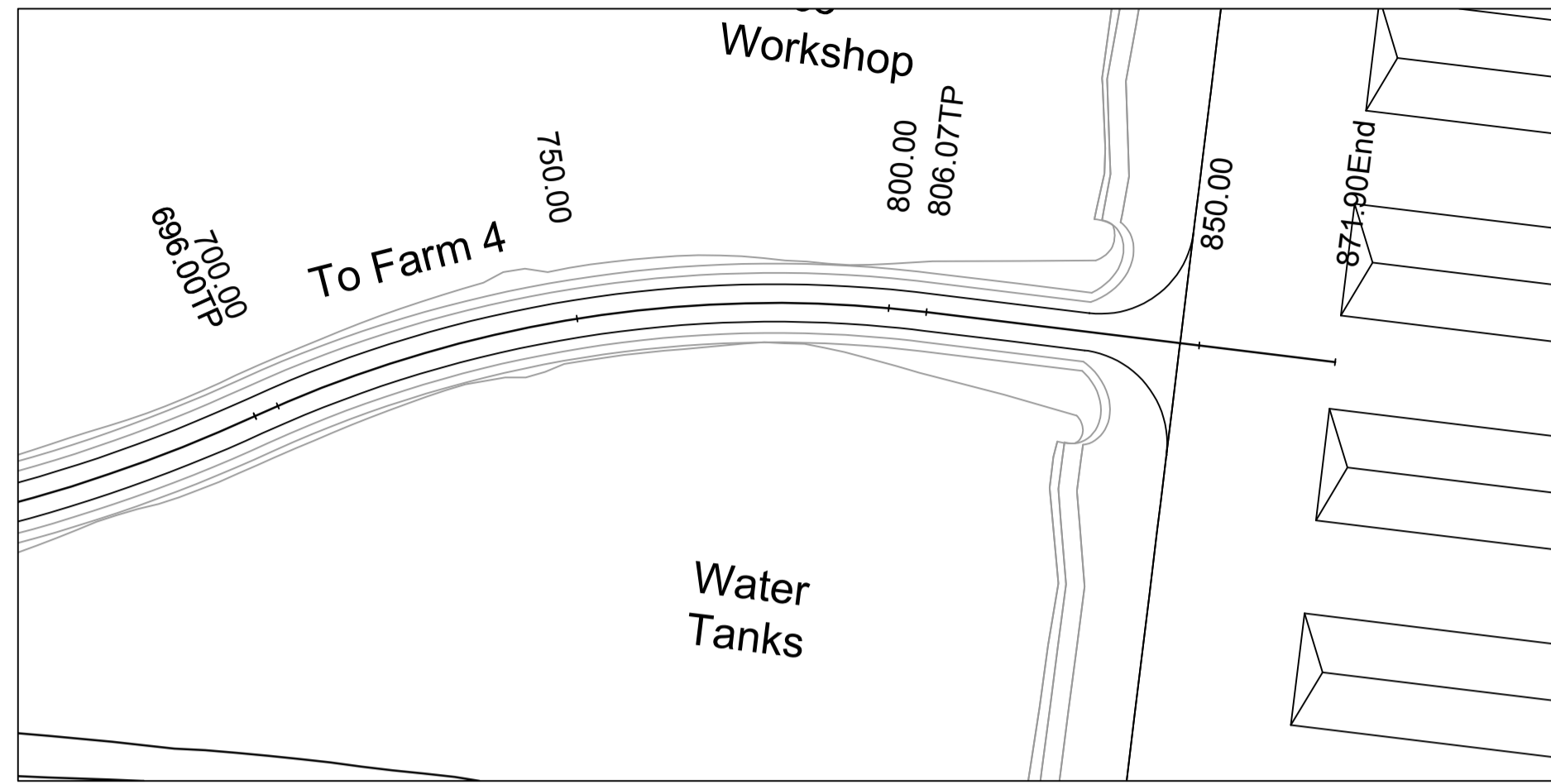
Dwg. No.
C36

Sheet
36 of 44

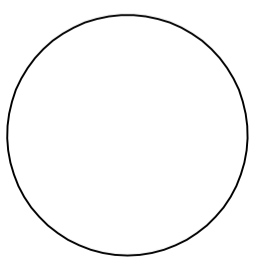

Revision
2

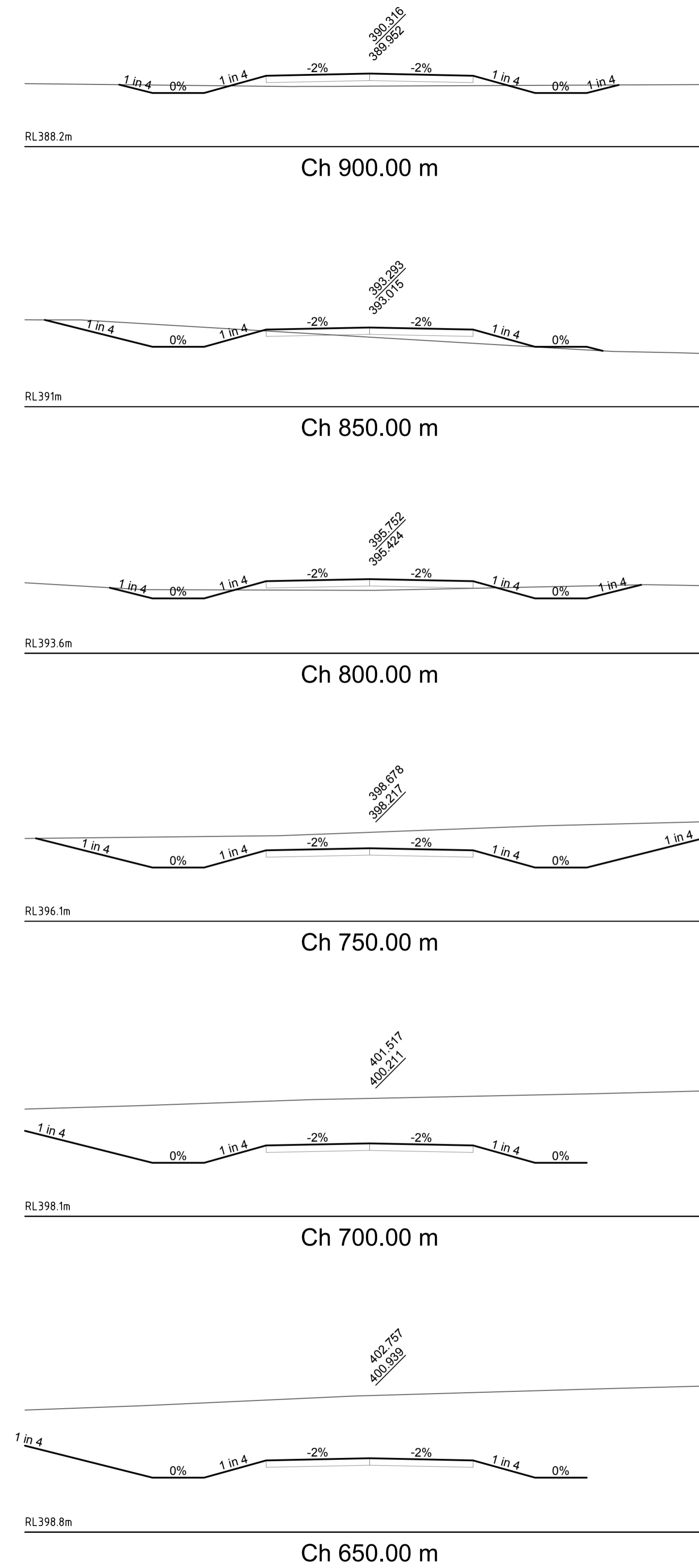
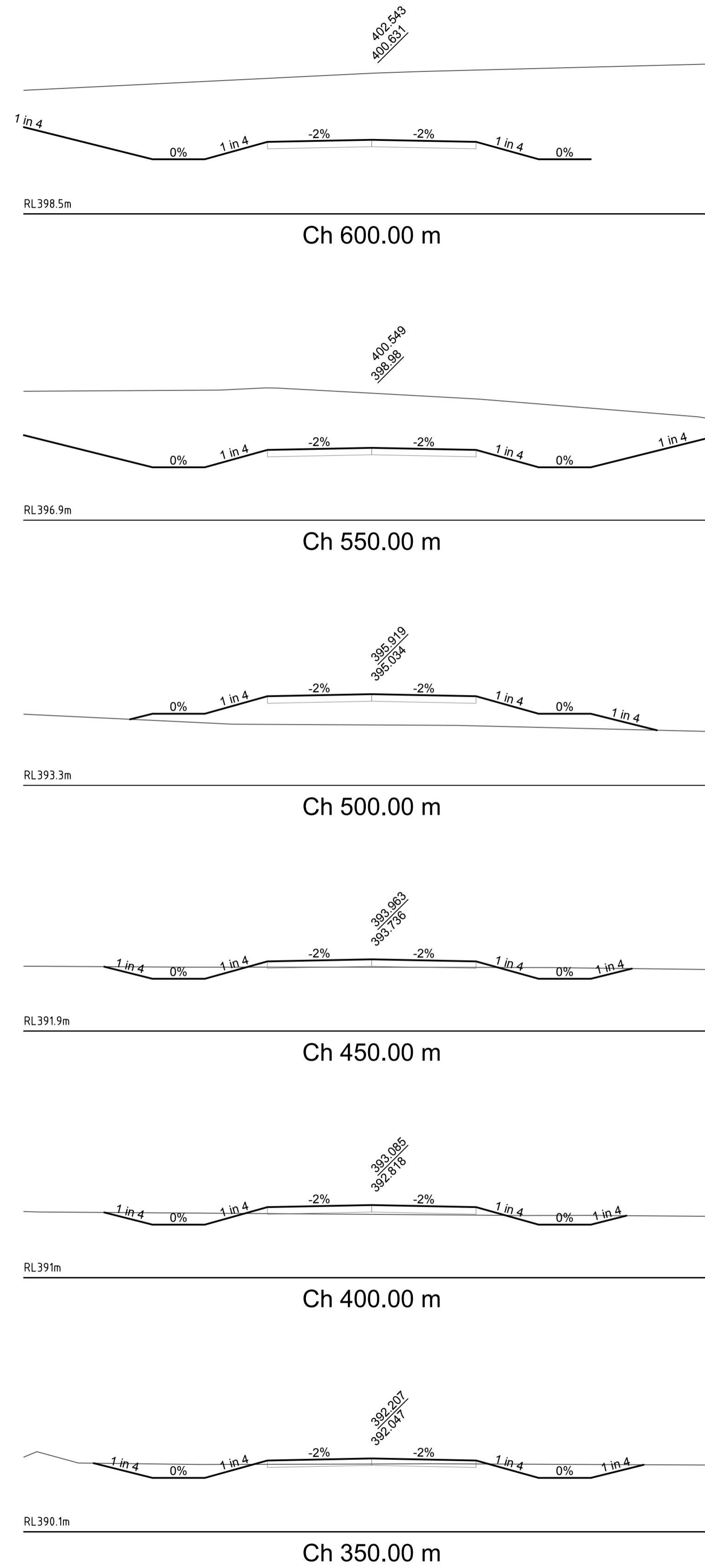
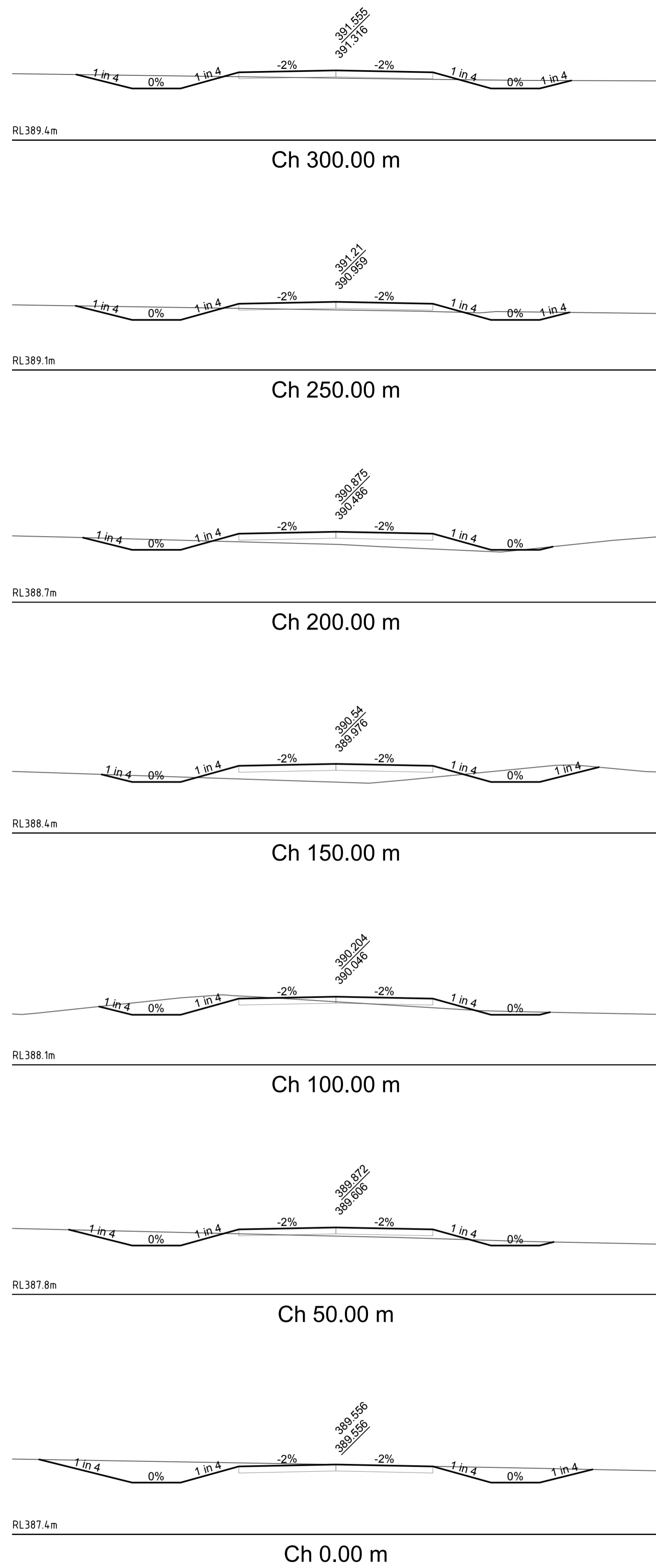
A1 SHEET





SCALES: HORIZONTAL 1:1000 VERTICAL 1:200
Access Road 4 From 720.000 to 871.902

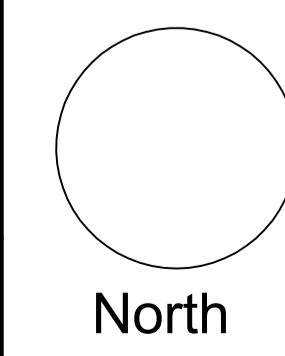
				Copyright This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd. It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission. Unauthorised use of this drawing is prohibited		 North	 LRCE Lance Ryan Consulting Engineers Pty Ltd Consulting Engineers Planners & Managers A.B.N. 53 631 529 091 52 Johnston Street, WAGGA WAGGA NSW 2650 P.O. Box 7 WAGGA WAGGA NSW 2650 Ph: 02 6921 1877 Mob: 0429 037 956 Fax: 02 6921 7415 Email: lance@lrce.com.au	Project ProTen Poultry Sheds Rushes Creek Tamworth		Drawing Title Access Road 4 Plan and Longsections	
2 Issued for Information - Road 3 and 4 Amended		23.08.2018	L.V.R.	L.V.R.	L.V.R.			Client ProTen		Scales H:1000, V1:200	
1 Issued for Information		15.05.2018	L.V.R.	L.V.R.	L.V.R.	Architect / Project Manager ProTen		Project Number 17W003		Dwg. No. C37	
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)			Sheet 37 of 44		Revision 2



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.

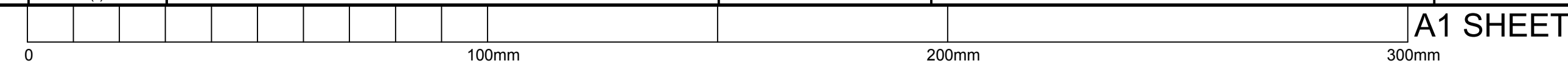


LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

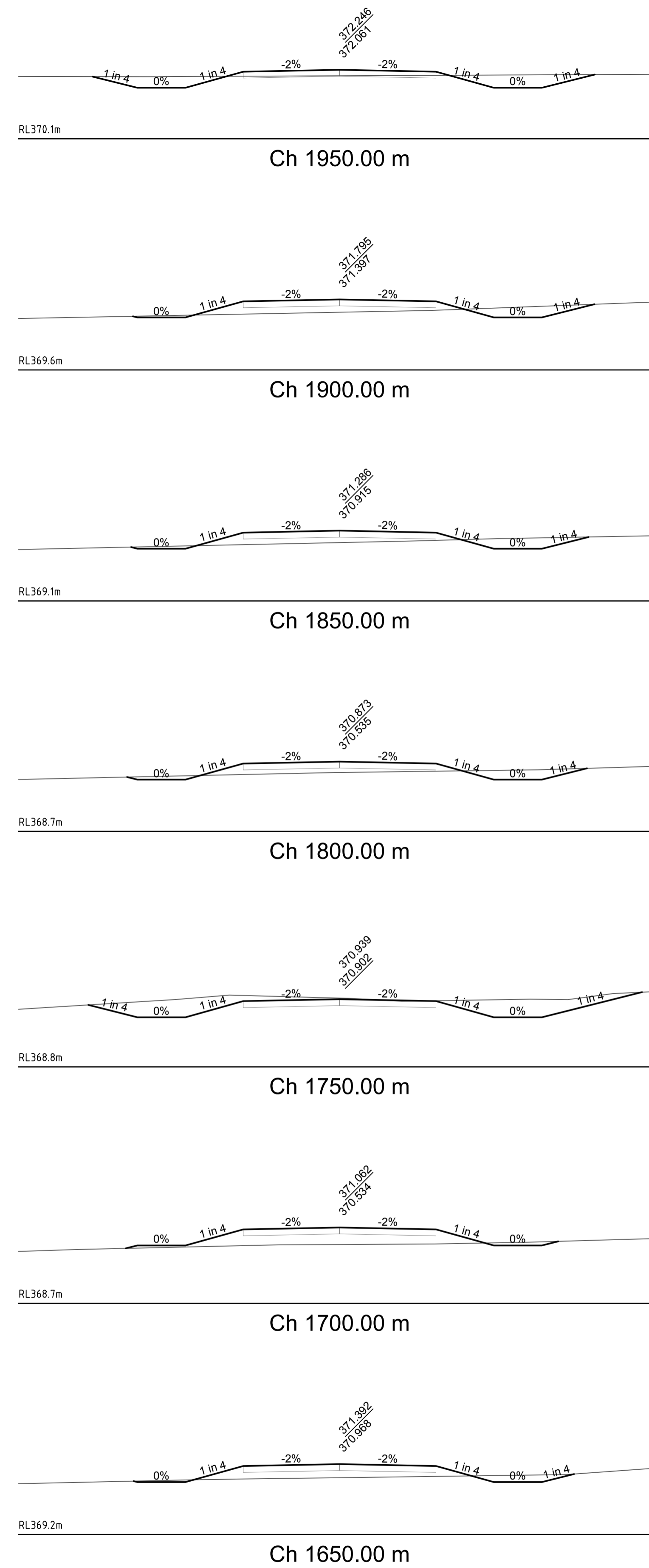
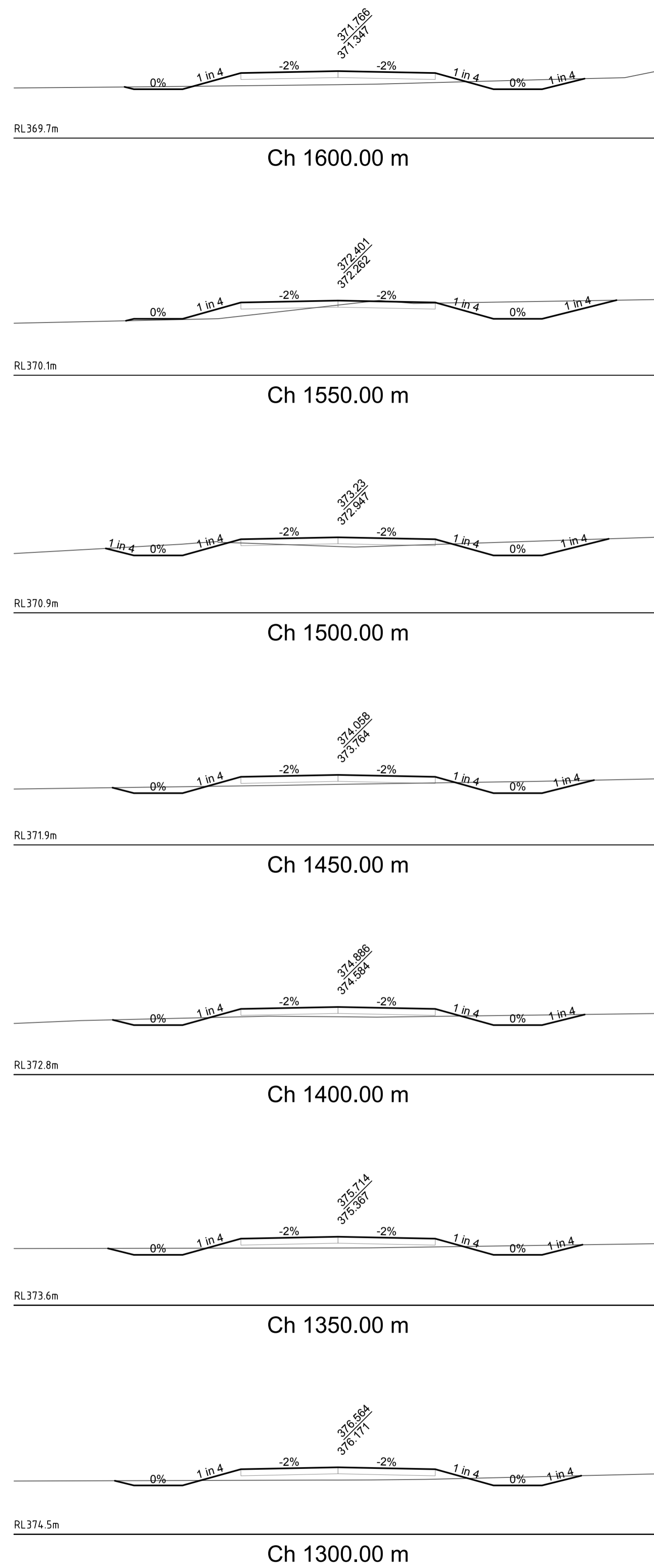
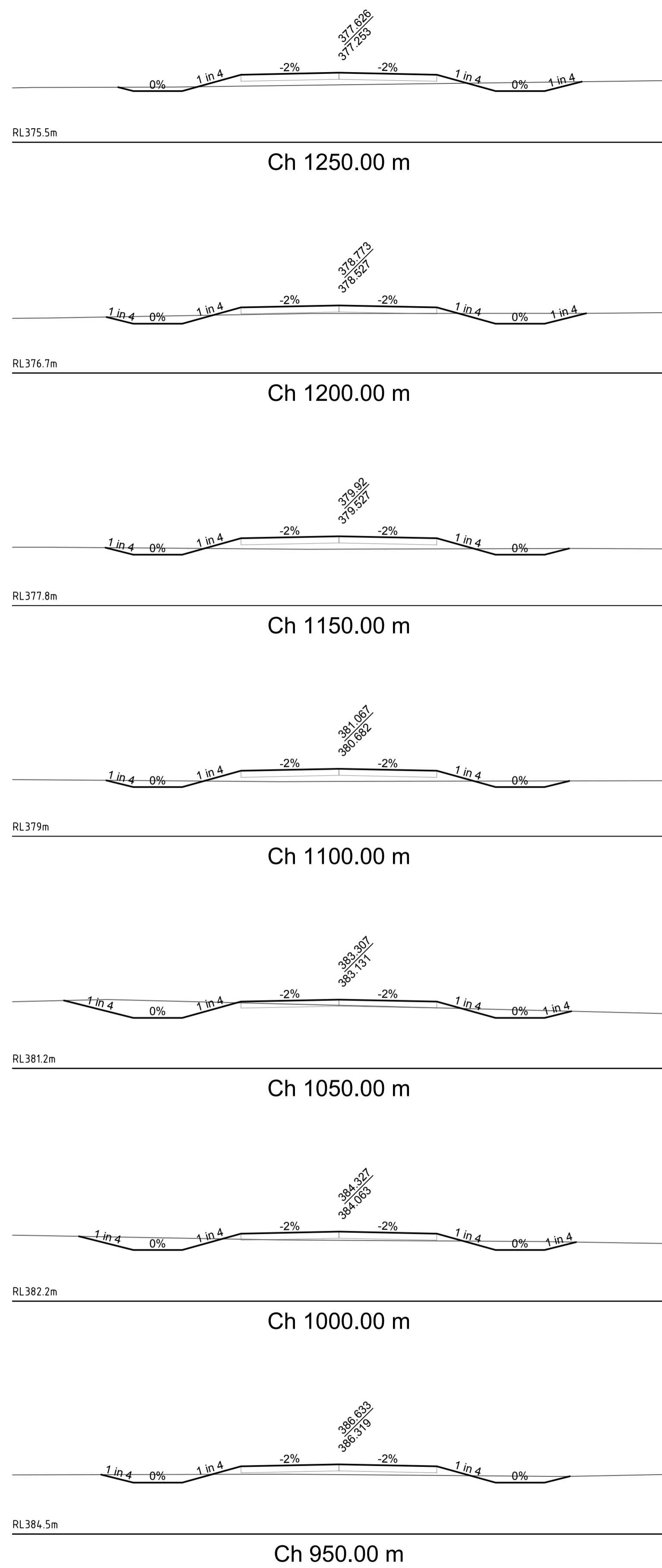
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 966
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Access Road 1 Cross Sections
Client ProTen	Architect / Project Manager ProTen
Project Number 17W003	Dwg. No. C38
Client Project No.	Sheet 38 of 44
Revision 2	



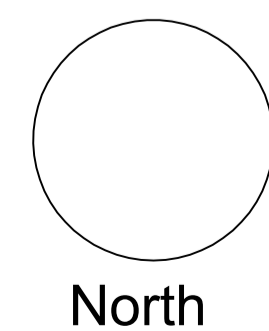
A1 SHEET



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lancevryan@gmail.com

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Access Road 1
Cross Sections

Scales
H:100, V1:100

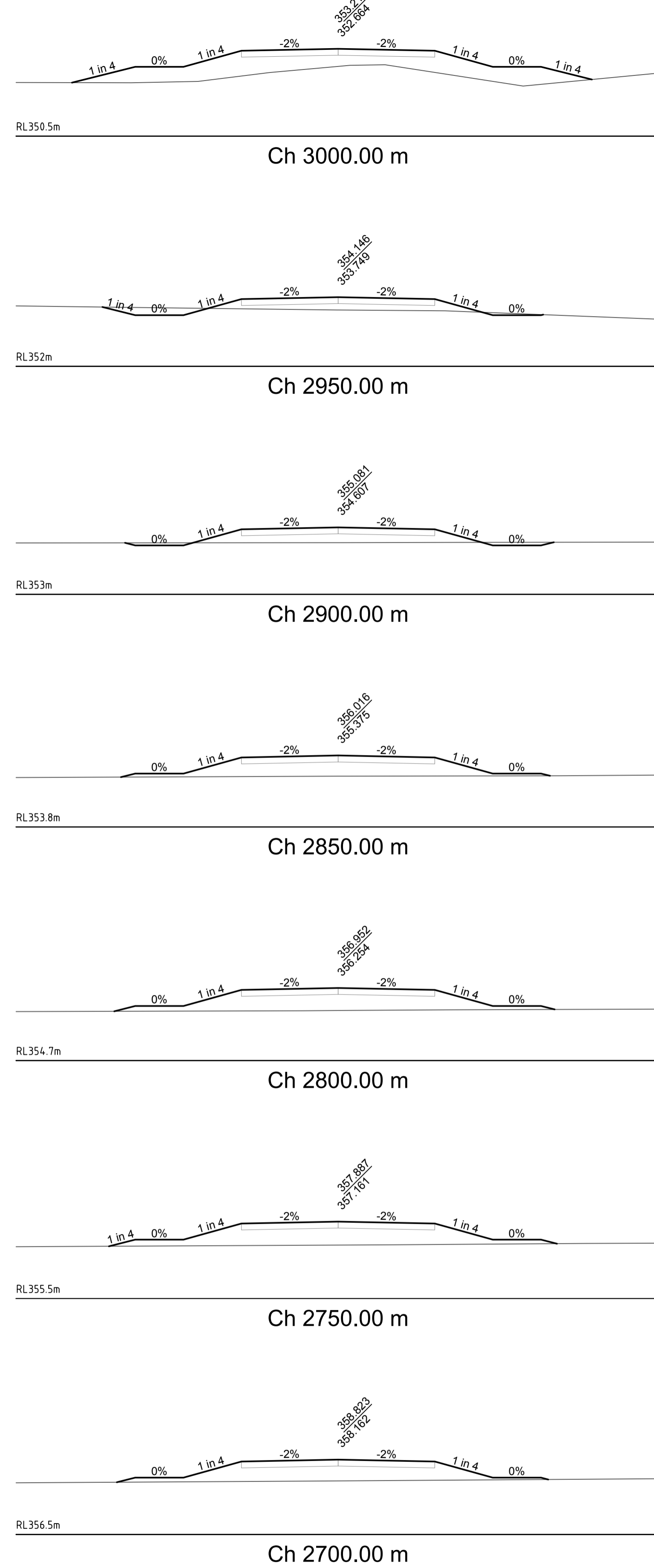
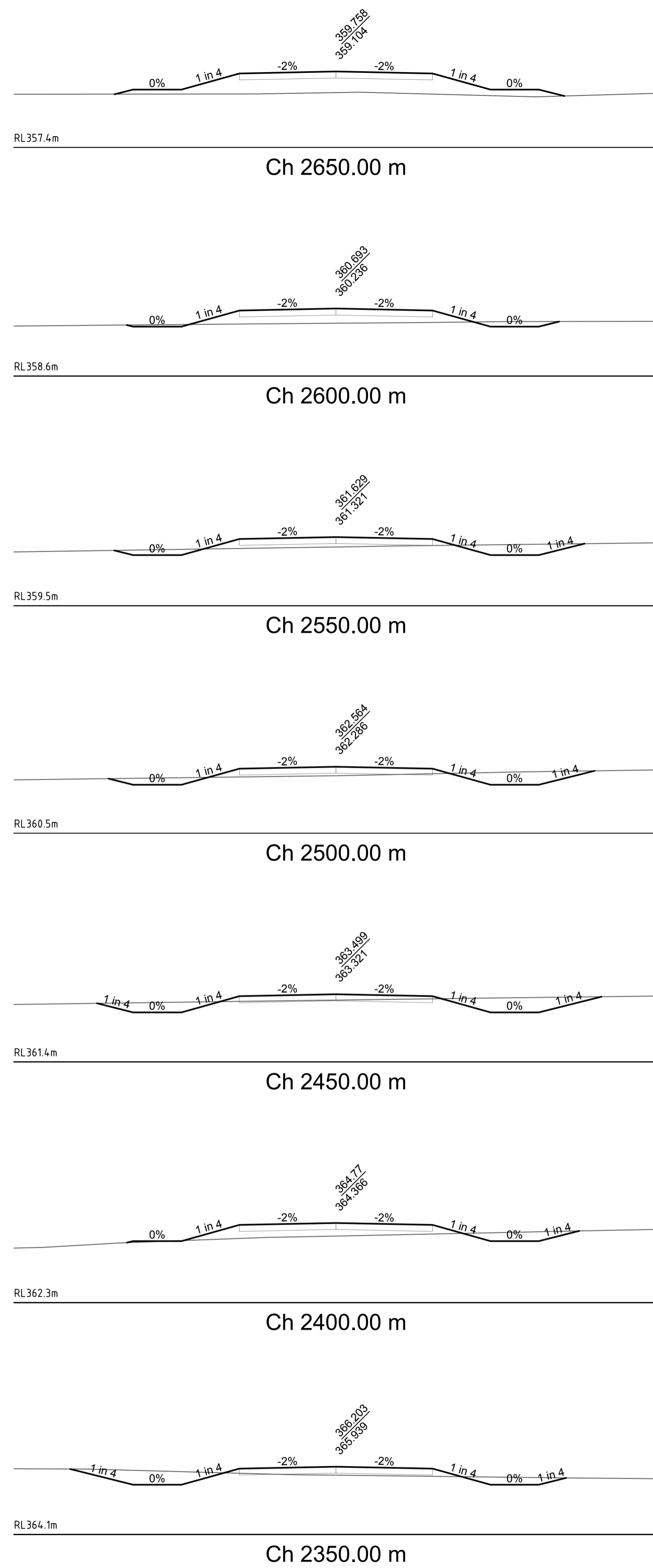
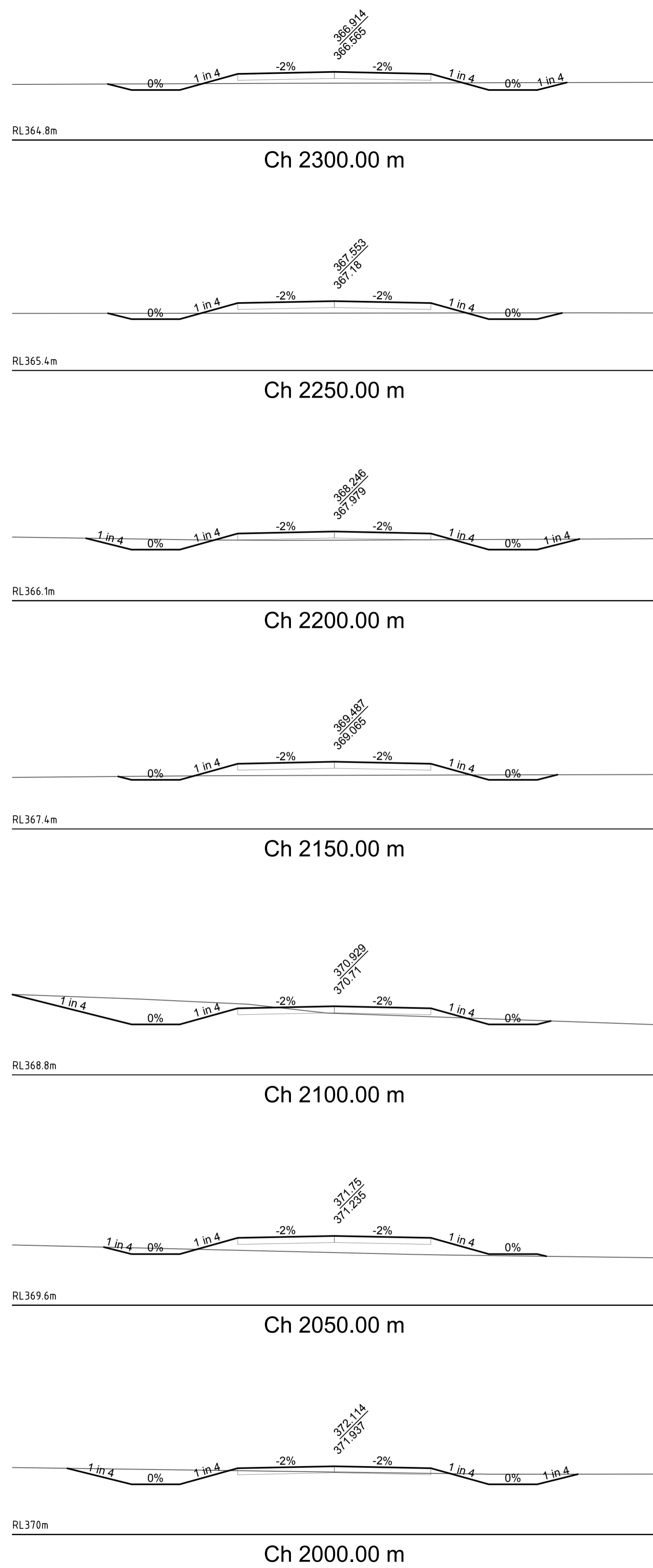
Project Number
17W003

Dwg. No.
C39

Client Project No.
Sheet
39 of 44
Revision
2

A1 SHEET

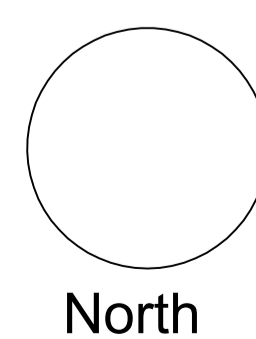
0 100mm 200mm 300mm



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.

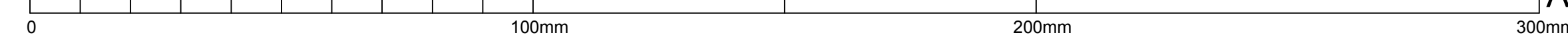


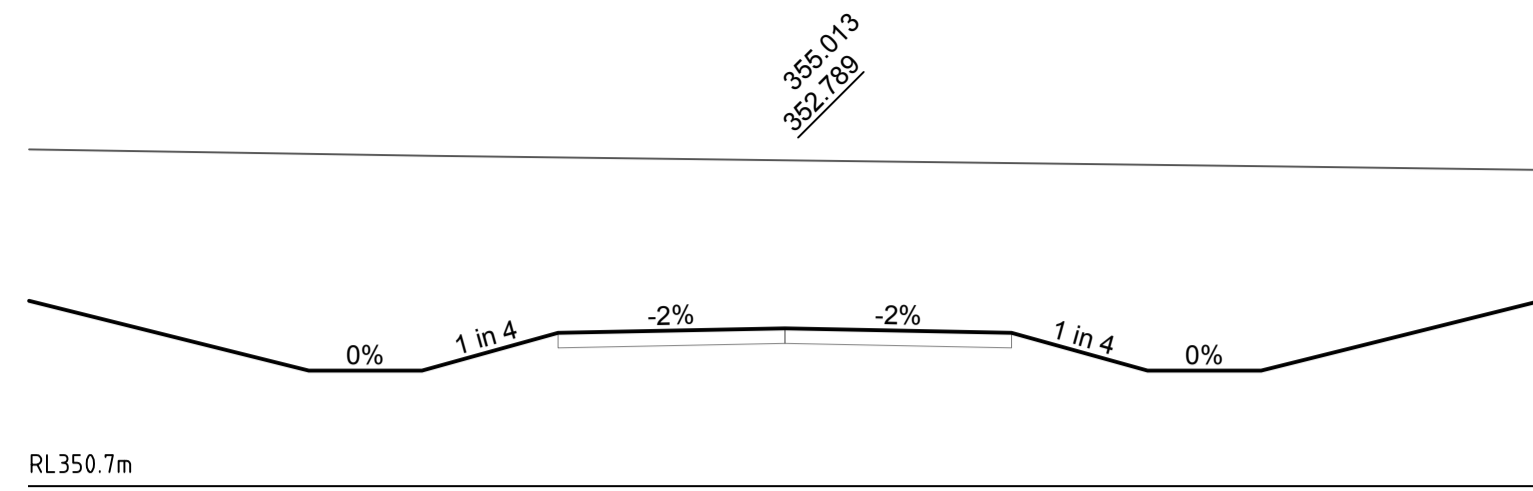
LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

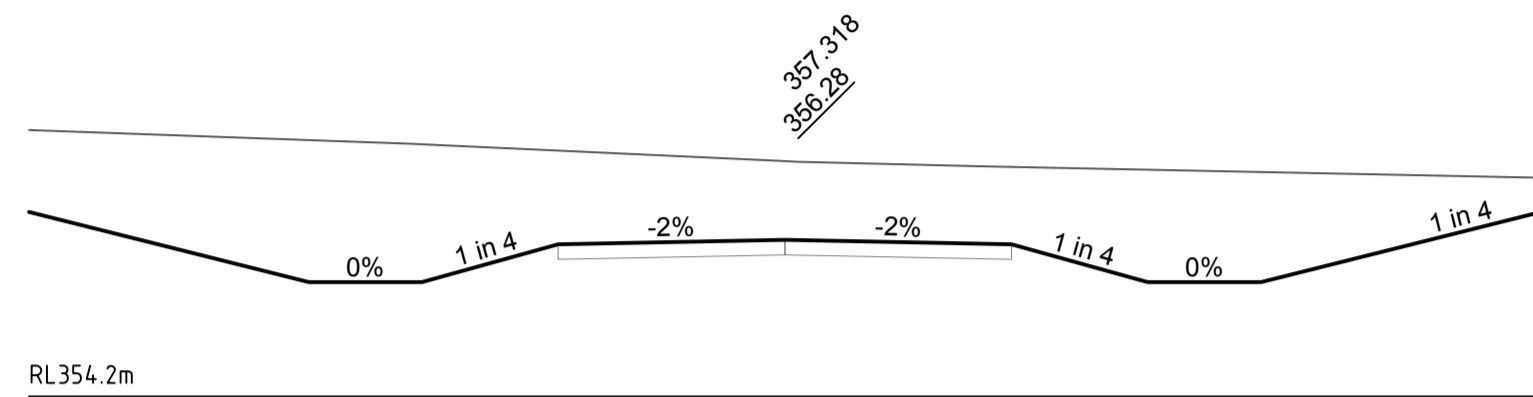
Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Access Road 1 Cross Sections
Client ProTen	Architect / Project Manager ProTen
Project Number 17W003	Dwg. No. C40
Client Project No.	Sheet 40 of 44
Revision 2	

A1 SHEET

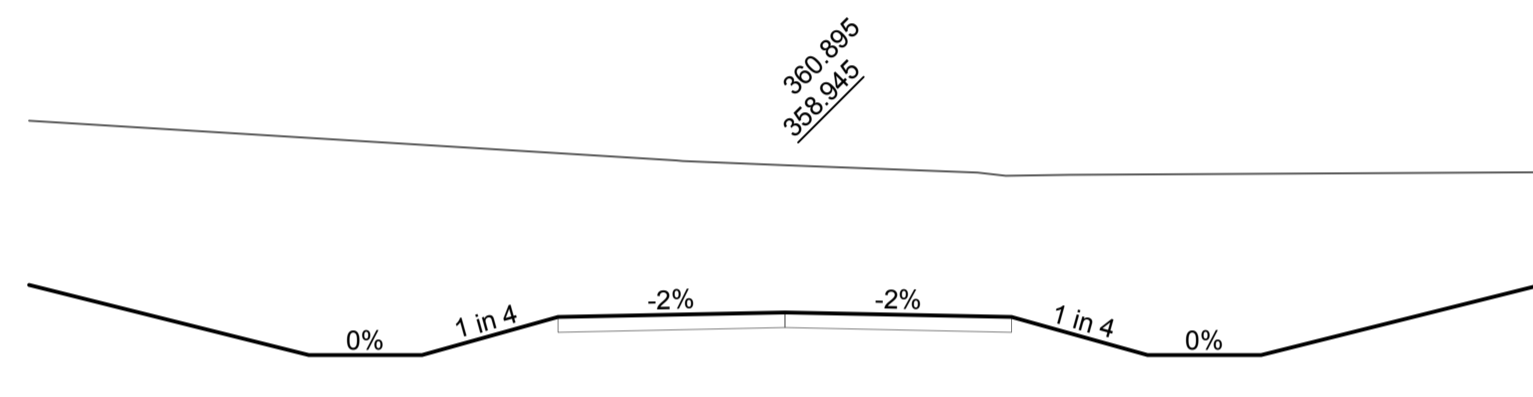




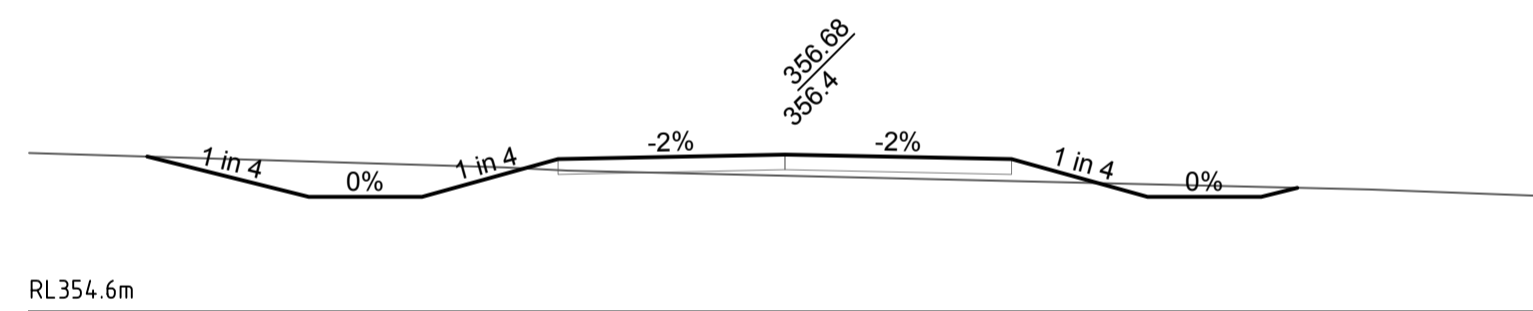
Ch 3300.00 m



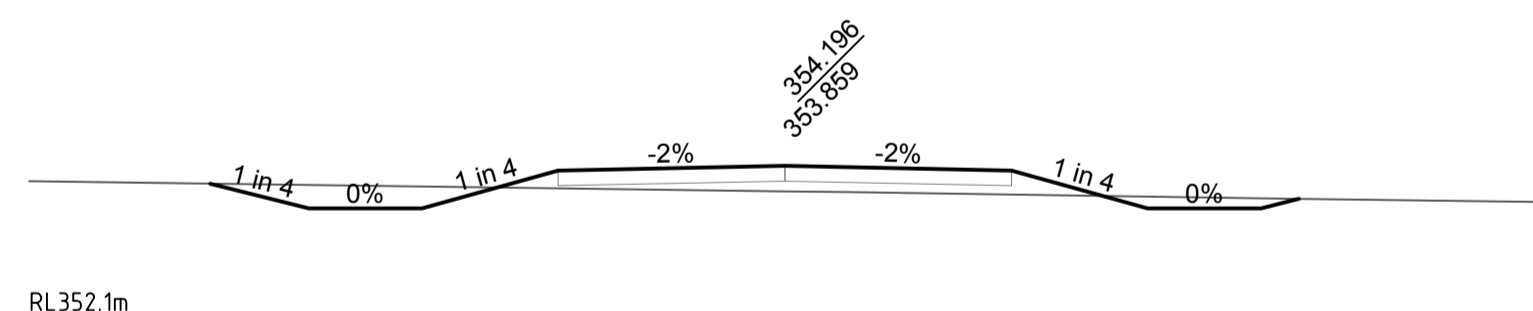
Ch 3250.00 m



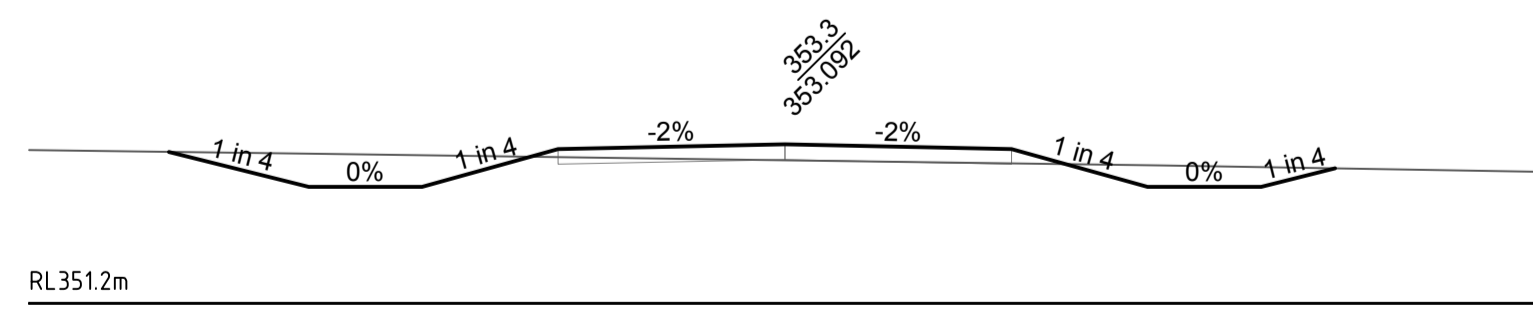
Ch 3200.00 m



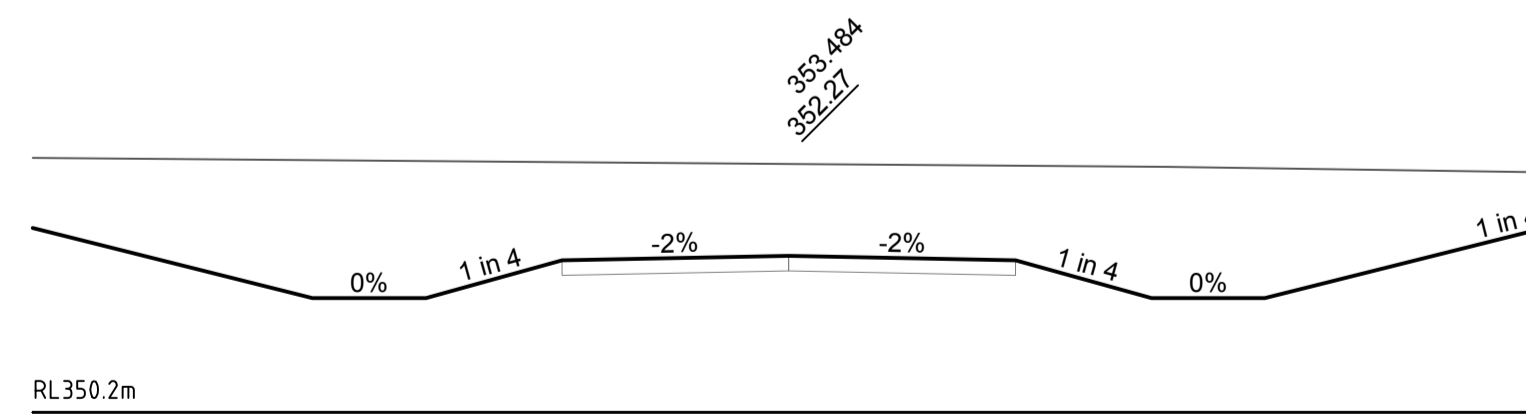
Ch 3150.00 m



Ch 3100.00 m



Ch 3050.00 m

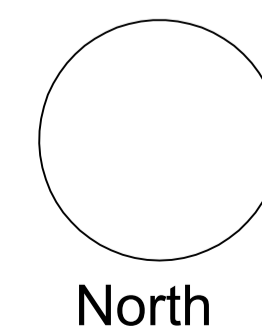


Ch 3339.69 m

Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 831 529 091
52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrcce.com

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen
Architect / Project Manager
ProTen

Drawing Title
Access Road 1
Cross Sections

Scales
H:100, V1:100

Project Number
17W003

Dwg. No.
C41

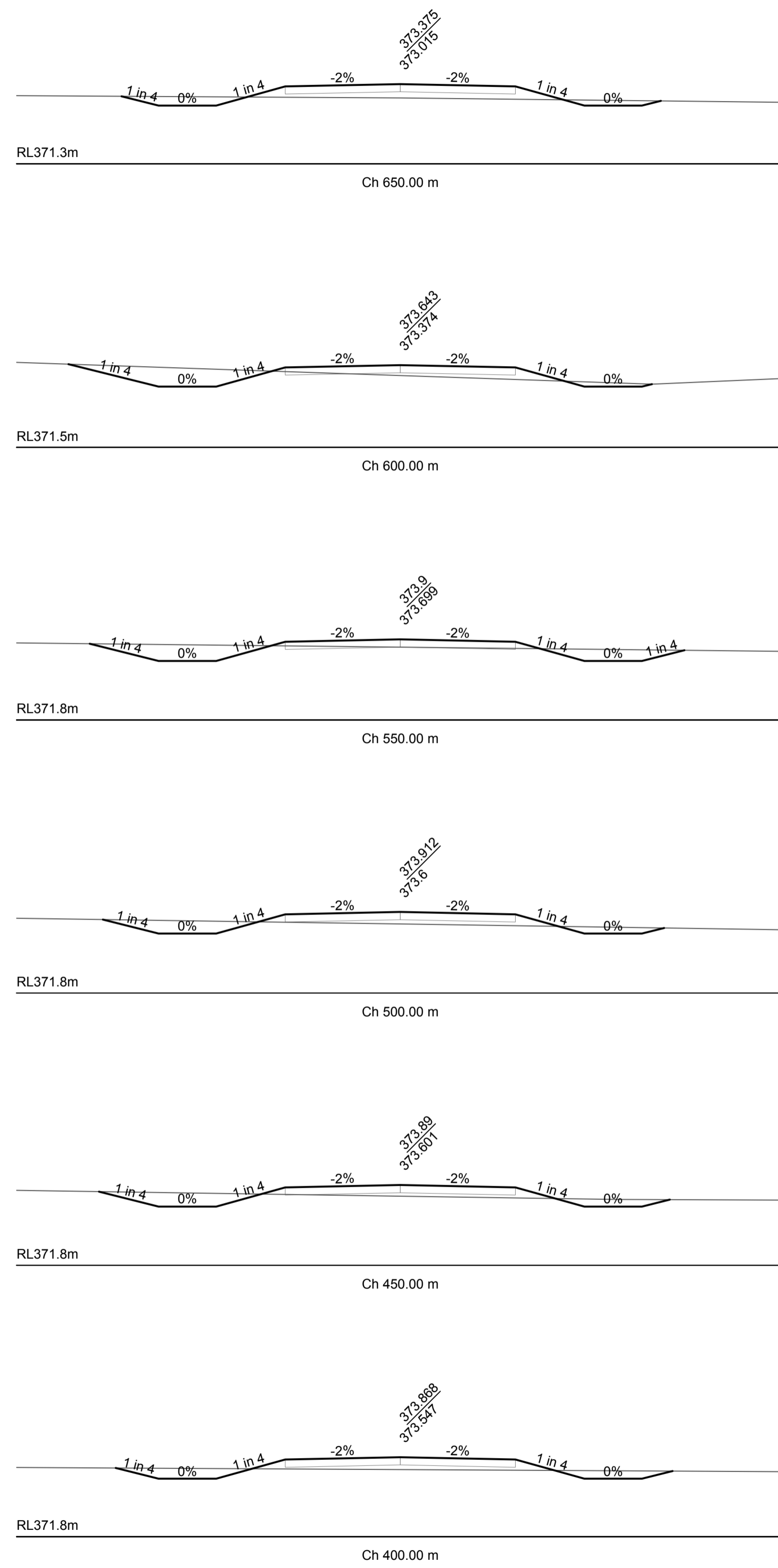
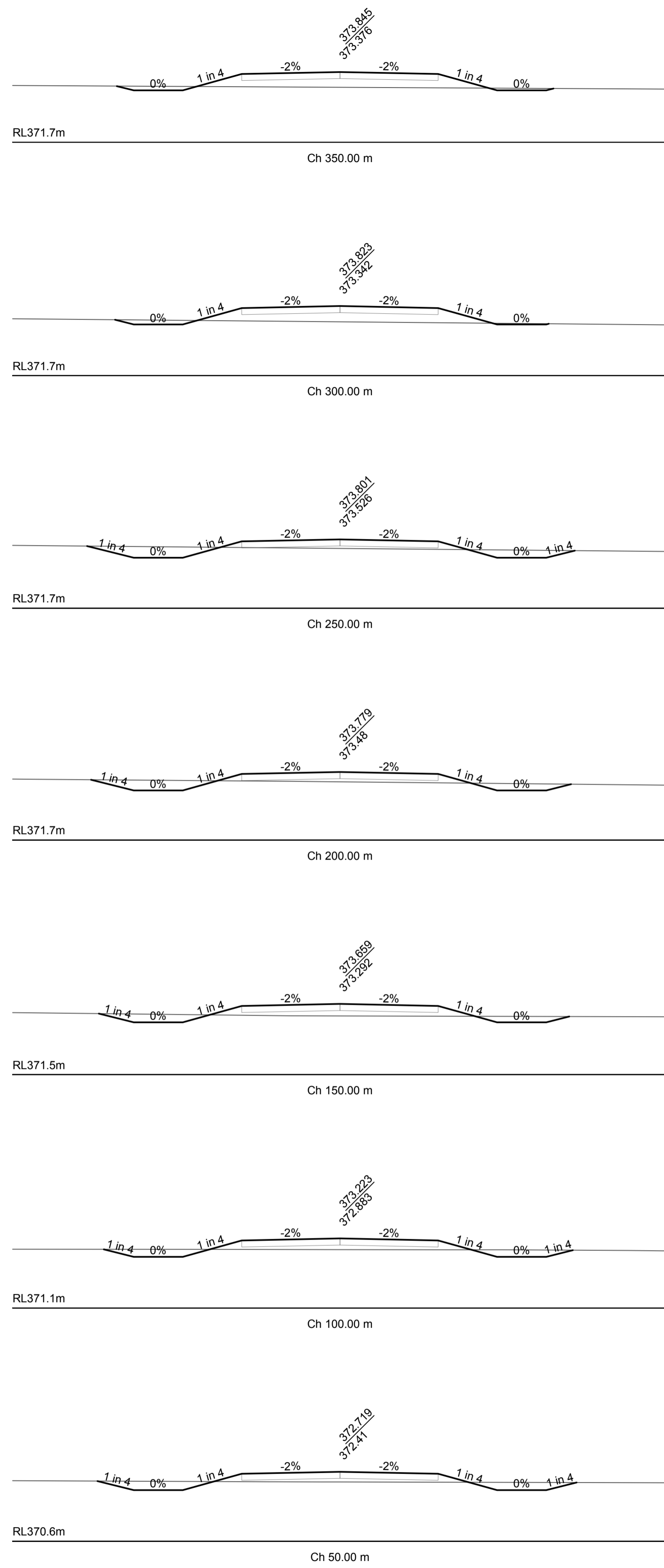
Client Project No.

Sheet
41 of 44

Revision
2

0 100mm 200mm 300mm

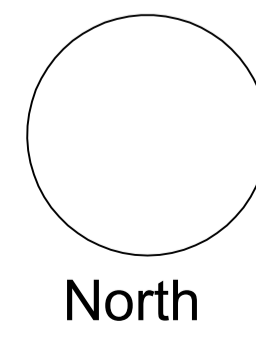
A1 SHEET



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at *, this drawing is not authorised for issue.



LRCE
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project
ProTen Poultry Sheds
Rushes Creek
Tamworth

Client
ProTen

Architect / Project Manager
ProTen

Drawing Title
Access Road 2
Cross Sections

Scales
H:100, V1:100

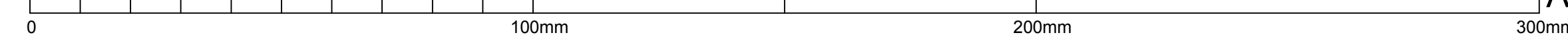
Client Project No.

Project Number
17W003

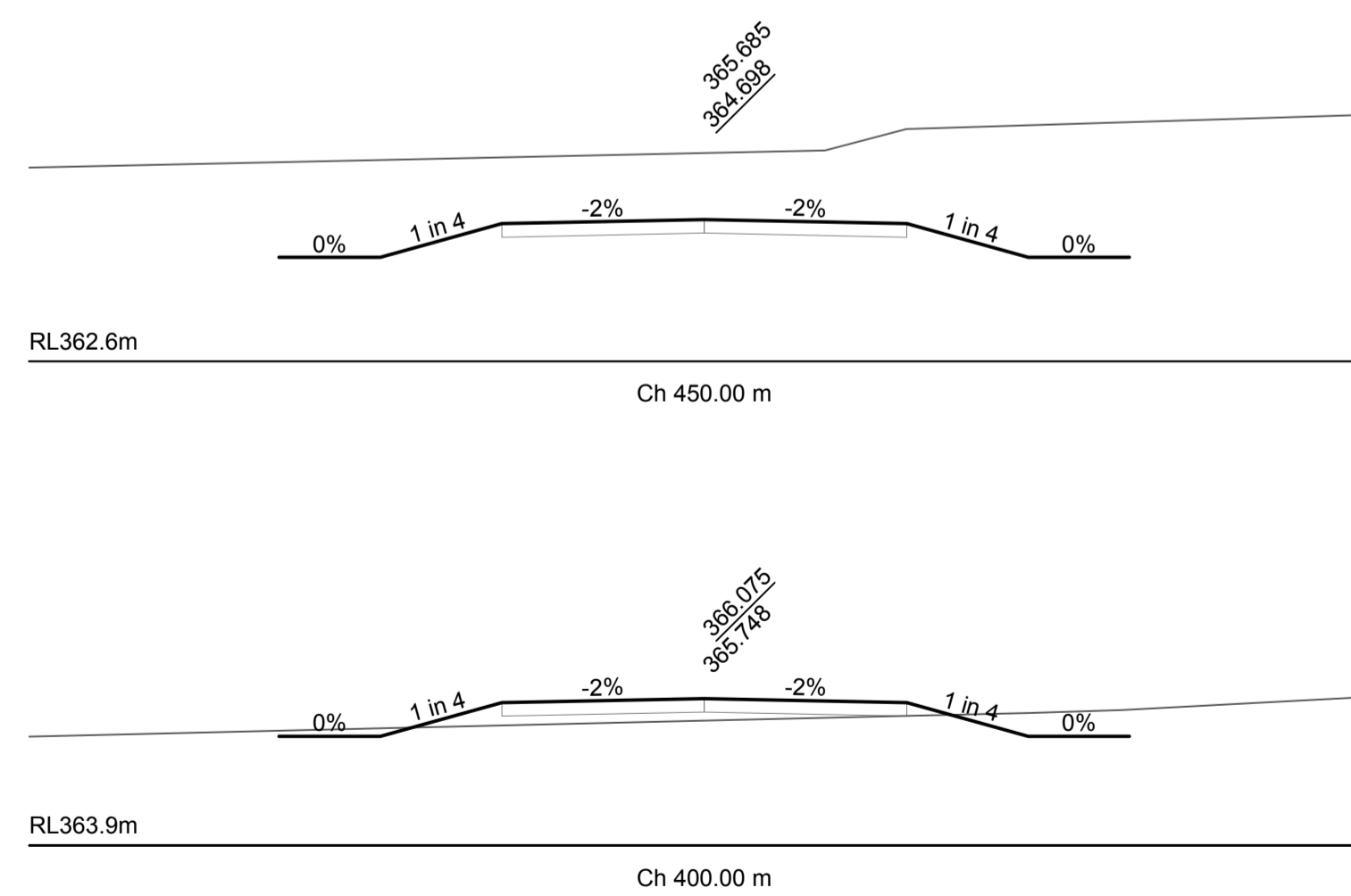
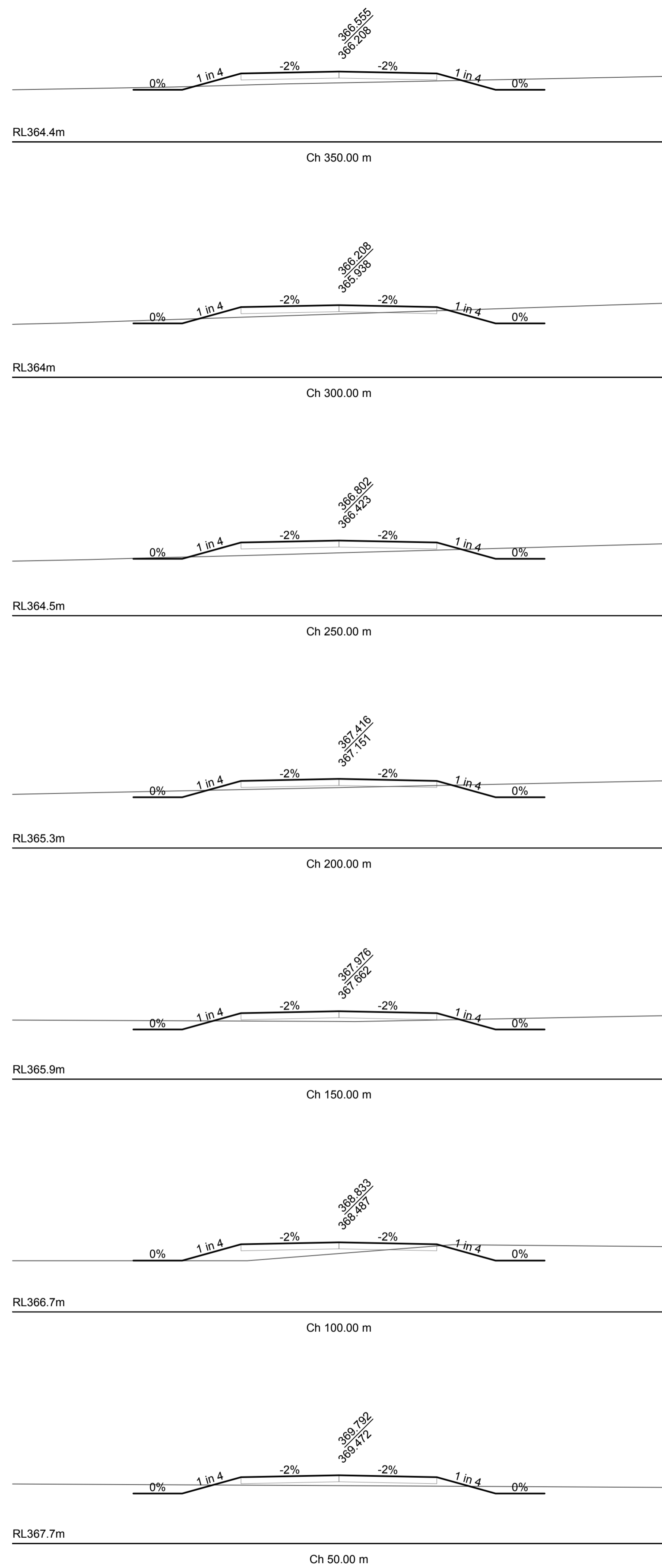
Dwg. No.
C42

Sheet
42 of 44

Revision
2



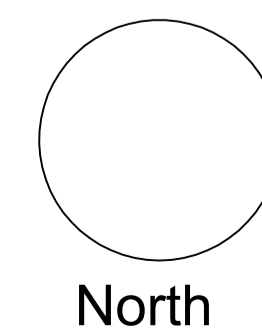
A1 SHEET



Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified	Issue authorised (*)
2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.	
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.	

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

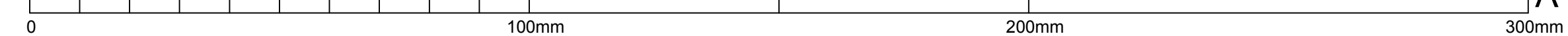
Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

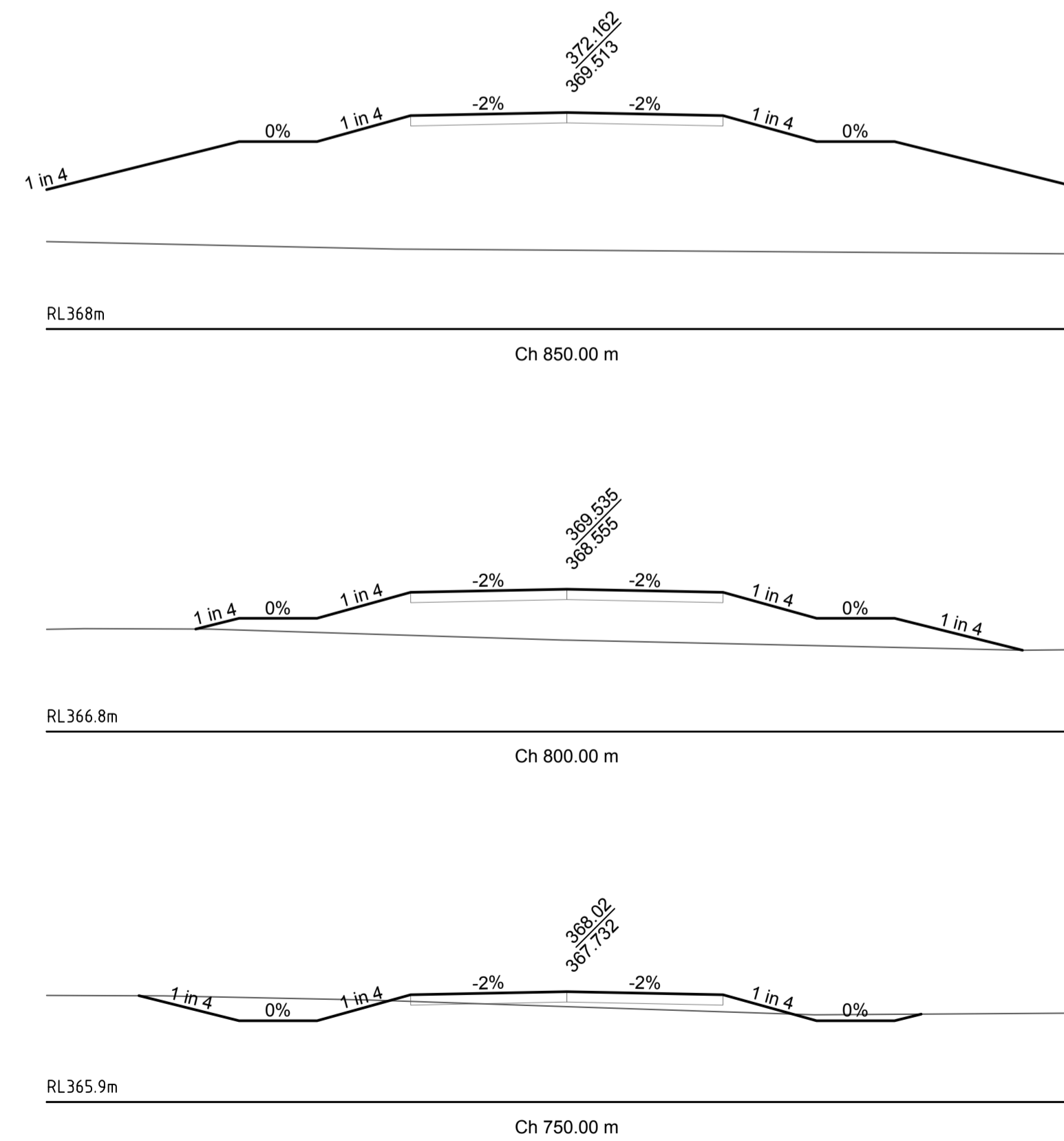
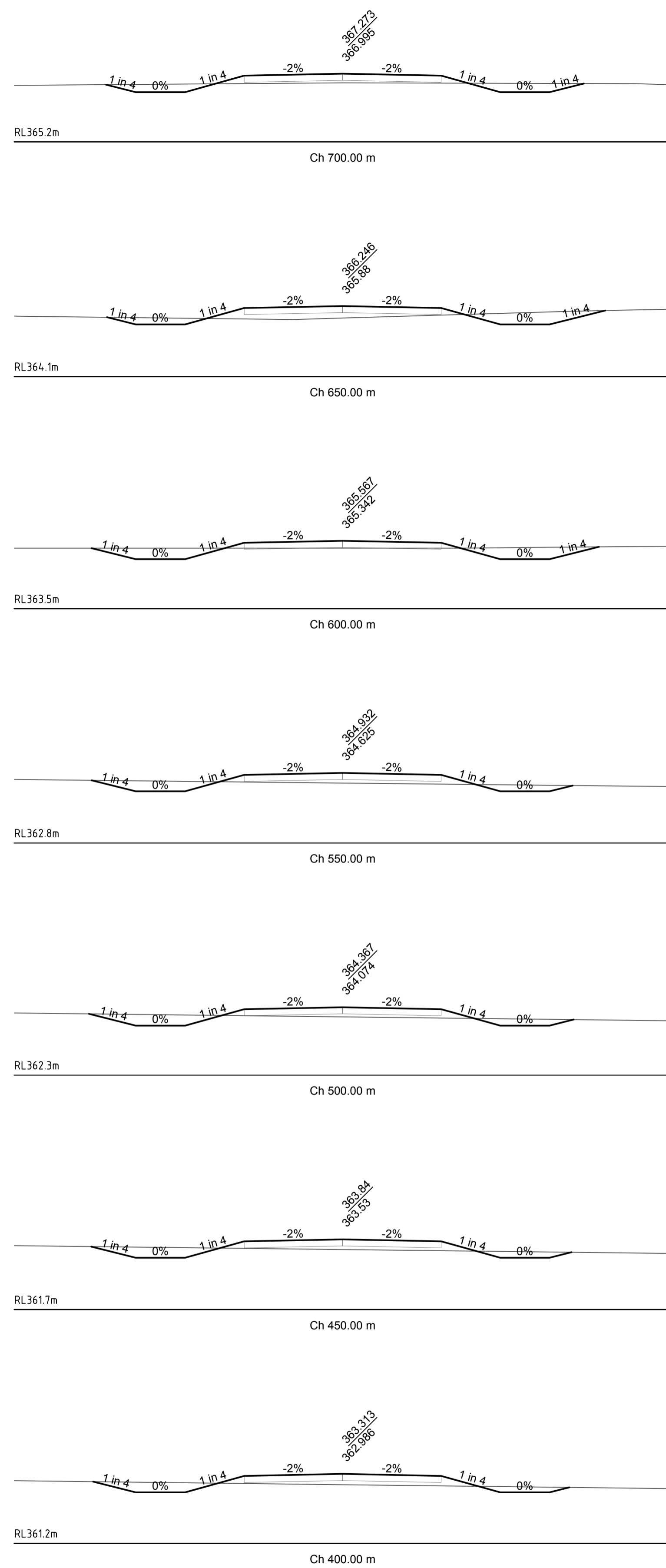
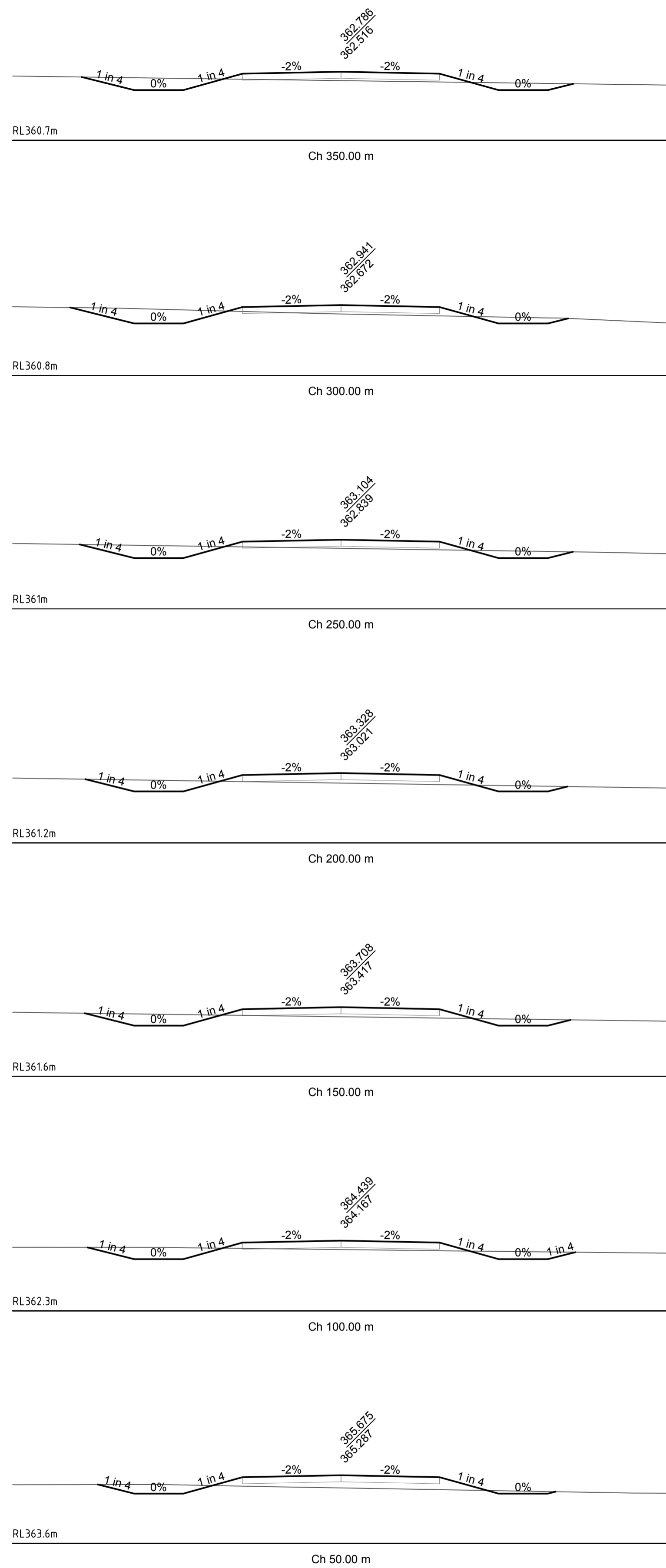
Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	
Client ProTen	
Architect / Project Manager ProTen	

Drawing Title Access Road 3 Cross Sections		Scales H:100, V1:100		Client Project No.	
Project Number 17W003	Dwg. No. C43	Sheet 43 of 44	Revision 2		



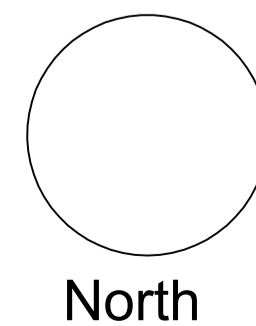
A1 SHEET



2	Issued for Information - Road 3 and 4 Amended	23.08.2018	L.V.R.	L.V.R.	L.V.R.
1	Issued for Information	15.05.2018	L.V.R.	L.V.R.	L.V.R.
Revision	Amendment or reason for issue	Issue date	Drawing completed by	Designed & dwg. checked by	Verified by X = Not verified

Copyright
This drawing remains the property of Lance Ryan Consulting Engineers Pty Ltd.
It may only be used for the purpose for which it was commissioned & in accordance with the terms of engagements for that commission.
Unauthorised use of this drawing is prohibited

* Drawing Status
Warning: Unless there is an authorised Lance Ryan Consulting Engineers Pty Ltd. signature at * , this drawing is not authorised for issue.



LRCE

Lance Ryan Consulting Engineers Pty Ltd
Consulting Engineers Planners & Managers
A.B.N. 53 631 529 091

52 Johnston Street,
WAGGA WAGGA NSW 2650
P.O. Box 7
WAGGA WAGGA NSW 2650

Ph: 02 6921 1877
Mob: 0429 037 995
Fax: 02 6921 7415
Email: lance@lrce.com.au

Project ProTen Poultry Sheds Rushes Creek Tamworth	Drawing Title Access Road 4 Cross Sections
Client ProTen	Scales H:100, V1:100
Architect / Project Manager ProTen	Client Project No.
Project Number 17W003	Dwg. No. C44
Sheet 44 of 44	Revision 2

A1 SHEET

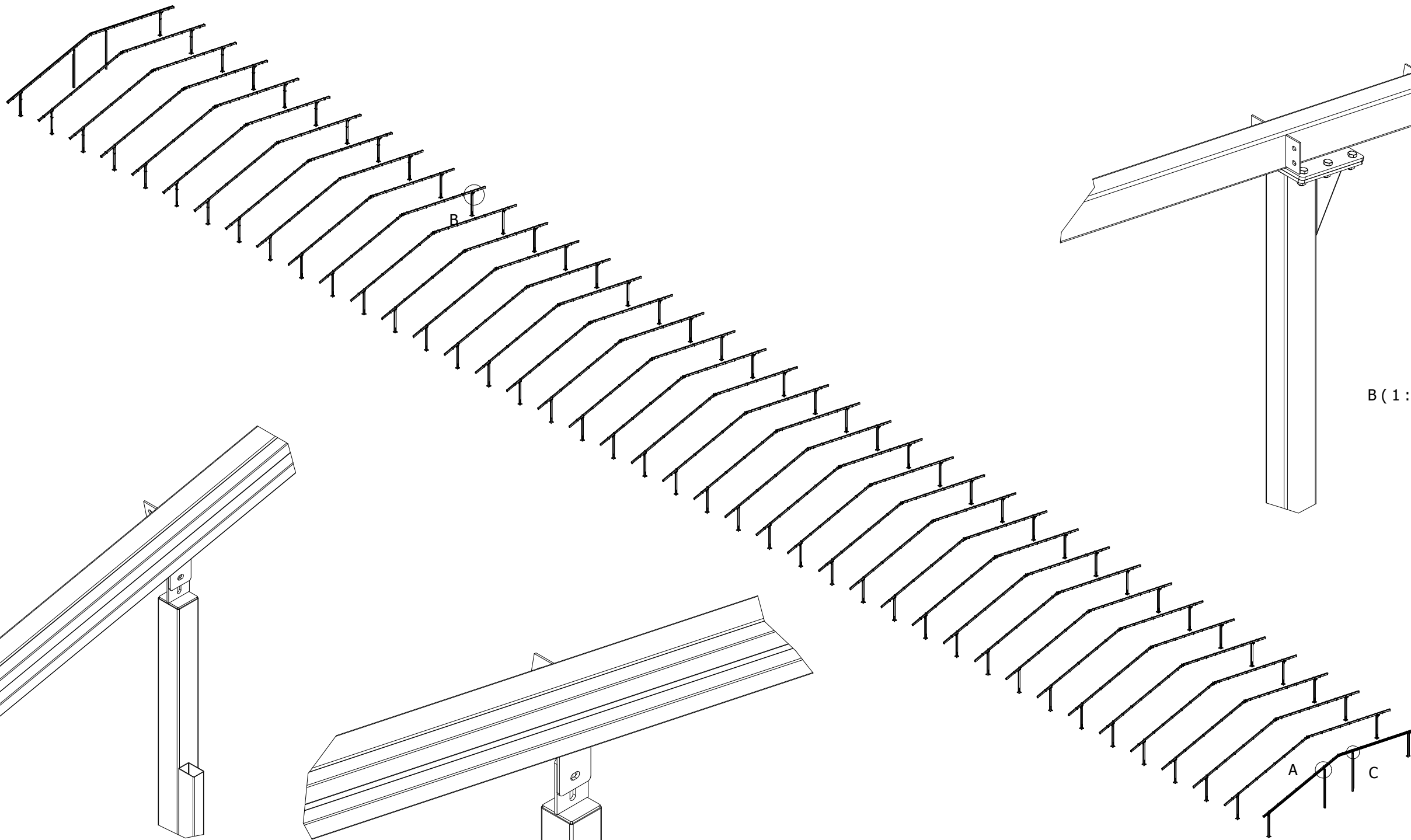
0 100mm 200mm 300mm

Appendix L

Preliminary Infrastructure Design Drawings/ Plans/Specifications



POULTRY SHEDS

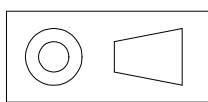


A (1 : 15)


B (1 : 15)

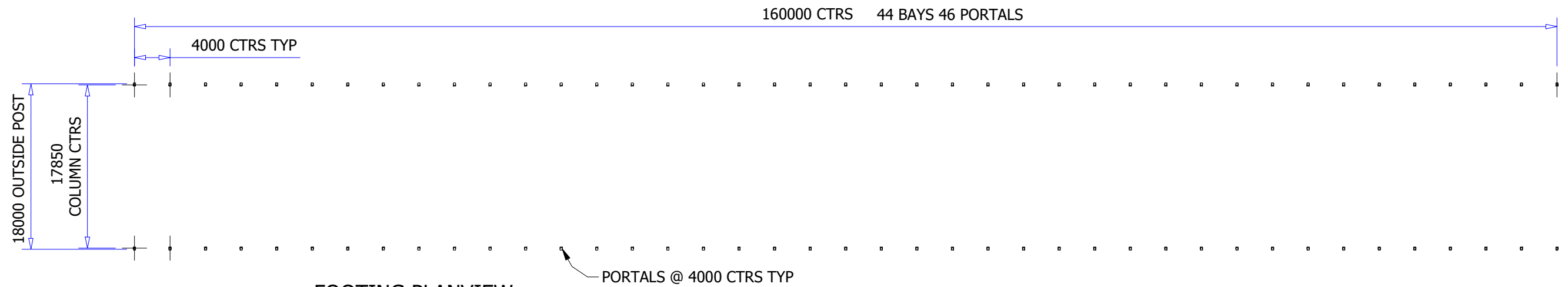
C (1 : 10)

A C

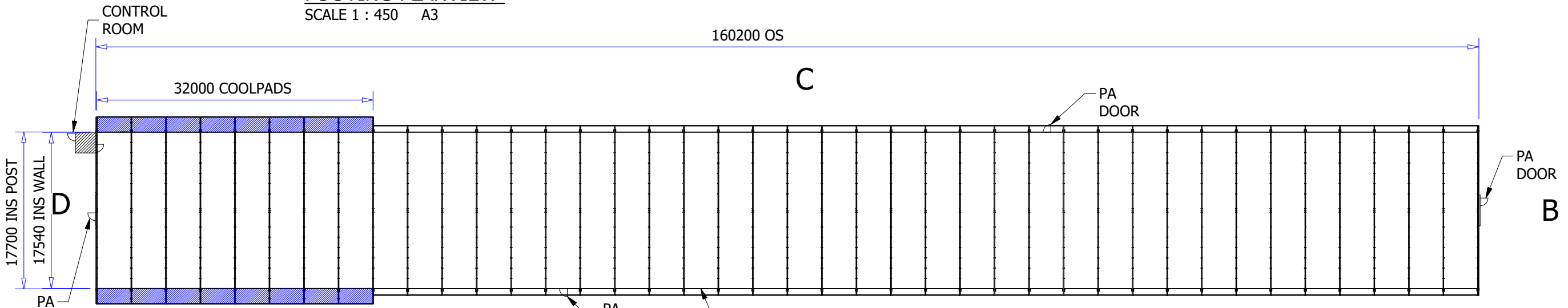


DO NOT SCALE
ALL DIMENSIONS IN MM

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		
		OVERVIEW	Edition	Sheet 1 / 8

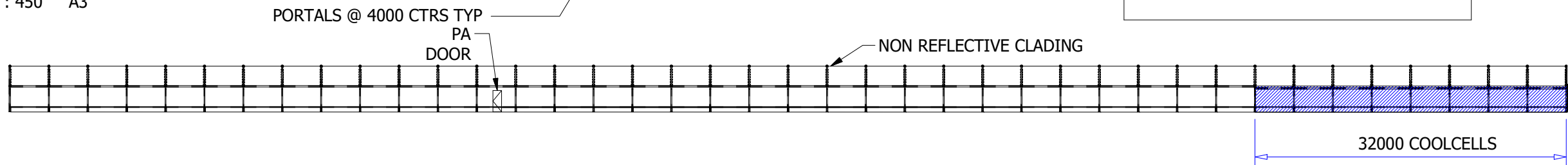


FOOTING PLANVIEW
SCALE 1 : 450 A3

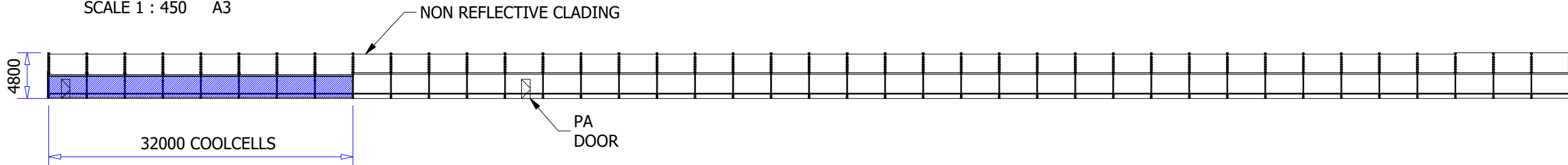


PLANVIEW
SCALE 1 : 450 A3

Walls Are 50mm Sandwich Panel

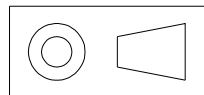


C ELEVATION
SCALE 1 : 450 A3



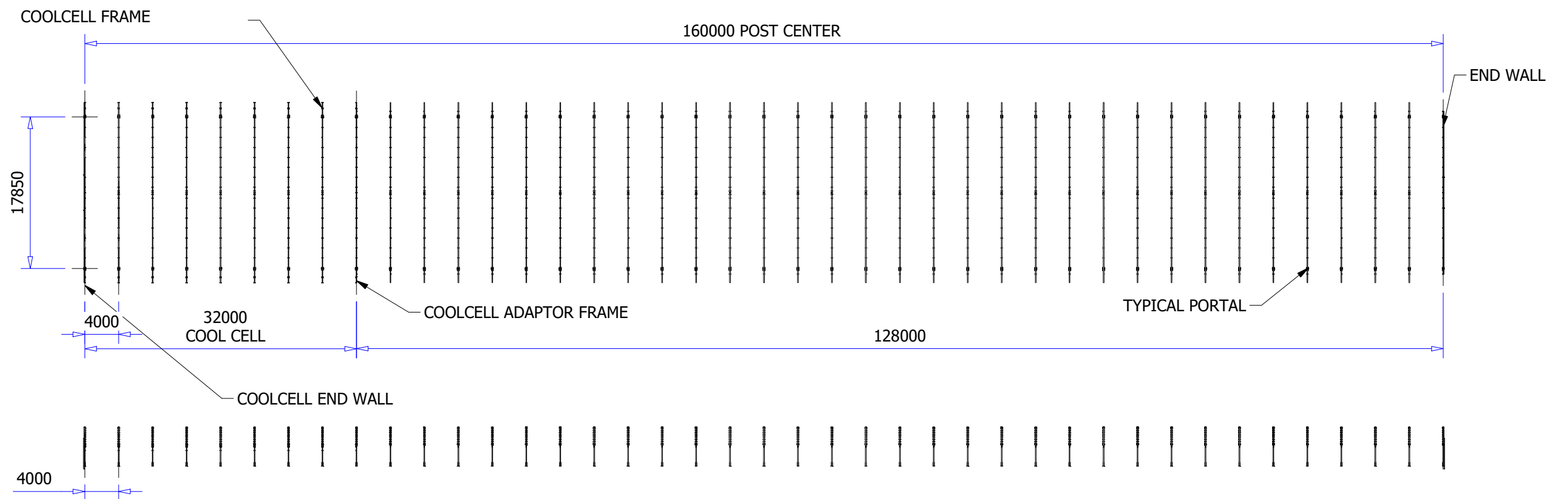
A ELEVATION
SCALE 1 : 450 A3

NOTE :
PA DOORS TO BE OPENED OUTWARD WITH A SINGLE HANDED DOWNWARD LEAVER ACTION
HANDLE TO BE BETWEEN 900 AND 1100 MM ABOVE FFL

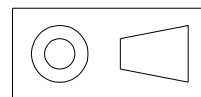
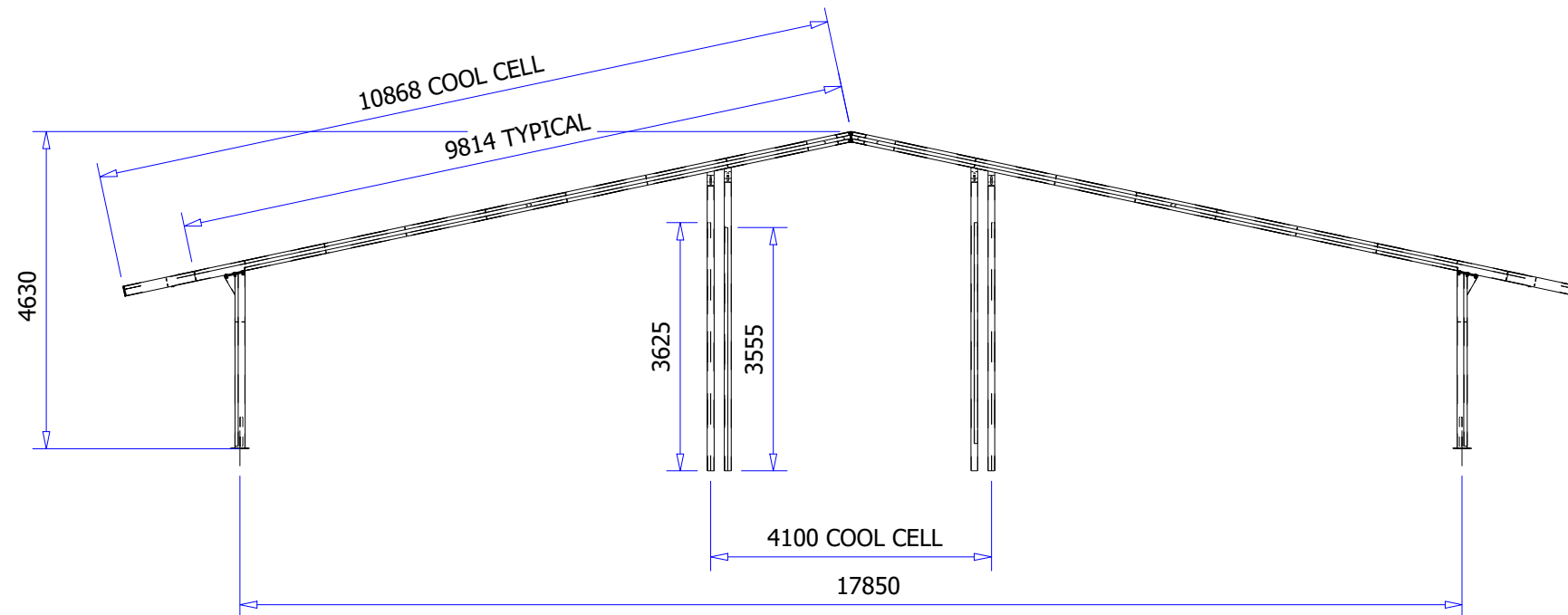


DO NOT SCALE
ALL DIMENSIONS IN MM

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		
		PLANVIEW & ELEVATIONS	Edition	Sheet 2 / 8

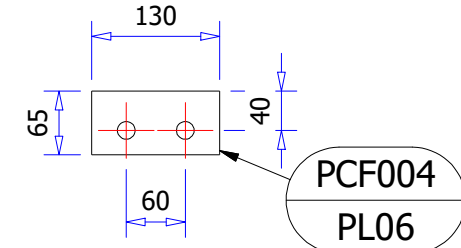
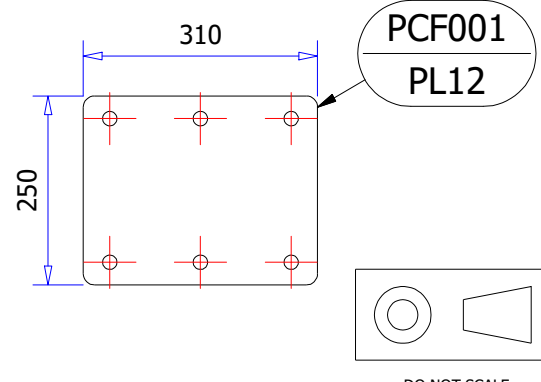
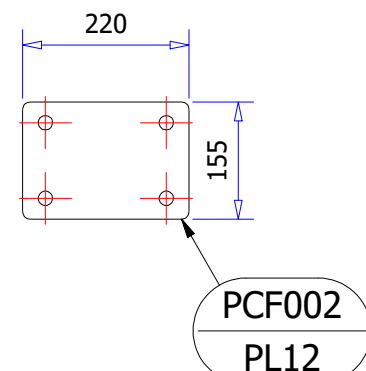
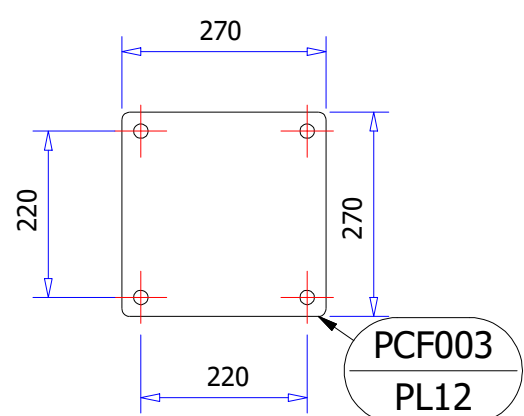
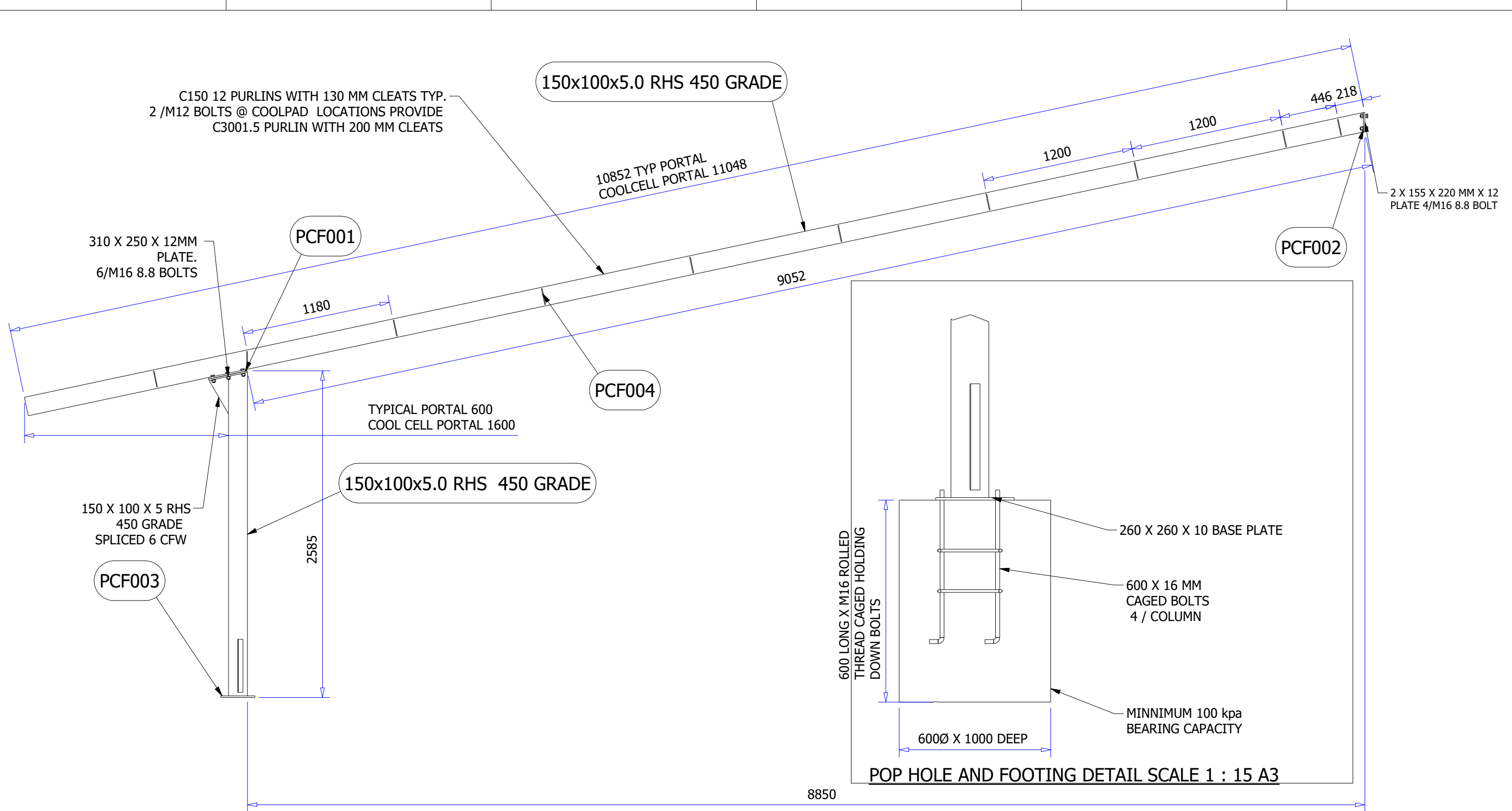


Parts List	
ITEM QTY	PART NUMBER
1	Cool Cell End Wall
1	B8
1	B7
1	C8
1	C7
1	DP1
1	DP2
7	Cool Cell
2	B4
2	C4
1	Cool Cell Adaptor Frame
1	B5
1	C5
1	B6
1	C6
31	Typical Portal
2	B1
2	C1
1	End Wall
1	B2
1	B3
1	C2
1	C3
1	DP3
1	DP4




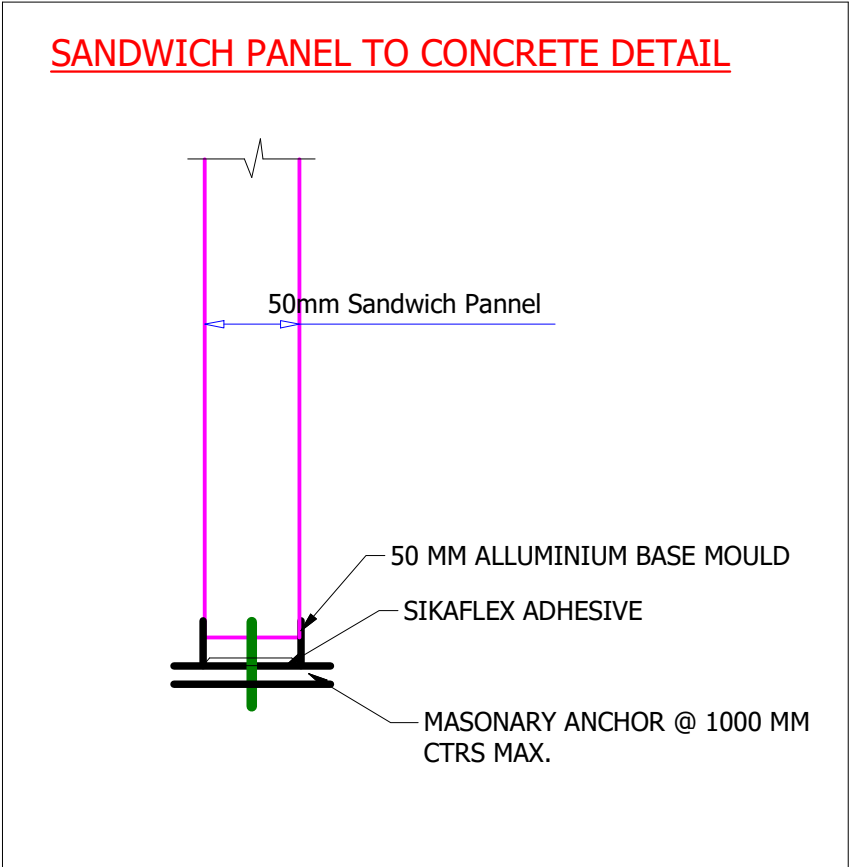
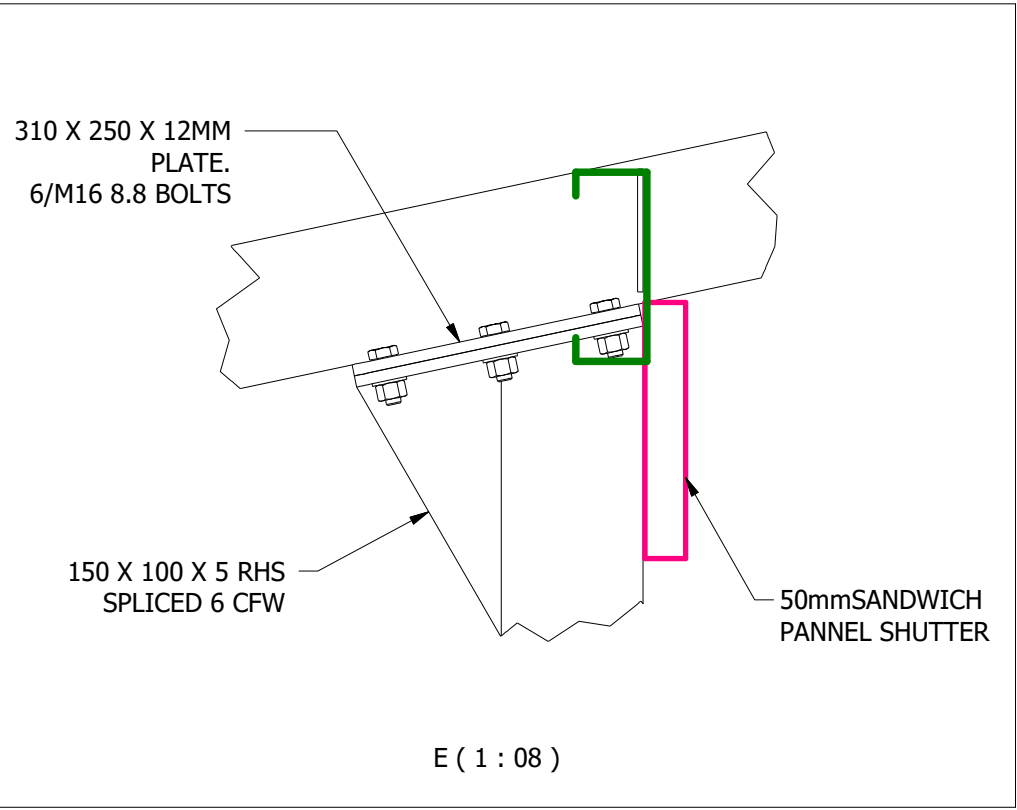
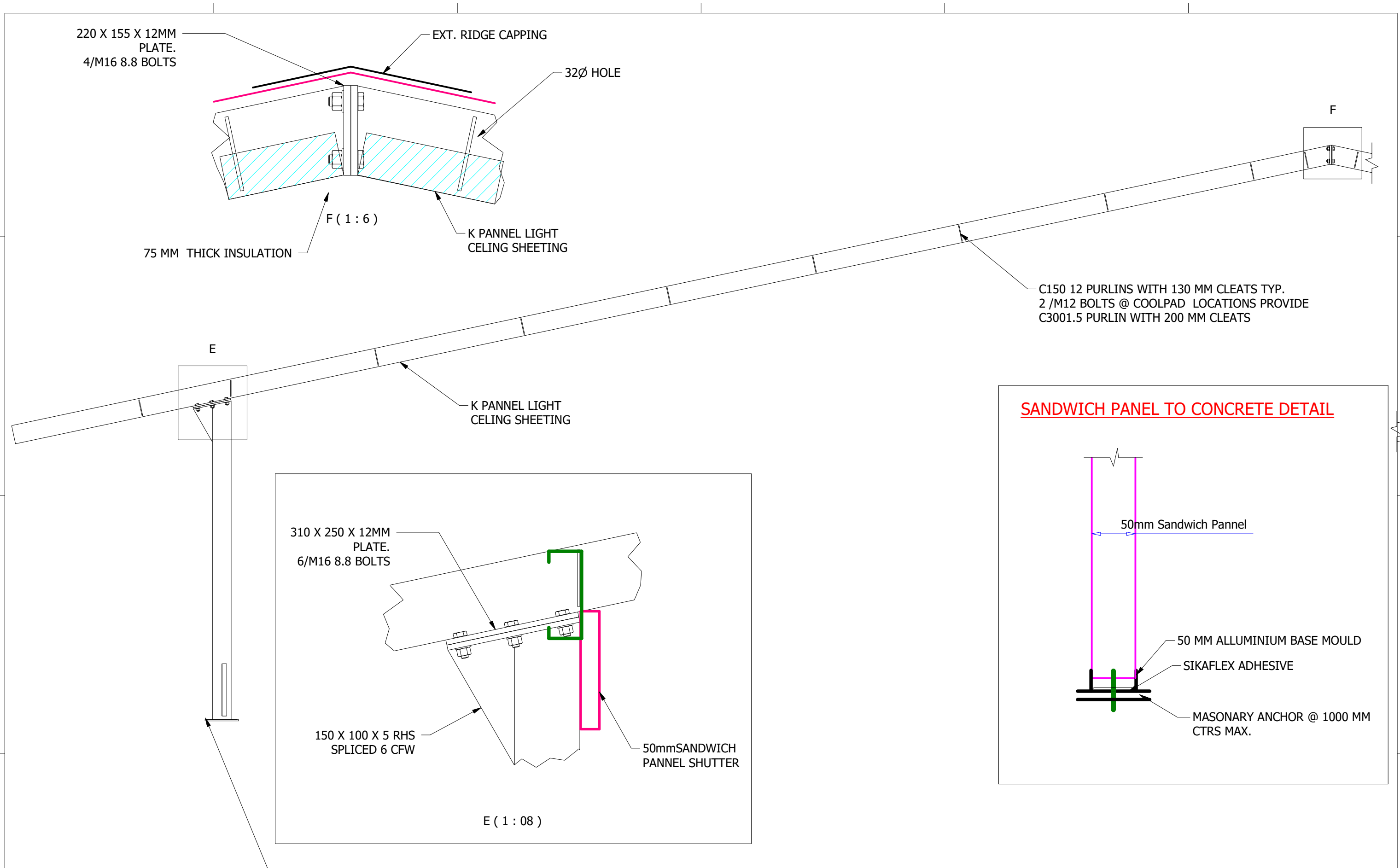
DO NOT SCALE
ALL DIMENSIONS IN MM

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		Edition Sheet 3 / 8
		FRAME OVERVIEW		




DO NOT SCALE
ALL DIMENSIONS IN MM

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com			PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340	



FOOTING TO BE CHEMSET INTO SLAB USING ENGEENERS SPECIFICATIONS

DO NOT SCALE
ALL DIMENSIONS IN MM

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		
		CONECTION DETAILS	Edition	Sheet 5 / 8

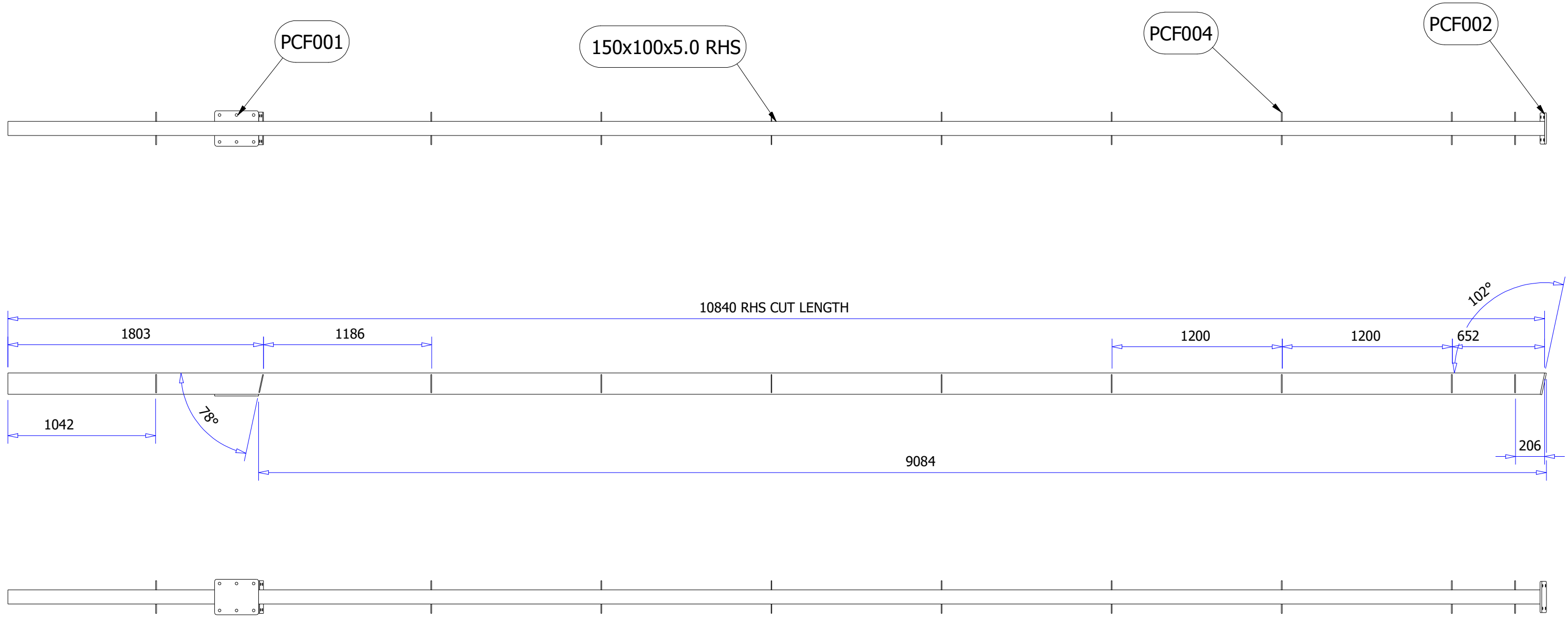

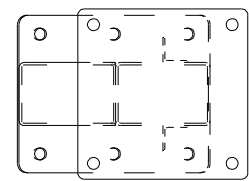
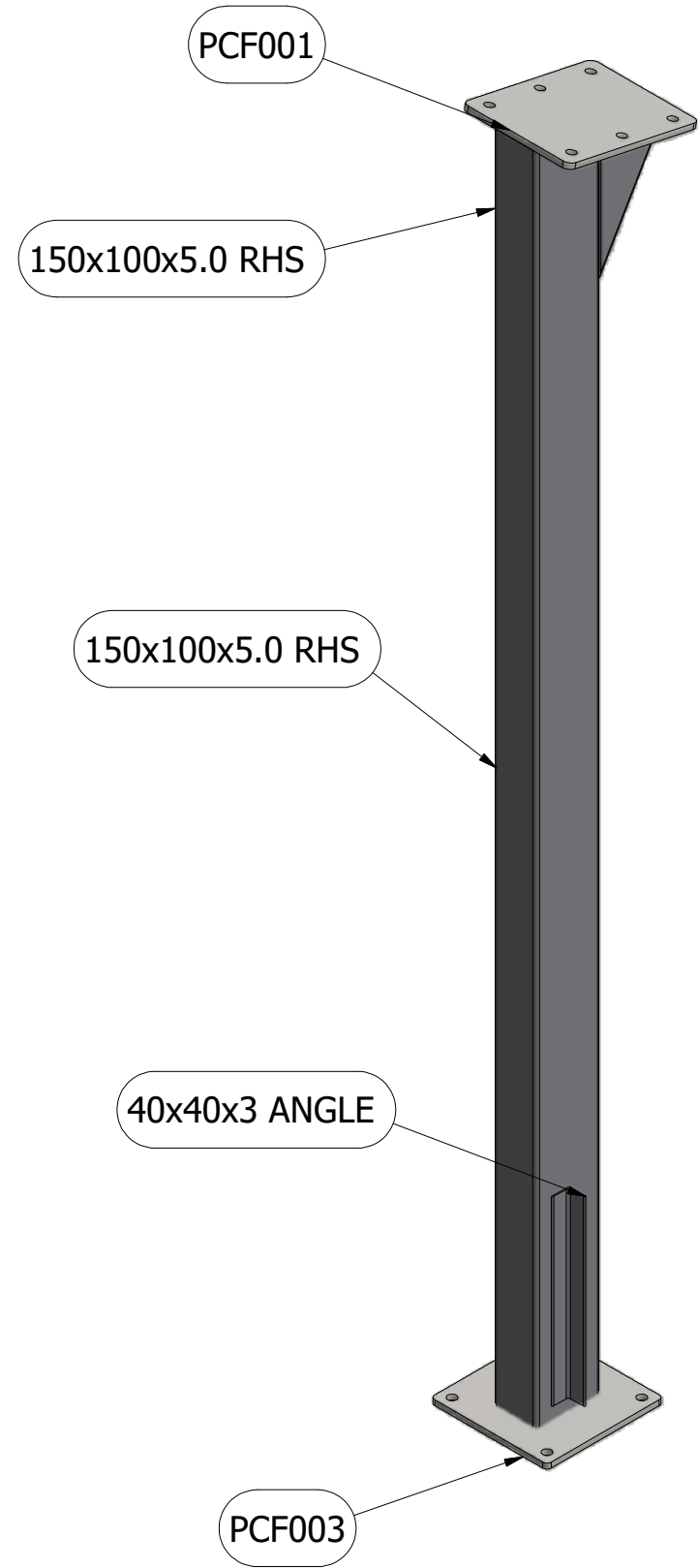
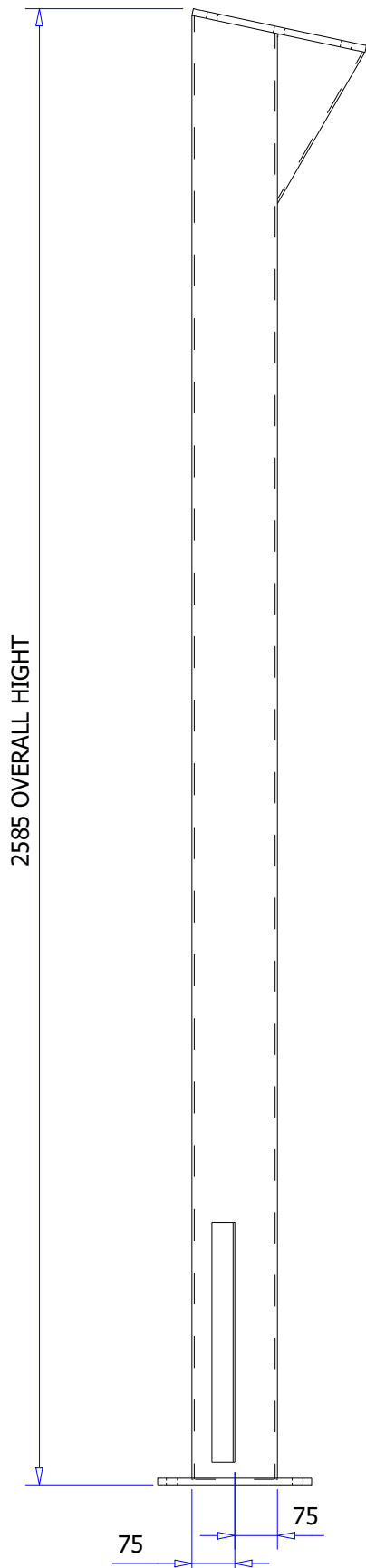
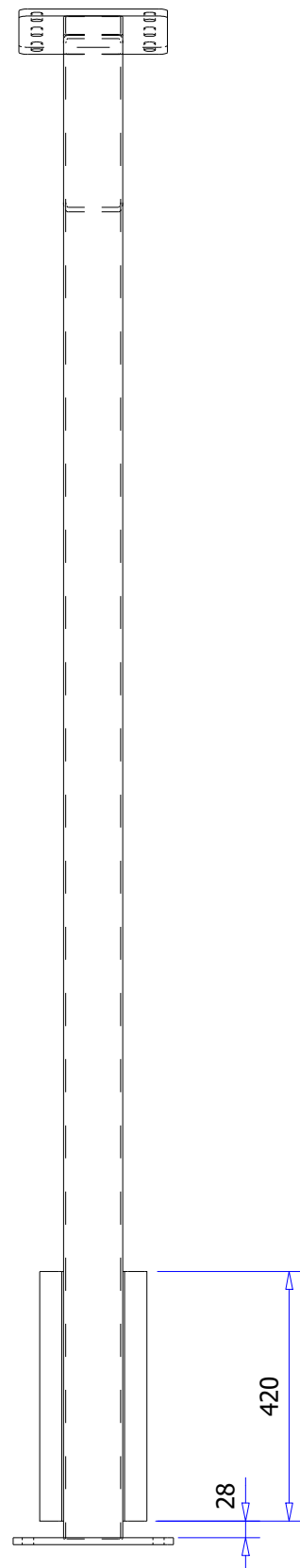
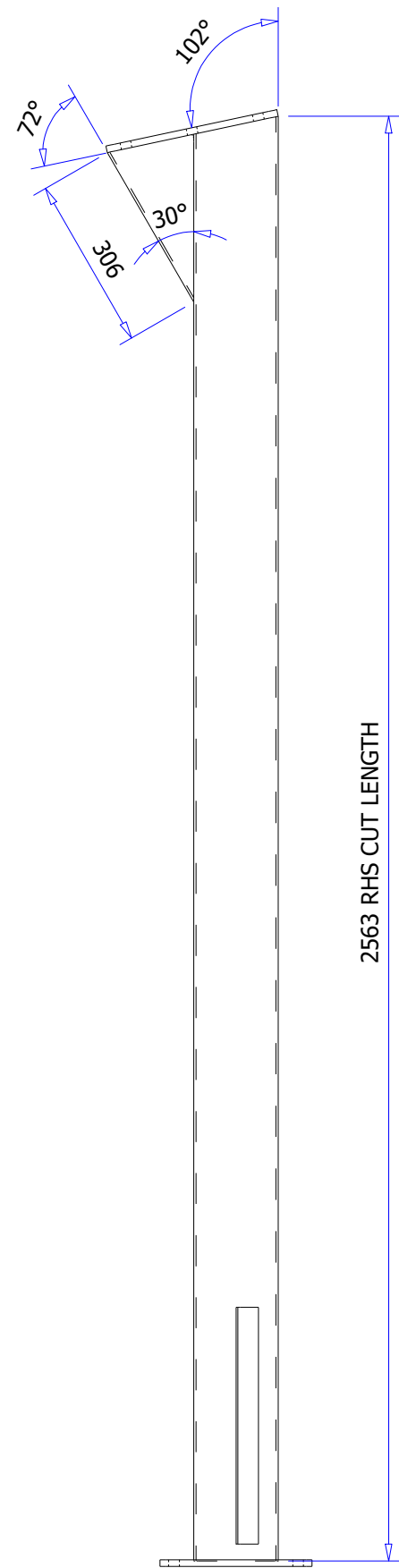


PLATE DETAILS ON PAGE 3


Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		
		TYPICAL BEAM	Edition	Sheet 6 / 8

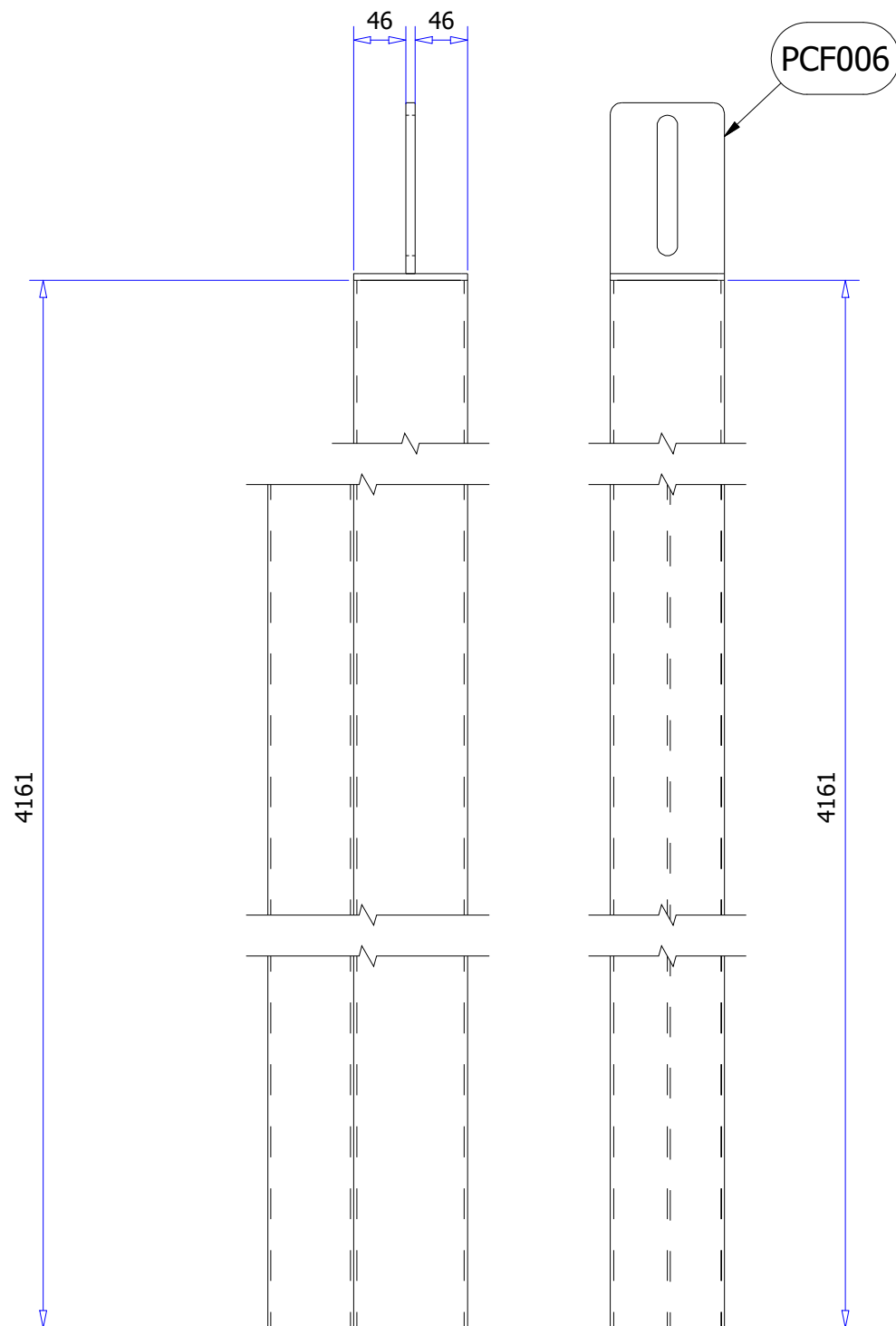
DO NOT SCALE
ALL DIMENSIONS IN MM



DO NOT SCALE
ALL DIMENSIONS IN MM

PLATE DETAILS ON PAGE 3

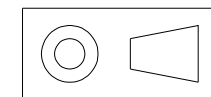
Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com			PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340	
			TYPICAL COLMN	Edition



75x50x2.5 RHS

100x100x3.0 SHS - 4160.811

Galvanized material to be used where available and cold gal paint to be used on all welds and non galvanized parts



DO NOT SCALE
ALL DIMENSIONS IN MM

BRIEF SPECIFICATIONS GENERAL SLAB AND FOOTING REQUIREMENTS:

1. TOP SOIL AND VEGETATION SHALL BE STRIPPED FROM SITE TO A MINIMUM DEPTH OF 100mm.
2. PRIOR TO THE PLACEMENT TO ANY CONTROLLED FILL, THE EXPOSED SUB GRADE SHALL BE COMPACTED TO A MINIMUM 95 % RELATIVE DENSITY.
3. ALL ORGANIC MATTER AND SOFT AREAS SHALL BE REMOVED AND REPLACED WITH GRANULAR MATERIAL. ALL FILLING SHALL BE CLEAR GRANULAR MATERIAL PLACED IN MAXIMUM 150mm COMPACTED LAYERS AND COMPACTED BY WATERING AND USE OF VIBRATING ROLLER OR COMPACTOR TO ACHIEVE CONTROLLED FILL
4. AS PER AS2870. FILL SHALL BE COMPACTED TO MINIMUM AS1289.1.1 (1993), OR WHEN TESTED PASS THE REQUIRED MIN. 100kPa BEARING CAPACITY FOR THE FOOTING.
5. GROUND SURFACES AROUND THE POLTRY SHED TO BE GRADED SO THAT NO WATER PONDS AROUND THE FOOTINGS. PROVIDE 100mm FALL OVER THE FIRST 1000mm FROM THE BUILDINGS. THE BUILDER IS TO DETERMINE THE PRESENCE OF ANY ADDITIONAL FILLED AREAS, WHICH WOULD NECESSITATE THE USE OF MODIFIED FOOTINGS.

GENERAL NOTES:

1. ALL DIMENSIONS ARE TO BE OBTAINED FROM THE ARCHITECTS DRAWINGS OR FROM SITE. ENGINEERS DRAWINGS MUST NOT BE SCALED.
2. THE APPROVAL OF A SUBSTITUTION BY THE ENGINEER IS NOT AN AUTHORIZATION FOR AN EXTRA. ANY EXTRA INVOLVED MUST BE TAKEN UP WITH THE ARCHITECT BEFORE WORK COMMENCES.
3. DURING CONSTRUCTION THE CONTRACTOR SHALL BE RESPONSIBLE FOR MAINTAINING THE STRUCTURE IN A STABLE CONDITION AND ENSURING NO PART SHALL BE OVERSTRESSED UNDER CONSTRUCTION ACTIVITIES.

STRUCTURAL STEEL

1. ALL STEELWORK SHALL BE CARRIED OUT IN ACCORDANCE WITH THE AS4100, SAA STEEL STRUCTURES CODE.
2. WELDS TO BE 6mm CONTINUOUS FILLET LAID DOWN WITH APPROVED COVERED ELECTRODE IN ACCORDANCE WITH AS1554 -WELDING CODE. BOLTS 16 mm DIA, BLACK IN 19 mm CLEARANCE
3. HOLES, GUSSET PLATES 10mm THICK UNLESS NOTED OTHERWISE. HIGH STRENGTH BOLTS NOMINATED 'HS' TO BE SNUG TIGHTENED ONLY UNLESS NOTED.


CONCRETE

1. ALL CONCRETE WORKMANSHIP SHALL BE IN ACCORDANCE WITH THE SAA CONCRETE STRUCTURES CODE AS3600.
2. ALL CONCRETE SHALL BE: GRADE 25 MPa - FOOTINGS. GRADE 25 MPa - SLAB, PANELS U.N.O.
3. DEPTHS OF BEAMS ARE GIVEN FIRST AND INCLUDE SLAB THICKNESS.
4. CONSTRUCTION JOINTS WHERE NOT SHOWN SHALL BE PROPERLY FORMED AND LOCATED TO THE APPROVAL OF THE ENGINEER.
5. CONCRETE TO BE KEPT FREE OF SUPPORTING BRICKWORK BY TWO LAYERS OF A SUITABLE MEMBRANE (MALTHOID ETC.) OR AS DIRECTED BY THE ENGINEER. VERTICAL FACES OF CONCRETE TO BE KEPT FREE BY A 12 THICKNESS OF BITUMINOUS CANITE.
6. CHECK WITH THE ARCHITECT REGARDING V-JOINT ON RENDERED SURFACES.
7. BRICKWORK MUST NOT BE BUILT ON CONCRETE SLABS OR BEAMS UNTIL THE SUPPORTING FORMWORK HAS BEEN REMOVED.
8. REINFORCEMENT IS SHOWN DIAGRAMMATICALLY AND NOT NECESSARILY IN TRUE PROJECTION. REINFORCEMENT NOTATIONS: SL DENOTES HARD-DRAWN WIRE REINFORCING FABRIC TO AS1304. R DENOTES STRUCTURAL-GRADE PLAIN ROUND BARS TO AS1302. Y DENOTES COLD-WORKED DEFORMED BAR TO AS1302. THE NUMBER IMMEDIATELY FOLLOWING THE BAR GRADE SYMBOL REPRESENTS THE NOMINAL BAR DIAMETER IN MILLIMETERS.
11. AT OPENINGS IN WALLS ADD 2/N16 BARS ON ALL SIDES PROJECTING 600 PAST THE CORNERS UNLESS OTHERWISE NOTED ON THIS DRAWING.
12. ALL REINFORCEMENT FOR ANY ONE POUR SHALL BE COMPLETELY PLACED AND TIED PRIOR TO INSPECTION BY THE ENGINEER OR ARCHITECT. NO CONCRETE SHALL BE POURED UNTIL REINFORCEMENT HAS BEEN INSPECTED AND APPROVED. THE BUILDERS ATTENTION IS SPECIALLY DIRECTED TO THE TOP STEEL ON THIS JOB. REINFORCEMENT IS TO BE SECURELY TIED AND SUPPORTED IN ITS CORRECT POSITION SO AS NOT TO BE DISPLACED DURING CONCRETING.

CONCRETE DETAILS

- STRENGTH: FLOORS -** 25MPa UNO REINFORCE USING SL72 MESH CENTRAL 25 MPa UNO
- U WALLS -** REINFORCE USING SL82 MESH CENTRAL UNO 20mm NOM. MAX
- AGGREGATE: CEMENT TYPE:** REINFORCE USING SL82 MESH CENTRAL UNO 20mm NOM. MAX A OR FA AS SHOWN, 225 SIDE & END LAP 40mm MIN COVER
- REINFORCING:** 225 SIDE & END LAP 40mm MIN COVER
- CONTRACTION JOINTS:** 5m MAX SPACING.
- FILL:** 100 mm COMPACTED SAND IF REQUIRED

PROVIDE WATER PROOFING MEMBRANE TO UNDERSIDE OF CONCRETE FLOORS THROUGHOUT. LAP 300 AND TAPE AS REQUIRED
FIGURED DIMENSIONS SHALL TAKE PREFERENCE OVER SCALED DRAWINGS CONTRACTORS SHALL VERIFY ALL DIMENSIONS BEFORE COMMENCING

Designed by T. Belardo	Checked by	Approved by	Date	Date 3/08/2018
 R&DG SANDAY 40 Glenning Rd Glenning Valley NSW 2261 PH 0404 489 573 EMAIL ron@rdgsanday.com		PROTEN 18M POLTRY SHED 69 BECTIVE LANE, TAMWORTH NSW, 2340		
		DROP POST AND DETAILS	Edition	Sheet 8 / 8

FARM MANAGERS' HOUSES

ILLUKA

4



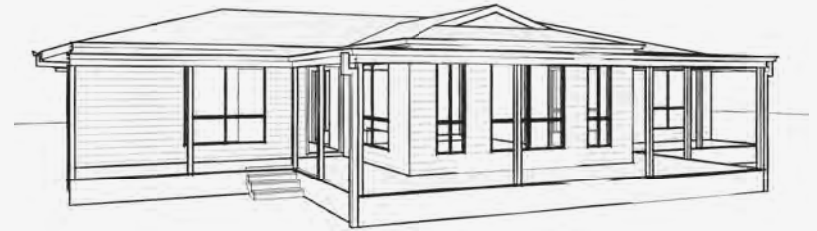
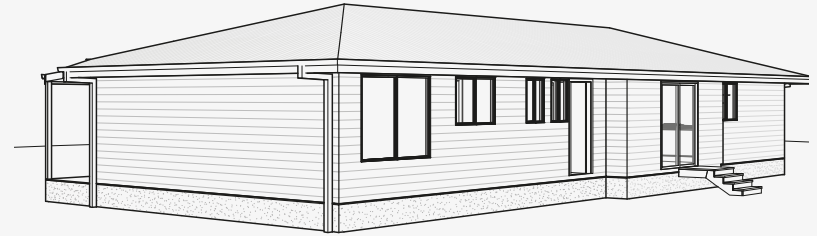
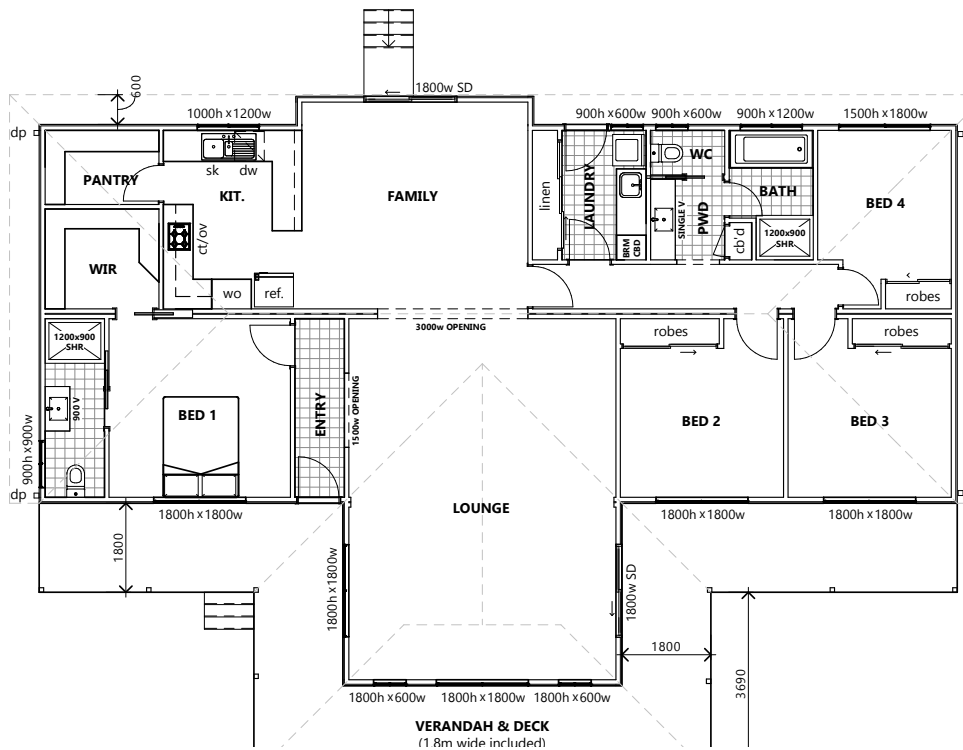
2



3



FLOOR PLAN



House Length 18.5m

House Width 11.2m

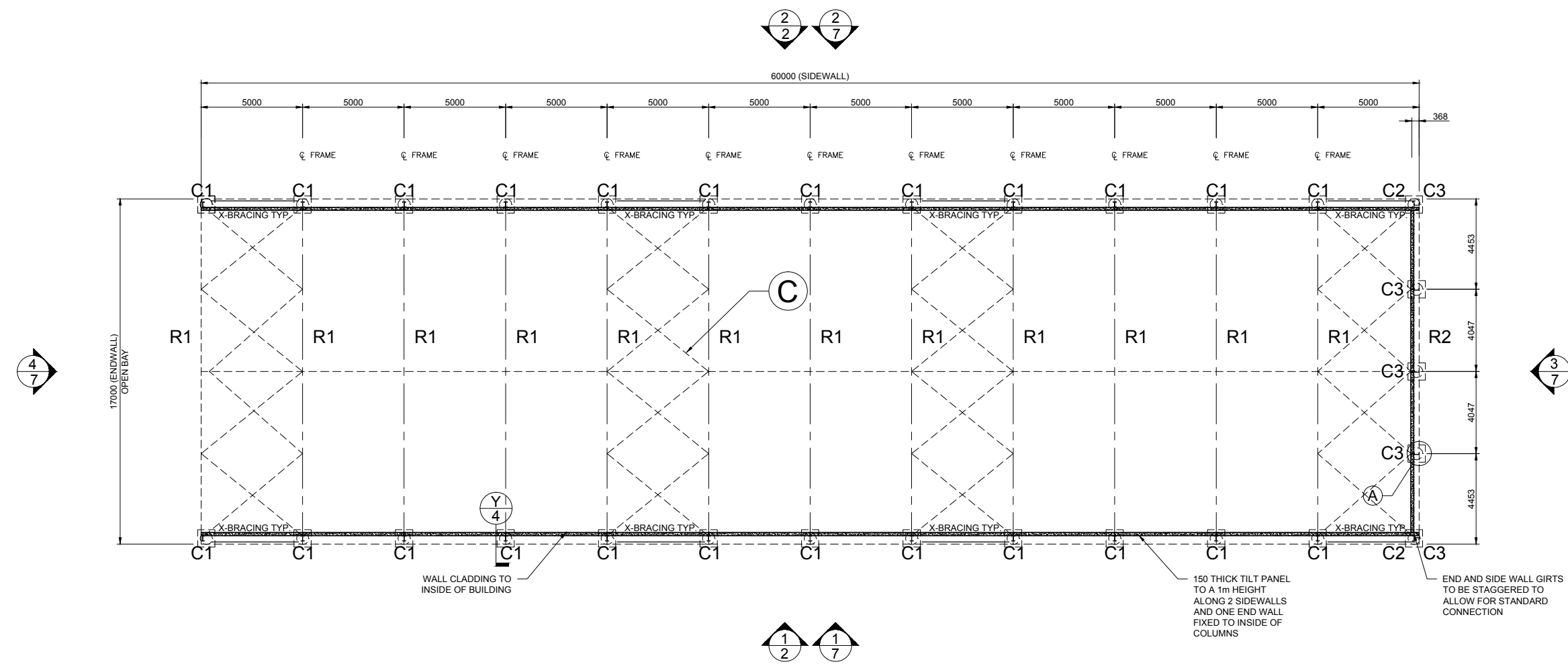
Verandah & Deck Area 46.7m²

Floor Area 165.8m²

BEDDING MATERIAL STORAGE SHED

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.

IF IN DOUBT, ASK.



1 FOUNDATION PLAN AND MEMBER LAYOUT
SCALE: 1 = 250

CHANGES REQUIREMENTS:

NCE ENGINEERING - FDPJ 7371

NOTES:

- RICE HULL - SPECIFIC WEIGHT 753 kg/m³ ANGLE OF REPOSE 40°.
- MAXIMUM HEIGHT OF 1.5m STORAGE OF PRODUCT AGAINST WALLS.
- MAXIMUM BACK FILL SLOPE 10°.
- ROOF STRAP BRACING TO BE CONNECTED TO THE PURLIN CLOSEST TO THE LINE OF THE END WALL MULLION.

MAIN FRAME RAFTER LEGEND

R1	C25024
R2	C25019

MAIN FRAME COLUMN LEGEND

C1	2C25024
C2	C25019
C3	C25024

1 OF 7 SHEET

JOB NO. GRIF 16660

DATE 30/8/2016

CERTIFIED TM KC

DRAWN FDS

CHECK 1 KC

CHECK 2 KC

STEEL BUILDING BY (CONTACT) **GRIFFITH SHEDS AND GARAGES**

FOR **PROTEN HOLDINGS RICE HULL SHED**

AT **FARM 60 LOT 2 BOWDITCH ROAD GRIFFITH**

02 6964 9991

SHED SAFE

fairdinkum SHEDS

NORTHERN CONSULTING engineers

Civil & Structural Engineers
50 Punari Street
Currarong, Qld 4812
Fax: 07 4725 5850
Email: design@nceng.com.au
ABN 341 008 173 56

Registered Chartered Professional Engineer
Registered Professional Engineer (Civil & Structural) QLD
Registered Certifying Engineer (Structural) N.T.
Registered Engineer - (Civil) VIC
Registered Engineer - (Civil) TAS

Regn. No. 2558980
Regn. No. 9985
Regn. No. 116373ES
Regn. No. EC36692
Regn. No. CC5648M

Mr Timothy Roy Messer BE MIEAust RPEQ
Registered Professional Engineer 2558980

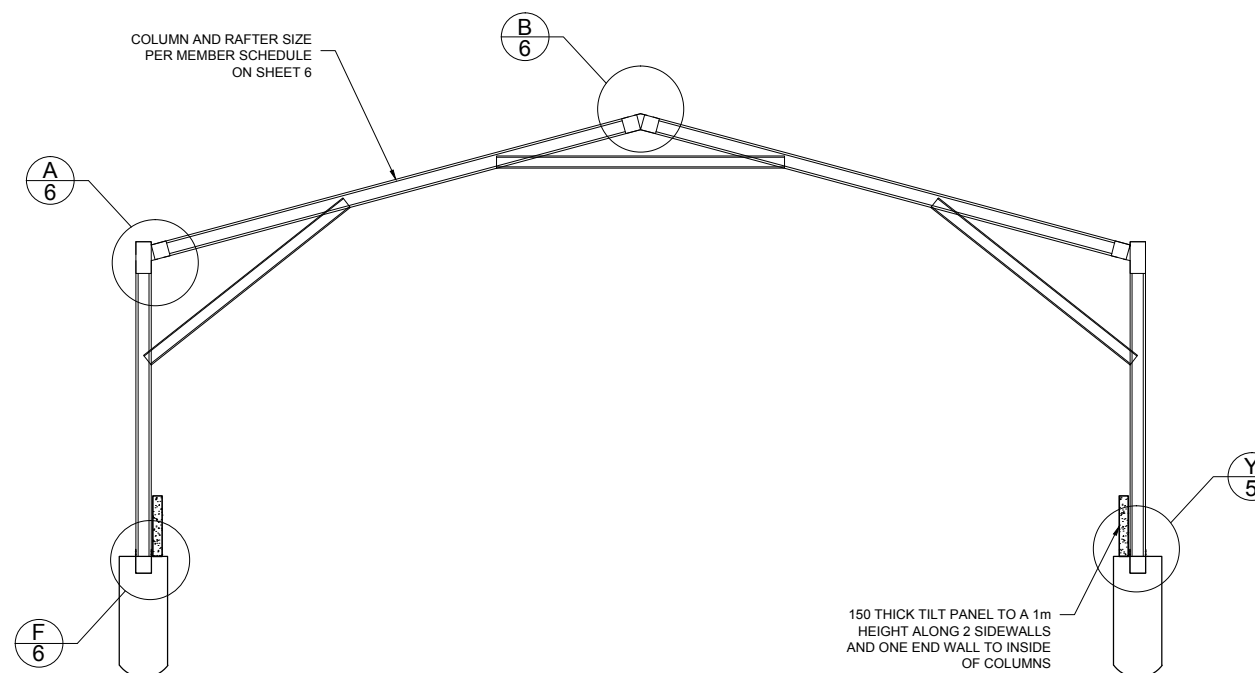
Signature *T. Messer*

Date 30/8/2016

Registered on the NPQR in the areas of practice of Civil & Structural National Professional Engineers Register

DO NOT SCALE THIS DRAWING. USE FIGURED DIMENSIONS ONLY. ALL DIMENSIONS TO BE VERIFIED ON SITE.

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.

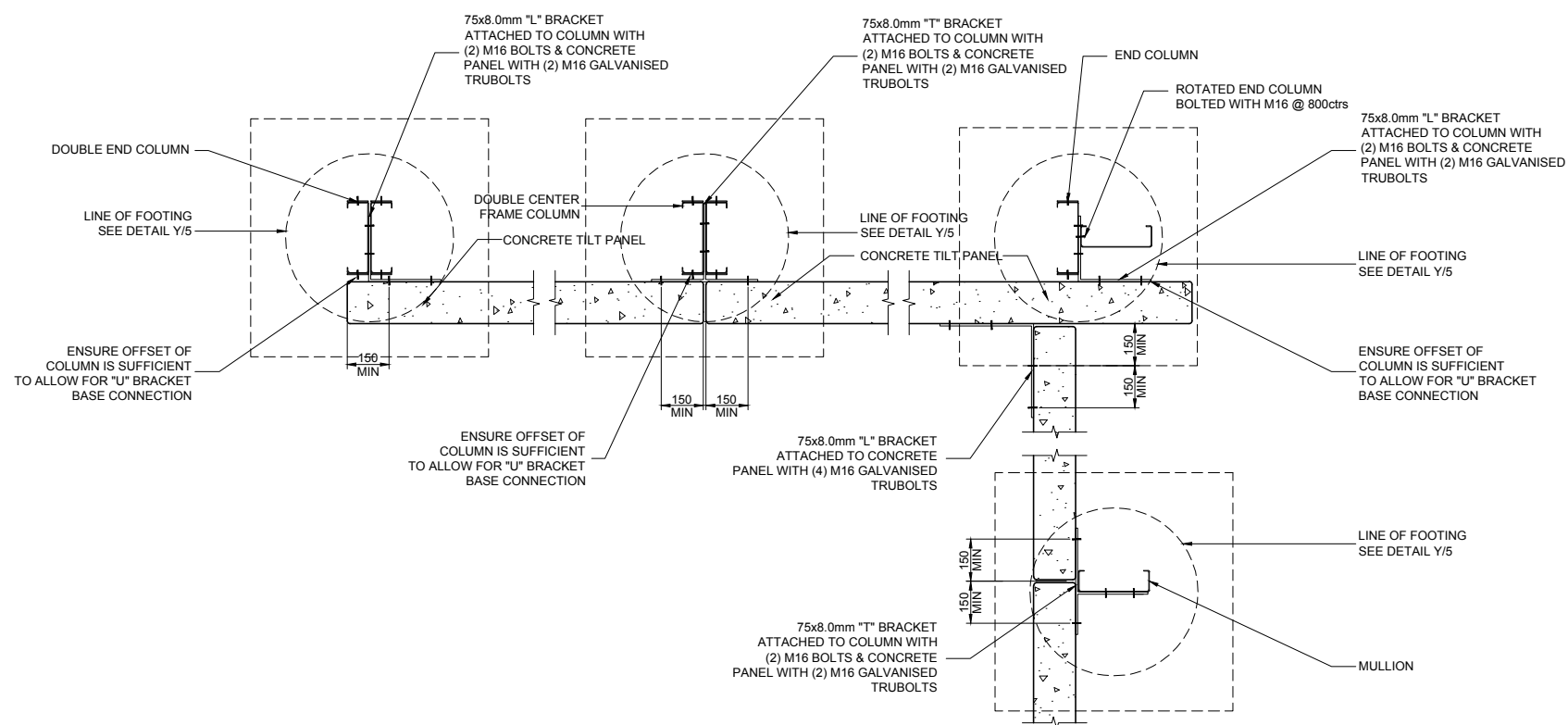


1 INTERNAL FRAME SECTION
3 SCALE: 1 = 125

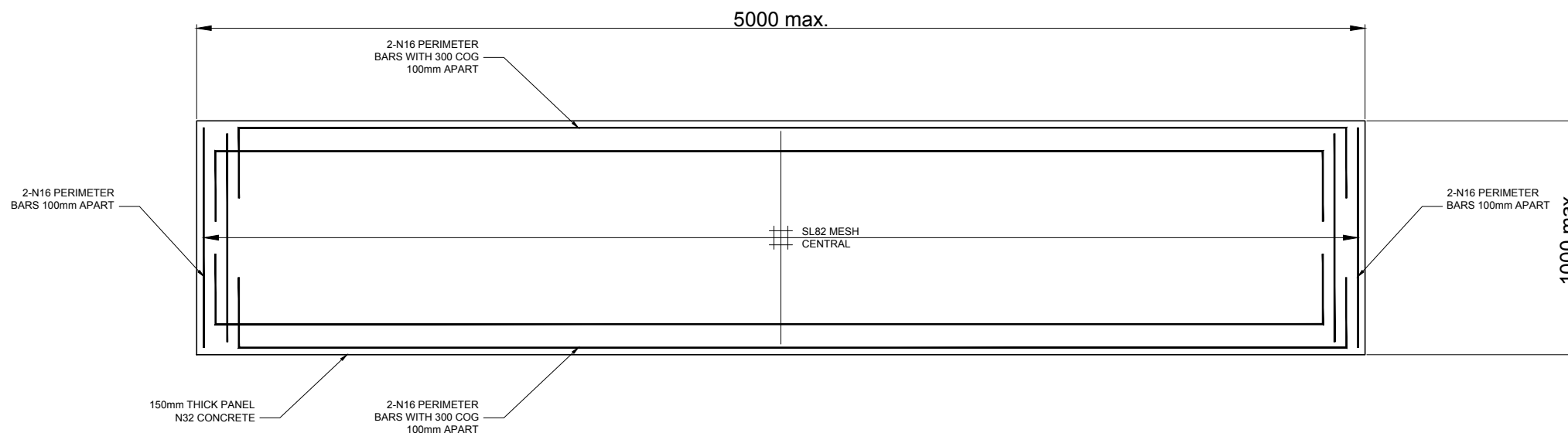
Refer to Sheet #5 for concrete specification.

3 OF 7 SHEET	JOB NO. GRIF 16660	DATE 25/8/2016	CERTIFIED TM KC	DRAWN FDS KC	CHECK 1 KC	CHECK 2 KC	STEEL BUILDING BY (CONTACT) GRIFFITH SHEDS AND GARAGES 02 6964 9991 FOR PROTEN HOLDINGS RICE HULL SHED AT FARM 60 LOT 2 BOWDITCH ROAD GRIFFITH	 	 Civil & Structural Engineers 50 Punari Street Currajong, Qld 4812 Fax: 07 4725 5850 Email: design@nceng.com.au ABN 341 008 173 56	Mr Timothy Roy Messer BE MIEAust RPEQ Registered Professional Engineer 2558980 Signature <i>T. Messer</i> Date 25/8/2016 Registered on the NPER in the areas of practice of Civil & Structural National Professional Engineers Register
	Registered Chartered Professional Engineer Registered Professional Engineer (Civil & Structural) QLD Registered Certifying Engineer (Structural) N.T. Registered Engineer - (Civil) VIC Registered Engineer - (Civil) TAS	Regn. No. 2558980 Regn. No. 9985 Regn. No. 116373ES Regn. No. EC36692 Regn. No. CC5648M								

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.



1 TILT PANEL CONNECTION DETAILS
7 SCALE: NTS



2 TYPICAL TILT PANEL REINFORCEMENT DETAILS
7 SCALE: NTS

4 OF 7	SHEET	JOB NO. GRIF 16660	DATE 25/8/2016	CHECKED KC	DRAWN FDS	STEEL BUILDING BY GRIFFITH SHEDS AND GARAGES	(CONTACT) 02 6964 9991
				CERTIFIED TM		FOR PROTEN HOLDINGS RICE HULL SHED	
						AT FARM 60 LOT 2 BOWDITCH ROAD GRIFFITH	

STEEL BUILDING BY (CONTACT)
GRIFFITH SHEDS AND GARAGES
02 6964 9991
FOR
PROTEN HOLDINGS RICE HULL SHED
AT
FARM 60 LOT 2 BOWDITCH ROAD
GRIFFITH

fairdinkum SHEDS
SHED SAFE

NORTHERN CONSULTING engineers
Civil & Structural Engineers
50 Punari Street
Currajong, Qld 4812
Fax: 07 4725 5850
Email: design@nceng.com.au
ABN 341 008 173 56

Registered Chartered Professional Engineer
Registered Professional Engineer (Civil & Structural) QLD
Registered Certifying Engineer (Structural) N.T.
Registered Engineer - (Civil) VIC
Registered Engineer - (Civil) TAS

Regn. No. 2558980
Regn. No. 9985
Regn. No. 116373ES
Regn. No. EC36692
Regn. No. CC5648M

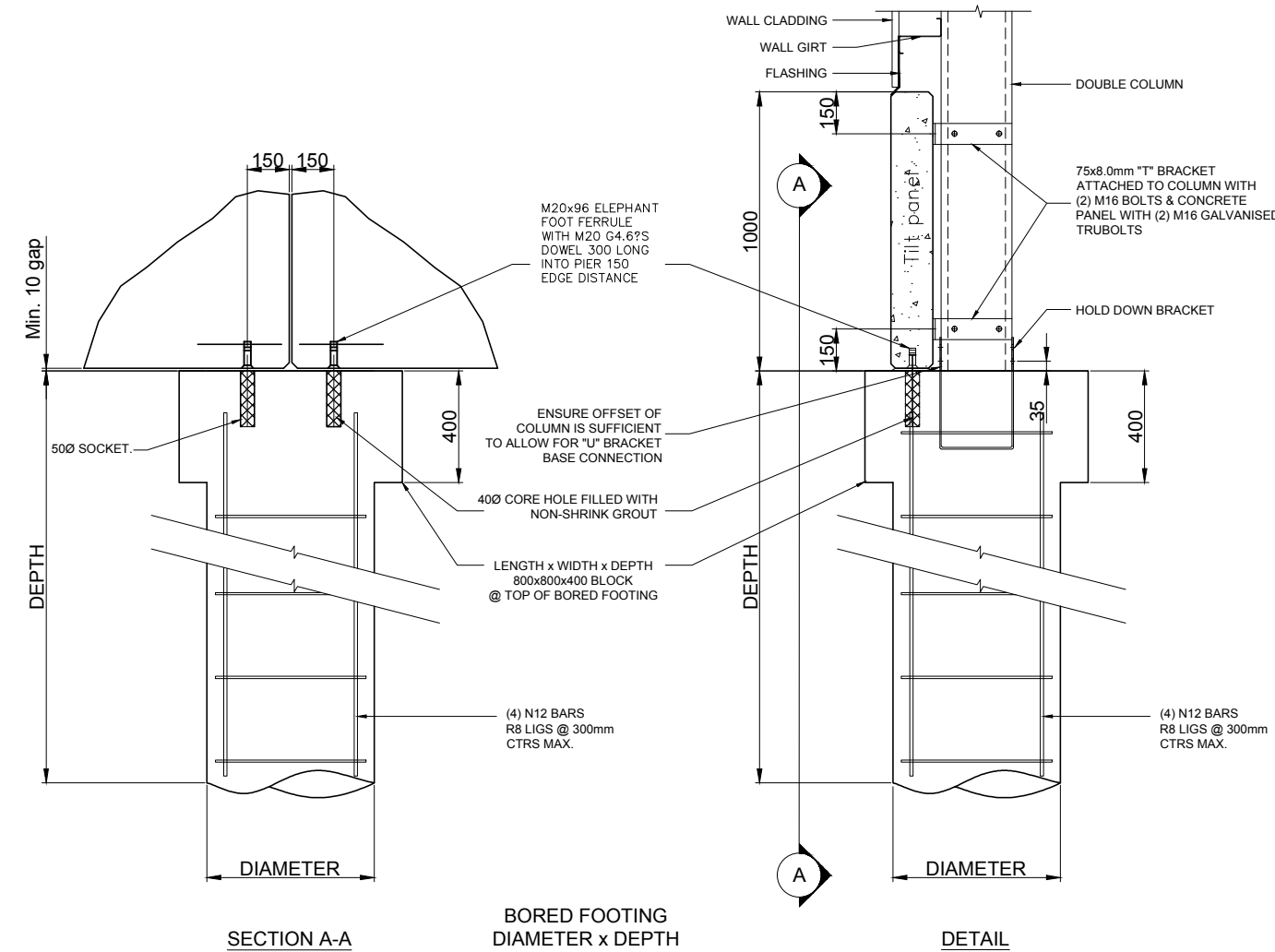
Mr Timothy Roy Messer BE MIEAust RPEQ
Registered Professional Engineer 2558980

Signature *T. Messer*

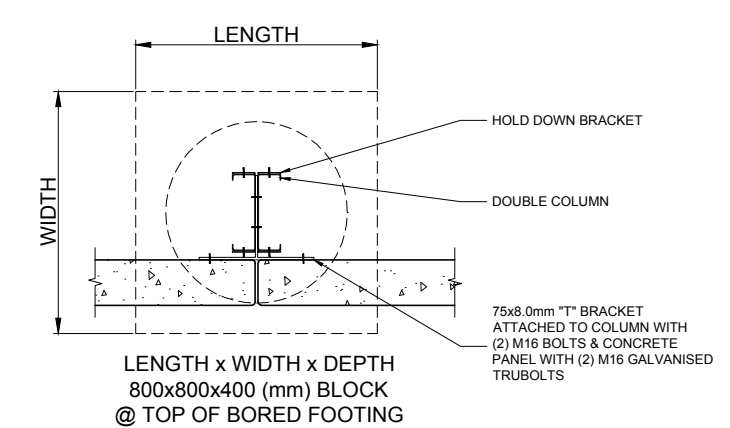
Date 25/8/2016

Registered on the NPER in the areas of practice
of Civil & Structural National Professional
Engineers Register

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.



BORED FOOTING
DIAMETER x DEPTH
600 x 1800



PLAN VIEW

Y
5 BORED FOOTING DETAIL
SCALE: NTS

STRUCTURAL GENERAL NOTES

- GOVERNING CODE:** NATIONAL CONSTRUCTION CODE (NCC), LOADING TO AS1170 - ALL SECTIONS. BUILDING SUITABLE AS EITHER A PRIVATE GARAGE CLASS 10A, OR A FARM SHED (CLASS 7 OR 8), UNLESS OTHERWISE SPECIFICALLY NOTED. FOR USE AS A FARM SHED, IT MUST MEET THE FOLLOWING REQUIREMENTS:
 - BE LESS THAN 2000 SQM IN AREA (INCLUSIVE OF ANY MEZZANINE FLOOR AREA).
 - MUST BE LOCATED ON A FARM AND USED IN CONNECTION WITH FARMING PURPOSES (AS DEFINED IN NCC 2016).
 - BUILDING IS NOT TO BE OCCUPIED FREQUENTLY NOR FOR EXTENDED PERIODS BY PEOPLE, WITH A MAXIMUM OF 1 PERSON PER 200 SQM OR 2 PERSONS MAXIMUM IN TOTAL WHICHEVER IS THE LESSER.
- DRAWING OWNERSHIP:** THESE DRAWINGS REMAIN THE PROPERTY OF FBHS (AUST) PTY LIMITED. ENGINEERING SIGNATURE AND CERTIFICATION IS ONLY VALID WHEN BUILDING IS SUPPLIED BY A DISTRIBUTOR OF FBHS. DRAWINGS ARE PROVIDED FOR THE DUAL PURPOSE OF OBTAINING BUILDING PERMITS AND AIDING CONSTRUCTION. ANY OTHER USE OR REPRODUCTION IS PROHIBITED WITHOUT WRITTEN APPROVAL FROM FBHS.
- DRAWING SIGNATURE REQUIREMENTS:** THESE DRAWINGS ARE NOT VALID UNLESS SIGNED BY THE ENGINEER. THE ENGINEER ACCEPTS NO LIABILITY OR RESPONSIBILITY FOR DRAWINGS WITHOUT A SIGNATURE. EACH TITLE BLOCK CONTAINS A WATER MARK UNDER THE CUSTOMERS NAME CONTAINING THE DATE OF PRODUCTION OF THE DRAWINGS; THE DRAWINGS ARE TO BE SUBMITTED TO COUNCIL WITHIN 21 DAYS OF THIS DATE. THIS IS TO ENSURE THAT ONLY CURRENT DRAWINGS ARE IN CIRCULATION.
- CONTRACTOR RESPONSIBILITIES:** CERTIFIER AND CONTRACTOR TO CONFIRM (ON SITE) THAT THE WIND LOADINGS APPLIED TO THIS DESIGN ARE TRUE AND CORRECT FOR THE ADDRESS STATED IN THE TITLE BLOCK. CONTRACTOR SHALL VERIFY AND CONFIRM ALL EXISTING CONDITIONS AND DIMENSIONS. ENGINEER SHALL BE NOTIFIED OF ANY DISCREPANCIES BETWEEN DRAWINGS AND EXISTING CONDITIONS PRIOR TO START OF WORK. CONTRACTOR MUST NOT MAKE ANY DEVIATION FROM THE PROVIDED PLANS WITHOUT FIRST OBTAINING WRITTEN APPROVAL FROM ONE OF THE UNDERSIGNING ENGINEERS. THE ENGINEER / FBHS TAKE NO RESPONSIBILITY FOR CHANGES MADE WITHOUT WRITTEN APPROVAL. CONTRACTOR IS RESPONSIBLE FOR ENSURING NO PART OF THE STRUCTURE BECOMES OVERSTRESSED DURING CONSTRUCTION. BUILDING IS NOT STRUCTURALLY ADEQUATE UNTIL THE INSTALLATION OF ALL COMPONENTS AND DETAILS SHOWN IS COMPLETED IN ACCORDANCE WITH THESE DRAWINGS. THE INDICATED DRAWING SCALES ARE APPROXIMATE. DO NOT SCALE DRAWINGS FOR CONSTRUCTION PURPOSES. FOR FURTHER DIRECTIONS ON CONSTRUCTION THE CONTRACTOR SHOULD CONSULT THE APPROPRIATE INSTRUCTION MANUAL.
- ENGINEERING:** THE ENGINEER / FBHS ARE NOT ACTING AS PROJECT MANAGERS FOR THIS DEVELOPMENT, AND WILL NOT BE PRESENT DURING CONSTRUCTION. THE UNDERSIGNING ENGINEERS HAVE REVIEWED THIS BUILDING FOR CONFORMITY ONLY TO THE STRUCTURAL DESIGN REQUIREMENTS APPLICABLE TO THIS DEVELOPMENT. THESE DOCUMENTS ARE STAMPED ONLY AS TO THE COMPONENTS SUPPLIED BY FBHS. IT IS THE RESPONSIBILITY OF THE PURCHASER TO COORDINATE DRAWINGS PROVIDED BY FBHS WITH OTHER PLANS AND/OR OTHER COMPONENTS THAT ARE PART OF THE OVERALL PROJECT. IN CASES OF DISCREPANCIES, THE LATEST DRAWINGS PROVIDED BY FBHS SHALL GOVERN. NO ALTERATIONS TO THIS STRUCTURE (INCLUDING REMOVAL OF CLADDING) ARE TO BE UNDERTAKEN WITHOUT THE CONSENT OF THE CERTIFYING ENGINEER.
- INSPECTIONS:** NO SPECIAL INSPECTIONS ARE REQUIRED BY THE GOVERNING CODE ON THIS JOB. ANY OTHER INSPECTIONS REQUESTED BY THE LOCAL BUILDING DEPARTMENT SHALL BE CONDUCTED AT THE OWNER'S EXPENSE.
- SOIL REQUIREMENTS:** SITE CLASSIFICATION TO BE A, S OR M ONLY. SOIL SAFE BEARING CAPACITY VALUE INDICATED ON DRAWING SHEET 4 OCCURS AT 100mm BELOW FINISH GRADE, EXISTING NATURAL GRADE, OR AT FROST DEPTH SPECIFIED BY LOCAL BUILDING DEPARTMENT, WHICHEVER IS THE LOWEST ELEVATION. REGARDLESS OF DETAIL Y ON SHEET 4 THE MINIMUM FOUNDATION DEPTH SHOULD BE 100MM INTO NATURAL GROUND OR BELOW FROST DEPTH SPECIFIED BY LOCAL COUNCIL. ROLLED OR COMPACTED FILL MAY BE USED UNDER SLAB, COMPACTED IN 150mm LAYERS TO A MAXIMUM DEPTH OF 900mm. CONCRETE FOUNDATION EMBEDMENT DEPTHS DO NOT APPLY TO LOCATIONS WHERE ANY UNCOMPACTED FILL OR DISTURBED GROUND EXISTS OR WHERE WALLS OF THE EXCAVATION WILL NOT STAND WITHOUT SUPPLEMENTAL SUPPORT, IN THIS CASE SEEK FURTHER ENGINEERING ADVICE.
- CLASS 10a or Class 7 FOOTING DESIGNS:** THE FOUNDATION DOCUMENTED IS ALSO APPROPRIATE FOR CLASS 10a or CLASS 7 BUILDING DESIGNS ON 'M-D', 'H', 'H-D' OR 'E' CLASS SOILS, IF TOTAL SLAB AREA IS UNDER 100m SQUARE AND THE MAXIMUM SLAB DIMENSION (LENGTH AND WIDTH) IS LESS THAN 12m. PLEASE BE AWARE THAT THE SLAB DESIGN FOR H & E CLASS SOILS IN THESE INSTANCES ARE DESIGNED TO EXPERIENCE SOME CRACKING. THIS CRACKING IS NOT CONSIDERED A STRUCTURAL FLAW OR DESIGN ISSUE, AND IS SIMPLY COSMETIC IN NATURE. IF THIS IS A CONCERN TO THE CLIENT IT IS ADVISED THEY DISCUSS OTHER OPTIONS WITH THE RELEVANT DISTRIBUTOR PRIOR TO THE POURING OF THE SLAB.
- CONCRETE REQUIREMENTS:** ALL CONCRETE DETAILS AND PLACEMENT SHALL BE PERFORMED IN ACCORDANCE WITH AS2870 AND AS3600. CONCRETE SHALL HAVE A MIN. 28-DAY STRENGTH OF 20MPa FOR EXPOSURE A1 & B1, 25MPa FOR EXPOSURE A2 & B2 AND 32MPa FOR EXPOSURE C, IN ACCORDANCE WITH SECTION 4, AS3600. CEMENT TO BE TYPE A. MAX AGGREGATE SIZE OF 20mm. SLUMP TO BE 80mm +/-15mm. SLABS TO BE CURED FOR 7 DAYS BY WATERING OR COVERING WITH A PLASTIC MEMBRANE, AFTER WHICH CONSTRUCTION CAN BEGIN, DUE CARE GIVEN NOT TO OVER-TIGHTEN HOLD DOWN BOLTS. GIVEN ALLOWABLE SOIL TYPES 1 LAYER OF SL72 REINFORCING MESH IS TO BE INSTALLED ON STANDARD SLABS WITH A MINIMUM 30MM COVER FROM CONCRETE SURFACE. CONCRETE REINFORCING TO CONFORM TO AS 1302, AS1303 & AS 1304. ALL REINFORCING COVER TO BE A MINIMUM OF 30mm.
- STRUCTURAL STEEL REQUIREMENTS:** ALL STRUCTURAL STEEL, INCLUDING SHEETING THROUGH EXCLUDING CONCRETE REINFORCING, SHALL CONFORM TO AS 1397 (GAUGE <= 1mm fy = 550MPa, GAUGE > 1mm < 1.5mm fy = 500MPa, GAUGE >= 1.5mm fy = 450MPa). NO WELDING IS TO BE PERFORMED ON THIS BUILDING. ALL STRUCTURAL MEMBERS AND CONNECTIONS DESIGNED TO AS4600. ALL BOLT HOLE DIAMETERS TO STRAMIT GENERAL FINCHINGS.
- DESIGN WIND REQUIREMENT:** THE FRAME AS A BASIC STRUCTURE IS DESIGNED AS AN "AIR LEAKY BUILDING" IN COMPLIANCE WITH AS 1170.5.3, AS SUCH, SHOULD A WINDOW OR DOOR FAIL, INTEGRITY OF THE BUILDING WILL BE MAINTAINED.
- FOOT TRAFFIC:** FOR ERECTION AND MAINTENANCE PLEASE NOTE THE FOLLOWING DEFINED FOOT TRAFFIC ZONES:
 - CORRUGATED: WALK ONLY WITHIN 200MM OF SCREW LINES. FEET SPREAD OVER AT LEAST TWO RIBS.
 - MONOCLAD: WALK ONLY IN PANS, OR ON RIBS AT SCREW LINES.

PROJECT DESIGN CRITERIA	
ROOF LIVE LOAD:	0.25 kPa
BASIC WIND SPEED:	VR 45 m/s
SITE WIND SPEED:	Vsit,B 40 m/s
WIND REGION:	Reg A
TOPOGRAPH FACTOR, k_t :	1
SHIELDING FACTOR, k_s :	1
MAX GROUND SNOW LOAD:	NA
MAX ROOF SNOW LOAD:	NA
SITE ALTITUDE:	NA
TERRAIN CATEGORY:	TCat 2.5
SOIL SAFE BEARING CAPACITY:	100 kPa
RETURN PERIOD:	1:500
LIMITING CPI 1:	-0.65
LIMITING CPI 2:	0.7
IMPORTANCE LEVEL:	2

DETAIL KEYS	
(A)	ENDWALL VERTICAL MULLION (SEE DETAIL C/6 FOR TOP CONN. AND F/6 FOR BASE CONN.)
(B)	FLYBRACING PER DETAIL L/6
(C)	X-BRACING IN ROOF ABOVE (SEE DETAIL M/6)
(D)	DOUBLE X-BRACING IN ROOF ABOVE (SEE DETAIL M/6)

5 OF 7 SHEET

JOB NO. GRIF 16660

DATE 25/8/2016

CERTIFIED TM

DRAWN FDS

CHECK 1 KC

CHECK 2 KC

STEEL BUILDING BY (CONTACT)

GRIFFITH SHEDS AND GARAGES

02 6964 9991

FOR PROTEN HOLDINGS RICE HULL SHED

AT FARM 60 LOT 2 BOWDITCH ROAD GRIFFITH

fairdinkum SHEDS

SHED SAFE

NORTHERN CONSULTING engineers

Civil & Structural Engineers

50 Punari Street

Currajong, Qld 4812

Fax: 07 4725 5850

Email: design@nceng.com.au

ABN 341 008 173 56

Registered Chartered Professional Engineer

Registered Professional Engineer (Civil & Structural) QLD

Registered Certifying Engineer (Structural) N.T.

Registered Engineer - (Civil) VIC

Registered Engineer - (Civil) TAS

Regn. No. 2558980

Regn. No. 9985

Regn. No. 116373ES

Regn. No. EC36692

Regn. No. CC5648M

Mr Timothy Roy Messer BE MIEAust RPEQ

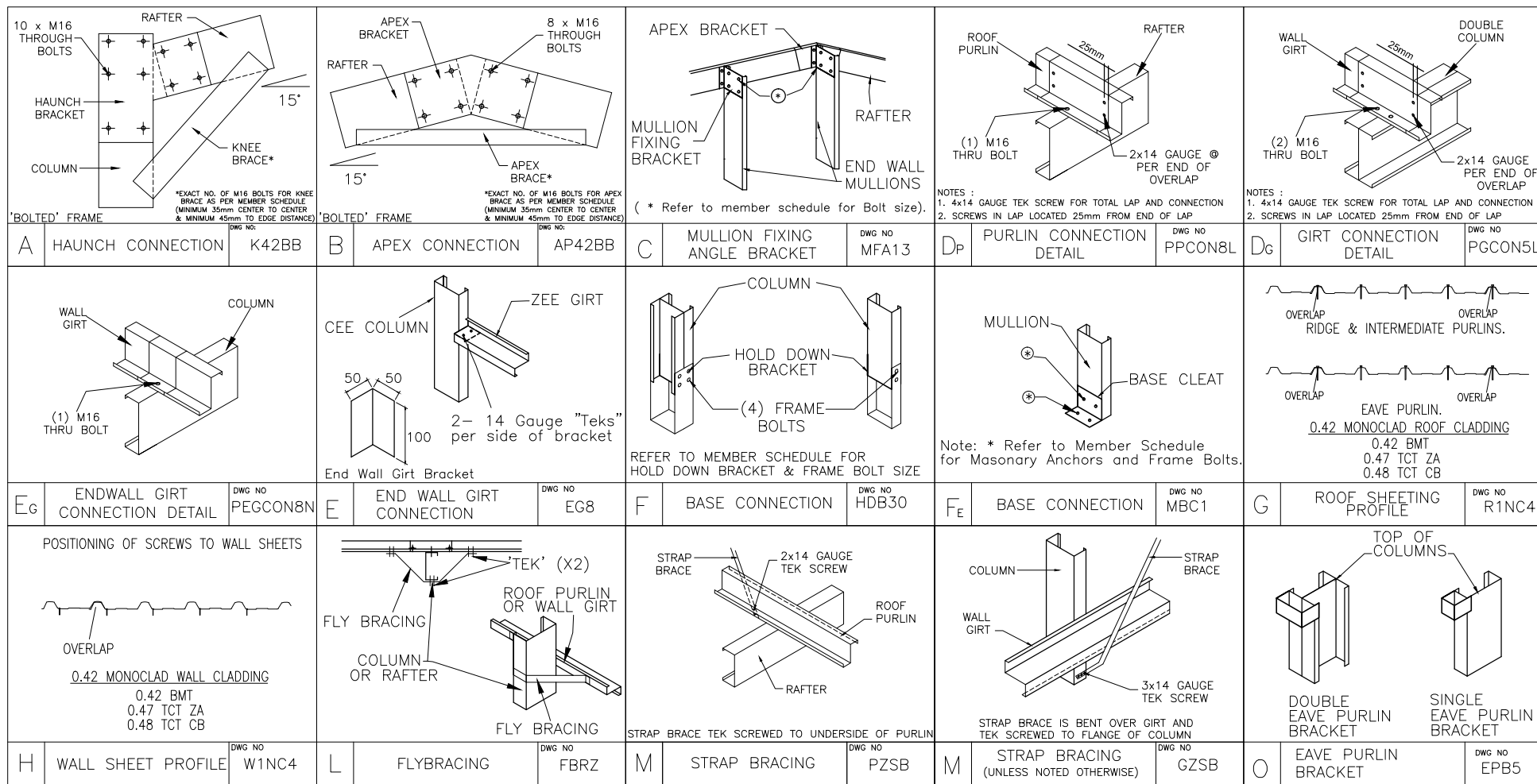
Registered Professional Engineer 2558980

Signature *T. Messer*

Date 25/8/2016

Registered on the NPER in the areas of practice of Civil & Structural National Professional Engineers Register

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.



MEMBER AND MATERIAL SCHEDULE

ITEM	DESCRIPTION	QUANTITY	ITEM TO CHANGE IN BOM
1	END WALL RAFTER (R2)	Single C25019	
2	END WALL RAFTER (R1)	Single C25024	X
3	C.S. FRAME RAFTER (R1)	Single C25024	
4	END FRAME COLUMN (C2)	Single C25019	
5	END FRAME ROTATED COLUMN (C3)	Single C25024 (Bolted with M16 @ 800 ctrs)	X
6	C.S. FRAME COLUMN (C1)	Double C25024	
7	MULLION (C3)	Single C25024	
8	C.S. FRAME KNEE BRACE	Single C20024 @ 4.20 LONG 3 bolts each end	
9	KNEE BRACE HEIGHT UP COLUMN	3.17m	
10	KNEE BRACE LENGTH UP RAFTER	3.34m	
11	C.S. FRAME APEX BRACE	Single C20024 @ 4.76 LONG 2 bolts each end	
12	APEX POSITION FROM RAFTER END	2.46m	
13	END DBL ANCHOR BRACKETS (# PER DETS.)	HDB Double 250 X 150 X 5 - 400 DEEP - Gal Flat	
14	MAIN DBL ANCHOR BRACKETS (# PER DETS.)	HDB Double 250 X 150 X 5 Gal Flat	
15	END ANCHOR BRACKETS (# PER DETS.)	HOLD DOWN BRKTS 250 X 75 X 5-400 DEEP GAL FLAT	
16	MULLION ANCHOR BOLTS (# PER DETS.)	Sleeve Anchor 16.0x110 ZY	
17	EAVE PURLIN	C15019 (Eave Purlin Bracket 15mm down from top of column)	X
18	TYP. ROOF PURLIN SIZE	Z15015 (Bridging rows 1)	X
19	MAIN BLDG. PURLIN SPACING	1.08 m. (8 rows) (Max Allow. 1.44m)	X
20	MAIN BLDG. PURLIN LENGTH	5.5 m. (0.5m Overlap)	
21	ROOF PURLIN BRIDGING	Tophat 64 x 0.75	
22	TYP. SIDEWALL GIRT SIZE	Z15015 (Bridging rows 1)	X
23	MAIN BLDG. SIDEWALL GIRT SPACING	0.80 m. (6 rows) (Max Allow. 0.98m)*	X
24	MAIN BLDG. SIDEWALL GIRT LENGTH	5.5 m. (0.5m Overlap)	
25	SIDEWALL GIRT BRIDGING	Tophat 64 x 0.75	
26	TYP. ENDWALL GIRT SIZE	Z15015	X
27	MAIN BLDG. ENDWALL GIRT SPACING	0.90 m. (8 rows) (Max Allow. 0.97m)*	X
28	MAIN BLDG. ENDWALL GIRT LENGTH	4.35 m. (0.3m Overlap)	
29	FRAME SCREW FASTENERS	14-13x22 Hex C/S (SP HD 5/16" Hex Drive)	
30	FRAME BOLT FASTENERS	8.8 Hex BN M16x45 Z/P	
31	PURLIN/GIRT FASTENERS	Purlin Assy M16x30 Z/P	X
32	X-BRACING STRAP AND FASTENERS	38x1.6 Strap	
33	WALL COLOUR	PALE_EUCALYPT	
34	ROOF COLOUR	PALE_EUCALYPT	
35	DOWNPIPE COLOUR	PALE_EUCALYPT	
36	GUTTER COLOUR	PALE_EUCALYPT	
37	CORNER FLASHING COLOUR	PALE_EUCALYPT	
38	BARGE FLASHING COLOUR	PALE_EUCALYPT	
39	OPENING FLASHING COLOUR	PALE_EUCALYPT	
40	OPEN BAY HEADER HEIGHT	600	

C.S. = CLEARSPAN "L." = LEFT "R." = RIGHT
 * HALVE GIRT SPACING FOR 1m ABOVE TILT PANELS AROUND PERIMETER OF BUILDING

BAY	WIDTH	PURLIN AND GIRT LENGTHS	
		PURLIN LENGTH	GIRT LENGTH
1	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
2	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
3	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
4	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
5	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
6	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
7	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
8	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
9	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
10	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
11	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)
12	5m	5.5 m. (0.5m Lap)	5.5 m. (0.5m Lap)

6 OF 7 SHEET
 JOB NO. GRIF 16660
 DATE 25/8/2016
 CERTIFIED T.M.
 DRAWN FDS
 CHECK 1 KC
 CHECK 2 KC

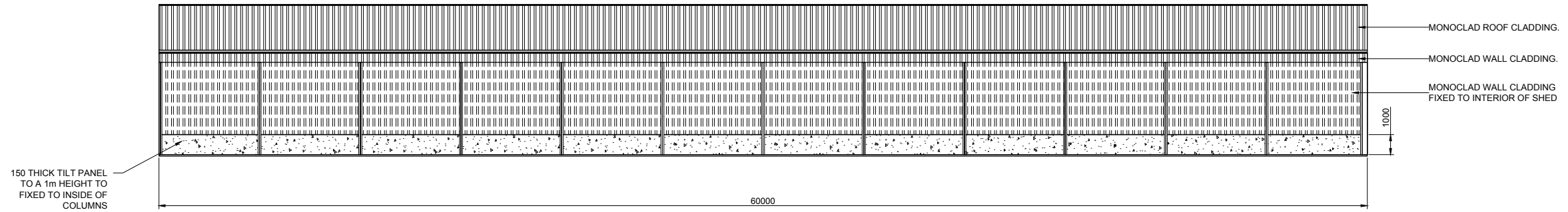
STEEL BUILDING BY (CONTACT)
GRIFFITH SHEDS AND GARAGES
 02 6964 9991
 FOR PROTEN HOLDINGS RICE HULL SHED
 AT FARM 60 LOT 2 BOWDITCH ROAD
 GRIFFITH



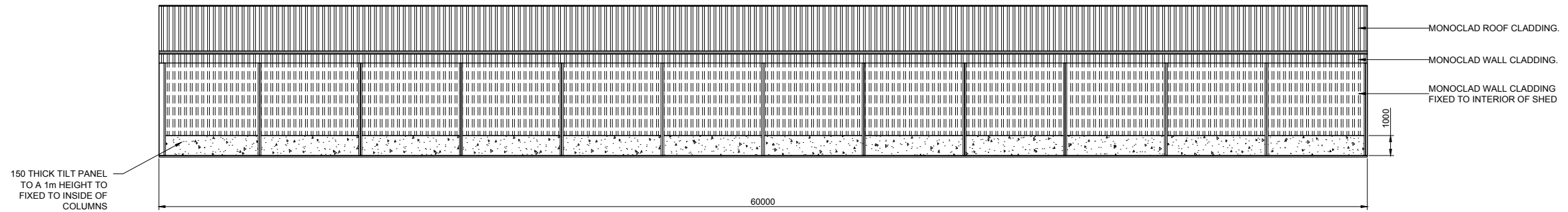
NORTHERN CONSULTING engineers
 Civil & Structural Engineers
 50 Punari Street
 Currajong, Qld 4812
 Fax: 07 4725 5850
 Email: design@nceng.com.au
 ABN 341 008 173 56
 Registered Chartered Professional Engineer
 Registered Professional Engineer (Civil & Structural) QLD
 Registered Certifying Engineer (Structural) N.T.
 Registered Engineer - (Civil) VIC
 Registered Engineer - (Civil) TAS

Mr Timothy Roy Messer BE MIEAust RPEQ
 Registered Professional Engineer 2558980
 Signature *T. Messer*
 Date 25/8/2016
 Registered on the NPER in the areas of practice
 of Civil & Structural National Professional
 Engineers Register

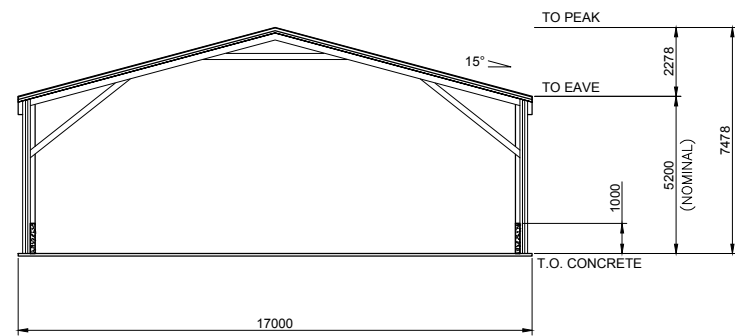
The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.



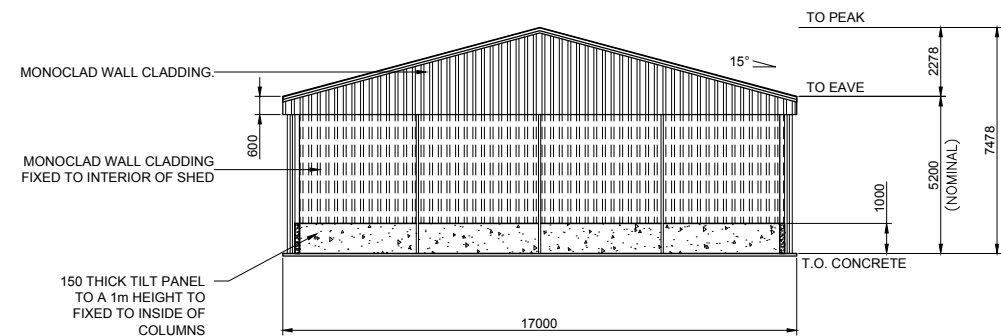
1
7 SIDEWALL EXTERIOR ELEVATION
SCALE: 1 = 250



2
7 SIDEWALL EXTERIOR ELEVATION
SCALE: 1 = 250



4
7 ENDWALL EXTERIOR ELEVATION
SCALE: 1 = 250



3
7 ENDWALL EXTERIOR ELEVATION
SCALE: 1 = 250

BUILDING COLOURS

WALL	PALE EUCALYPT
ROOF	PALE EUCALYPT
DOWNPIPE	PALE EUCALYPT
GUTTER	PALE EUCALYPT
CORNER FLASHING	PALE EUCALYPT
BARGE FLASHING	PALE EUCALYPT
OPENING FLASHING	PALE EUCALYPT

7 OF 7 SHEET

JOB NO. GRIF 16660

DATE 25/8/2016

CERTIFIED TM KC

DRAWN FDS

CHECK 1 KC

CHECK 2 KC

STEEL BUILDING BY (CONTACT) **GRIFFITH SHEDS AND GARAGES**

FOR **PROTEN HOLDINGS RICE HULL SHED**

AT **FARM 60 LOT 2 BOWDITCH ROAD GRIFFITH**

02 6964 9991



NORTHERN CONSULTING engineers

Civil & Structural Engineers
50 Punari Street
Currajong, Qld 4812
Fax: 07 4725 5850
Email: design@nceng.com.au
ABN 341 008 173 56

Registered Chartered Professional Engineer
Registered Professional Engineer (Civil & Structural) QLD
Registered Certifying Engineer (Structural) N.T.
Registered Engineer - (Civil) VIC
Registered Engineer - (Civil) TAS

Regn. No. 2558980
Regn. No. 9985
Regn. No. 116373ES
Regn. No. EC36692
Regn. No. CC5648M

Mr Timothy Roy Messer BE MIEAust RPEQ
Registered Professional Engineer 2558980

Signature *T. Messer*

Date 25/8/2016

Registered on the NPER in the areas of practice of Civil & Structural National Professional Engineers Register

The design and detail shown on these drawings are applicable to this project only and may not be reproduced in whole or any part or be used for any other purpose without the written permission of FBHS (Aust) Pty Limited with whom copyright resides. The local distributor you are dealing with is an authorised independent distributor of Fair Dinkum Sheds' products and enters into agreements with its customers on its own behalf and not as an agent of Fair Dinkum Sheds.

NOTES:

BRACING MATERIALS - THE SHED ERECTOR TO SUPPLY SPECIFIC BRACING. SUITABLE RIGID MEMBERS CAPABLE OF TENSION AND COMPRESSION OR OPPOSING CHAINS OR OPPOSING LOAD RATED RATCHET STRAPS TO BE USED. (RIGID BRACING AS SHOWN ON DIAGRAM) ROPE BRACING SUITABLE ONLY FOR SMALLER STRUCTURES IN IDEAL CONDITIONS.

BRACING LOCATION - TEMPORARY BRACING TO BE ERECTED AS CLOSE TO 45 DEGREE ANGLE AND FIXED TO THE TOP OF THE COLUMN OR MULLION TO ACHIEVE THE OPTIMUM EFFECTIVENESS. IF THERE IS NOT ENOUGH SPACE FOR A 45 DEGREE ANGLE, THEN 20 DEGREE ANGLE IS TO BE THE MINIMUM ANGLE ALLOWED (REFER TO DIAGRAM). RIGID TEMPORARY BRACING MEMBER TO BE BOLTED TO HEAVY ANGLE PEGS HAMMERED INTO THE GROUND OR TO A BRACKET, MASONRY ANCHORED TO THE SLAB.

BRACING REMOVAL - TEMPORARY BRACING TO REMAIN IN PLACE UNTIL CLADDING IS FULLY INSTALLED WHERE POSSIBLE. IN NO CASE SHOULD TEMPORARY BRACING BE REMOVED UNTIL ALL PURLINS, GIRTS (AND PERMANENT CROSS BRACING WHERE USED) ARE FIXED.

SITE SAFETY - DUE CONSIDERATION TO BE GIVEN TO SITE SAFETY IN REGARD TO LOCATIONS OF BRACING AND PEGS.

GUIDE APPLICATION - TEMPORARY BRACING AS DESCRIBED IS A MINIMUM REQUIREMENT FOR AN AVERAGE, STANDARD SITE CONDITION. PROVIDE ADDITIONAL BRACING FOR MORE SEVERE AND/OR HIGH EXPOSURE SITE CONDITIONS. ADDITIONAL BRACING TO BE USED AS AND WHERE NECESSARY TO ENSURE THAT ENTIRE FRAME IS RIGID THROUGHOUT CONSTRUCTION. RESPONSIBILITY FOR ENSURING STABILITY OF STRUCTURE REMAINS WITH THE BUILDER.

TILT UP METHOD
FOR STRUCTURES UNDER 9M SPAN, LESS THAN 3M HIGH AND LESS THAN 12M LONG

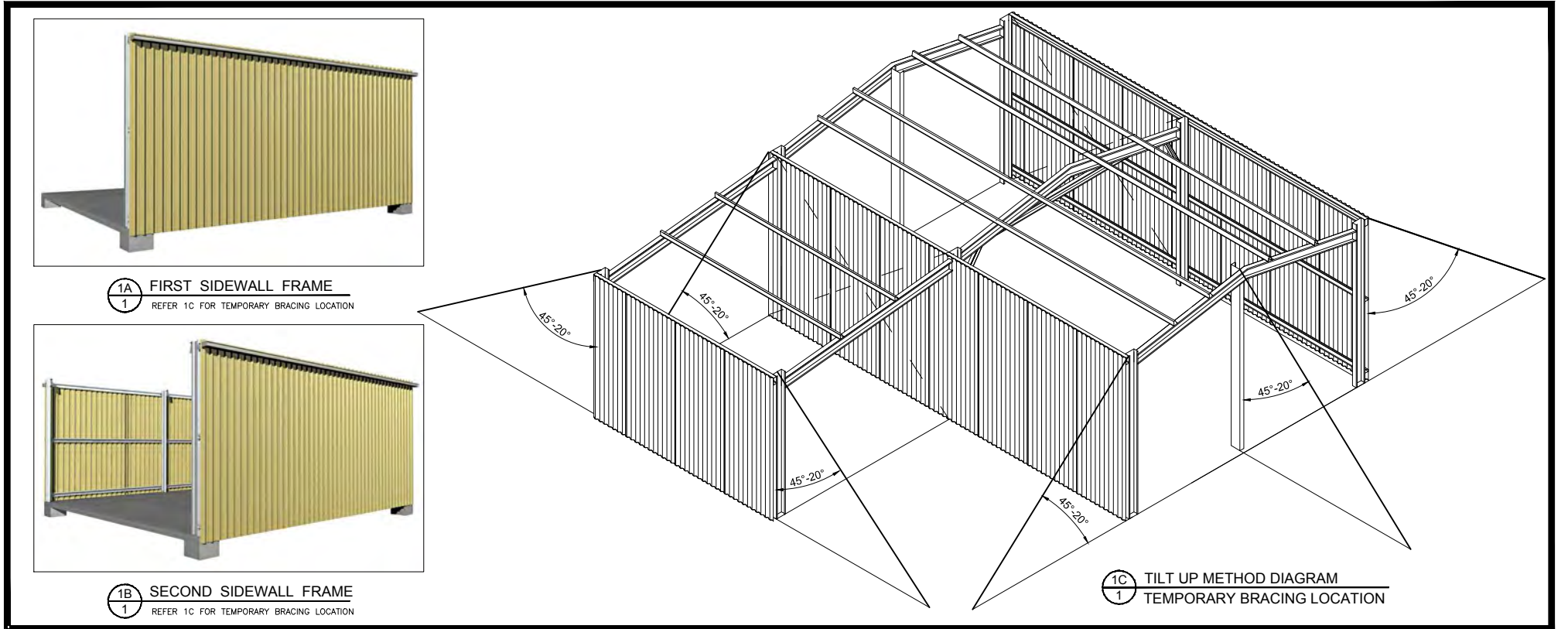
- A. ASSEMBLE THE FIRST SIDEWALL FRAME (COMPLETE WITH WALL SHEETING, BRACING AND GUTTER) ON THE GROUND AND LIFT ASSEMBLED SIDEWALL FRAME INTO POSITION. FIX OFF TEMPORARY SIDE BRACING TO EACH END (REFER TO DIAGRAM). FIX BASE CLEATS.
- B. ASSEMBLE THE SECOND SIDEWALL FRAME AS PER FIRST SIDEWALL FRAME. LIFT INTO POSITION. FIX OFF TEMPORARY WALL BRACING TO EACH END (REFER TO DIAGRAM) FIX BASE CLEATS.
- C. FIX GABLE END RAFTERS TO COLUMNS TO TIE WALLS. PROP APEX UNTIL ENDWALL MULLION AND APEX TEMPORARY BRACE ARE FIXED OFF. IF NO MULLION IS REQUIRED THEN PROP AND BRACE APEX UNTIL CLADDING IS COMPLETE.
- D. INSTALL REMAINING RAFTERS. AS EACH RAFTER PAIR IS INSTALLED, AT LEAST ONE PURLIN PER 3M OF RAFTER LENGTH IS TO BE INSTALLED TO SECURE RAFTERS.
- E. INSTALL REMAINING PURLINS
- F. INSTALL KNEE AND APEX BRACES IF AND WHERE APPLICABLE.
- G. REPEAT FOR LEANTO'S.

FRAME FIRST METHOD
FOR STRUCTURES OVER 9M SPAN, GREATER THAN 3M HIGH AND GREATER THAN 12M LONG

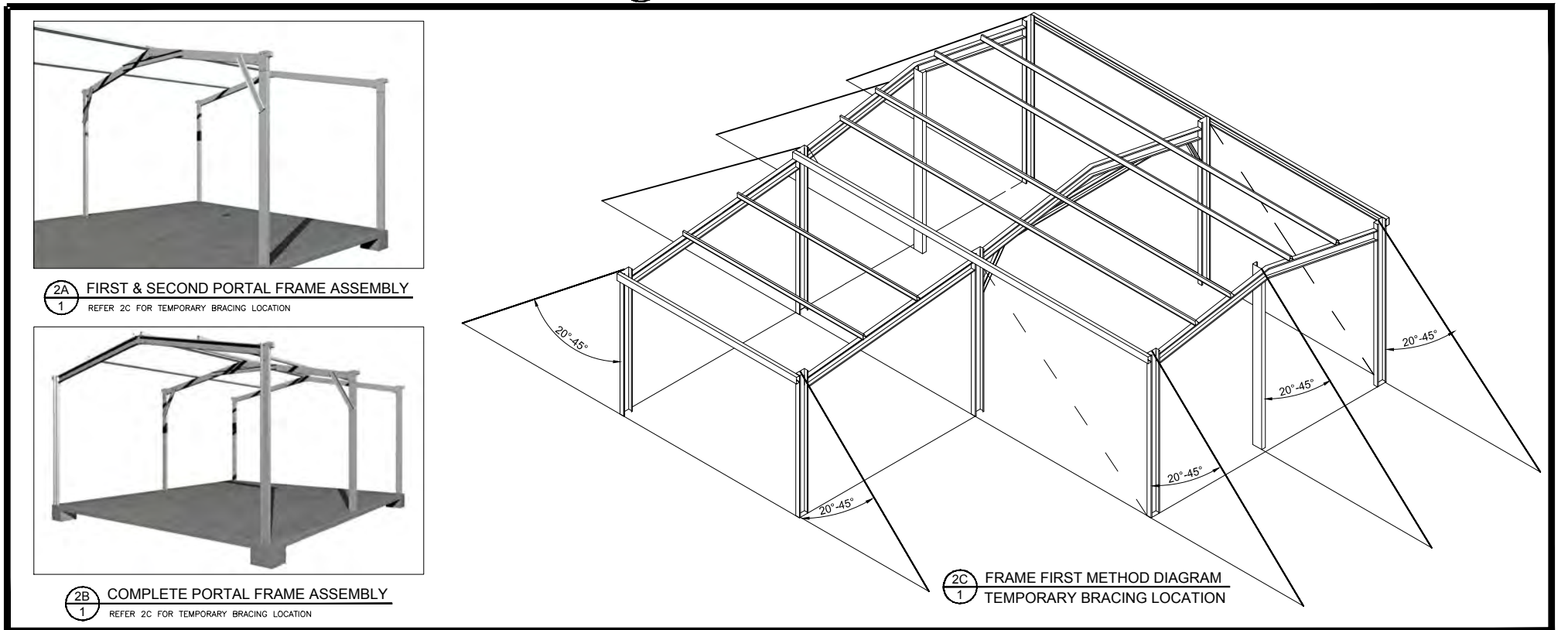
- A. ASSEMBLE PORTAL FRAMES ON THE GROUND (WITH KNEE AND APEX BRACES IF AND WHERE APPLICABLE). LIFT THE FIRST PORTAL FRAME ASSEMBLY INTO POSITION. FIX OFF TEMPORARY END BRACING (REFER TO DIAGRAM). FIX BASE CLEATS.
- B. PROP APEX UNTIL ENDWALL MULLION AND APEX TEMPORARY BRACE ARE FIXED OFF. IF NO MULLION IS REQUIRED THEN PROP AND BRACE APEX UNTIL CLADDING IS COMPLETE.
- C. THE SECOND PORTAL FRAME ASSEMBLY TO BE LIFTED INTO POSITION. FIX EAVE PURLINS AND AT LEAST ONE PURLIN PER 3M OF RAFTER TO SECURE FRAME ASSEMBLY. FIX BASE CLEATS. FIX TEMPORARY SIDEWALL BRACING.
- D. STAND REMAINING PORTAL FRAME ASSEMBLY AS PER STEP C, FIXING TEMPORARY SIDE WALL BRACING TO EVERY SECOND BAY. BRACE OTHER END PORTAL FRAME AS PER FIRST PORTAL FRAME.
- E. INSTALL REMAINING PURLINS AND GIRTS.
- F. REPEAT FOR LEANTO'S.

GUIDE TO THE INSTALLATION OF TEMPORARY BRACING

(REFER TO FDHS INSTALLATION GUIDE MANUAL FOR THE TWO METHODS OF CONSTRUCTION)



1 TILT UP METHOD DIAGRAM
SCALE: NTS



2 FRAME FIRST METHOD DIAGRAM
SCALE: NTS

JOB NO.	DATE	CHECKED	DRAWN
GRIF-16660	25/8/2016	TM	FDS

STEEL BUILDING BY (CONTACT) **GRIFFITH SHEDS AND GARAGES**

FOR 02 6964 9991

AT **PROTEN HOLDINGS RICE HULL SHED**

FARM 60 WALLA AVE
GRIFFITH

fairdinkum SHEDS

NORTHERN CONSULTING engineers

Civil & Structural Engineers
50 Punari Street
Currajong, Qld 4812
Fax: 07 4725 5850
Email: design@nceng.com.au
ABN 341 008 173 56

Registered Chartered Professional Engineer
Registered Professional Engineer (Civil & Structural) QLD
Registered Certifying Engineer (Structural) N.T.
Registered Engineer - (Civil) VIC
Registered Engineer - (Civil) TAS

Regn. No. 2558980
Regn. No. 9985
Regn. No. 116373ES
Regn. No. EC36692
Regn. No. CC5648M

Mr Timothy Roy Messer BE MIEAust RPEQ
Registered Professional Engineer 2558980

Signature *T. Messer*

Date 25/8/2016

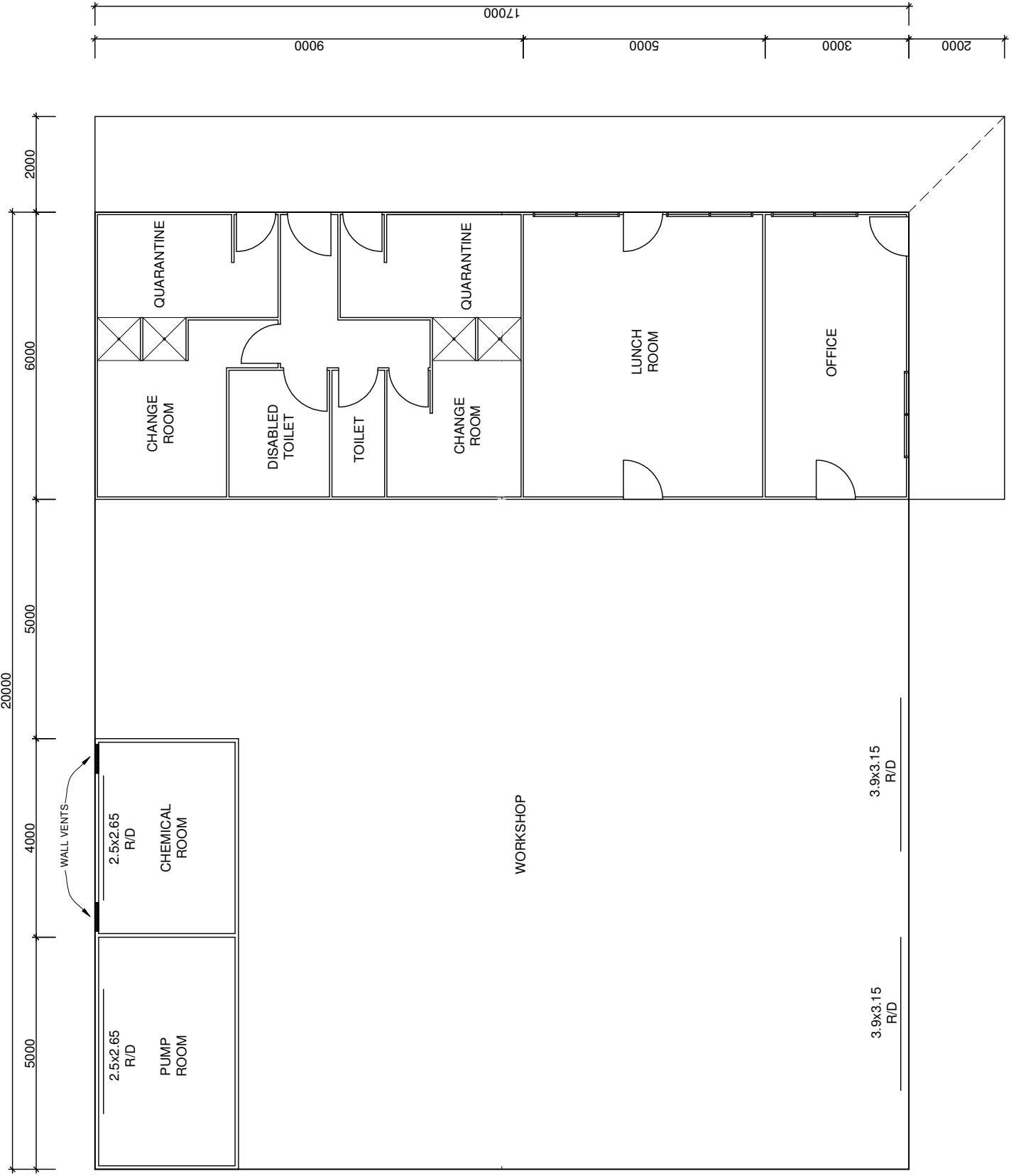
Registered on the NPER in the areas of practice
of Civil & Structural National Professional
Engineers Register

COMPLIANCE CERTIFICATE FOR BUILDING DESIGN

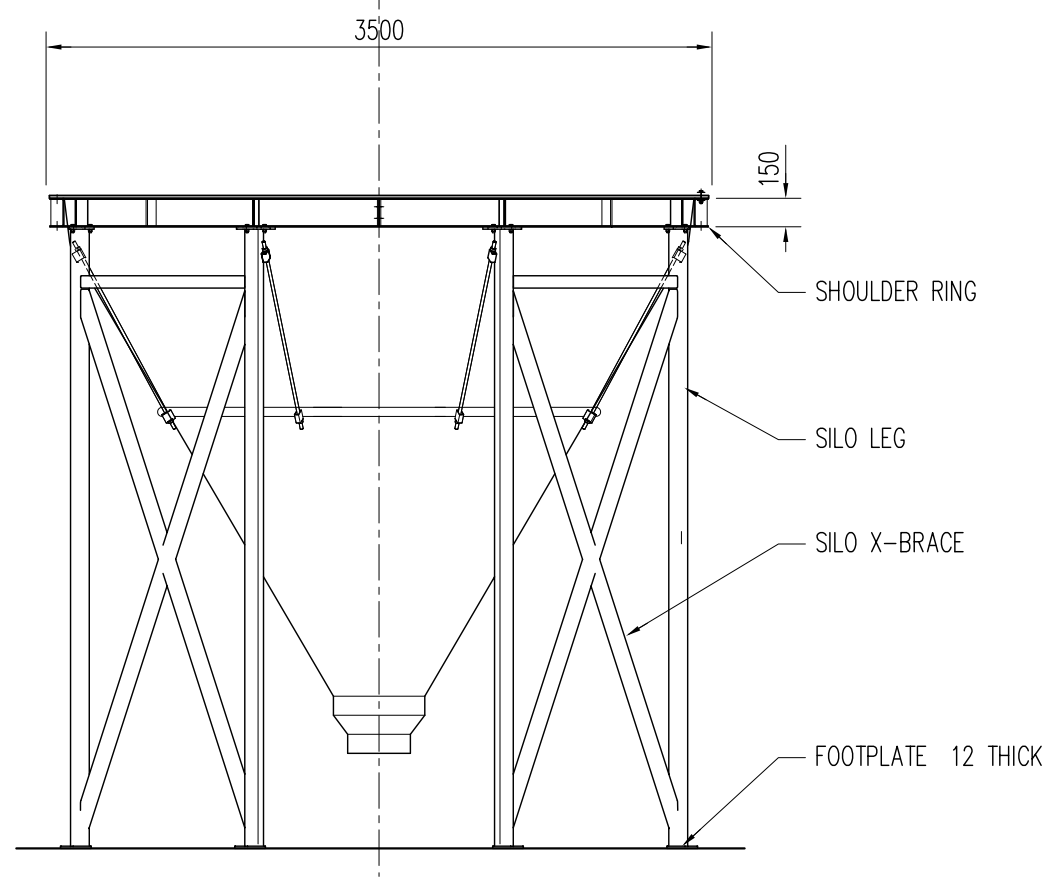
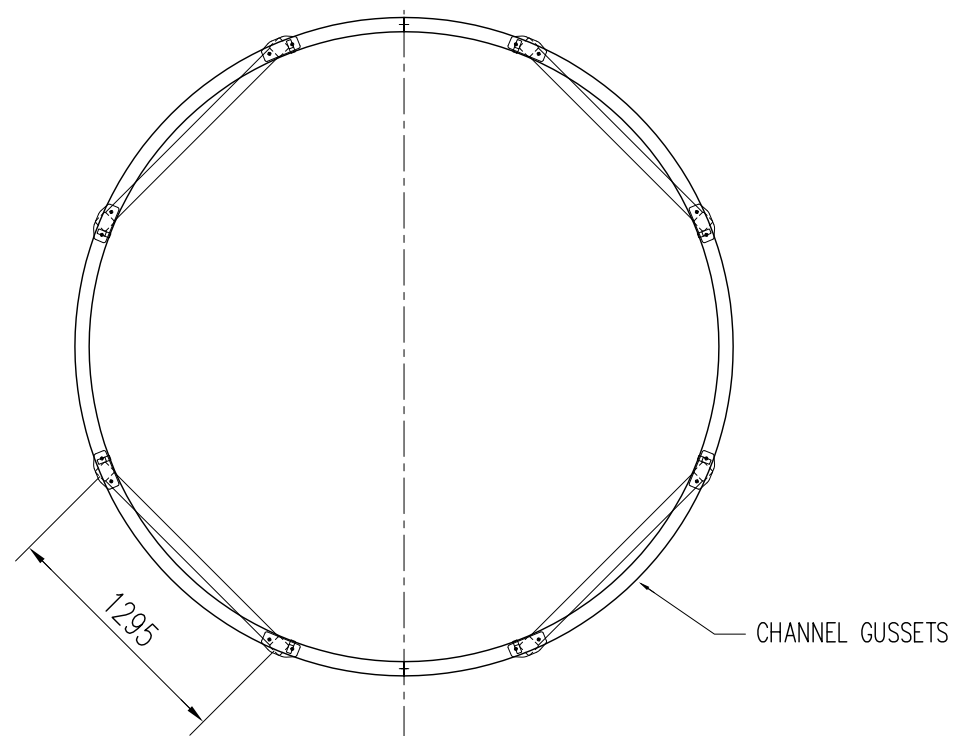
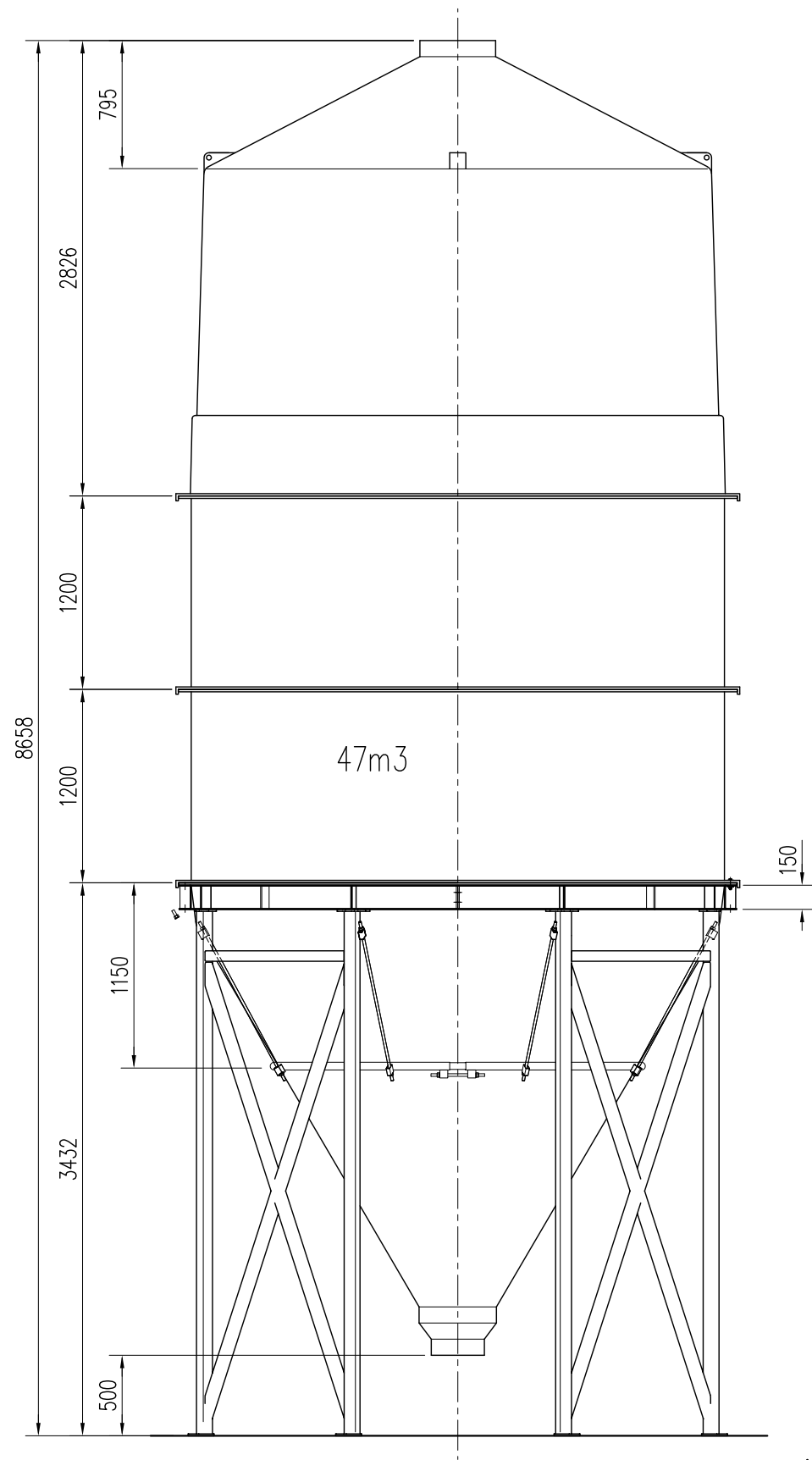
<p>Property Description Street address (include number, street, suburb/locality & postcode)</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="padding: 2px;">FARM 60 LOT 2 BOWDITCH ROAD*</td> <td style="padding: 2px;">Postcode : 2680</td> </tr> <tr> <td style="padding: 2px;">GRIFFITH</td> <td style="padding: 2px;"></td> </tr> </table> <p>★ - Certifier to confirm on site that the wind loadings for this design are true and correct for the address stated</p>	FARM 60 LOT 2 BOWDITCH ROAD*	Postcode : 2680	GRIFFITH																			
FARM 60 LOT 2 BOWDITCH ROAD*	Postcode : 2680																						
GRIFFITH																							
<p>Description of Component/s Certified Clearly describe the extent of work covered by this certificate.</p>	<p>Steel Portal Frame Structure.</p> <p>17m span x 60m O/A length x 5.2m eaves height.</p> <p>Consisting of 12 bays at 5m, 5m, 5m, 5m, 5m, 5m, 5m, 5m, 5m, 5m, 5m, 5m spacings.</p>																						
<p>Basis of Certification Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="padding: 2px;">Australian Standards (list) AS/NZS 4600-2005, AS/NZS 1170.0.1,2,3-2011, AS2870-2011, AS3600-2009</td> </tr> <tr> <td colspan="2" style="padding: 2px;">2016 National Construction Code of Australia</td> </tr> <tr> <td style="padding: 2px;">Region AS1170.2 = Reg A</td> <td style="padding: 2px;">Factor for Region = NA</td> </tr> <tr> <td style="padding: 2px;">NCC Importance Level = 2</td> <td style="padding: 2px;">NCC Equivalent Wind class = N/A</td> </tr> <tr> <td style="padding: 2px;">Annual Probability Exceedance wind = 1:500</td> <td style="padding: 2px;">Design Roof Live Load = 0.25 kPa</td> </tr> <tr> <td colspan="2" style="padding: 2px;">Regional 3 s Gust Wind Speed for annual probability of exceedance $V_R = 45$ m/s</td> </tr> <tr> <td colspan="2" style="padding: 2px;">Wind directional multipliers for the 8 cardinal directions $M_d = 1.00$</td> </tr> <tr> <td style="padding: 2px;">Terrain/Height multiplier (M_z, Cat) = 0.93</td> <td style="padding: 2px;">Shielding Multiplier $M_s = 1$</td> </tr> <tr> <td style="padding: 2px;">Topographic multiplier $M_t = 1$</td> <td style="padding: 2px;">Site Wind Speed $V_{sit,B} = 40$ m/s</td> </tr> <tr> <td style="padding: 2px;">Ext. Pressure Coefficient $c_{pe} = -1.35, 1.35$</td> <td style="padding: 2px;">Int. Pressure Coefficient $c_{pi} = -0.65, 0.7$</td> </tr> </table>	Australian Standards (list) AS/NZS 4600-2005, AS/NZS 1170.0.1,2,3-2011, AS2870-2011, AS3600-2009		2016 National Construction Code of Australia		Region AS1170.2 = Reg A	Factor for Region = NA	NCC Importance Level = 2	NCC Equivalent Wind class = N/A	Annual Probability Exceedance wind = 1:500	Design Roof Live Load = 0.25 kPa	Regional 3 s Gust Wind Speed for annual probability of exceedance $V_R = 45$ m/s		Wind directional multipliers for the 8 cardinal directions $M_d = 1.00$		Terrain/Height multiplier (M_z, Cat) = 0.93	Shielding Multiplier $M_s = 1$	Topographic multiplier $M_t = 1$	Site Wind Speed $V_{sit,B} = 40$ m/s	Ext. Pressure Coefficient $c_{pe} = -1.35, 1.35$	Int. Pressure Coefficient $c_{pi} = -0.65, 0.7$		
Australian Standards (list) AS/NZS 4600-2005, AS/NZS 1170.0.1,2,3-2011, AS2870-2011, AS3600-2009																							
2016 National Construction Code of Australia																							
Region AS1170.2 = Reg A	Factor for Region = NA																						
NCC Importance Level = 2	NCC Equivalent Wind class = N/A																						
Annual Probability Exceedance wind = 1:500	Design Roof Live Load = 0.25 kPa																						
Regional 3 s Gust Wind Speed for annual probability of exceedance $V_R = 45$ m/s																							
Wind directional multipliers for the 8 cardinal directions $M_d = 1.00$																							
Terrain/Height multiplier (M_z, Cat) = 0.93	Shielding Multiplier $M_s = 1$																						
Topographic multiplier $M_t = 1$	Site Wind Speed $V_{sit,B} = 40$ m/s																						
Ext. Pressure Coefficient $c_{pe} = -1.35, 1.35$	Int. Pressure Coefficient $c_{pi} = -0.65, 0.7$																						
<p>Reference Documentation Clearly identify any relevant documentation, e.g numbered structural engineering plans</p>	<p>Drawing Nos: 'Fair Dinkum Sheds' Structural Design Drawing</p> <p>To be read in conjunction with Pages 1 to 6</p> <p>For Job Number: GRIF16660 DATED : 30/8/2016</p> <p>Specifications:</p> <p>Computations:</p> <p>Test Reports:</p> <p>Other Documentation:</p>																						
<p>Competent Person Details A competent person for building work, means a person who is assessed by the building certifier for the work as competent to practise in aspect of the design, building or inspection of the building work because of the person's skill and experience in the aspect. The competent person must also be registered or licensed under a law applying in the state to practice the aspect.</p> <p>A COPY OF A CURRENT CV AND PROFESSIONAL REGISTRATION DETAILS MUST BE PROVIDED WITH THE CERTIFICATE</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 2px;">Name:</td> <td style="padding: 2px;">Timothy Roy Messer</td> </tr> <tr> <td style="padding: 2px;">Company Name (If applicable):</td> <td style="padding: 2px;">Northern Consulting Engineers</td> </tr> <tr> <td style="padding: 2px;">Postal Address:</td> <td style="padding: 2px;">50 Punari Street, Currajong 4812</td> </tr> <tr> <td style="padding: 2px;">Contact Person:</td> <td style="padding: 2px;">Timothy Roy Messer</td> </tr> <tr> <td style="padding: 2px;">Telephone Number:</td> <td style="padding: 2px;">07 4725 5550</td> </tr> <tr> <td style="padding: 2px;">Mobile Number:</td> <td style="padding: 2px;">N/A</td> </tr> <tr> <td style="padding: 2px;">Fax Number:</td> <td style="padding: 2px;">07 4725 5850</td> </tr> <tr> <td style="padding: 2px;">Email Address:</td> <td style="padding: 2px;">design@nceng.com.au</td> </tr> <tr> <td style="padding: 2px;">License or Registration Number:</td> <td style="padding: 2px;">2558980</td> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px;">Copy of CV Attached: Tick Box</td> </tr> <tr> <td style="padding: 2px;"></td> <td style="padding: 2px; text-align: right;">Y <input type="checkbox"/> or N <input checked="" type="checkbox"/></td> </tr> </table>	Name:	Timothy Roy Messer	Company Name (If applicable):	Northern Consulting Engineers	Postal Address:	50 Punari Street, Currajong 4812	Contact Person:	Timothy Roy Messer	Telephone Number:	07 4725 5550	Mobile Number:	N/A	Fax Number:	07 4725 5850	Email Address:	design@nceng.com.au	License or Registration Number:	2558980		Copy of CV Attached: Tick Box		Y <input type="checkbox"/> or N <input checked="" type="checkbox"/>
Name:	Timothy Roy Messer																						
Company Name (If applicable):	Northern Consulting Engineers																						
Postal Address:	50 Punari Street, Currajong 4812																						
Contact Person:	Timothy Roy Messer																						
Telephone Number:	07 4725 5550																						
Mobile Number:	N/A																						
Fax Number:	07 4725 5850																						
Email Address:	design@nceng.com.au																						
License or Registration Number:	2558980																						
	Copy of CV Attached: Tick Box																						
	Y <input type="checkbox"/> or N <input checked="" type="checkbox"/>																						
<p>Signature of Competent Person This form may be used by competent persons to certify the design of a material, system, method of building, building element design or other thing.</p> <p>If the competent person is a licensed company the authorised person of the company is to sign the form.</p>	<p>I certify that the item/s described above, if installed or carried out in accordance with the information contained in this certificate, including any referenced documentation, will comply with the National Construction Code of Australia/relevant Australian or International Standard.</p> <p>Signature of competent person: Date: 30/8/2016</p>																						

LOCAL GOVERNMENT USE ONLY			
Date received		Reference Number/s	

AMENITIES AND WORKHOP BUILDING



SILOS



**KNOCK-DOWN SILO
ASSEMBLY 47m3**
SCALE 1:30

ALL DATA DISCLOSED HEREIN IS THE PROPERTY OF ENMACH INDUSTRIES Pty Ltd AND MAY NOT BE USED FOR MANUFACTURE, PROCUREMENT OR DISCLOSURE WITHOUT THE PERMISSION OF THE OWNERS

No.	REVISION	DRAWN	DATE
B	FOR CONSTRUCTION	RBB	02/17
A	FOR APPROVAL	RGR	02/16



BUNDABERG. QUEENSLAND. AUSTRALIA

1800 502 167

SCALE	1:40	
DRAWN	R.BRITTON	02-2016
CHECKED	-	-
DESIGNED	-	-
APPROVED		

ENMAC INDUSTRIES
KNOCK-DOWN SILO 47m3
ARRANGEMENT

DRAWING No. A3

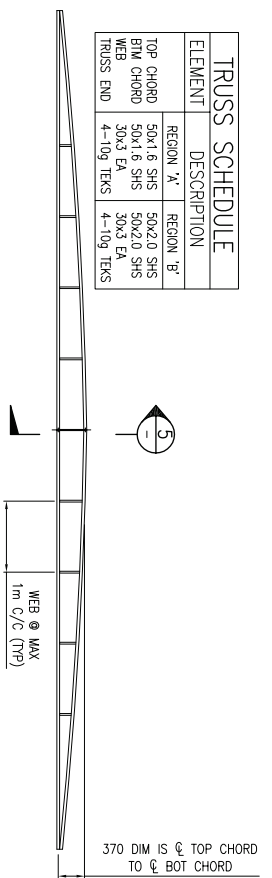
P712-112

ICON DESIGN

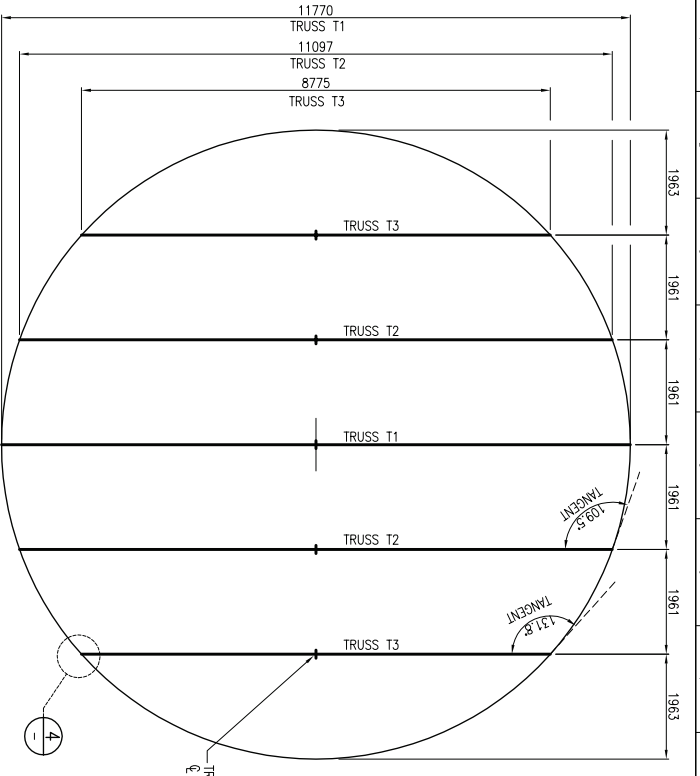
ISSUE	A	B		
-------	---	---	--	--

WATER STORAGE TANKS

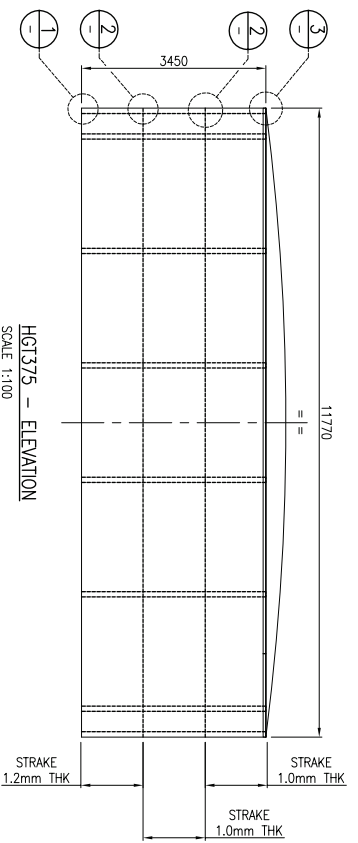
TRUSS SCHEDULE	
ELEMENT	DESCRIPTION
REGION 'A'	REGION 'B'
TOP CHORD	50x1.6 SHS
BM CHORD	50x2.0 SHS
WEB	30x2.0 SHS
STRUT	30x3.0 SHS
TRUSS END	4-10g TENS



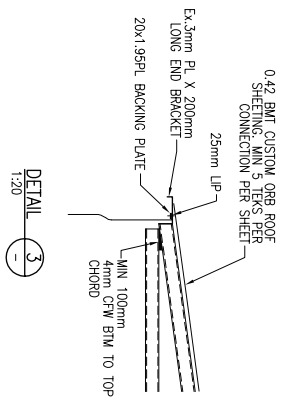
TYPICAL TRUSS 1 ELEVATION
(OTHER TRUSSES SIMILAR)
SCALE 1:75



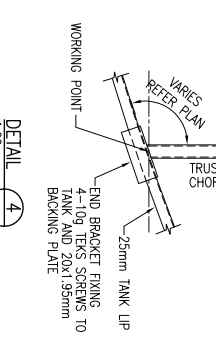
HGT375 - PLAN VIEW
Ø11,770mm TANK x 3,450mm HIGH
SCALE 1:100



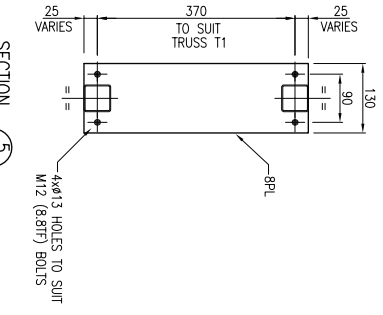
HGT375 - ELEVATION
SCALE 1:100



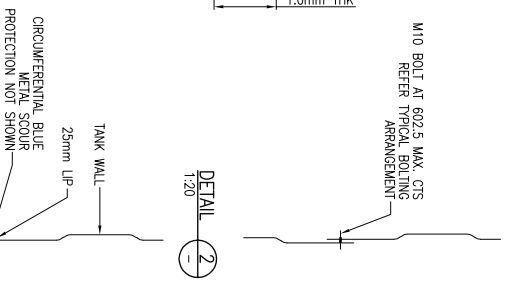
DETAIL 3
1:20



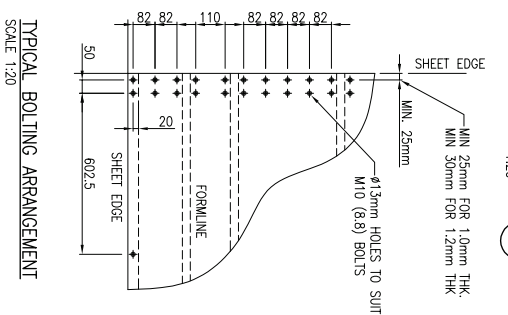
DETAIL 4
1:20



SECTION 5
1:10



DETAIL 1
1:20



TYPICAL BOLTING ARRANGEMENT
SCALE 1:20

DESIGN CRITERIA
AS/NZS 1170.2: 2011 (WIND ACTIONS)
REGION A & B
TERRAIN CATEGORY 2
IMPORTANCE LEVEL 2

- NOTES:**
1. WALL SHEET STEEL GRADE C250
 2. ROOF SHEETING 0.42MM CUSTOM ORB. MIN 5 TENS PER CONNECTION PER SHEET & EQUIVALENT SPACING
 3. CIRCUMFERENTIAL TER FIXING TO TOP OF TANK
 4. ROOF SHEETING TO BE SIDE LAP FASTENED AT MAX 1.0m C/C
 5. ALL BOLTS GRADE M10 (8.8) GALV.
 6. MIN FILLET WELD SIZE OF 4mm

Innovative Structural Concepts Pty Ltd
ISC
Consulting & Engineering
PO Box 2958 WARRICK WA 6024
Tel: +61 81 403 483 597
Fax: +61 81 403 483 591
K9M12460 0750 0681

Reviewed
Praveen Kumar
12/01/2013



No.	DATE	REVISION	BY	ENG APP
C	23.02.17	MINOR REVISIONS	AJC	GT
B	22.11.16	ISSUED FOR CONSTRUCTION	AJC	GT
A	16.09.16	ISSUED FOR APPROVAL	AJC	GT

REVISIONS

DESCRIPTIONS IS COMPARE TO THE HISTORY OF ISCS. IF NOT NOT BE DETAIL, CORRECT OR USED WITHOUT THE AUTHORITY OF ISCS.

THE DRAWING & ITS CONTENTS ARE ELECTRONICALLY GENERATED, AND COMPARE, & NOT ONLY BE USED FOR THE ORIGINAL DRAWING. THE USER MUST BE RESPONSIBLE FOR THE ACCURACY OF THE DATA AND THE CONTENTS OF THE DRAWING. THE USER MUST BE RESPONSIBLE FOR THE ACCURACY OF THE DATA AND THE CONTENTS OF THE DRAWING. THE USER MUST BE RESPONSIBLE FOR THE ACCURACY OF THE DATA AND THE CONTENTS OF THE DRAWING.

Innovative Structural Concepts Pty Ltd
ISC
Consulting & Engineering
PO Box 2958 WARRICK WA 6024
Tel: +61 81 403 483 597
ABN: 4560 0750 0689

DATE	AJC	CHECKED	GT	APPROVED	GT
16.09.16	16.09.16	16.09.16	16.09.16	16.09.16	16.09.16

SCALE	AS SHOWN	DRG NO.	REV.
A3	16045-HGT375-001	C	



Innovative Structural Concepts

Consulting & Engineering

Tel: +61 403 463 597
PO Box 2358 Warwick WA 6024
gavin@istructconcepts.com.au

ABN: 4560 0750 669

1st May 2017

Heritage Tanks Australia Pty Ltd
PO Box 3382
Malaga DC 6945
WESTERN AUSTRALIA

Attention: Mr Peter Schaudin

Dear Peter

**RE: HGT TANK RANGE - STRUCTURAL CERTIFICATION
HGT 18 TO HGT 375**

As requested we confirm that we have completed a structural design review of the above range of tanks. Based on the results of this exercise we certify that this range of tanks is structurally satisfactory subject to compliance with the attached signed drawings.

The above certification is based on compliance with the following Australian Standards:

- AS/NZS 1170.0 Part 0: General Principles
- AS/NZS 1170.1 Part 1: Permanent, imposed and other actions
- AS/NZS 1170.2 Part 2: Wind actions – up to and including
Region A, Importance Level 2, Terrain Category 2
- AS 1170.4 Part 4: Earthquake actions in Australia
Hazard Factor $Z = 0.22$
- AS 2304 Water storage tanks for fire protection systems
- AS 4100 Steel structures

Global stability of the tank under adverse wind or seismic conditions is dependent upon adequate restraint of the tank base by fixing to a suitable foundation or by ensuring a satisfactory minimum level of stored water in the tank.

We confirm that Innovative Structural Concepts Pty Ltd is an independent third party to Heritage Tanks, responsible for the structural design review of the HGT range of tanks.

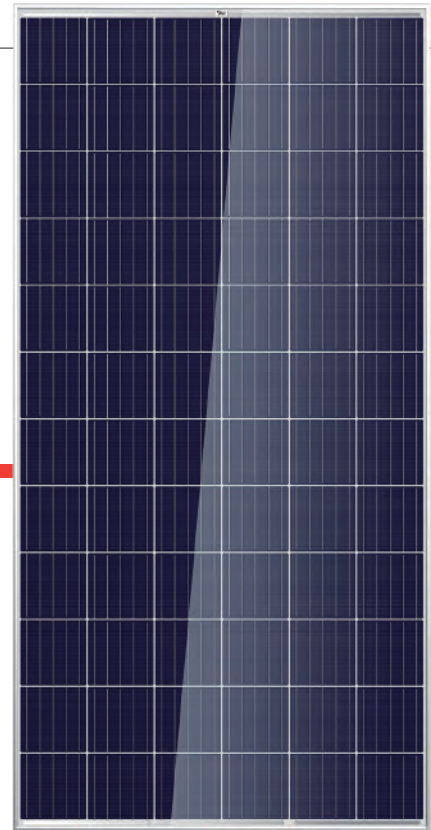
We confirm that the HGT range of tanks complies with Part B1 – Volume 1 of the Building Code of Australia.

Yours faithfully

A handwritten signature in blue ink, appearing to read 'G Thomas', is centered below the text 'Yours faithfully'.

Gavin Thomas
Director
Principal Civil/Structural Engineer
Mob: 0403 463 597

SOLAR PANELS



THE TALLMAX

FRAMED 72-CELL MODULE (1500V)

72 CELL
MULTICRYSTALLINE MODULE

320-335W
POWER OUTPUT RANGE

17.3%
MAXIMUM EFFICIENCY

0~+5W
POSITIVE POWER TOLERANCE

Founded in 1997, Trina Solar is the world's leading comprehensive solutions provider for solar energy. We believe close cooperation with our partners is critical to success. Trina Solar now distributes its PV products to over 60 countries all over the world. Trina is able to provide exceptional service to each customer in each market and supplement our innovative, reliable products with the backing of Trina as a strong, bankable partner. We are committed to building strategic, mutually beneficial collaboration with installers, developers, distributors and other partners.

Comprehensive Products And System Certificates

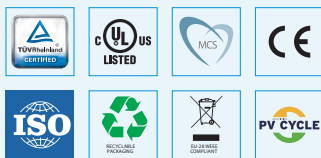
IEC61215/IEC61730/UL1703/IEC61701/IEC62716

ISO 9001: Quality Management System

ISO 14001: Environmental Management System

ISO14064: Greenhouse gases Emissions Verification

OHSAS 18001: Occupation Health and Safety Management System



Ideal for large scale installations

- Reduce BOS cost by connecting more modules in a string
- 1500V UL/1500V IEC certified



One of the industry's most trusted modules

- Field proven performance



Highly reliable due to stringent quality control

- Over 30 in-house tests (UV, TC, HF, and many more)
- In-house testing goes well beyond certification requirements
- 100% EL double inspection

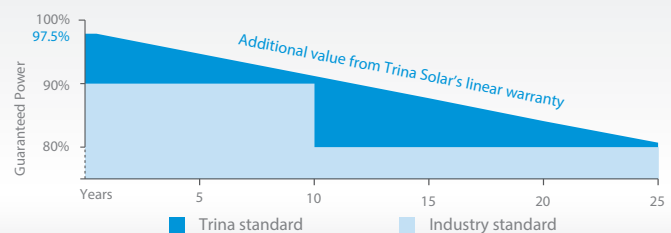


Certified to withstand the most challenging environmental conditions

- 2400 Pa wind load
- 5400 Pa snow load
- 35 mm hail stones at 97 km/h

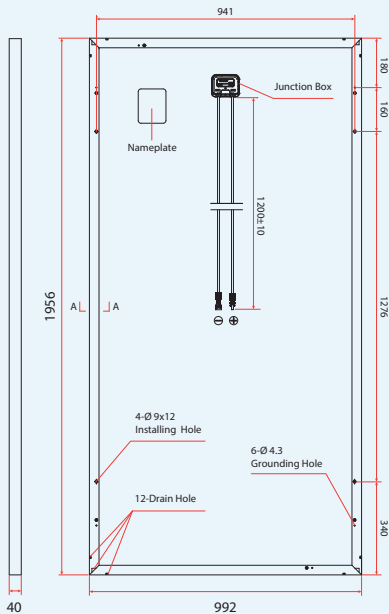
LINEAR PERFORMANCE WARRANTY

10 Year Product Warranty · 25 Year Linear Power Warranty

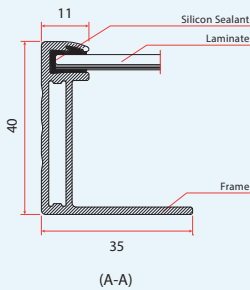


PRODUCTS | POWER RANGE
TSM-PE14A | 320-335W

DIMENSIONS OF PV MODULE(mm)

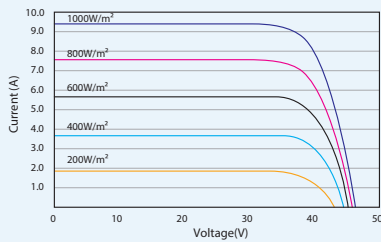


Back View

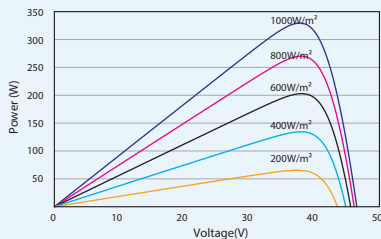


(A-A)

I-V CURVES OF PV MODULE(335W)



P-V CURVES OF PV MODULE(335W)



ELECTRICAL DATA (STC)

Peak Power Watts- P_{MAX} (Wp)*	320	325	330	335
Power Output Tolerance- P_{MAX} (W)	0 ~ +5			
Maximum Power Voltage- V_{MPP} (V)	37.1	37.2	37.3	37.6
Maximum Power Current- I_{MPP} (A)	8.63	8.76	8.87	8.91
Open Circuit Voltage- V_{OC} (V)	45.8	45.9	46.1	46.3
Short Circuit Current- I_{SC} (A)	9.10	9.25	9.38	9.39
Module Efficiency η_p (%)	16.5	16.8	17.0	17.3

STC: Irradiance 1000W/m², Cell Temperature 25°C, Air Mass AM1.5.
*Measuring tolerance: ±3%.

ELECTRICAL DATA (NOCT)

Maximum Power- P_{MAX} (Wp)	238	242	246	249
Maximum Power Voltage- V_{MPP} (V)	34.4	34.5	34.6	34.9
Maximum Power Current- I_{MPP} (A)	6.91	7.02	7.11	7.14
Open Circuit Voltage- V_{OC} (V)	42.5	42.6	42.7	42.9
Short Circuit Current- I_{SC} (A)	7.35	7.47	7.57	7.58

NOCT: Irradiance at 800W/m², Ambient Temperature 20°C, Wind Speed 1m/s.

MECHANICAL DATA

Solar Cells	Multicrystalline 156.75 × 156.75 mm (6 inches)
Cell Orientation	72 cells (6 × 12)
Module Dimensions	1956 × 992 × 40 mm (77.0 × 39.1 × 1.57 inches)
Weight	22.5 kg (49.6 lb)
Glass	3.2 mm (0.13 inches), High Transmission, AR Coated Tempered Glass
Backsheet	White
Frame	Silver Anodized Aluminium Alloy
J-Box	IP 67 or IP 68 rated
Cables	Photovoltaic Technology Cable 4.0mm ² (0.006 inches ²), 1200 mm (47.2 inches)
Connector	MC4 (1500V)

TEMPERATURE RATINGS

NOCT (Nominal Operating Cell Temperature)	44°C (±2°C)
Temperature Coefficient of P_{MAX}	-0.41%/°C
Temperature Coefficient of V_{OC}	-0.32%/°C
Temperature Coefficient of I_{SC}	0.05%/°C

MAXIMUM RATINGS

Operational Temperature	-40~+85°C
Maximum System Voltage	1500V DC (IEC) 1500V DC (UL)
Max Series Fuse Rating	15A

(DO NOT connect Fuse in Combiner Box with two or more strings in parallel connection)

WARRANTY

10 year Product Workmanship Warranty
25 year Linear Power Warranty

(Please refer to product warranty for details)

PACKAGING CONFIGURATION

Modules per box: 27 pieces
Modules per 40' container: 648 pieces

Declaration of Diffuse Reflection of Module Glass

To whom it may concern,

Trina Solar hereby states that the glass used in PV modules is in high transmittance and low reflectivity with specification as below:

For normal low iron toughened glass, the transmittance is >91% and absorbance of glass is around 1%, which means a reflectivity <4% for the incident light from each side of glass.

Trina Solar has introduced glass with diffused reflection coat to reduce the reflectivity on illuminated side, which makes the reflectivity of the side lower than 2%.

The reflectivity will not cause direct reflection and dazzling of glass.

Our technical department would be glad to provide any support and answer your question anytime.

Signature: *Martin Mao*

Job Title: *CQM Director*

Date: *08-03-2012*

Changzhou Trina Solar Energy Co. Ltd. (HQ)

No 2 . Tianhe Road, Trina PV Industrial Park, New District,
Changzhou, Jiangsu, 213031

T: +86 519 8548 2008

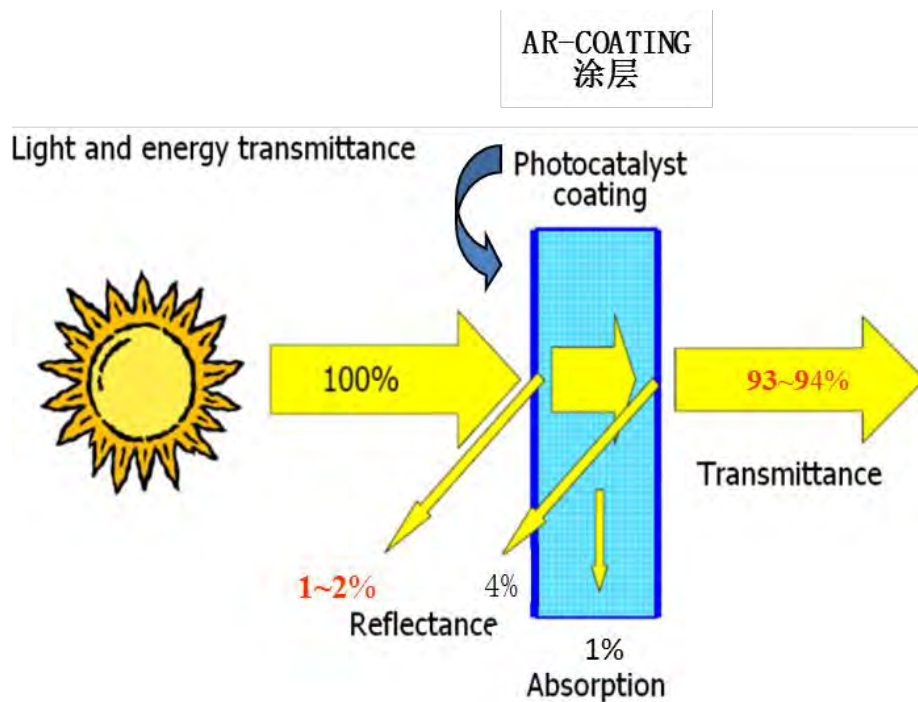
F: +86 519 8517 6021

E: sales@trinasolar.com

Seller/insurer: **Changzhou Trina Solar Energy Co., Ltd.**

To whom it may concern,

TRINA SOLAR LTD hereby states that reflection rate of the AR-Coating glass of the modules sold to your company is less than 6% and the modules can be installed in the airport.



All the possible responsibilities and liabilities of this warranty are grouped into the document called **Limited Warranty Policy for Trina Solar Brand Crystalline Solar Photovoltaic Module**.

Customer Quality Manager: James Wu

Changzhou Trina Solar Energy Co. Ltd. (HQ)

No 2 . Tianhe Road, Trina PV Industrial Park, New District,
Changzhou, Jiangsu, 213031

T: +86 519 8548 2008

F: +86 519 8517 6021

E: sales@trinasolar.com

LPG 7,500 L BULK TANKS

PUBLIC PLACE

Any place, other than private property, open to the public and including a street or road. Public areas for commercial and public buildings are not treated as public places.

PROTECTED PLACE

Any of the following:

- A dwelling, place of worship, public building, school or college, hospital, theatre or any building or open area in which persons are accustomed to assemble in large numbers, whether within or outside the boundary of the installation.
- A factory, office, workshop, store, warehouse, shop or building where people are employed, except a building used for the storage and handling of LPGas.
- A vessel lying at permanent berthing facilities
- Any storage facility for dangerous goods outside the property boundary of the installation, except those defined as minor storage in other standards or regulations

SPECIFICATIONS:

TANK FOOTINGS are to be of minimum crushed rock that will support the total mass of the tank when filled with water

DAMAGE AVOIDANCE if a tank is susceptible to impact is shall be protected by:

- Bollards,
- 'W' guard rails (Armco), or
- Fenced Compound

All to be positioned greater than 1.5m from edge of any Tank

BOLLARDS, if used, must be minimum 75mm steel pipe a max of 1.3m apart, filled with and set in concrete to a minimum height of 1.2 m and minimum depth of 500 mm

FENCE COMPOUNDS are to 1.8 m chain link fence with tension wires and 50 mm diam steel poles set in concrete

ADDITIONAL TANKS can be added; parallel to each other with tank diameter separation between each one

MANIFOLDS for additional Tanks must be made of steel, copper pig-tails to the Manifold are acceptable. Tanks must be fitted with excess flow valve

NOTES:

All clauses of AS1596 are to be observed when planning a Tank Location

Always consider the safe access to the Tank by a Road Tanker when planning a location

No Drains, Pits or Stumps within 3m of the edge of the Tank

Tanks shall not be installed in or above a ground depression

Overhead Electricity lines shall not cross the tank compound

For the use of Vapour Barriers, Firewalls and Thermal check with Elgas Technical Staff

For Tank locations near other Flammable, Combustible or Dangerous Goods check with Elgas Technical Staff

TYPICAL TANK DIMENSIONS		
Tank Size	Length	Diameter
1.35 kl	2.2 m	0.9 m
2.2 kl	2.7 m	1.1 m
2.75 kl	3.3 m	1.1 m
4.3 kl	3.9 m	1.2 m
5.1 kl	4.6 m	1.2 m
7.5 kl	6.6 m	1.2 m

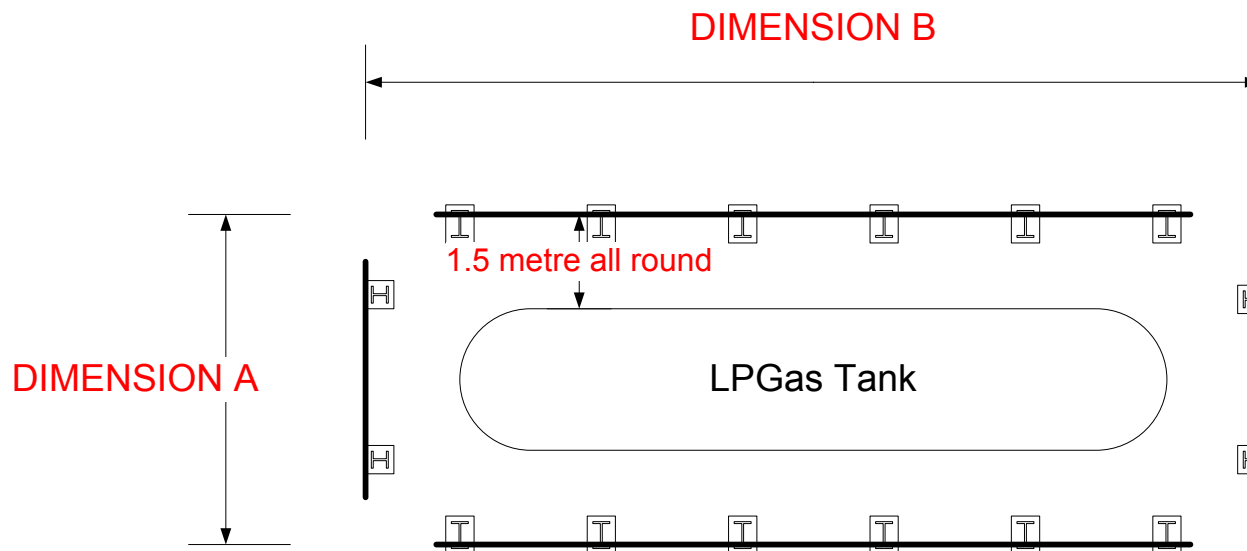
Note: Tank Dimensions in this table are indicative only - ensure correct dimensions for the tank to be installed are used

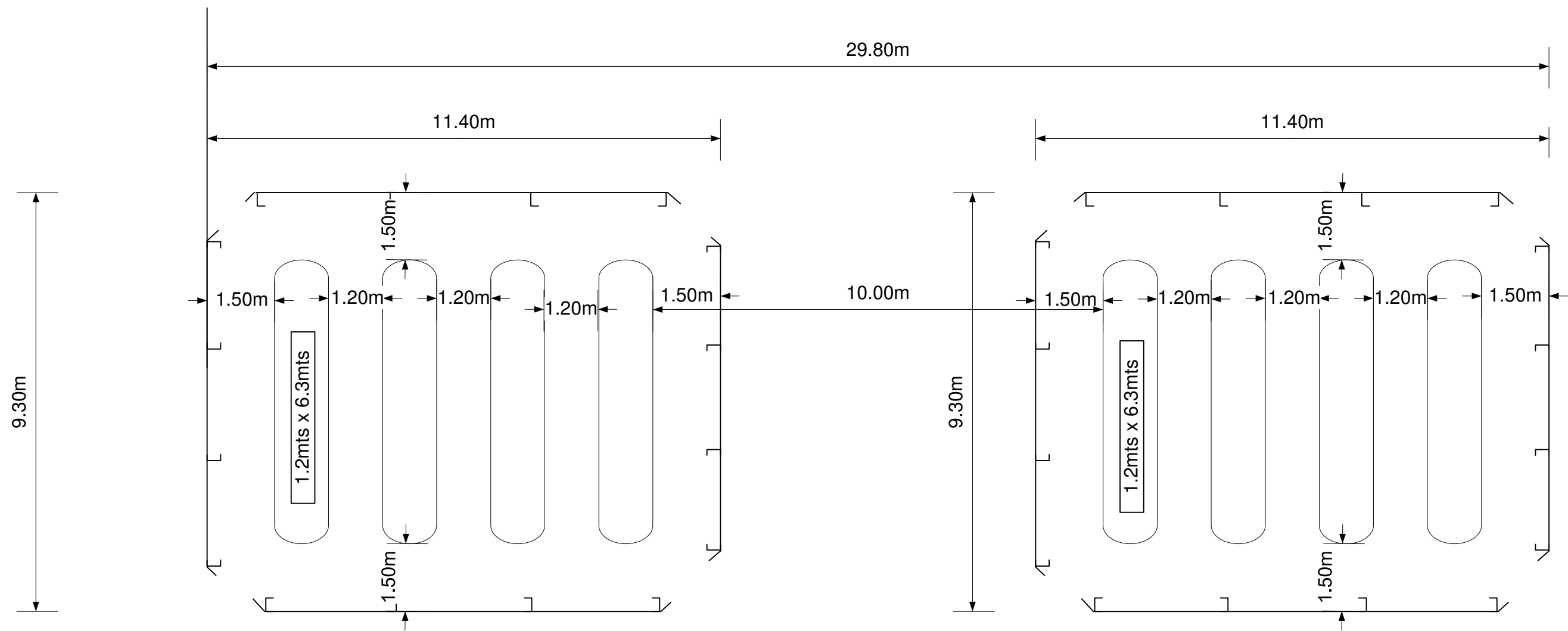
TYPICAL SPACE REQUIREMENTS		
Tank Size	DIMENSION A	DIMENSION B
1.35 kl	3.9 m	5.2 m
2.2 kl	4.1 m	5.7 m
2.75 kl	4.1 m	6.3 m
4.3 kl	4.2 m	6.9 m
5.1 kl	4.2 m	7.6 m
7.5 kl	4.2 m	9.6 m

Note: Space Requirements in this table are indicative only - ensure correct dimensions for the tank to be installed are used

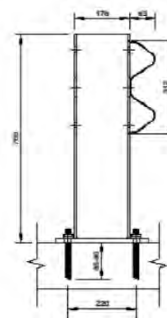
TYPICAL SEPARATION REQUIREMENTS		
Tank Size	Public Place	Protected Place
1.35 kl	2.3 m	3.4 m
2.2 kl	4.0 m (3.1 m)	6.1 m (4.6 m)
2.75 kl	4.3 m (3.3 m)	6.3 m (4.8 m)
4.3 kl	4.6 m (3.4 m)	7.2 m (4.7 m)
5.1 kl	5.0 m (3.5 m)	8.0 m (5.0 m)
7.5 kl	6.0 m (4.0 m)	10.0 m (6.0 m)

Note: Distances in Brackets are for single Tanks used for vapour only - no other Tank within 8m. Distances to be taken from edge of Tank





No source of ignition within 6 mts
10 Mts to a protected place
Min 1.2mts to boundry



DRAWN BY	David Rankin
TITLE	
SCALE	1: 100

GENERATORS



HIMOINSA®
THE ENERGY

MODEL
HFW-350 T5
INDUSTRIAL RANGE
Standard soundproofing
Powered by FPT_IVECO



- G1
- WATER-COOLED
- THREE PHASE
- 50 HZ
- STAGE 2
- DIESEL

Generating Rates



SERVICE		PRP	STANDBY
Power	kVA	350	390
Power	kW	280	312
Rated Speed	r.p.m.	1.500	
Standard Voltage	V	400/230	
Available Voltages	V	230 - 230/132	
Rated at power factor	Cos Phi	0,8	

01

HIMOINSA Company with quality certification ISO 9001

HIMOINSA gensets are compliant with EC mark which includes the following directives:

- 2006/42/CE Machinery safety.
- 2014/30/UE Electromagnetic compatibility.
- 2014/35/UE electrical equipment designed for use within certain voltage limits
- 2000/14/EC Sound Power level. Noise emissions outdoor equipment. (amended by 2005/88/EC)
- EN 12100, EN 13857, EN 60204

Ambient conditions of reference according to ISO 8528-1:2005 normative: 1000 mbar, 25°C, 30% relative humidity.

Prime Power (PRP):

According to ISO 8528-1:2005, Prime power is the maximum power which a generating set is capable of delivering continuously whilst supplying a variable electrical load when operated for an unlimited number of hours per year under the agreed operating conditions with the maintenance intervals and procedures being carried out as prescribed by the manufacturer. The permissible average power output (Ppp) over 24 h of operation shall not exceed 70 % of the PRP.

Emergency Standby Power (ESP):

According to ISO 8528-1:2005, Emergency standby power is the maximum power available during a variable electrical power sequence, under the stated operating conditions, for which a generating set is capable of delivering in the event of a utility power outage or under test conditions for up to 200 h of operation per year with the maintenance intervals and procedures being carried out as prescribed by the manufacturers. The permissible average power output over 24 h of operation shall not exceed 70 % of the ESP

G2 class load acceptance in accordance with ISO 8528-5:2005

HIMOINSA HEADQUARTERS:

Fábrica: Ctra. Murcia - San Javier, Km. 23,6 | 30730 SAN JAVIER (Murcia) Spain
Tel.+34 968 19 11 28 Fax +34 968 19 12 17 Fax +34 968 19 04 20 info@himoinsa.com www.himoinsa.com

Manufacture facilities:

SPAIN • FRANCE • INDIA • CHINA • USA • BRASIL

Subsidiaries:

ITALY | PORTUGAL | POLAND | GERMANY | SINGAPORE | UAE | MEXICO | PANAMÁ | ARGENTINA | UK



Ctra. Murcia - San Javier, km. 23,6 | 30730 San Javier (Murcia) SPAIN | Tel.: +34 902 19 11 28 / +34 968 19 11 28
Fax: +34 968 19 12 17 | Export Fax +34 968 19 04 20 | E-mail: info@himoinsa.com | www.himoinsa.com





Engine Specifications 1.500 r.p.m.

ENGINE		PRP	STANDBY
Rated Output	kW	300	330
Manufacturer		FPT_IVECO	
Model		C13TE2A	
Engine Type		4-stroke diesel	
Injection Type		Direct	
Aspiration Type		Turbocharged and after-cooled	
Number of cylinders and arrangement		6 - L	
Bore and Stroke	mm	135 x 150	
Displacement	L	12,9	
Cooling System		Liquid (water + 50% glycol)	
Lube Oil Specifications		ACEA E3 - E5	
Compression Ratio		16,5 : 1	
Fuel Consumption Standby	l/h	77,9	
Fuel Consumption 100% PRP	l/h	70	
Fuel Consumption 80 % PRP	l/h	57,3	
Fuel Consumption 50 % PRP	l/h	38,8	
Lube oil consumption with full load		0,5 % of fuel consumption	
Total oil capacity including tubes, filters	L	35	
Total coolant capacity	L	67	
Governor	Type	Electrical	
Air Filter	Type	Dry	
Inner diameter exhaust pipe	mm	108	

02

Generator

Generator		
Poles	No.	4
Connection type (standard)		Star-series
Mounting type		S-1 14"
Insulation	Class	H class
Enclosure (according IEC-34-5)		IP23
Exciter system		Self-excited, brushless
Voltage regulator		A.V.R. (Electronic)
Bracket type		Single bearing
Coupling system		Flexible disc
Coating type		Standard (Vacuum impregnation)



Application Data

Exhaust System		
Maximum exhaust temperature	°C	479
Exhaust Gas Flow	Kg/s	0,518
Maximum allowed back pressure	kPa	5
Exhaust Flange Size (external diameter)	mm	140
Heat dissipated by exhaust pipe	KCal/Kwh	648

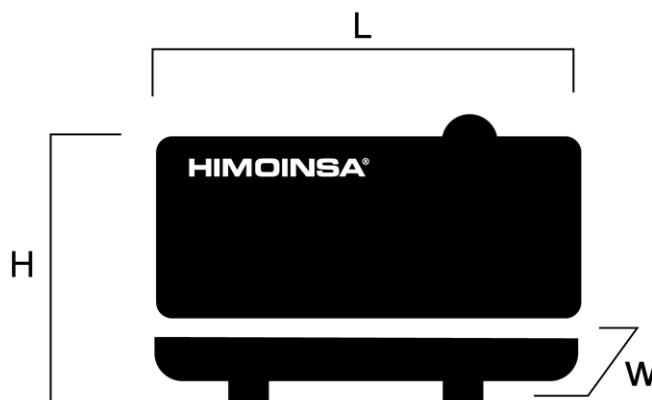
Necessary Amount Of Air		
Intake air flow	m3/h	1495
Cooling Air Flow	m3/s	6,8
Alternator fan air flow	m3/s	0,8

Starting System		
Starting power	kW	5,5
Starting power	CV	7,48
Recommended battery	Ah	185
Auxiliary Voltage	Vdc	24

Fuel System		
Fuel Oil Specifications		Diesel
Fuel Tank	L	597
Other fuel tank capacities	L	1.660



Dimensions



Gi Weight and Dimensions		
(L) Length	mm	4.100
(H) Height	mm	2.200
(W) Width	mm	1.600
Maximum shipping volume	m ³	14,43
(*) Weight with liquids in radiator and sump	Kg	4.191
Fuel tank capacity	L	597
Autonomy	Hours	10
Sound pressure level	dB(A)@7m	68 ± 2,3

(*) (with standard accessories)

STANDARD VERSION (Steel tank)

Himoinsa has the right to modify any feature without prior notice.

Weights and dimensions based on standard products. Illustrations may include optional equipment.

Technical data described in this catalogue correspond to the available information at the moment of printing.

Industrial design under patent.

Local Distributor



Dimensions of Other Available Versions

<i>Weight and Dimensions</i>		
(L) Length	mm	4.100
(H) Height	mm	2.600
(W) Width	mm	1.600
Maximum shipping volume	m ³	17,06
(*) Weight with liquids in radiator and sump	Kg	4.826
Fuel tank capacity	L	1.660,0
Autonomy	Hours	29
Sound pressure level	dB(A)@7m	68 ± 2,3

(*) (with standard accessories)

HIGH CAPACITY VERSION (Steel tank)



CONTROL PANEL MODEL

MODEL
HFW-350 T5
INDUSTRIAL RANGE
Standard soundproofing
Powered by FPT_IVECO

M5

Digital manual Auto-Start control panel and thermal magnetic protection (depending on current and voltage) and differential with CEM7. Digital control unit CEM7



AS5

Automatic panel WITHOUT transfer switch and WITHOUT mains control with CEM7 unit. (*) AS5 as optional with CEA7 unit. Automatic panel without transfer switch and WITH mains control.



CC2

Himoinsa Switching cabinet WITH display. Digital control unit CEC7





CONTROL PANEL MODEL

AS5 + CC2

Automatic panel WITH transfer switch and with mains control. The display will be on the genset and on the cabinet. Digital control unit CEM7+CEC7



AC5

Automatic mains failure control panel. Wall-mounted cabinet WITH transfer switch and thermal magnetic protection (depending on current and voltage). Digital control unit CEA7



MODEL
HFW-350 T5
INDUSTRIAL RANGE
Standard soundproofing
Powered by FPT_IVECO



Controller features (I)

- : Standard
- x : Not included
- : Optional

Generator Readings	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Voltage between phases	•	•	•	•
Voltage between neutral and phase	•	•	•	•
Current intensities	•	•	•	•
Frequency	•	•	•	•
Apparent power (Kva)	•	•	•	•
Active power (Kw)	•	•	•	•
Reactive power (kVAr)	•	•	•	•
Power factor	•	•	•	•
Mains Readings	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Voltage between phases	x	•	•	•
Voltage between phases and neutral	x	•	•	•
Current intensities	x	•	•	•
Frequency	x	•	•	•
Apparent power	x	•	x	x
Active power	x	•	x	x
Reactive power	x	•	x	x
Power factor	x	•	x	x
Engine Readings	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Coolant temperature	•	•	x	•
Oil pressure	•	•	x	•
Fuel level (%)	•	•	x	•
Battery voltage	•	•	x	•
R.P.M.	•	•	x	•
Battery charge alternator voltage	•	•	x	•
Engine Protections	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
High water temperature	•	•	x	•
High water temperature by sensor	•	•	x	•
Low water temperature by sensor	•	•	x	•
Low oil pressure	•	•	x	•
Low oil pressure by sensor	•	•	x	•
Low water level	•	•	x	•
Unexpected shutdown	•	•	x	•



Controller features (II)

- : Standard
- x : Not included
- : Optional

Engine Protections	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Fuel storage	•	•	x	•
Fuel storage by sensor	•	•	x	•
Stop failure	•	•	x	•
Battery voltage failure	•	•	x	•
Battery charge alternator failure	•	•	x	•
Overspeed	•	•	x	•
Underspeed	•	•	x	•
Start failure	•	•	x	•
Emergency stop	•	•	•	•
Alternator Protections	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
High frequency	•	•	•	•
Low frequency	•	•	•	•
High voltage	•	•	•	•
Low voltage	•	•	•	•
Short-circuit	•	•	x	•
Asymmetry between phases	•	•	•	•
Incorrect phase sequence	•	•	•	•
Inverse power	•	•	x	•
Overload	•	•	x	•
Genset signal drop	•	•	•	•
Counters	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Total hour counter	•	•	•	•
Partial hour counter	•	•	•	•
Kilowatt meter	•	•	•	•
Starts valid counters	•	•	•	•
Starts failure counters	•	•	•	•
Maintenance	•	•	•	•
Communications	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
RS232	•	•	•	•
RS485	•	•	•	•
Modbus IP	•	•	•	•
Modbus	•	•	•	•



Controller features (III)

- : Standard
- x : Not included
- : Optional

Communications	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
CCLAN	•	•	x	•
Software for PC	•	•	•	•
Analogue modem	•	•	•	•
GSM/GPRS modem	•	•	•	•
Remote screen	•	•	x	•
Tele signal	• (8 + 4)	• (8 + 4)	x	• (8 + 4)
J1939	•	•	x	•
Features	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
Alarm history	• (10) / (opc. +100)	• (10) / (opc. +100)	• (10) / (opc. +100)	• (10) / (opc. +100)
External start	•	•	•	•
Start inhibition	•	•	•	•
Mains failure start	x	•	•	•
Start under normative EJP	•	•	x	•
Pre-heating engine control	•	•	x	•
Genset contactor activation	•	•	•	•
Mains & Genset contactor activation	x	•	•	•
Fuel transfer control	•	•	x	•
Engine temperature control	•	•	x	•
Manual override	•	•	x	•
Programmable alarms	•	•	x	•
Genset start function in test mode	•	•	•	•
Programmable outputs	•	•	x	•
Multilingual	•	•	•	•
Special Functions	CEM 7	CEA 7	CEC 7	CEM7 + CEC7
GPS Positioning	•	•	x	•
Synchronisation	•	•	x	•
Mains synchronization	•	•	x	•
Second Zero elimination	•	•	x	•
RAM7	•	•	x	•
Remote screen	•	•	x	•
Programming timer	•	•	x	•



Generator set features

Engine

- Diesel engine
- 4-stroke cycle
- Water-cooled
- 24V electrical system
- Radiator with blower fan
- Water separator filter (no visible level)
- Electronic governor
- ATA bulbs
- BPA bulbs
- Radiator water level sensor
- Dry air filter
- Hot parts protection
- Moving parts protection

Alternator

- Self-excited and self-regulated
- 4 poles
- AVR governor
- IP23 protection
- H class insulation
- Single drive-shaft
- Flexible disc coupling

Electrical system

- Electric control and power panel with measurements devices and control unit (according to necessity and configuration)
- 4-pole thermal magnetic circuit breaker
- Battery isolator
- Adjustable earth leakage protection (time & sensitivity) standard in M5 and AS5, with thermal magnetic protection
- Battery charger (standard on gensets with automatic control panels)
- Heating resistor (standard on sets with automatic control panels)
- Battery charger alternator with ground connection
- Starter battery/ies installed (cables and bracket included)
- Ground connection electrical installation with connection ready for ground spike (not supplied)



Generator set features

Soundproofed version

- Steel chassis
 - Oil sump extraction kit
 - Versatility to assemble a high capacity chassis with a metallic fuel tank
 - Anti-vibration shock absorbers
 - Fuel tank
 - Fuel level gauge
 - Emergency stop button
 - Bodywork made from high quality steel plate
 - High mechanical strength
 - Low level of noise emissions
 - Soundproofing provided by high-density volcanic rock wool
 - Epoxy polyester powder coating (salt spray test of more than 1000 hours)
 - Full access for maintenance (water, oil and filters, no need to remove the bonnet)
 - Reinforced lifting hooks for crane hoisting
 - Watertight chassis (acts as a double barrier against liquid retention)
 - Fuel tank drain plug
 - Chassis drain plug
 - Chassis ready for future mobile kit installation
 - Steel residential silencer -35db(A) attenuation.
- Optional :
- 3-way valve fuel filling (available in 1/2" and 3/8" fittings)
 - Fuel transfer pump



HIMOINSA®
THE ENERGY

MODEL
HFW-350 T5
INDUSTRIAL RANGE
Standard soundproofing
Powered by FPT_IVECO

PDF Summary

Created : 26/04/2017 10:33

Author : Himoinsa

Number of pages : 13

Report Type: Data Sheet - **Industrial range**

Generated by: HIMOINSA Engineering Dept.

Page 1. Genset data

Page 2. Engine Specifications. Generator Specifications.

Page 3. Installation Data

Page 4. Dimensions

Page 5. Dimensions of Other Available Versions

Page 6. Control Panel Model

Page 7. Control Panel Model

Page 8. Controller features (I)

Page 9. Controller features (II)

Page 10. Controller features (III)

Page 11. Generator Features & Options

Page 12. Generator Features & Options

Page 13. PDF Summary (ID454E3634373639)

http://www.himoinsa.com/generating-sets/64_22/diesel-generator-hfw-350_t5-fpt_iveco-50hz-industrial-range-prp_350kva.aspx





Technical testing

Date: 06/06/2016

Acoustic Study

Review : 5.0

I+D+I Department

Directive: 2000/14/CE

GENERATING SET - SOUNDPROOF - G1

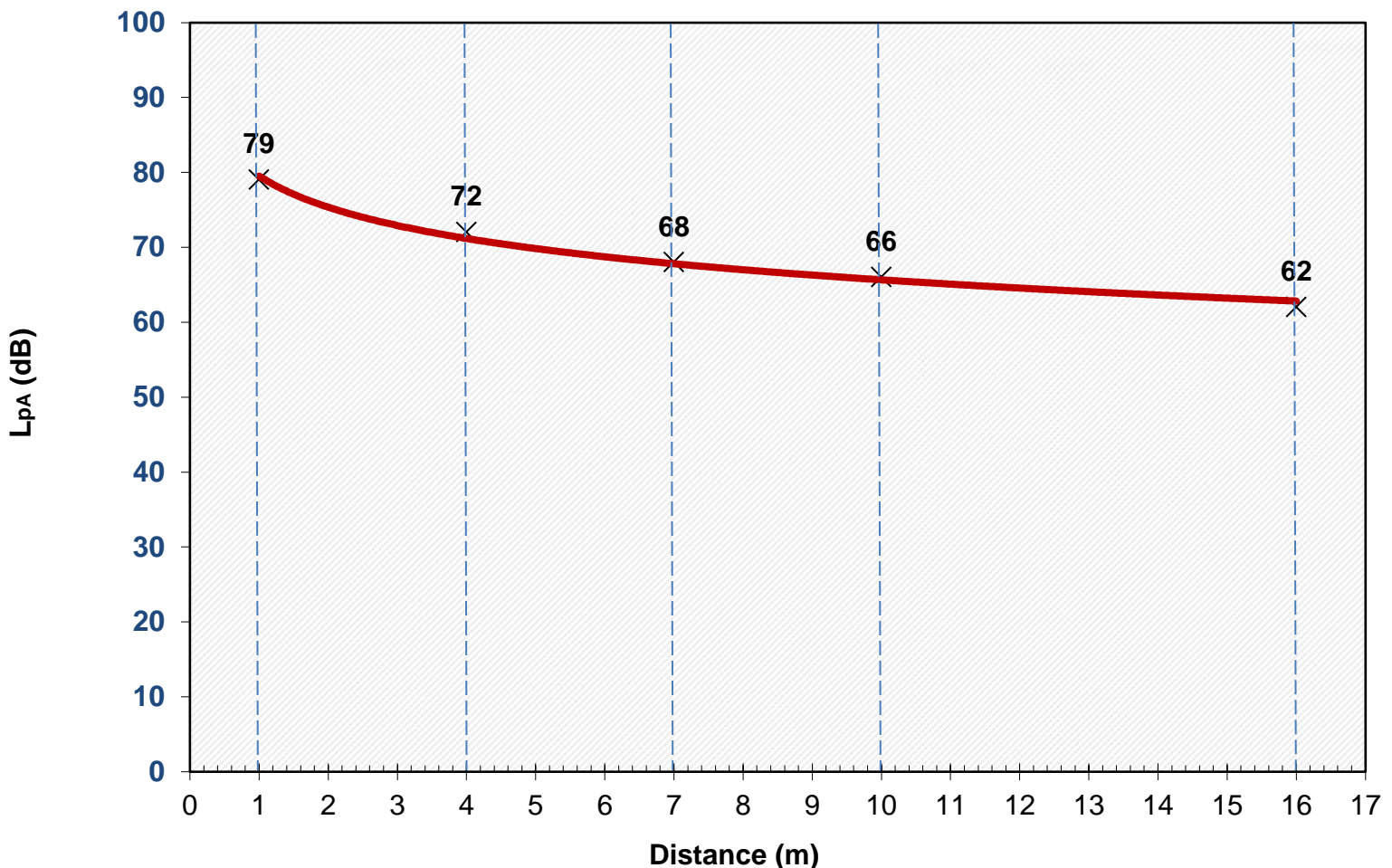
MODEL:	HFV-350 T5	TYPE:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
ENGINE:	FPT_IVECO	MODEL:	C13TE2A				
ALTERNATOR:	STAMFORD	MODEL:	HCI444E				
POWER PRP (kVA):	350	DIMENSIONS (mm):	4100 X 1600 X 2200 (length x width x height)				
POWER PRP (kW):	280	MANUFACTURING:	HIMOINSA	2016			
Measurement with CESVA sound level meter model SC-160 (serial number 1234938)							

RESULTS

* LWA (dB)	97
Uncertainty	2,3

** Distance (m)	1	4	7	10	16
LpA (dB)	79	72	68	66	62

Sound pressure level according to the distance



Sound pressure level according 2000/14/CE directive

* LWA: guaranteed power level.

** The distance in meters from the noise measurement is based on the parallelepip method.

Review 01 06/2015

AERATED WASTEWATER TREATMENT SYSTEMS

Manual



Ozzi Kleen

Please contact your Ozzi Kleen Service Provider with any queries:

Owner's

RP10
RP10A

Manufactured by: Suncoast Waste Water Management
59 Industrial Avenue, Kunda Park, QLD, 4556
Head Office: 07 5459 4900
Fax: 07 5456 4677 Email: info@ozzikleen.com
www.ozzikleen.com

SPECIFICATIONS

Parameter	Raw Wastewater Characteristics
Wastewater treatment capacity	10 persons EP at 200 l/person/day
Maximum hydraulic load	2,000 l/day
Biological Oxygen Demand (BOD ₅)	350 mg/litre or 70 g/day/person
Total Suspended Solids (TSS)	350 mg/litre or 70 g/day/person
Fats, Oils and Grease (FOG)	75 mg/litre. For restaurant applications, a grease trap must be fitted upstream of the treatment plant to remove grease and oils.
pH	6<pH<10
Wastewater temperature range	10°C to 38°C

Treatment Plant Construction:

Tank and components	Polyethylene (MDPE)
All Pipe work	PVC

Electrical Equipment:

Air Blower	LP80HN
Effluent Pump	Submersible
Controls	Electronic (OK1 Control Board)

Alarm System:

Alarm System	24VDC Audio/Visual
Alarm signal	Indicator lights for High Water Power & Blower

Aeration Tank:

Operating Volume	4.1m ³
Aeration tank volume	5.3 m ³
Residence time	46 hr
Buffer Zone	1m ³ (approx.)

Disinfection equipment:

Chlorinator Type	Tablet Dispenser Cassette
Chlorine min contact time (max flow)	30 min

Motor Box:

Equipment Contained	Air Blower, Control Board, Decanter Solenoid Valve equipment
---------------------	--

Effluent Pump (standard):

Effluent pump duty	100 litres/min @ 8 m head
Pump Mounting	Suspended on discharge pipe

Optional Equipment

Rapid Sand Filtration Equipment:

Flow rate (max)	250 litre/min
-----------------	---------------

Nutrient Reduction Equipment:

Process control	Electronic
Phosphate reduction process	Chemical dosing / Sludge wasting

Sock Filters

120/210/Other Microns

Lifting/Pump Stations

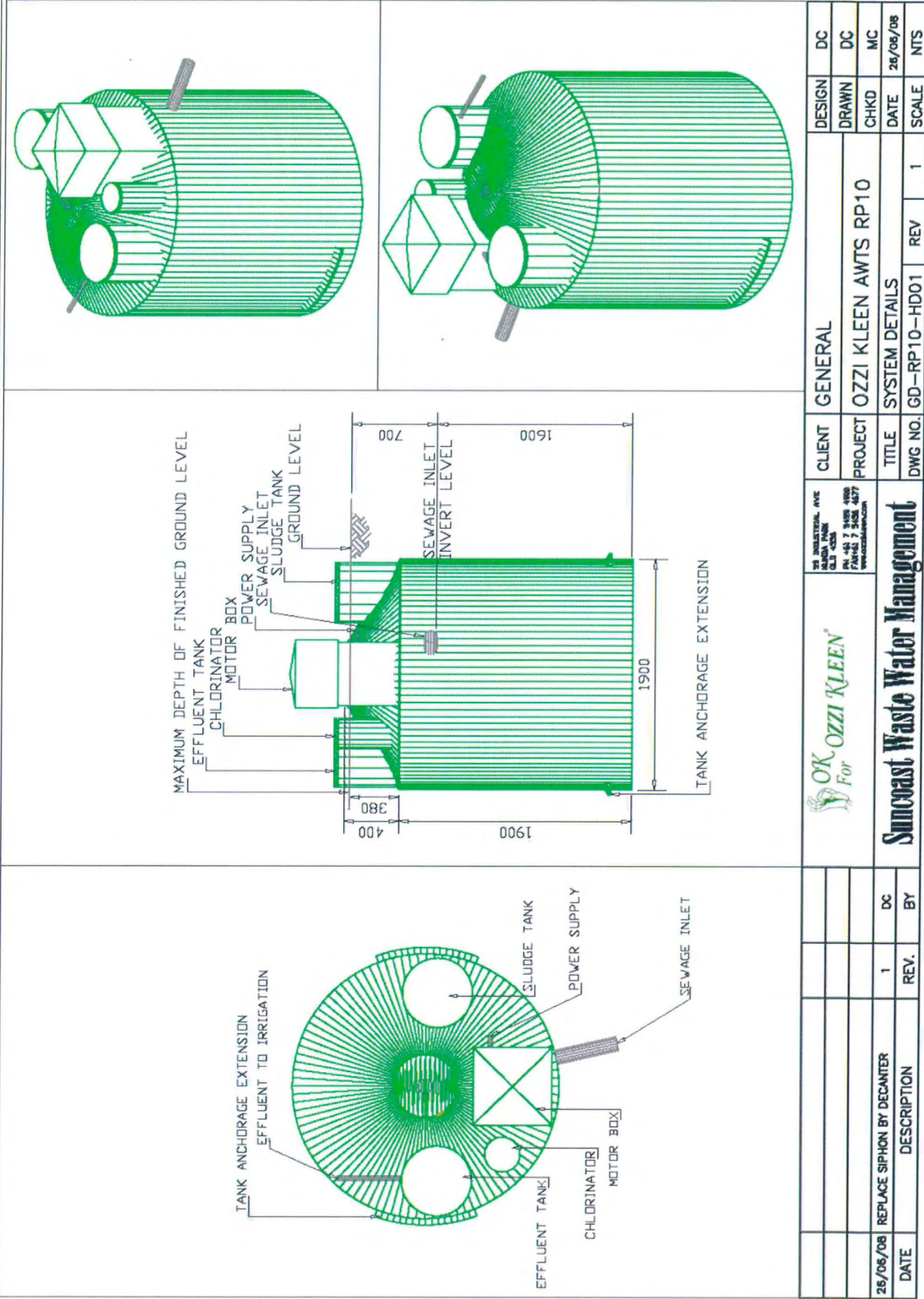
SLS250, PT500, other sizes available

Other Customization available

Please enquire

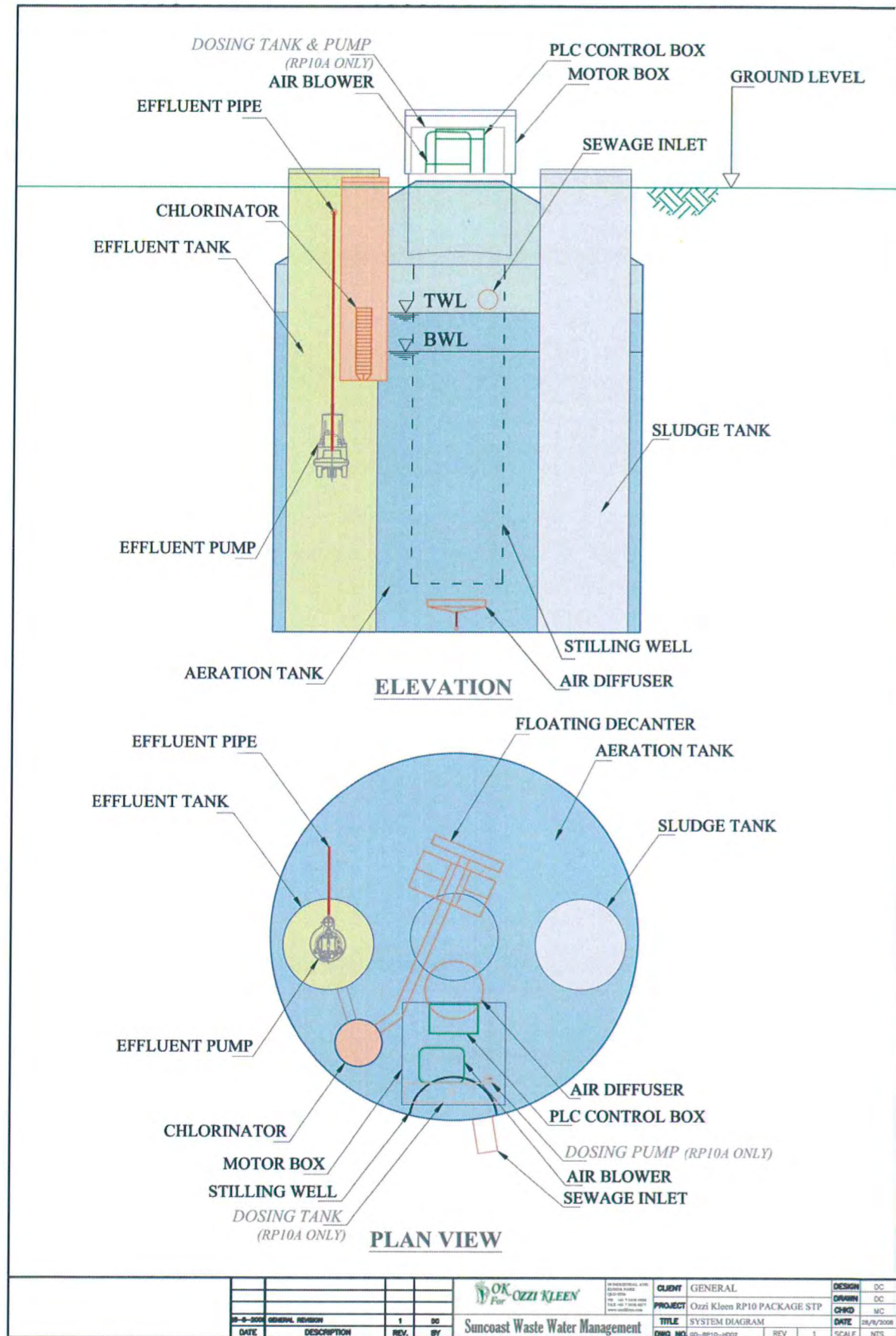
Irrigation Equipment: Basic irrigation equipment is supplied with the treatment plant. The irrigation system could be of several different formats. Check with Local Authority requirements.

SYSTEM DRAWING



		26 INDUSTRIAL AVE MAHARAJA TANK 01310 PH. NO. 7 3438 4988 WWW.OZZIKLEEN.COM	CLIENT PROJECT TITLE DWG NO.	GENERAL OZZI KLEEN AWTS RP10 SYSTEM DETAILS GD-RP10-HD01	DC DC MC DATE SCALE REV 1	DC DC MC 26/06/08 1 NTS
		Suncoast Waste Water Management	REV. 1 DESCRIPTION REPLACE SIPHON BY DECANTER	DATE 26/06/08	DC BY	DC BY

SYSTEM FLOW DIAGRAM



SAFETY INFORMATION

Never enter any compartment of the treatment plant.

There could be potential hazards from:

- Drowning in the tanks,
- Asphyxiation from an oxygen depleted atmosphere within the tanks.

There are five accessible compartments:

- The motor box control compartment, which is accessible through the top lid.
- The main aeration tank, which is accessible by tilting the motor box on its hinges.
- The effluent tank with its pump, which is accessible through one of the large round lids.
- The sludge waste tank, which is accessible through the other large round lid.
- The chlorinator, which is accessible through the small round lid between the motor box and effluent tank.

All access lids are normally secured with set screws. The Owner should ensure that they are all in place after any site inspection has been carried out.

Signs indicating that the treated water is recycled and is not fit for drinking have been provided and are to be erected in the irrigation area. This is a State Regulatory Authority requirement in all areas.

The Ozzi Kleen system operates on a 240 V power supply.

The main power outlets within the motor box are intended for the use of the treatment plant equipment only. These should be kept plugged in at all times. The power outlets cannot be used for any other power appliances. Plugging anything else into these outlets will affect the systems controls, and may void warranty.

Ensure all household drains are never dry.

Check with your plumber that they have been installed correctly. Floor waste gully traps in your home require to be charged with water to prevent odours from the drains. If odours occur have your plumbing checked.

OPTIONAL RAPID SAND FILTRATION SYSTEM OPERATING INSTRUCTIONS

The Sand Filter is a tertiary treatment process. Under normal operation, the sand filter will have to be backwashed at infrequent intervals. Backwashing will be required approximately every three months, at each treatment plant service, or more often as required. Please observe and check the sand filter regularly.



Appendix M

Water Access Licences



BOX 128V
(AN186004)

NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000



WAL TITLE REFERENCE WAL41834	
EDITION 1	DATE OF ISSUE 21/3/2018
CERTIFICATE AUTHENTICATION CODE RM5L-CF-JYWF	

This certificate is issued under s87B of the Water Management Act, 2000.



WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER (S)

PROTEN TAMWORTH PTY LIMITED

ENCUMBRANCES

1. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: REGULATED RIVER (GENERAL SECURITY)

SHARE COMPONENT:

SHARE - 317.2 UNITS
WATER SOURCE - UPPER NAMOI REGULATED RIVER WATER SOURCE
WATER SHARING PLAN - UPPER NAMOI AND LOWER NAMOI REGULATED RIVER
WATER SOURCES 2016

EXTRACTION COMPONENT:

TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER
ACCESS LICENCE
EXTRACTION FROM - RIVER, LAKE OR SURFACE WATER RUNOFF
EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:

WORK APPROVAL NUMBER(S) - NIL
INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE
AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM
WATERNSW

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE WATERNSW
WEBSITE AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE.
WATERNSW PHONE 1300 662 077, EMAIL CUSTOMER.HELPDESK@WATERNSW.COM.AU
LICENCE REFERENCE NUMBER: 90AL835020

**** END OF CERTIFICATE ****

ANY ATTEMPT TO ALTER THIS CERTIFICATE COULD RESULT IN HEAVY FINES OR IMPRISONMENT (S.141 REAL PROPERTY ACT).

BOX 128V
(AM249186)



NEW SOUTH WALES

CERTIFICATE OF TITLE

WATER MANAGEMENT ACT, 2000



WAL TITLE REFERENCE	
WAL37794	
EDITION	DATE OF ISSUE
2	24/3/2017
CERTIFICATE AUTHENTICATION CODE	
K9GG-CR-NTDJ	

This certificate is issued under s87B of the Water Management Act, 2000.



WARNING NOTE: INFORMATION ON THIS REGISTER IS NOT GUARANTEED

TENURE TYPE: CONTINUING

HOLDER (S)

PROTEN TAMWORTH PTY LTD

ENCUMBRANCES

1. TERM TRANSFER: NIL

ACCESS LICENCE DETAILS

CATEGORY: REGULATED RIVER (GENERAL SECURITY)

SHARE COMPONENT:

SHARE - 120 UNITS

WATER SOURCE - UPPER NAMOI REGULATED RIVER WATER SOURCE

WATER SHARING PLAN - UPPER NAMOI AND LOWER NAMOI REGULATED RIVER
WATER SOURCES 2016

EXTRACTION COMPONENT:

TIMES/RATES/CIRCUMSTANCES - SUBJECT TO THE CONDITIONS OF THE WATER
ACCESS LICENCE

EXTRACTION FROM - RIVER, LAKE OR SURFACE WATER RUNOFF

EXTRACTION ZONE - WHOLE WATER SOURCE

NOMINATED WORKS:

WORK APPROVAL NUMBER(S) - NIL

INTERSTATE TAGGING ZONE - NIL

CONDITIONS

LICENCE CONDITIONS FORM A PART OF THIS LICENCE AND AFFECT THE SHARE
AND EXTRACTION COMPONENTS. CONDITION STATEMENTS ARE AVAILABLE FROM
THE NSW OFFICE OF WATER (NOW).

NOTES

A WATER LICENCE INFORMATION SHEET IS AVAILABLE FROM THE NSW OFFICE OF
WATER (NOW) AND SHOULD BE REFERRED TO IN INTERPRETING THIS LICENCE.
NOW WEBSITE WWW.WATER.NSW.GOV.AU, PHONE 1800 353 104, EMAIL
INFORMATION@WATER.NSW.GOV.AU
NOW REFERENCE NUMBER: 90AL834441

**** END OF CERTIFICATE ****

ANY ATTEMPT TO ALTER THIS CERTIFICATE COULD RESULT IN HEAVY FINES OR IMPRISONMENT (S.141 REAL PROPERTY ACT).



Appendix N

Landowners' Consents





CONSENT OF OWNER

Property Location: Rushes Creek Road, Rushes Creek NSW

Development Description Rushes Creek Poultry Production Farm SSD 7704

Land within Development Site under the care and management of Council: Unformed Council public road - untitled parcel of land approximately 20 metres wide traversing through Lot 171 DP 752169

Land adjoining the Development Site under the care and management of Council to be impacted by the Development: Rushes Creek Road; and Ski Gardens Road

Tamworth Regional Council hereby consents to ProTen Tamworth submitting a Development Application to the Department of Planning and Environment seeking development consent under the provisions of Division 4.7 of Part 4 of the *Environmental Planning and Assessment Act 1979* for the proposed development on the subject land.

PAUL BENNETT
(Name in Block Letters)

COLIN JOAN MURRAY
(Name in Block Letters)

GENERAL MANAGER
(Position)

MAYOR
(Position)


(Signature)


(Signature)

21/5/2018
(Date)

22-5-18
(Date)

ProTen Tamworth Pty Ltd
Daniel Bryant
P O Box 1746
NORTH SYDNEY NSW 2060

10 May 2018

Dear Mr Bryant

**Consent for
development
comprising:**

Water pipeline and electricity line to be installed underground through unformed Crown Road using open trenching for water supply to Ruses Creek Poultry Production Farm development

Crown Land

Crown Public Road traversing Lot 1 DP 504111

Parish

Baldwin

County

Darling

Consent is granted by the Minister for Lands and Water to the lodgement of applications for approval under the *Environmental Planning and Assessment Act 1979*, and other associated applications required under other legislation, for the development proposal described above.

The Land Owner Consent is granted conditional to the following:

1. Land Owner Consent will expire after a period of 12 months from the date of this letter if not acted on within that time. Extensions of this consent may be sought
2. You are required to forward a copy of the approval to the NSW Department of Industry - Lands and Water ("the Department") after approval and prior to commencing works.
3. You are required to ensure that the approval provided is consistent with this Land Owner Consent.
4. You must apply to the Department for authority to occupy the Crown land. Crown land cannot be occupied prior to this authority being granted.
5. The Land Owner Consent is restricted to the works detailed on the plans provided by you and retained by the Department as 18/02912.

Land Owner Consent is granted in accordance with the following:

- Land Owner Consent is given without prejudice so that consideration of the proposed development may proceed under the *Environmental Planning and Assessment Act 1979* and any other relevant legislation;
- The grant of this Land Owner Consent does not guarantee that any subsequent authority to occupy will be granted;
- Land Owner Consent does not imply the concurrence of the Minister for Lands and Water for the proposed development and does not provide authorisation under the Crown Lands Act 1989 for this proposal;
- The issue of Land Owner Consent does not prevent the Department from making any submission commenting on, supporting or opposing an application;

- The Minister reserves the right to issue Land Owner Consent for the lodgement of applications for any other development proposals on the subject land concurrent with this Land Owner Consent;
- Any changes made to the proposal, including those imposed by the consent authority, must be consistent with the Land Owner Consent and therefore if modifications are made to the proposed development details must be provided to the Department for approval;
- Land Owner Consent also allows application to any other approval authority necessary for this development proposal.

This letter should be submitted to the relevant consent or approval authority in conjunction with the development application and/or any other application. You are responsible for identifying and obtaining all other consents, approvals and permits required under NSW and Commonwealth laws from other agencies for the proposed development.

It is important that you understand your obligations relating to Condition 3. If any alterations are made to the application (whether in the course of assessment, by conditions of consent, or otherwise), it is your responsibility to ensure the amended or modified development remains consistent with this Land Owner Consent. If there is any inconsistency or uncertainty you are required to contact the Department before undertaking the development to ensure that the Department consents to the changes. A subsequent LOC application may incur additional application fees.

It is advised that the Department will provide Department of Planning and Environment a copy of this Land Owner Consent and will request that Department of Planning and Environment notify the Department of the subsequent development application, for potential comment, as part of any public notification procedure.

Authority to occupy Crown land in this instance refers to the right under the Crown Lands Act 1989 to either use or manage the land. If development consent is granted you must make an application with the Department of Industry – Lands and Water for a licence on the reserve/road prior to undertaking any works/activities on Crown land.

During the assessment the Department conducted an Aboriginal Heritage Information Management System (AHIMS) search and 3 Aboriginal sites has been recorded in or near the proposed development site and/or there are natural landscape features that indicate the potential presence of Aboriginal heritage in or near the proposed development site. You are required to undertake the due diligence process to identify if any Aboriginal heritage is present at or nearby the proposal site and should seek further advice from NSW Office of Environment and Heritage (OEH).

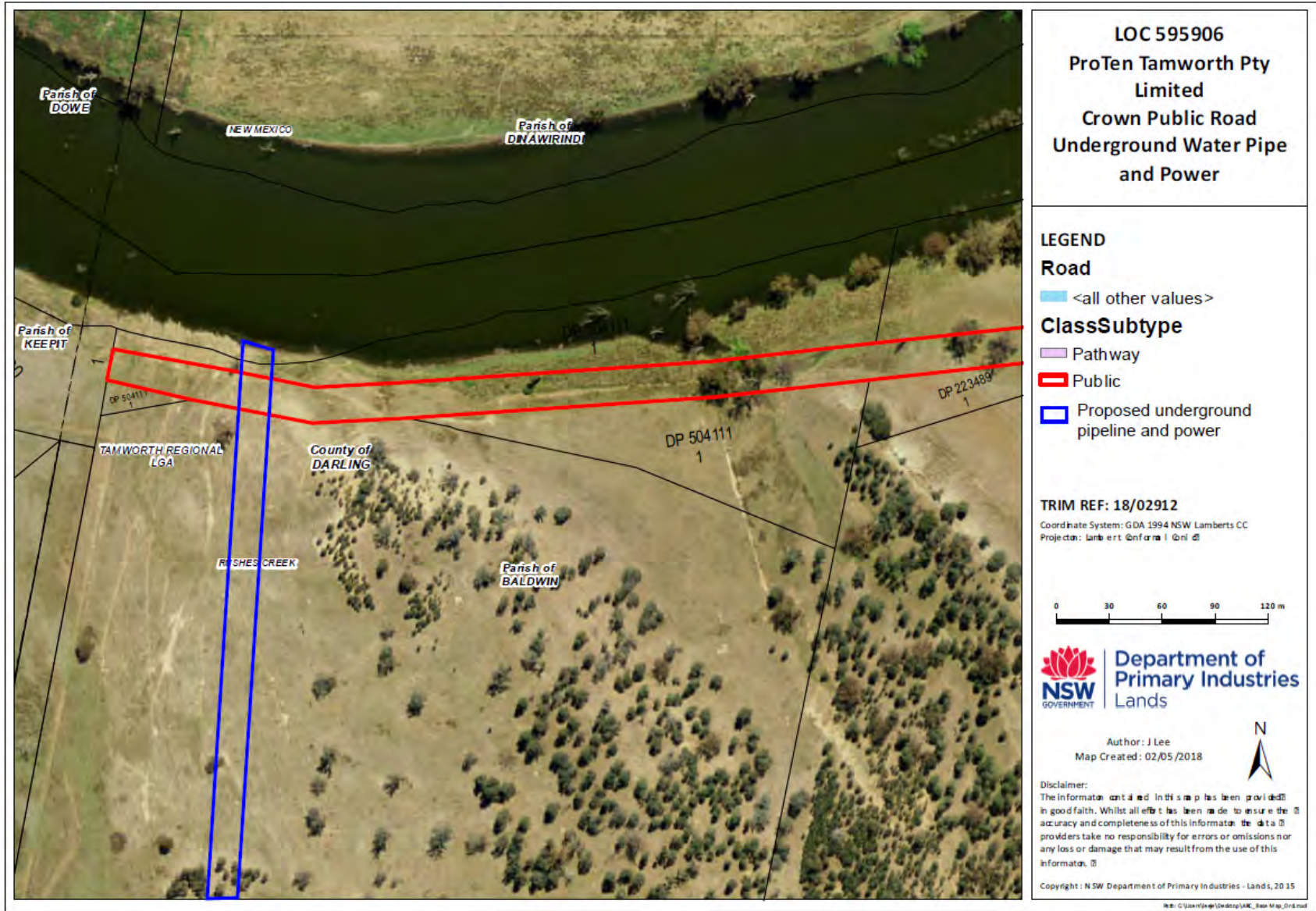
For further information, please contact Jennifer Lee via the details given in the letter head.

Yours sincerely,



Jennifer Lee
Senior Property Management Officer
Department of Industry – Crown Lands and Water, Tamworth

Attachment A – Location Map





Eryn Bath <eryn@emeadvisory.com>

FW: Rushes Creek Poultry Production Farm - land owner's consent

1 message

Peter Beard <Peter.Beard@waternsw.com.au>
To: "eryn@emeadvisory.com" <eryn@emeadvisory.com>

Fri, Aug 24, 2018 at 1:57 PM

Peter Beard

Property



PO Box 398 and 169 Macquarie Street, Parramatta NSW 2124

T: 02 9865 2354 M: 0436 656 459

peter.beard@waternsw.com.au
www.waternsw.com.au

The information contained in this electronic mail message is privileged and confidential, and is intended only for use of the addressee. If you are not the intended recipient, you're hereby notified that any disclosure, reproduction, distribution or other use of this communication is strictly prohibited. If you have received this communication in error, please notify the sender by reply transmission and delete the message without copying or disclosing it.

From: Peter Beard
Sent: Tuesday, 15 May 2018 4:34 PM
To: Eryn Bath <ebath@slrconsulting.com>
Cc: Kristine Ward <Kristine.Ward@waternsw.com.au>
Subject: RE: Ruses Creek Poultry Production Farm - land owner's consent

Eryn

WAMC have replied that as the parcel of WAMC land mentioned (Lot 1//DP504111) is not listed on the schedule of land titles within the development site, they deem landowner consent not to be required.

Should the DA be approved and the development proceed, they will evaluate and consider granting of an easement over the nominated parcel. Alternately, a licence agreement for use of the land, administered by WaterNSW may also be an option to facilitate access to site and establish infrastructure for the proposal.

I trust this will assist with the application.

Regards

Peter Beard

Sent from [Mail](#) for Windows 10

From: Eryn Bath
Sent: Friday, 27 April 2018 12:57 PM

To: [Peter Beard](#); [Kristine Ward](#)

Subject: RE: Rushes Creek Poultry Production Farm - land owner's consent

Thanks Peter. I'll follow up again late next week.

Cheers

Eryn



Eryn Bath

Principal - Env & Social Impact Assessment

.

 +61 427 024 739

 +61 2 9428 8100

 ebath@slrconsulting.com

.

SLR Consulting Australia Pty Ltd

2 Lincoln Street, Lane Cove, NSW, 2066

.



WINNERS: International Business
Excellence Award, 2016

Confidentiality Notice and Limitation

This communication, and any attachment(s) contains information which is confidential and may also be legally privileged. It is intended for the exclusive use of the recipient(s) to whom it is addressed. If you are not the intended recipient, any disclosure, copying, distribution or action taken or not taken in reliance on it is prohibited and may be unlawful. If you have received this communication in error, please advise SLR by e-mail and then delete the email from your system. As e-mails and any information sent with them may be intercepted, corrupted and/or delayed, SLR does not accept any liability for any errors or omissions in the message or any attachment howsoever caused after transmission.

Any advice or opinion is provided on the basis that it has been prepared by SLR with reasonable skill, care and diligence, taking account of the manpower, timescales and resources devoted to it by agreement with its Client. It is subject to the terms and conditions of any appointment to which it relates. Parties with whom SLR is not in a contractual relationship in relation to the subject of the message should not use or place reliance on any information, advice, recommendations and opinions in this

message and any attachment(s) for any purpose.

© 2017 SLR Consulting Limited. All Rights Reserved

SLR Consulting Australia Pty Ltd, Registered Office: Ground Floor, 2 Lincoln Street Lane Cove NSW 2066, Australia

From: Peter Beard [<mailto:Peter.Beard@waternsw.com.au>]
Sent: Friday, 27 April 2018 12:51 PM
To: Eryn Bath; Kristine Ward
Subject: RE: Rushes Creek Poultry Production Farm - land owner's consent

Eryn and Kristine

The WAMC delegate has been away, and is due back 30 April, the landowners consent application is in their office for consideration.

Regards

Peter Beard

Property



PO Box 398 and 169 Macquarie Street, Parramatta NSW 2124

T: 02 9865 2354 M: 0436 656 459

peter.beard@waternsw.com.au
www.waternsw.com.au

The information contained in this electronic mail message is privileged and confidential, and is intended only for use of the addressee. If you are not the intended recipient, you're hereby notified that any disclosure, reproduction, distribution or other use of this communication is strictly prohibited. If you have received this communication in error, please notify the sender by reply transmission and delete the message without copying or disclosing it.

From: Eryn Bath [<mailto:ebath@slrconsulting.com>]
Sent: Friday, 27 April 2018 12:44 PM
To: Kristine Ward <Kristine.Ward@waternsw.com.au>
Cc: Peter Beard <Peter.Beard@waternsw.com.au>
Subject: RE: Rushes Creek Poultry Production Farm - land owner's consent

Hi Kristine,

Further to my below email, please find attached an updated submission. The only revision is a change to the untitled parcel of land traversing through Lot 1 DP 752169 from "unformed Council public road" to "unformed Crown public road". This change has no implications for Lot 1 DP 504111 owned by WAMC.

Can you please advise the status of the land owner's consent from WAMC?

Thanks and regards

Eryn



Eryn Bath

Principal - Env & Social Impact Assessment

 +61 427 024 739

 +61 2 9428 8100

 ebath@slrconsulting.com

SLR Consulting Australia Pty Ltd

2 Lincoln Street, Lane Cove, NSW, 2066



Confidentiality Notice and Limitation

This communication, and any attachment(s) contains information which is confidential and may also be legally privileged. It is intended for the exclusive use of the recipient(s) to whom it is addressed. If you are not the intended recipient, any disclosure, copying, distribution or action taken or not taken in reliance on it is prohibited and may be unlawful. If you have received this communication in error, please advise SLR by e-mail and then delete the email from your system. As e-mails and any information sent with them may be intercepted, corrupted and/or delayed, SLR does not accept any liability for any errors or omissions in the message or any attachment howsoever caused after transmission.

Any advice or opinion is provided on the basis that it has been prepared by SLR with reasonable skill, care and diligence, taking account of the manpower, timescales and resources devoted to it by agreement with its Client. It is subject to the terms and conditions of any appointment to which it relates. Parties with whom SLR is not in a contractual relationship in relation to the subject of the message should not use or place reliance on any information, advice, recommendations and opinions in this message and any attachment(s) for any purpose.

© 2017 SLR Consulting Limited. All Rights Reserved

SLR Consulting Australia Pty Ltd, Registered Office: Ground Floor, 2 Lincoln Street Lane Cove NSW 2066, Australia

From: Eryn Bath
Sent: Thursday, 12 April 2018 10:55 AM
To: 'Kristine Ward'
Cc: Peter Beard; daniel@proten.com.au
Subject: RE: Rushes Creek Poultry Production Farm - land owner's consent
Importance: High

Hi Kristine,

Further to our discussions yesterday, please find attached a submission seeking land owner's consent from WAMC to submit the DA for ProTen's Rushes Creek Poultry Production Farm SSD 7704.

The submission provides relevant background information, describes the Development, identifies the land owned by WAMC and advises how this land will be impacted by the Development. Obviously considerable more information will be provided in the EIS, which will be referred to WAMC and WaterNSW during the public exhibition period.

Separate submissions have been sent to the Crown Lands division of the Department of Industry – Lands & Water and Tamworth Regional Council for the Crown / public land within or adjoining the Development Site of which they have care and management jurisdiction.

We hope that the attached letter provides adequate information to allow WAMC to provide land owner consent to submit the DA to the DPE. Please do not hesitate to contact me to discuss the matter further.

Thanks for your advance.

Kind regards

Eryn

From: Kristine Ward [<mailto:Kristine.Ward@waterNSW.com.au>]
Sent: Wednesday, 11 April 2018 1:23 PM
To: Eryn Bath
Cc: Peter Beard
Subject: RE: Rushes Creek Poultry Production Farm - land owner's consent

Hi Erin,

Thank you for your correspondence. The parcel of Crown land with the title Lot 1 DP 504111 between the Development Site and the Namoi River is owned by the Water Administration Ministerial Corporation as successor in title. WaterNSW is able to act on their behalf for some property matters however in the instance of Owners Consent we would need to refer the request to their office in Orange.

Please forward, to me, your formal request for owners consent to lodge a DA, detailing the proposal? I will coordinate it's referral through our property team and we will respond to you in due course.

Regards, Kris

Kristine Ward
Catchment Protection Adviser