Stormwater Strategy

Associated with the Proposed

Poultry (Broiler) Farm Comprising 16 Sheds and Associated Facilities

‘Silverweir’ 448 Appleby Lane, Appleby

(Lot 17 to 19 in DP 95993)

Client: Baiada Pty Ltd

Ref: 23310

Hanlons

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Ref.: 23310

Document Revision

ISSUE	REV	DATE	AUTHOR	REVIEWED	APPROVED	ISSUED TO
00	0	12 April 2024	T McLean			Internal Document and Model Review
01	A	16 April 2024	T McLean	S Griffiths	S Griffiths	Baiada
01	B	15 May 2024	T McLean	S Griffiths	S Griffiths	Baiada
02	B	22 May 2024	T McLean	S Griffiths	S Griffiths	Baiada
03	B	22 July 2024	T McLean	S Griffiths	S Griffiths	Baiada
04	B	24 July 2024	T McLean	S Griffiths	S Griffiths	Baiada
05	B	9 August 2024	T McLean	S Griffiths	S Griffiths	Baiada

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS & ACRONYMS

Table 1: List of Abbreviations & Acronyms

ABBREVIATION	DESCRIPTION	ABBREVIATION	DESCRIPTION
AADT	Annual Average Daily Traffic	MGA	Map Grid of Australia
AEP	Annual Exceedance Probability	MH	Manhole
AS/NZS	Australian Standard / New Zealand Standard	mm	Millimetres
AR&R	Australian Rainfall & Runoff	mm/h	Millimetres per Hour
ARI	Annual Recurrence Interval	m^3/s	Cubic meters per second
AS	Australian Standard	NSW	New South Wales
DBYD	Dial Before You Dig	RCP	Reinforced Concrete Pipe
DP	Deposited Plan	RRJ	Rubber Ring Joint
dia	Diameter	SEE	Statement of Environmental Effects
EY	Exceedances per Year	SiD	Safety in Design
GDA	Grid Datum of Australia	SFAIRP	So Far As Is Reasonably Practicable
Ha	Hectares	TRC	Tamworth Regional Council
km/h	Kilometres per Hour	TfNSW	Transport for New South Wales
LGA	Local Government Area	uPVC	un-plasticised Polyvinyl Chloride
M	Metres	WHS	Work, Health, and Safety

1.0 INTRODUCTION

Baiada Pty Ltd. (Baiada) has engaged Hanlons Consulting (Hanlons) for the preparation a Preliminary Stormwater Management Strategy to accompany a Development Application (DA) for a 16 shed poultry (broiler) farm at 'Silverweir', 448 Appleby Lane, Appleby (Refer to Figure 1).

Hanlons have subsequently prepared a Preliminary Stormwater Design for the proposed development. The extent of the design is detailed in Figure 2.

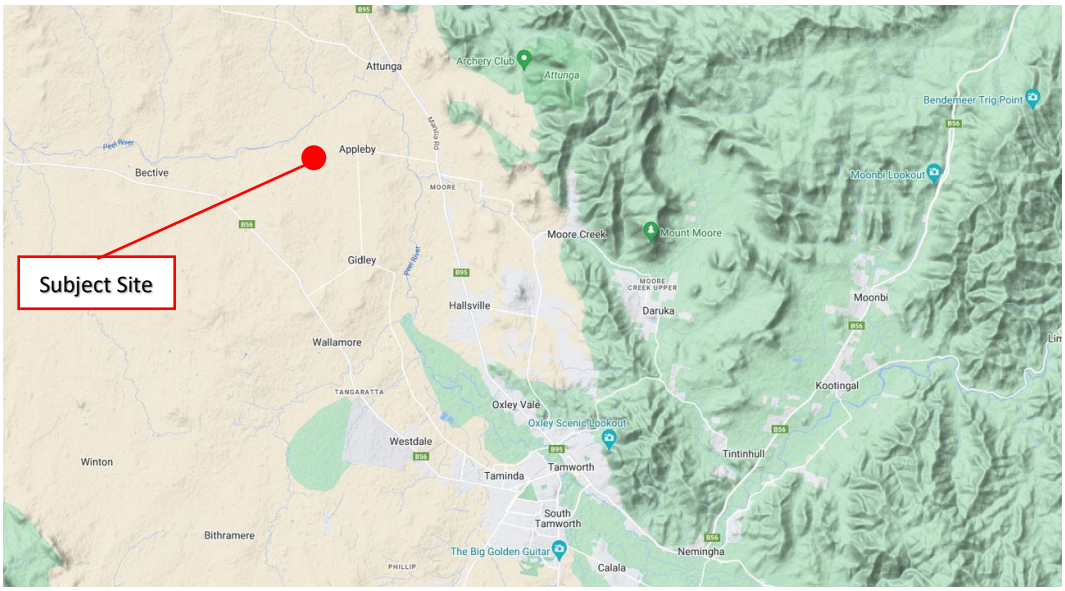

Figure 1: Site Locality

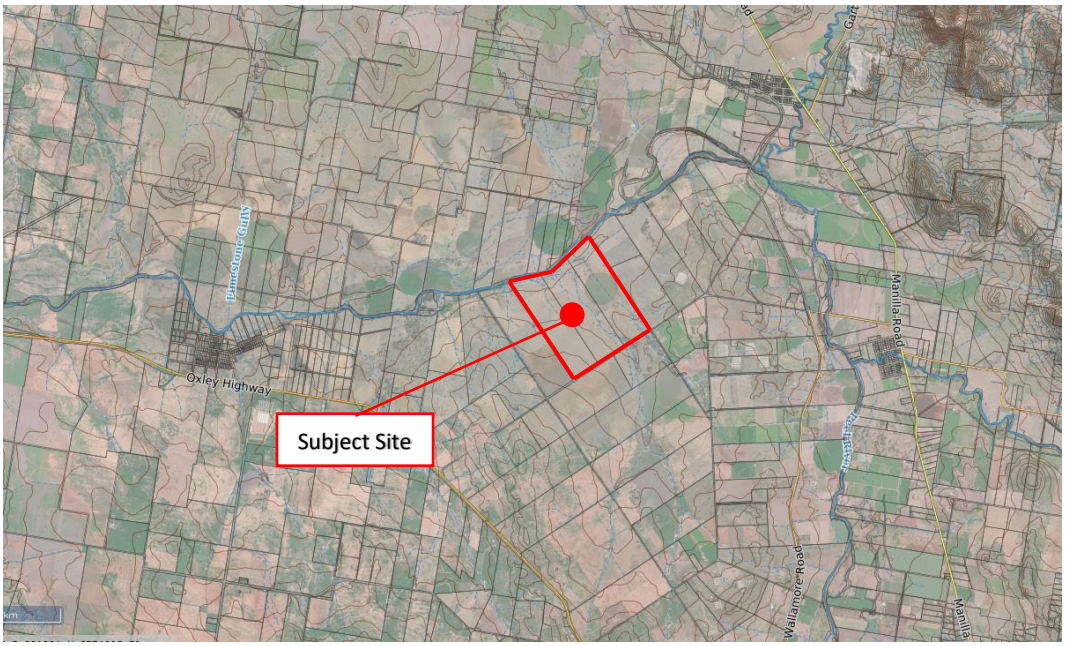

Figure 2: Development Site

The methodology utilised in the preliminary design of the subdivision is detailed below.

1.1 Purpose of this Document

The purpose of this report is to provide an explanation of the design methodologies used to produce a Preliminary Stormwater Management Strategy.

The scope includes an identification of the stormwater management requirements for the proposed development, in order to devise a suitable Preliminary Stormwater Management Strategy.

This report describes the principles and operation of the proposed stormwater system as well as the primary components of the drainage system. Given the preliminary nature of this report, the final stormwater system layout may need to be revised during the detailed design, as part of the subsequent application for a Construction Certificate.

The increase in impervious areas and alteration of the natural topography, due to land development, will increase and concentrate stormwater flows. This has the potential to impact on flow regimes and cause erosion of the natural downstream drainage network and associated waterways.

To avoid any adverse impact on the downstream drainage systems, the site's stormwater management system must be designed to ensure the safe conveyance of flows throughout the site and within the capacity of the downstream drainage systems in a healthy environmental state for *Ecological Sustainable Development*.

The methodology utilised in the preliminary design of the stormwater network is detailed below. All design considerations have revolved around current design guidelines, Australian Standards and TRC *Engineering Design Minimum Standards (EDMS)* and *TRC Construction Specifications*.

1.2 Site Location

The site is identified as Lot 17 to 19 in DP 95993 & forms part of a larger agricultural holding known as 'Silverweir', 448 Appleby Lane, Appleby.

Primary access to the site is gained from Appleby Lane via either the Oxley Highway (to the west), Gidley Appleby Road (to the south) or Manilla Road (to the east).

The site, being the subject of this report, is bounded by the Appleby Lane to its south, a Crown Road and another smaller poultry farm (further) to its east, agricultural land to its west and the Peel River and rural land to its north.

1.3 Proposed Development

The proposed development seeks to allow the construction of 16 poultry sheds suitable for broiler birds. It will also include internal roadways, poultry sheds, drainage infrastructure and two new dwellings.

2.0 MODEL INPUTS

2.1 Survey

In 2023, an engineering detail survey of the site was conducted by Hanlons Consulting. This survey complimented a drone LIDAR survey completed across the areas adjacent to the site.

Specifically, the survey located all (where possible) existing features including existing road, services (both Council and electrical/telecommunications), table drains, culverts, vegetation, and other built structures.

The survey included the location of underground infrastructure and telecommunication / electrical service location within the extent of works.

However, to supplement the electro-induction locating Dail Before You Dig plans were also obtained to help identify the location of services within the extent of works.

2.2 Relevant Design Documents & Inputs

The preliminary strategy has utilised and/or made reference to the relevant design standards and guidelines (as detailed in this preliminary design report) as well as the following documents:

- Hanlons Consulting, 2023, *Detail Survey,* Ref: 23310;
- Hanlons Consulting, 2024, *Baiada Pty Ltd, Preliminary Plan Set, Silverweir Broiler Farm,* Ref: 23310 Rev C;
- Tamworth Regional Council, *Engineering Design Minimum Standards (Ver2, May 2023)*;
- Institution of Engineers Australia, *Australian Rainfall & Runoff,* (2019); and
- Relevant Australian Standards.

3.0 MODELLING METHODOLOGY

3.1 Introduction

In general terms, the Major/Minor Stormwater approach, as outlined in Australian Rainfall and Runoff (AR&R), has been followed with minor and major flows conveyed to a natural drainage line adjacent to the site.

Hydrologic and hydraulic calculations were undertaken using Watercom DRAINS hydraulic software. This is TRC's preferred method as stated in TRC's EDMS (v2 2023).

3.2 Predeveloped Conditions

The site is currently utilised as open grazing land sloping towards the Peel River. A number of 1st, 2nd and 3rd order streams are present within the development site. The development footprint has been located in such a way as to avoid any 2nd and 3rd order stream.

3.2.1 Existing Discharge Points

Given the lack of existing stormwater infrastructure within the vicinity of the development site it is proposed that all flows will discharge to the Peel River via channel flow through the existing natural drainage lines.

3.3 Hydrological Modelling

The performance of the proposed stormwater management system was assessed using the DRAINS stormwater modelling package utilising the ILSAX and RAFTS hydrological models.

This model is able to:

- Model spatial and temporal variations in storm rainfall across the catchment.
- Model variations in catchment characteristics.
- Model storage routing effects in drainage lines, and
- Calculate discharge hydrographs (included peak discharge rates) at any required location in the catchment.

The analytical technique used in DRAINS involves the division of the catchment into a number of sub-catchments. To allow the sizing of a drains to capture and direct the improved flow, the analysis has been limited to the footprint of the development to predeveloped flow rates.

Sub-catchment outlets are located at the upstream end of drainage lines, at points corresponding to significant changes in catchment characteristics, or at any other point of interest.

3.3.1 Modelling Parameters

To assess the predeveloped and developed scenarios a combined *Horton/ILSAX* and RAFTS model has been used. In general, ILSAX catchments have been utilised for catchment areas up to 2Ha, while RAFTS catchments used for areas in excess of 2Ha.

The DRAINS model adopted the following assumptions and parameters for modelling.

Table 2: DRAINS Parameters

PARAMETER	VALUE
Modelling Procedure	AR&R 2019
Minor Event	0.2 EY
Major Event	1% AEP
Storm Events	0.2 EY to 1% AEP
Storm Durations	5min to 2 hours
Hydrological Models	Horton / ILSAX & RAFTS
Pre and Post Developed Catchment (ILSAX)	
Impervious area depression storage	1mm
Supplementary area depression storage	1mm
Pervious area depression storage	8mm
Soil Type	3
Antecedent Moisture Condition (AMC)	3
Pre and Post Developed Catchment (RAFTS)	
Impervious Area Initial Loss	2mm/h
Impervious Area Continuing Loss	0mm/h
Pervious Area Initial Loss	20mm/h
Pervious Area Continuing Loss	2.5mm/h
Storage Multiplier, Bx	1.0*

* Bx = 1 due to the catchment being ungauged and therefore unable to be calibrated

It is noted that the pits used in the model contain a 50% blockage factor within the pit inlet capacity data and as such, the blockage factor in the pit properties dialogue box is set to zero.

In addition, the adopted design criteria and assumptions made include:

- Total developed site area of approximately 17ha;
- Site imperviousness:
    - Predeveloped scenario: 35% impervious area with a manning value of 0.025 given the rural/agricultural nature of the site.
    - Developed scenario: 50% paved and 50% grassed for developed catchments containing 'shed and inter-shed drains' and 95% paved for developed 'road areas'.
- Assumed collection conditions: Roof water collected via gutters and discharged to inter-shed drains via downpipes. Road flows directed to internal drains via sheetflow. All captured flows discharged to external drains and subsequently natural drainage lines; and
- 23% Climate Change Factor as per TRC's EDMS

3.3.2 Design Storms and Durations

The site was modelled for the 1 EY, 0.2EY, 10% AEP, 5% AEP & 1% AEP design storms to cover both the minor and major events. Design rainfall intensity/frequency/duration (IFD) data and storm temporal patterns were derived using the procedures set out in Australia Rainfall and Runoff, in line with TRC's *Engineering Design Minimum Standards for Subdivisions & Developments.*

Design storm durations from 5 minutes to 2.0 hours were modelled to determine the critical storm duration. (i.e. the storm that produced the highest peak flow) for both predeveloped and developed cases.

3.4 Proposed Layout

The proposed development footprint has been delineated in the Concept Development Plans contained within Appendix A.

3.4.1 Open Channel Network

Given the rural nature of the development, open channels have been utilised.

As mentioned above, the development contains a number of inter-shed drains as well as external collections drains that convey flows to the proposed discharge point. Generally, these drains have the following design features:

Table 3: Open Channel Feature

CHANNEL TYPE	DESIGN FEATURE
Inter-shed drains	• Trapezoidal cross section; • 2.5m wide; • 1:6 batters; • longitudinal grade of 0.5% to 1%; • Grass lined with suitable rock armouring; and • Discharge to the external collector drain via 450mm diameter pipe culvert and headwall.

CHANNEL TYPE	DESIGN FEATURE
External drains	• Trapezoidal cross section; • 3.5m wide; • 1:3 batters; • Grass lined with suitable rock armouring; and • Discharge to the existing natural drainage line to the north east of the farm site.

The results of the modelling have been briefly detailed in Section 4.0 of this report.

3.4.2 Proposed Network Discharge Points

The proposed stormwater network will discharge to the existing natural drainage line adjacent to the farm location. The drainage line then feeds into the Peel River north of the site.

4.0 MODELLING RESULTS

4.1 Predeveloped Flows

The predeveloped and developed site conditions were modelled to establish the peak rate of discharge for each critical storm event from the 1 EY to 1% AEP events. The preliminary stormwater plans are shown in Appendix A.

A summary of the selected predeveloped peak flows is provided in Table 4 below.

Table 4: Predeveloped Catchment (DRAINS Analysis)

NODE / DISCHARGE POINT	PEAK FLOW RATE (m^3/s)				
	1 EY	0.2 EY	10% AEP	5% AEP	1% AEP
N-Site Disch_Pre	1.4	3.3	4.2	5.5	8.5

4.2 Developed Flows

The developed model was run to assess the performance of the proposed preliminary stormwater design, including the proposed drains within the site.

A summary of selected developed peak flows is provided in Table 5 below.

Table 5: Developed Catchment Outflow

NODE / DISCHARGE POINT	PEAK FLOW RATE (m^3/s)				
	1 EY	0.2 EY	10% AEP	5% AEP	1% AEP
N-Site Disch	0.7	1.6	2.1	2.5	3.8

The incorporation of the proposed drainage structures will reduce developed flowrates to less than the predeveloped flowrates for all storm events up to and including the 1% AEP event.

A summary of the performance of the proposed system is provided in Table 6 below.

Table 6: Developed versus Predeveloped Modelled Peak Flows

NODE / DISCHARGE POINT	PRE vs POST DEVELOPMENT	PEAK FLOW RATE (m^3/s)			
		0.2 EY	10% AEP	5% AEP	1% AEP
N-Site Disch	Predeveloped	3.3	4.2	5.5	8.5
	Developed	1.6	2.1	2.5	3.8

The modelling results contained Table 6 demonstrate that with the provision of the proposed inter-shed drains, the developed peak flow discharging from the site are below predeveloped flows.

Given the results of the DRAINS modelling, the inter-shed drains function as individual detention structures and result in an overall reduction of the developed flows without the need for a detention basin. As such, the proposed stormwater strategy is deemed to adequately collect and convey the developed flows generated from the farm site.

The final configuration of the proposed stormwater management system is subject to detailed design, at which stage some adjustment to the system is expected. The design objectives, however, would remain unchanged.

5.0 CONCLUSION

This report presents an assessment of the preliminary stormwater management strategy for the proposed construction of 16 poultry sheds suitable for broiler birds.

The modelling undertaken indicates that the proposed stormwater network results in developed peak discharges from the site that are less than predeveloped flow for the full range of storms from 0.2EY to 1% AEP.

6.0 LIMITATIONS

This report only details information relevant to the works undertaken by '*Mitchel Hanlon Consulting Pty Ltd*' (trading as '*Hanlons Consulting*'). Therefore, this report should be read in conjunction with all other documentation accompanying any associated development application.

The design relates solely to the areas delineated on the accompanying plan/s;

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APPENDIX A CONCEPT DEVELOPMENT PLANS

FOR PLANNING PURPOSES ONLY

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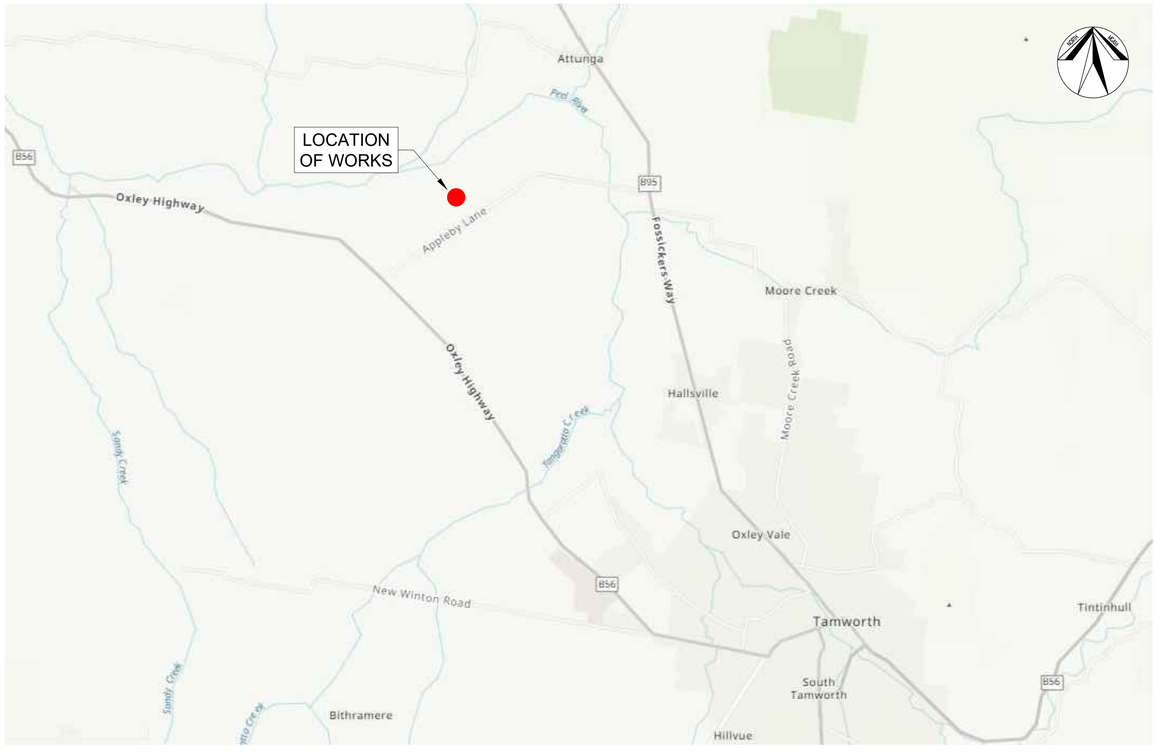
PRELIMINARY PLAN SET
SILVERWEIR BROILER FARM
APPLEBY LANE, APPLEBY, TAMWORTH

SHEET INDEX



LOCALITY SKETCH

TAMWORTH
Not to Scale

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DESIGNED	MH
DRAWN	MH
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VERIFICATION SCHEDULE

DATE	REV	REMARKS	BY
19 JULY 2024	E	Shed Spacing Adjusted	MH
13 MAY 2024	C	Drainage Lines and Residences	MH
4 MAR 2024	B	Revised location	MH
17 FEB 2024	A	For Discussion	SG

REFERENCE	23310
DATE	03 APRIL 2024
DATUM HOR	MGA (56-2020)
DATUM VER	AHD
LGA	TAMWORTH REGIONAL
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COUNTY	

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CLIENT: **BAIADA**

PROJECT
BAIADA-SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

FRONT SHEET

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DRAINAGE LINE

APPLEBY LANE

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A4: 1:6000

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PROJECT
BAIADA - SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

PLAN - OVERALL SITE SURVEY

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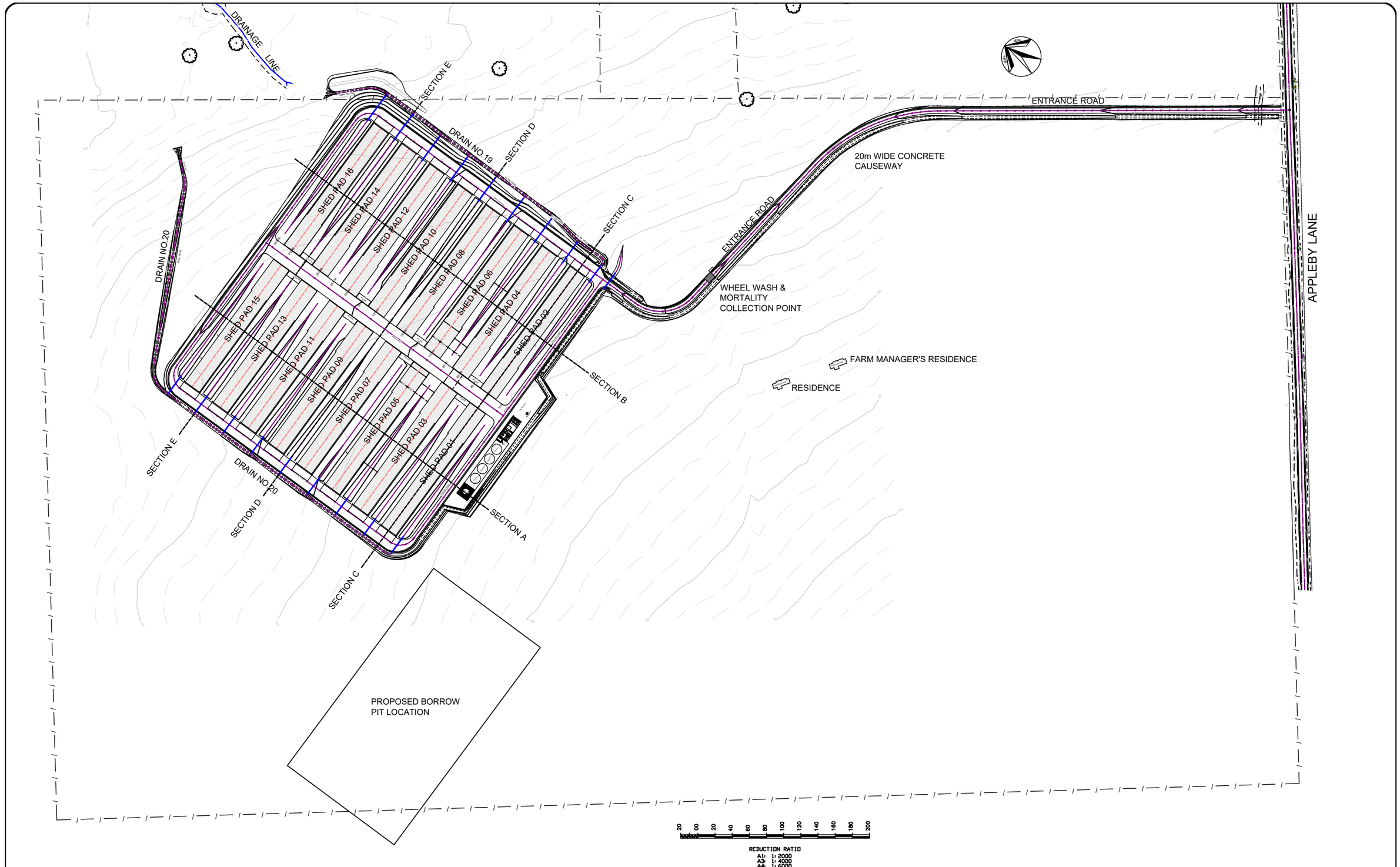

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PLAN - OVERALL SITE

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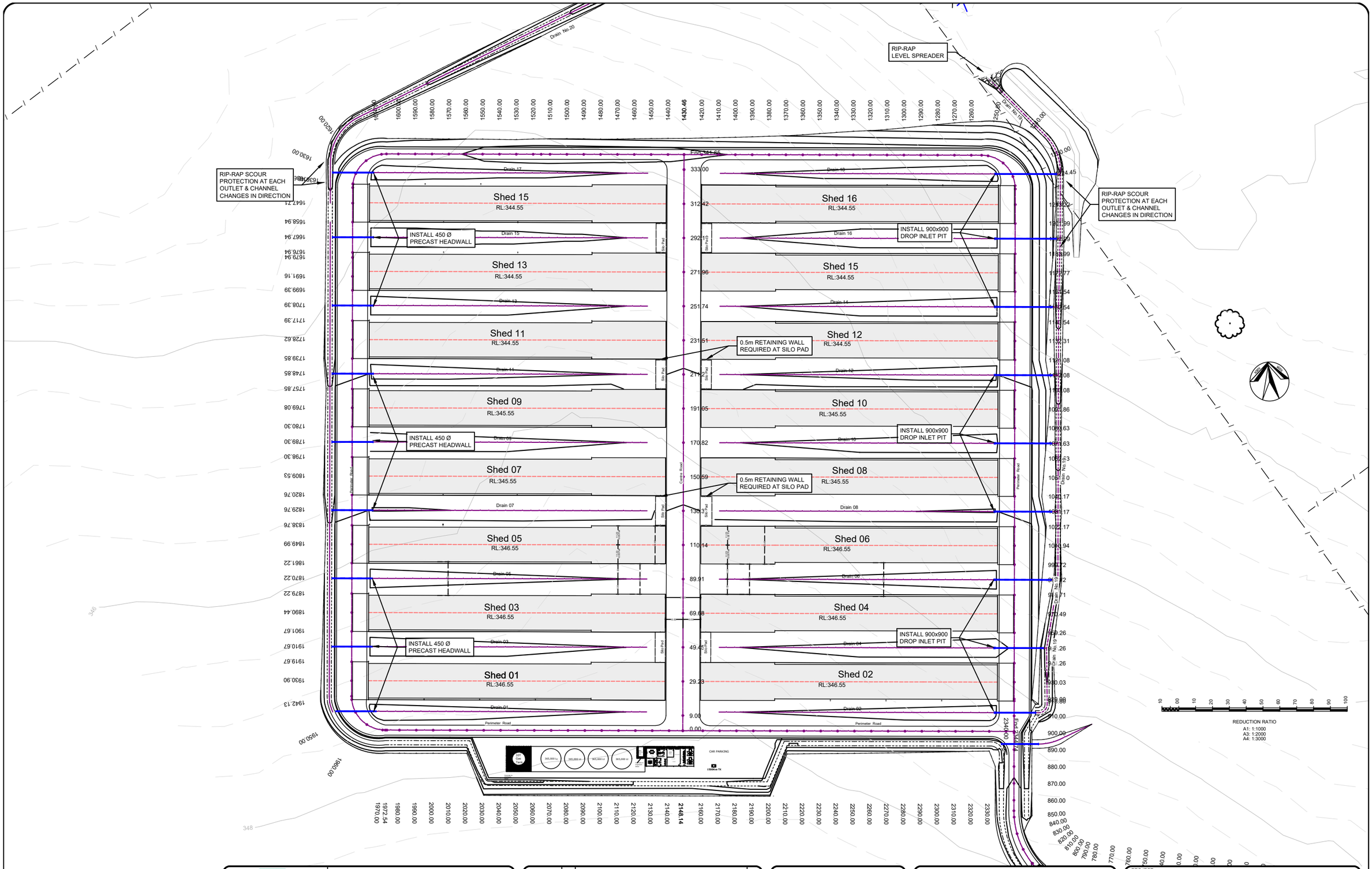

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PLAN - SHEDS SITE

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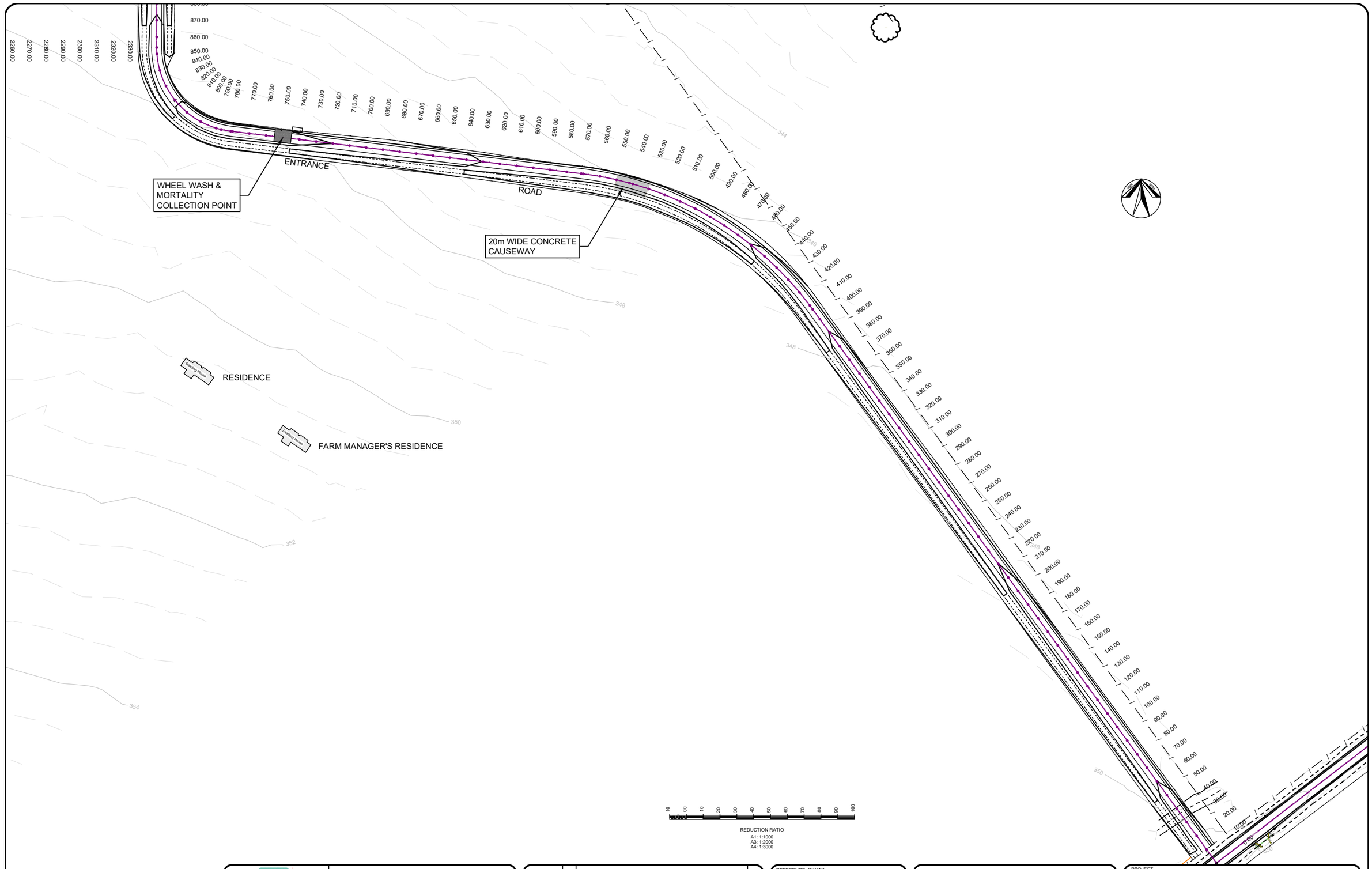

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BAIADA - SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

PLAN - ENTRANCE ROAD

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PLOTTED: 19 JULY 2024

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LEVEL SPREADER

224° 15' 40"

Drain No.20

RIP-RAP
LEVEL SPREADER

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Drain No.19

1240.00

1230.00

1224.45

1213.22

End 341.65

333.00

Drain 18

312.42

Shed 16
RL:344.55

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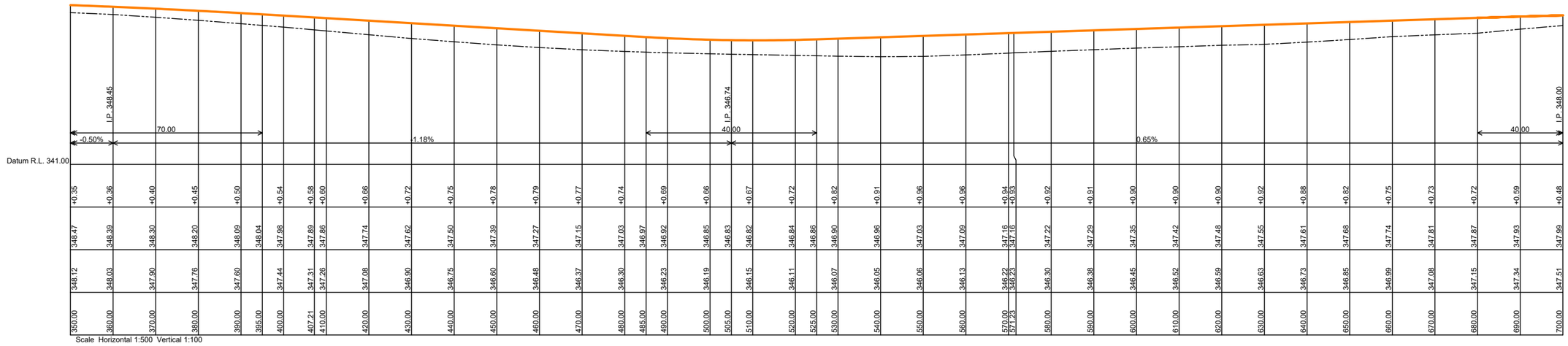
PROJECT
BAIADA - SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

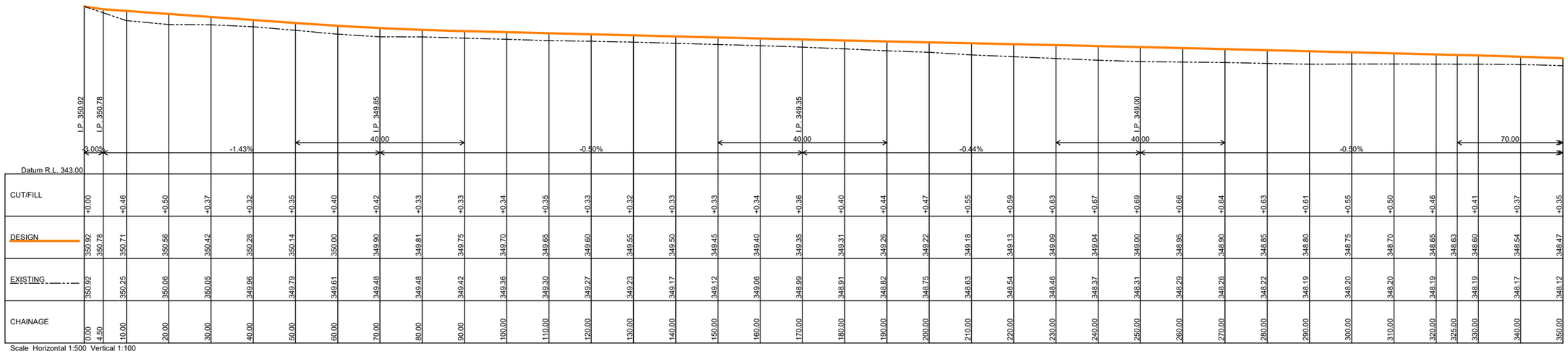
PLAN - LEVEL SPREADERS

SCALE 1:500 1:1000 (0 5 10 15 20 25)
SHEET SIZE A1 A3
DRAWING No. VER. **DES-E**
SHEET **06** OF **12** SHEETS

PLOTTED: 19 JULY 2024



Perimeter Road



REDUCTION RATIO
A1: H:1: 500 V:1:100
A3: H:1:1000 V:1:200
A4: H:1:1500 V:1:300

Baiada

DESIGNED MH
DRAWN MH
REVIEWED

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APPROVED REGISTERED SURVEYOR

VERIFICATION SCHEDULE

DATE	REV	REMARKS	BY
19 JULY 2024	E	Shed Spacing Adjusted	MH
13 MAY 2024	C	Drainage Lines and Residences	MH
4 MAR 2024	B	Revised location	MH
17 FEB 2024	A	For Discussion	SG

REFERENCE	23310
DATE	16 FEB 2024
DATUM HOR	MGA (56-2020)
DATUM VER	AHD
LGA	TAMWORTH REGIONAL
LOCALITY	APPLEBY
PARISH	
COUNTY	

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CLIENT **BAIADA POULTRY**

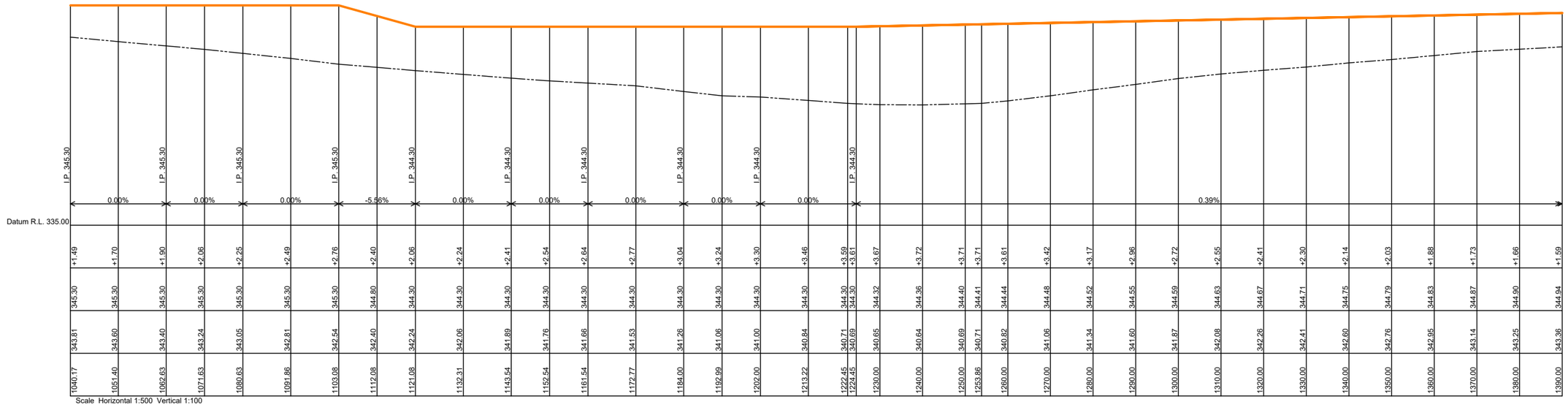
PROJECT

BAIADA - SILVERWEIR EARTHWORKS, ROAD & DRAINAGE

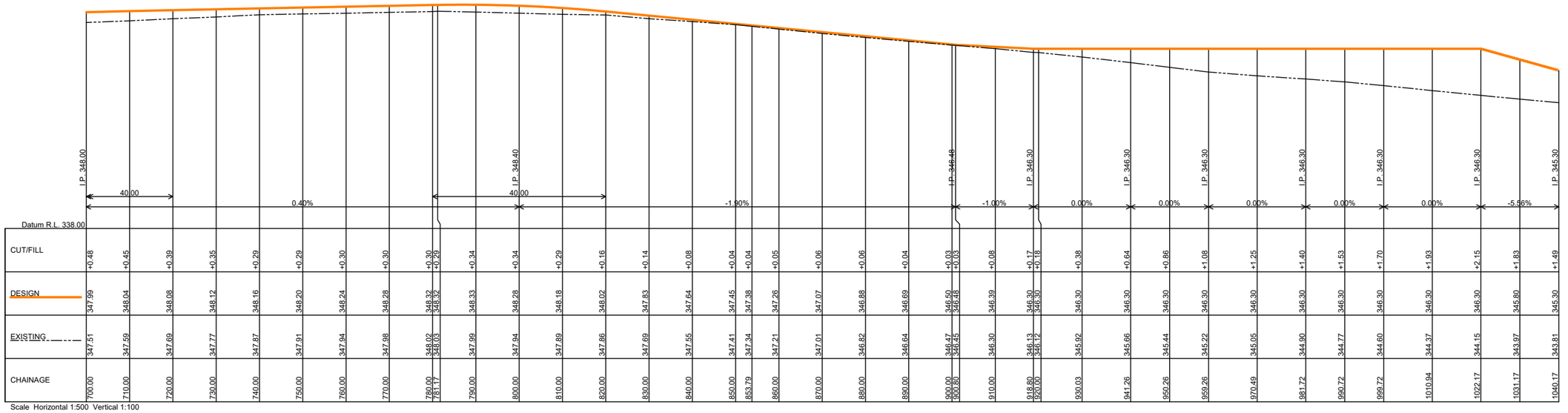
LONG.SECTIONS - ENTRY ROAD

SCALE 1:500 HOR. 1:100 VER.
SHEET SIZE A1
DRAWING No. VER. **DES-E**
SHEET **08** OF **12** SHEETS

PLOTTED: 19 JULY 2024



Perimeter Road



Perimeter Road

REDUCTION RATIO
A1: H:1: 500 V:1:100
A3: H:1:1000 V:1:200
A4: H:1:1500 V:1:300

Baiada

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DESIGNED MH
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REVIEWED
APPROVED REGISTERED SURVEYOR
VERIFICATION SCHEDULE

DATE	REV	REMARKS	BY
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4 MAR 2024	B	Revised location	MH
17 FEB 2024	A	For Discussion	SG

REFERENCE 23310
DATE 16 FEB 2024
DATUM HOR MGA (56-2020)
DATUM VER AHD
LGA TAMWORTH REGIONAL
LOCALITY APPLEBY
PARISH
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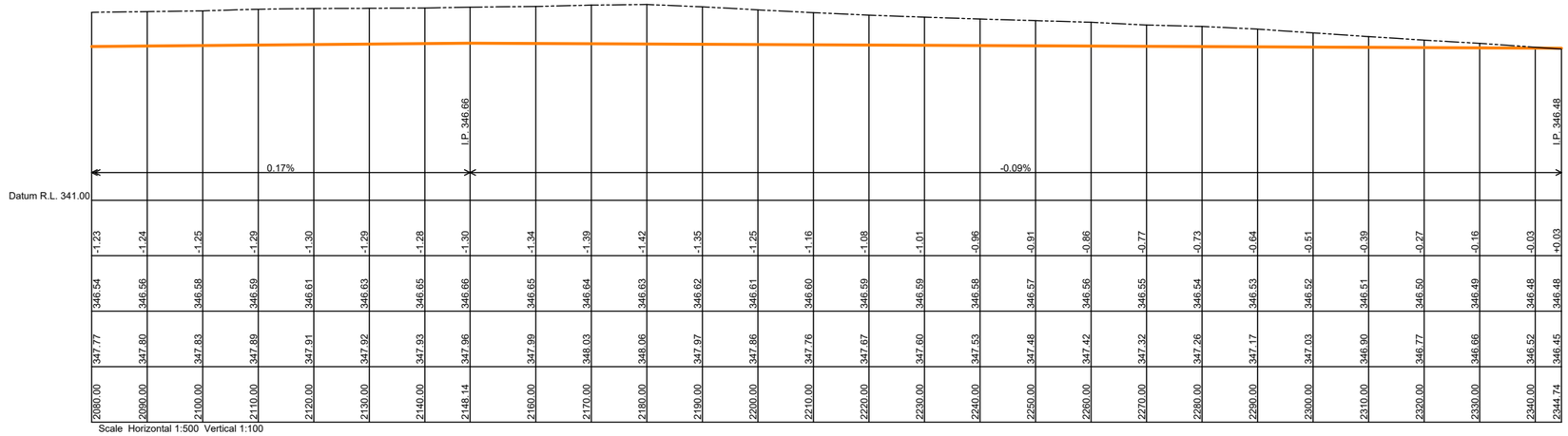
CLIENT **BAIADA POULTRY**

PROJECT
BAIADA - SILVERWEIR EARTHWORKS, ROAD & DRAINAGE

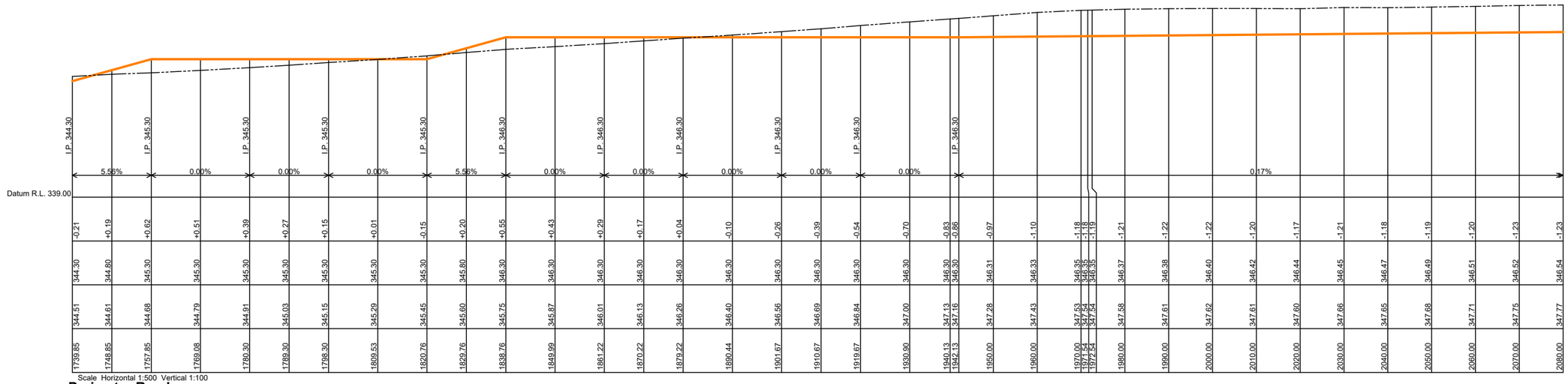
LONG.SECTIONS - PERIMETER ROAD

SCALE 1:500 HOR. 1:100 VER.
SHEET SIZE A1
DRAWING No. VER. **DES-E**
SHEET **08** OF **12** SHEETS

PLOTTED: 19 JULY 2024

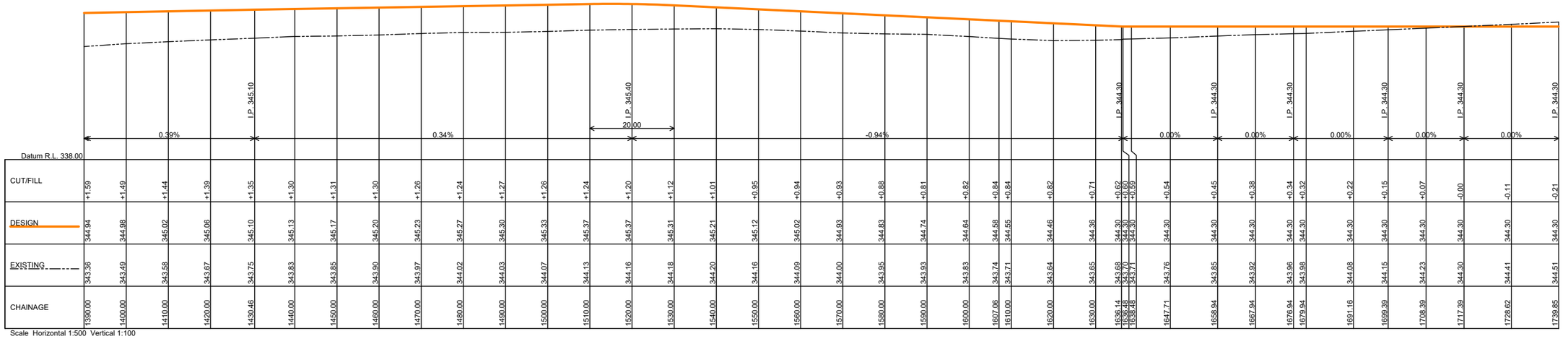


Scale Horizontal 1:500 Vertical 1:100



Scale Horizontal 1:500 Vertical 1:100

Perimeter Road



Scale Horizontal 1:500 Vertical 1:100

Perimeter Road

REDUCTION RATIO
A1: H:1: 500 V:1:100
A3: H:1:1000 V:1:200
A4: H:1:1500 V:1:300

Baiada

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DESIGNED	MH
DRAWN	MH
REVIEWED	

APPROVED REGISTERED SURVEYOR

VERIFICATION SCHEDULE

DATE	REV	REMARKS	BY
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DATUM HOR	MGA (56-2020)
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LGA	TAMWORTH REGIONAL
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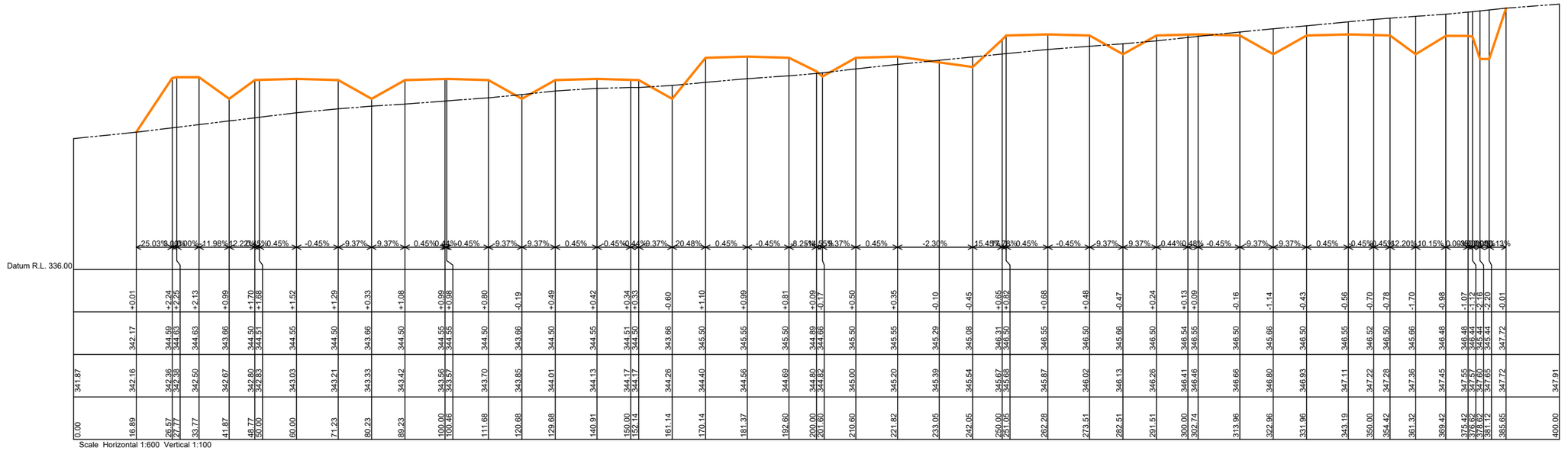
CLIENT
BAIADA POULTRY

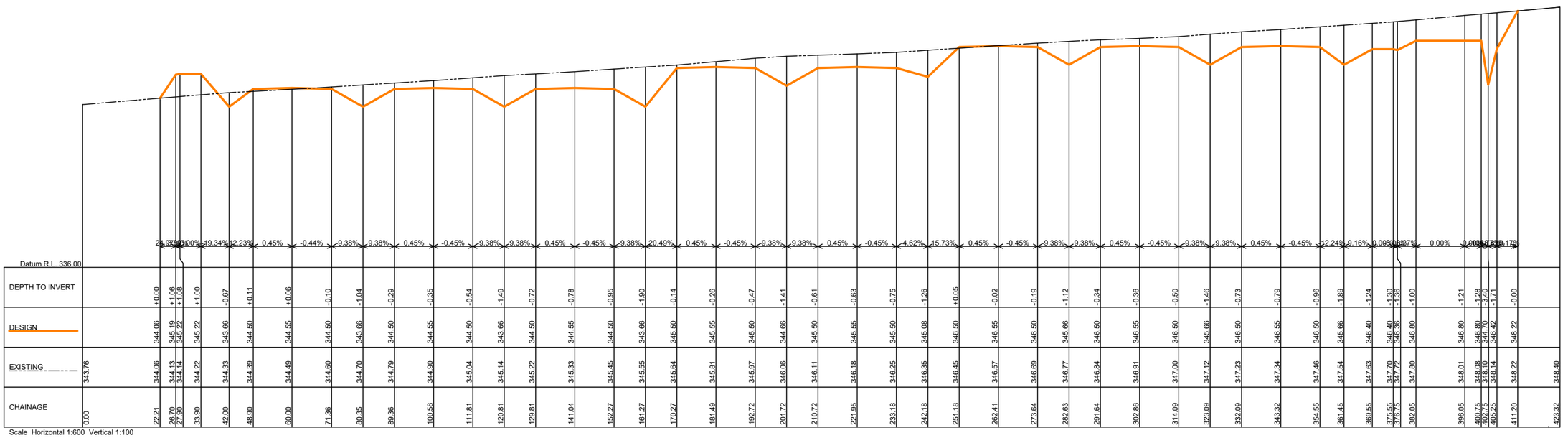
PROJECT
BAIADA - SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE
LONG.SECTIONS - PERIMETER ROAD

SCALE 1:500 HOR. 1:100 VER.	SHEET SIZE A1	DRAWING No. DES-E	VER. SHEET 09 OF 12 SHEETS

PLOTTED: 19 JULY 2024



Section-B



Section-A

Baiada

DESIGNED MH
DRAWN MH
REVIEWED

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APPROVED REGISTERED SURVEYOR

VERIFICATION SCHEDULE

DATE	REV	REMARKS	BY
19 JULY 2024	E	Shed Spacing Adjusted	MH
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REFERENCE 23310
DATE 4/04/2024
DATUM HOR MGA (56-2020)
DATUM VER AHD
LGA TAMWORTH
LOCALITY APPLEBY
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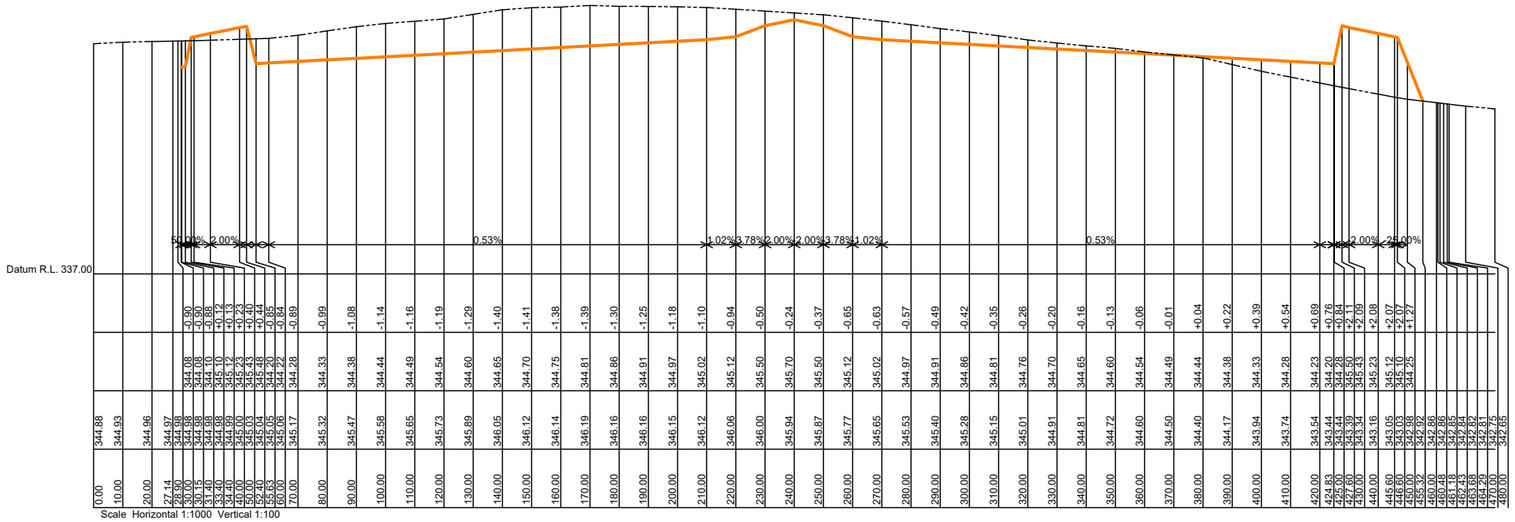
CLIENT **BAIADA POULTRY**

PROJECT
BAIADA - SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

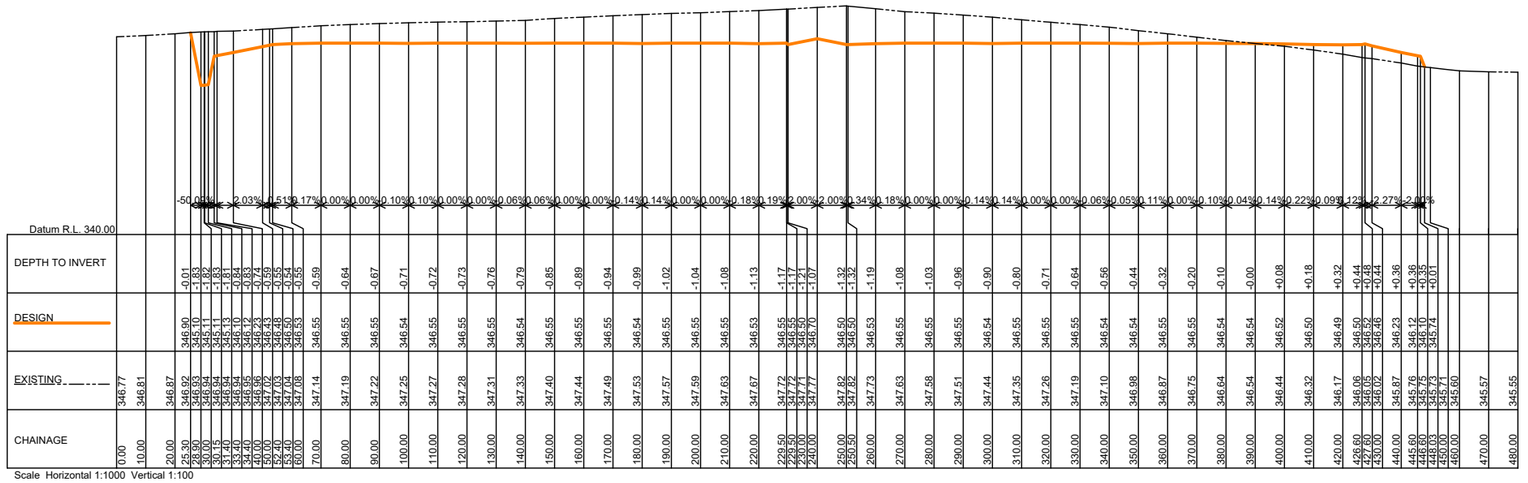
CROSS SECTIONS - SHEDS - SECTIONS A & B

SCALE
SHEET SIZE
DRAWING No. VER. **DES-E**
SHEET **10** OF **12** SHEETS

PLOTTED: 19 JULY 2024



Section-D



Section-C

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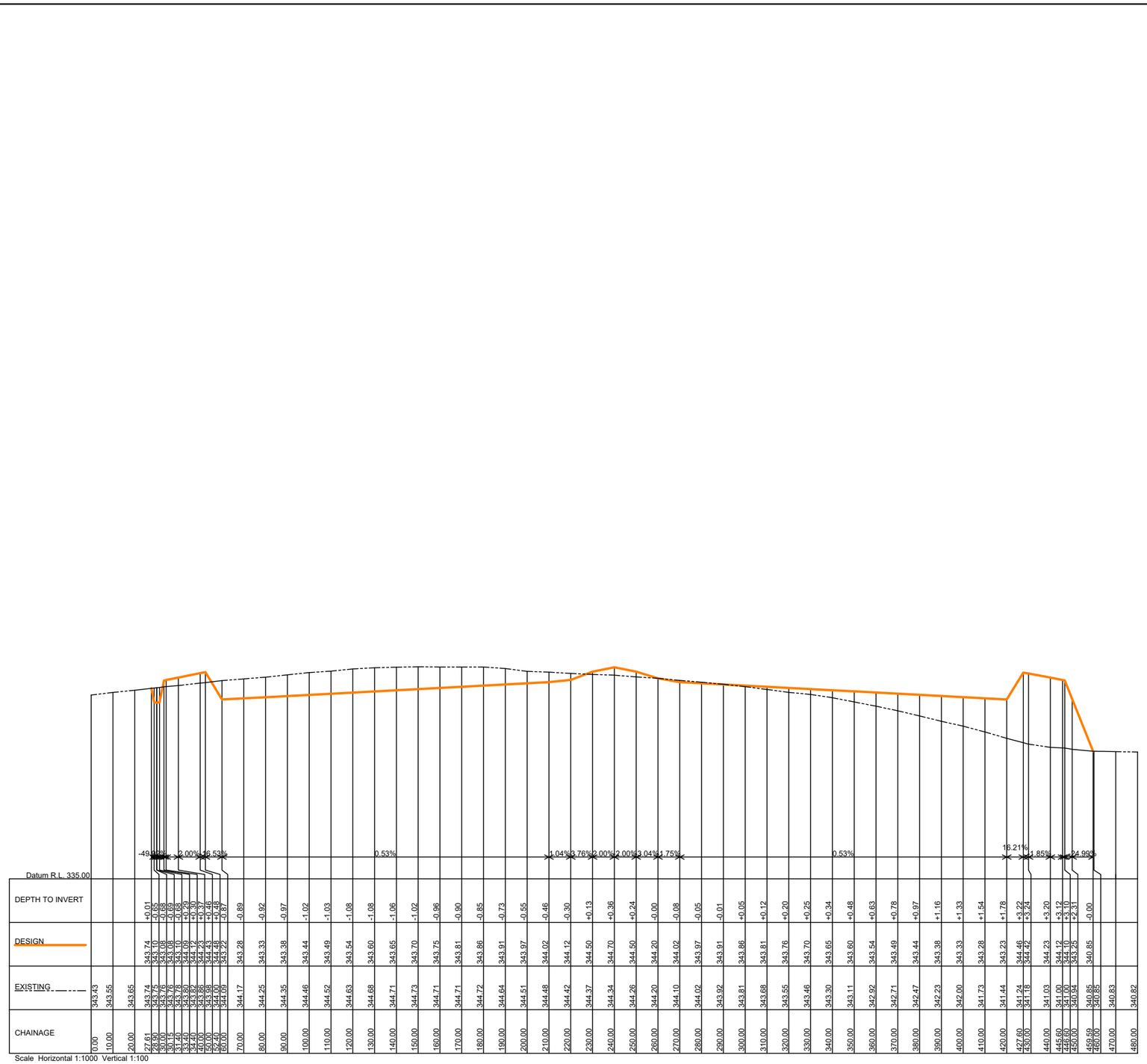
CLIENT **BAIADA POULTRY**

PROJECT
BAIADA-SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

CROSS SECTIONS - SHEDS - SECTION C & D

SCALE | SHEET SIZE | DRAWING No. SP-001-B | VER | SHEET 11 OF 12 SHEETS

PLOTTED: 19 JULY 2024



Scale Horizontal 1:1000 Vertical 1:100

Section-E

Baiada

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BAIADA-SILVERWEIR
EARTHWORKS, ROAD & DRAINAGE

CROSS SECTIONS - SHEDS - SECTION E

SCALE | SHEET SIZE | DRAWING No. SP-001-B | VER. | SHEET 12 OF 12 SHEETS

PLOTTED: 19 JULY 2024