Sandy Hollow Solar Farm

Engineering Services and Civil Report

Prepared for:	**Vernon Trust**
Date:	**9th November 2023**
Prepared by:	**Lauren Todd**
Ref:	**301351404**

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Revision

Site Address:	1333 Golden Highway, Sandy Hollow, NSW 2333
Proposed Development:	Solar Farm
Client:	Vernon Trust
Local Authority	Muswellbrook Shire Council
Authority Reference #:	N/A
Stantec Reference:	301351404-SWMP_001

Rafal Piwonski

Civil Project Technical Lead

For and on behalf of
Stantec Australia Pty Ltd

Revision	Date	Comment	Prepared By	Approved By
001	09.11.2023	Issued for DA Approval	LPT	RKP

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1. Introduction

Stantec have been commissioned by Vernon Trust to prepare this Stormwater Management Plan (SWMP) in support of the Development Application (DA) for the proposed development at 1333 Golden Highway, Sandy Hollow, NSW 2333.

This SWMP illustrates that the proposed development complies with the conditions set out by Muswellbrook Shire Council, Australian Rainfall and Runoff (ARR) 2019, Australian Standards and best engineering practices.

The purpose of this SWMP is to evaluate the quantity and quality of stormwater associated with the proposed development plan so as to demonstrate that an appropriate stormwater management strategy has been adopted.

The site is situated off the Golden Highway to the south east of the Sandy Hollow Township. Adjacent to the southern boundary is railway land with the Goulburn River located further south.

The total area of the precinct is approximately 17.25 hectares and is expected to accommodate an arrangement of photovoltaic solar arrays consisting of solar panels attached to mounting structures, access roads, temporary office and set down area.

This report relates to civil development of the Sandy Hollow Solar Farm and outlines strategies associated with the provision for civil infrastructure including internal roads, stormwater drainage and earthworks.

2. Abbreviations Definitions

- **AEP** Annual Exceedance Probability
- **AHD** Australian Height Datum
- **ARI** Average Recurrence Interval
- **ARR** Australian Rainfall and Runoff
- **DA** Development Application
- **DCP** Development Control Plan
- **DN** Diameter Nominal (mm)
- **DPIE** Department of Planning, Industry and Environment
- **EY** Exceedances per Year
- **GPT** Gross Pollutant Trap
- **IFD** Intensity-Frequency-Duration
- **IL** Invert Level
- **L/s** Litres per second
- **m/s** Metres per second
- **MUSIC** Model for Urban Stormwater Improvement Conceptualisation
- **OSD** On-site Stormwater Detention
- **PSD** Permissible Site Discharge
- **RCP** Reinforced Concrete Pipe
- **RL** Relative Level
- **SID** Safety In Design
- **SQID's** Stormwater Quality Improvement Devices
- **SSDA** State Significant Development Application
- **SSR** Site Storage Requirement
- **WQO's** Water Quality Objectives
- **WSC** Water Services Coordinator
- **WSUD** Water Sensitive Urban Design

3. Relevant Policies, Standards and Guidelines

The following listed policies, standards and guidelines were referred to in the preparation of this report:

- Muswellbrook Shire Council AUS-SPEC Development Design Specifications
- Muswellbrook Shire Council Development Control Plan (DCP), 2009
- Australian Rainfall & Runoff 2019
- AS3500 parts 0-5: 2021 Plumbing and Drainage
- Landcom Managing Urban Stormwater: Soils and Construction Volume 1 2004
- NSW Floodplain Development Manual 2005
- Guidelines for development adjoining land and water managed by DECCW (OEH, 2013)

4. Existing Site Characteristics

4.1 Property Detail

The proposed development forms part of the site with the following property details:

Site Address:	511 Richmond Grove Road, Sandy Hollow, NSW 2333
Real Property Description:	Lot 12/ DP1042612
Site Area:	17.35 Ha

The proposed development can be seen on the Civil Design Documentation shown in Appendix A of this report.

The overall site is bounded by:

- Golden Highway to the North
- Gulgong Sandy Hollow Railway to the South
- Landscaped lots to the West and East

Refer to locality plan in Figure 1 for further clarification.

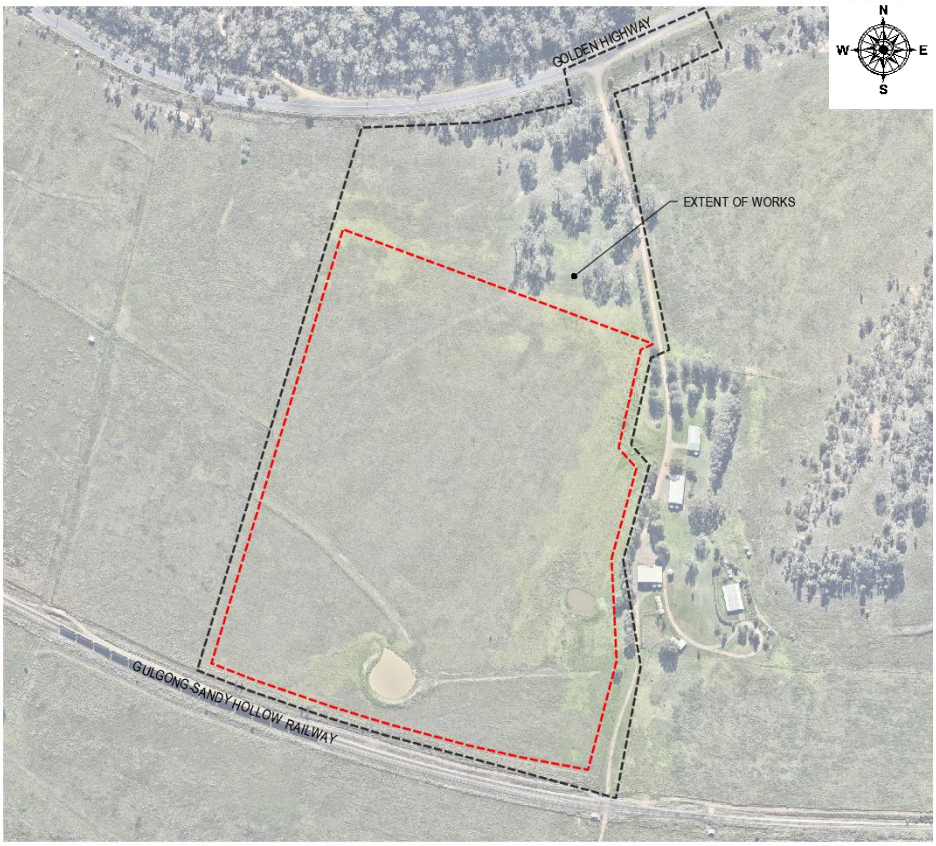

Figure 1: Site Location Plan (Source: Nearmaps 2023)

4.2 Topography

The topography of the site has been determined by analysis of survey documents and through Mecone Mosaic. The site is located to the south east of the Sandy Hollow Township and is currently used as farm land. The current site grades fall from the north east corner to the south west corner with a height range of 172.0m to RL 130.0m.

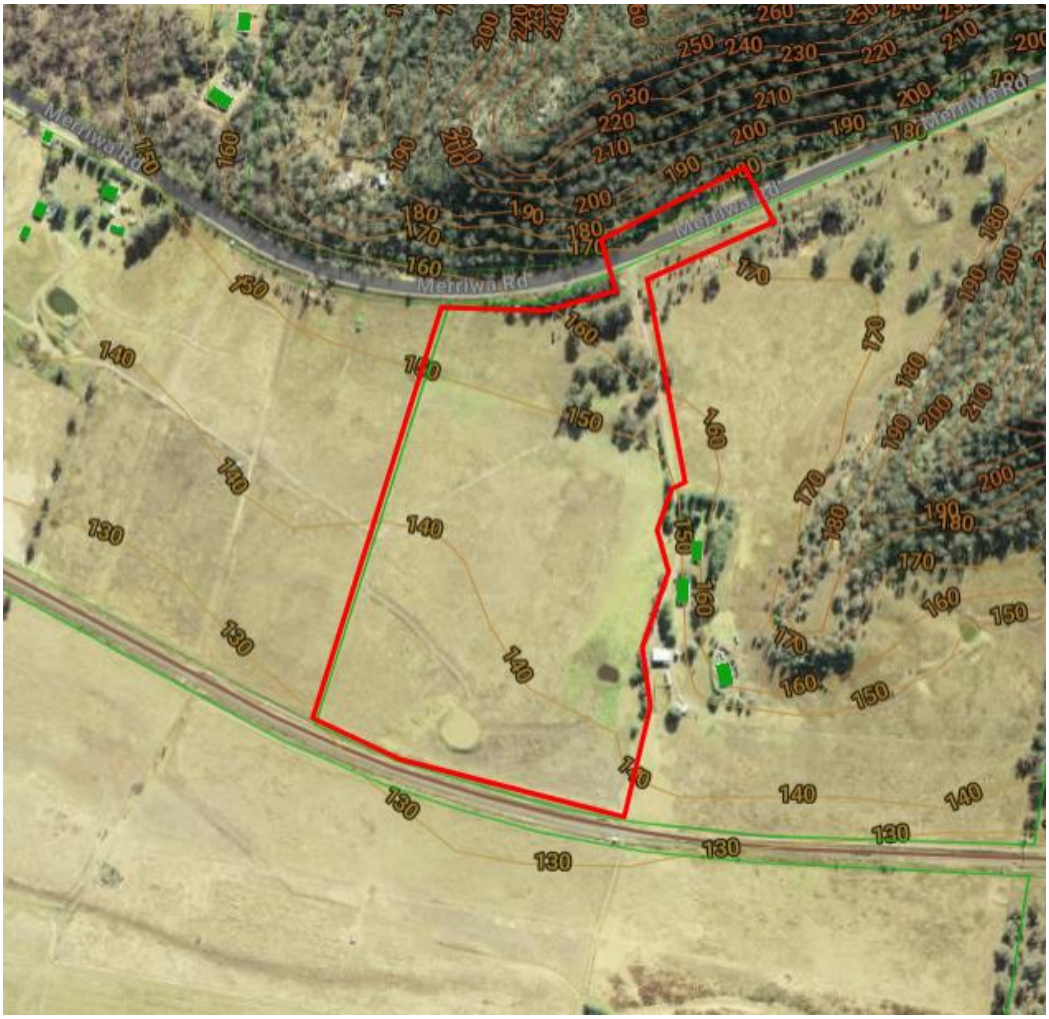

Figure 2: Sie Topography (Mecome Mosaic 2023)

4.3 Stormwater Catchments

The surrounding area has been investigated to determine the likely impact of existing external stormwater catchments on the proposed site.

Majority of the surrounding lots and roadway convey stormwater around the proposed site. There is a minor portion of stormwater from the northern lot that, in its existing condition, discharges overland toward the proposed development site. However, it is believed that little to no external catchments impact the site.

4.4 Existing Stormwater Infrastructure

Through survey information and Google Maps, it has been determined that the site does not contain pit and pipe infrastructure. The site contains two existing dams at the southern end of the site, with bund and swales running across the site to capture and direct flows into these dams.

4.5 Existing Stormwater Discharge

There is currently no formalised drainage within the site. Under existing conditions, the site drains via overland flow to the southern boundary of the site.

5. Flood Impact Assessment

When considering a new development, it is important to assess the impact of existing flooding on the proposed dev elopement and also the impact of the proposed development on existing or potential flooding both upstream and downstream of the development.

5.1 Existing Flooding

5.1.1 Regional Flooding

The subject site has been identified in the Sandy Hollow Flood Assessment (Appendix B). The site is not within the regional 100-year flood level zone, as existing levels site are above the 100-year ARI regional level of 124.4m. Therefore, it has been determined that the site is not within Flood Prone Land and is not affected by the 100-year Flood Level, as such, no flood-related development controls apply to the site.

Please refer to Flood Assessment Letter in Appendix B for further details.

5.1.2 Local Flooding

Local or Nuisance flooding describes flooding occurring due to site specific constraints. Local flooding is often caused by local topographical constraints and stormwater drainage system capacity restrictions.

Stantec have assessed the local constraints surrounding and through the site to ascertain any areas where local flooding may be an issue. The topography of the site is such that there is no risk of flooding on the site as it currently exists.

6. Earthworks and Grading

6.1 Site Grading

The proposed works on the solar farm will generally consist of minimal earthworks cut and fill operations to establish the access track and corresponding swales within the site. The two existing dams will be filled with the excavated materials from the proposed OSD/WSUD basin.

The proposed road levels are to match in with existing site grades that currently fall to the proposed basin location. Trackside swales are to follow road grades with invert depths to vary to suit draining to basin. The site is constrained by existing levels of nearby structures and existing trees.

6.2 Construction Sequence

The sequence of work for the access road construction will generally include:

a. Provision of erosion and sediment control measures typically as outlined in section XX

b. Inspection of exposed natural material by a qualified geotechnical engineer to ensure conformity with design assumptions and requirements; and

c. Placement of cut to fill in layers no greater than 300mm in thickness and compacted as per the drawings.

7. Roads

The proposed road layout is based upon the concept plan approved by Vernon Trust

7.1 Design Vehicle

The design vehicle for the proposed internal roads is a 12.5m Service Vehicle which is to be used throughout the operation of the solar farm. This vehicle was used to check all turns.

7.2 Road Geometry and Width

Internal road geometry design has generally been undertaken in accordance with Council's AUS-SPEC *'Development Design Specification, 2011'.*

There are 3 types of internal roads proposed for the Sandy Hollow Solar farm. Details of the internal roads are presented in the table below and are generally consistent with the works in Council's LGA.

Table 1: Internal Road Types and Widths

Internal Road Type ID	Pavement Width
Type 1	3m
Type 2	4m
Type 3	4m

7.3 Road Grading

Internal roads have generally been graded to match existing and ensure that parameters meet those presented in Council's AUS-SPEC Development Design Specification. Table 2 presents minimum, maximum and typical road grades proposed for the Solar Farm.

Table 2: Summary of minimum, maximum and typical road grades

Road Type ID	Minimum Road Grade	Maximum Road Grade	Typical Road Grade Range
All Internal Roads	0.7%	7%	4% to 6%

All internal roads have generally been designed with 3% cross fall.

7.4 Road Pavement

Preliminary internal road pavement designs have been prepared and presented in the design drawings. It should be noted that final internal road pavements are subject to further site geotechnical investigations and subgrade confirmation during construction.

Table 3: Pavement Design Summary

	Internal Road Types 1 & 3	Internal Road Type 2
Assumed CBR	3.0%	3.0%
Base	100mm	200mm

Total Pavement Thickness	100mm	200mm

7.5 Intersection with Golden Highway

Preliminary intersection design reflecting requirements of the Traffic Impact Assessment undertaken by Amber has been included in the drawing set. Intersection design subject to review and approval by other agencies during construction certificate application.

8. Stormwater Drainage Network

8.1 Drainage Standards

The road stormwater drainage network has been designed to comply with Muswellbrook Shire Council's AUS-SPEC 'Development Design Specification, 2011' and 'Australian rainfall and Runoff, 2016".

The proposed system will safely convey major and minor flows to the detention basin before discharging out of the site. Design rainfall intensities have been adopted from Council's Guidelines as follows:

- Minor System – 20% AEP
- Major System – 1% AEP

All overland flow paths are designed to cater for the 1% AEP storm event by maintaining a velocity-depth product of 0.4 or less and maximum flow depth equal or less than 200mm.

8.2 Catchment Area

The site is divided into 3 internal catchments and 2 external catchments. The internal catchments will drain to the proposed OSD basin for detention. The majority of the internal roads runoff will be collected by the trackside swale, then conveyed to the bioretention basins for treatment.

The external catchment to the east of the site will be captured by the swale along the boundary and bypasses the proposed OSD basin.

8.3 Hydrology Calculation

Detailed catchment modelling was conducted to calculate flows generated by the site using the Watercom DRAINS dynamic drainage modelling software. This software uses the industry standard hydrology calculation ILSAX.

The following parameters were used in the model:

- IFD Data from the ARR Data Hub;
- Depression Storage:
    - 1 mm for paved area;
    - 5mm for grassed area;
- Antecedence moisture condition 3 (rather wet);
- Time of Concentrations have been calculated within the model based on catchment size, slope and roughness.

8.4 Hydraulics Calculation

The hydraulic calculations were conducted using the Manning's Equation for the design of the road side swales.

The model represents all catchments collected via the swale network designed to cater for the minor flows with consideration to major design storms. All areas are gravity drained with overland flow in excess of swale capacity safely directed to detention basin.

There is no applicable reference to freeboard in Council's AUS-SPEC Development Design Specification. We have allowed a 150mm freeboard with the channel and road crossings have been designed for the 20% AEP.

9. On-Site Detention

An On-Site Detention basin will be provided to control stormwater discharges from the site in accordance with Council's AUS-SPEC Development Design Specification.

Hydrological analysis was conducted to determine the requirement and size of detention basins needed to reduce peak post development flows to predevelopment levels using the rainfall-runoff routing model DRAINS.

Model parameters used to determine pre and post flows are outlined in Section 6.3 of this report. A summary of peak flows from the proposed OSD basin are presented in the table below.

Table 4: OSD Basin summary of existing and developed discharge

Storm Event	Existing Peak Flow (cu.m/s)	Total Developed Peak Flow
0.5EY	0.125	0.123
0.2EY	0.326	0.161
5% AEP	0.77	0.686
1% AEP	1.48	1.48

The on-site detention system shall be sized to limit the site discharge using DRAINS to ensure post-development discharge is less than or equal to the pre-development discharge. Refer to the table below for the calculated OSD volume. This volume is based on a total site development area of 17.35Ha, a total pre-development site imperviousness of 0% and a total post development site imperviousness of 7%.

Table 5: On-Site Detention Volume

Item	Detention Volume Required (Preliminary) (m^3)
OSD	950

10. Water Quality

Water quality areas on the site have been modelled and designed in accordance with Muswellbrook Shire Council's AUS-SPEC Development Design Specification, 2011 and in accordance with, Draft Handbook Part 4: MUSIC Modelling Guide, June 2013.

Muswellbrook Council Control of erosion and stormwater management (2011) states that the main components to enhance stormwater quality are:

- Buffer zones and filter strips, being grassed, or similarly treated areas to facilitate the natural assimilation of water pollutants and reduce run-off. Refer to Buffer Zones.
- Wet retention ponds are permanent sediment ponds designed to allow particulate matter to settle out. They operate under both sedimentation and macrophyte regimes. Note that a large proportion of nutrients adhere to the sediments, and therefore settle out. Other nutrients are removed by macrophytic vegetation as part of the food chain.
- Trash Racks and Gross Pollutant Traps (GPT) designed to intercept litter and debris to maintain visual quality in downstream waterways, and to reduce the coarse sediment load on downstream water management structures.

Wetland (nutrient) filter to enhance the removal of fine sediment and nutrients from stormwater run off, and are largely dependent on biochemical removal mechanisms (i.e. nutrients taken up as part of the plant food chain).

10.1 Input Data

Water quality assessment has been undertaken using MUSIC computer software (Version 6.3.0). Catchments have been estimated from CAD base drawings with road areas assumed to be 100% impervious and the remaining catchment area pervious. Road areas were measured to calculate each catchment's total percentage impervious.

The water quality treatment train will consist of:

10.1.1 Swale/Buffer

Swales will be installed prior to stormwater discharge to the basins for catchments not bypassing bioretention areas. For catchment areas bypassing bioretention, buffer zones have been modelled prior to discharge to the basins.

10.1.2 Bioretention Areas

Two permanent bioretention areas will be provided as part of the treatment train associated with the catchments for the site. All bioretention areas will be constructed after the proposed site works have been completed and will operate as temporary sedimentation basins.

10.2 MUSIC Modelling Results

Figure 2 shows the proposed treatment train.

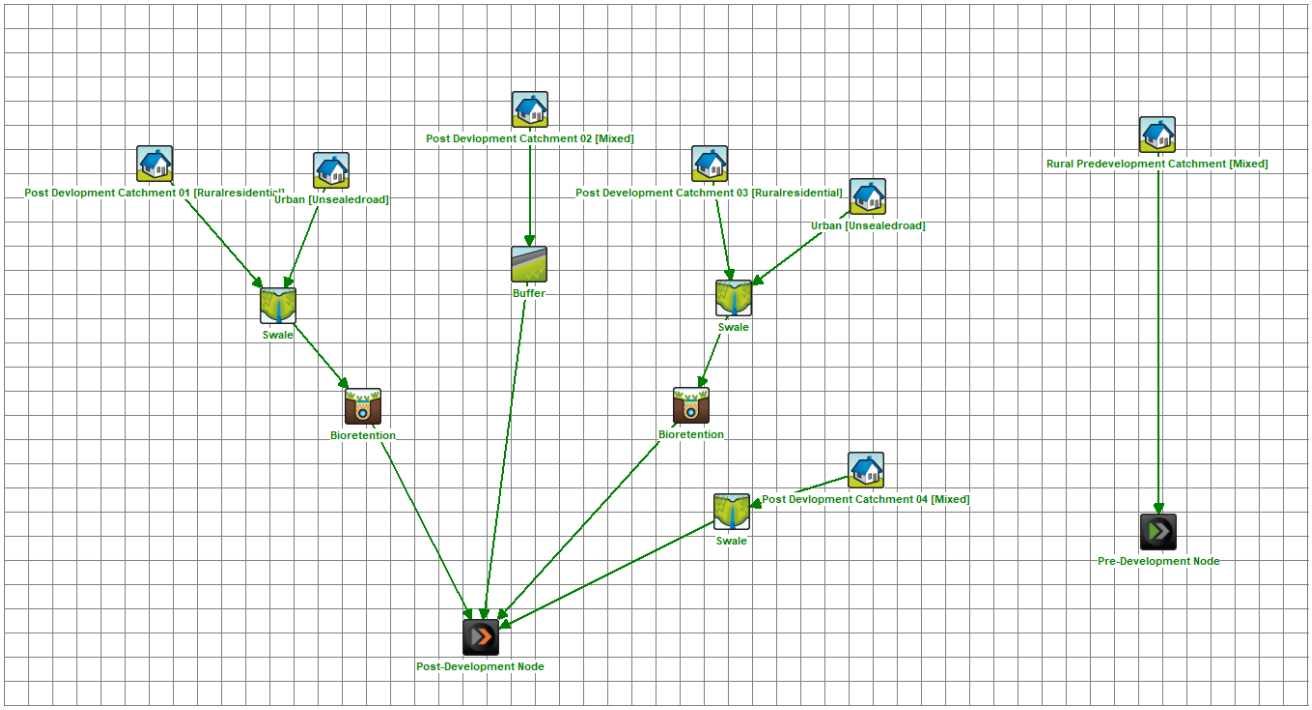

Figure 2: MUSIC Model Layout

Table 5 below presents a summary of achieved water pollutant reduction against pre-development Mean Annual Loads for the site treatment train.

Table 6: MUSIC Model Results Summary

Pollutant	Pre-Development Loads (kg/yr)	Post-Development Loads (kg/yr)
TSS[i]	383	210
TP[ii]	1.09	1.41
TN[iii]	9.96	13.1
GP[iv]	0	68.3

i. Total Suspended Solids
ii. Total Phosphorous
iii. Total Nitrogen
iv. Gross Pollutants

11. Sediment and Erosion Control

Erosion and sediment control will be installed and maintained in accordance with Council's requirements and Landcom's Managing Urban Stormwater, Soils and Construction ('Blue Book').

One temporary sediment basin will be constructed as part of the bulk earthworks and maintained throughout the construction phase. The sediment basin will be located where final detention basins are proposed. The sediment basin will provide a minimum volume of approx. 3,000m^3. The basin will be decommissioned as required by the construction staging.

Construction stockpiles will be located near areas of minimal cut and fill. Stockpiles will be protected above by local diversion drains and below by sediment fence.

The full sedimentation and erosion control strategy is presented in drawings 301351404-CI-070-001.

12. Conclusion

Based on the preliminary investigations, analyses and designs, it is not anticipated that any significant issues will be encountered during the detailed design of the road and drainage.

The ultimate provision of water quality measures will ensure that the water quality objectives can be achieved. The proposed OSD basin will ensure that flow rates post development will not exceed pre development rates as per Council's requirements.

Appendix A Civil Design Documentation

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VERNON TRUST

DRAWING LIST	
NO.	DRAWING NAME
CI-000-001	COVER SHEET, DRAWING REGISTRY AND LOCALITY PLAN
CI-007-001	GENERAL NOTES
CI-050-001	GENERAL ARRANGEMENT PLAN
CI-060-001	SITEWORKS PLAN
CI-070-001	EROSION AND SEDIMENT CONTROL PLAN
CI-076-001	EROSION AND SEDIMENT CONTROL DETAILS
CI-080-001	UTILITIES COORDINATION PLAN
CI-500-001	CATCHMENT PLAN
CI-520-001	OSD BASIN PLAN
CI-526-001	BASIN DETAILS
CI-526-101	SITEWORKS AND STORMWATER DETAILS

SANDY HOLLOW SOLAR FARM

N

511 RICHMOND GROV ROAD, SANDY HOLLOW, NSW 2333

DA RE-ISSUE
2023.11.09

Stantec Project Number: 301351404

The professional's seal on the cover sheet represents that the information on the cover sheet is accurate in designer's professional opinion but does not assume professional responsibility for documents sealed by others that are referenced on the cover sheet. All professionals sealing drawings as a part of the design are professionally responsible for their own sealed documents.

LOCALITY PLAN (SCALE 1:2500)

SOURCE: NEARMAP

GENERAL

ALL WORKS TO BE CONSTRUCTED IN ACCORDANCE WITH MUSWELLBROOK SHIRE COUNCIL COUNCIL STANDARDS.

1. MUSWELLBROOK SHIRE COUNCIL STANDARD DETAILS TO BE USED WHERE POSSIBLE.

2. UTILITY ADJUSTMENTS AT DEVELOPERS EXPENSE.

3. CONDUITS TO BE PLACED WHERE REQUIRED BY THE RELEVANT AUTHORITIES.

4. SUBSOIL DRAINAGE LINES TO BE PLACED AS INDICATED ON DRAWINGS.

6. A MINIMUM OF 3m OF SUBSOIL LINE SHALL BE LAID INTO UPSTREAM SIDE OF COUNCIL PITS

SITEWORKS NOTES

1. ORIGIN OF LEVELS:- REFER SURVEY NOTES.
2. CONTRACTOR MUST VERIFY ALL DIMENSIONS AND EXISTING LEVELS ON SITE PRIOR TO COMMENCEMENT OF WORK. ANY DISCREPANCIES TO BE REPORTED TO STANTEC.
3. MAKE SMOOTH CONNECTION WITH EXISTING WORKS.
4. ALL TRENCH BACKFILL MATERIAL SHALL BE COMPACTED TO THE SAME DENSITY AS THE ADJACENT MATERIAL.
5. ALL SERVICE TRENCHES UNDER VEHICULAR PAVEMENTS SHALL BE BACKFILLED WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% MODIFIED MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75)
6. PROVIDE 10mm WIDE EXPANSION JOINTS BETWEEN BUILDINGS AND ALL CONCRETE OR UNIT PAVEMENTS.
7. ASPHALTIC CONCRETE SHALL CONFORM TO R.M.S. SPECIFICATION R116.
8. ALL BASECOURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051, COMPACTED TO MINIMUM 98% MODIFIED DENSITY IN ACCORDANCE WITH AS 1289 5.2.1 FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m³ OF BASECOURSE MATERIAL PLACED.
9. ALL SUB-BASE COURSE MATERIAL SHALL BE IGNEOUS ROCK QUARRIED MATERIAL TO COMPLY WITH R.M.S. FORM 3051, AND COMPACTED TO MINIMUM 95% MODIFIED DENSITY IN ACCORDANCE WITH A.S 1289 5.2.1 FREQUENCY OF COMPACTION TESTING SHALL NOT BE LESS THAN 1 TEST PER 50m³ OF SUB-BASE COURSE MATERIAL PLACED.
10. AS AN ALTERNATIVE TO THE USE OF IGNEOUS ROCK AS A SUB-BASE MATERIAL IN (9) A CERTIFIED RECYCLED CONCRETE MATERIAL COMPLYING WITH R.M.S. FORM 3051 WILL BE CONSIDERED. SUBJECT TO MATERIAL SAMPLES AND APPROPRIATE CERTIFICATIONS BEING PROVIDED TO THE SATISFACTION OF STANTEC.
11. SHOULD THE CONTRACTOR WISH TO USE A RECYCLED PRODUCT THIS SHALL BE CLEARLY INDICATED IN THEIR TENDER AND THE PRICE DIFFERENCE BETWEEN AN IGNEOUS PRODUCT AND A RECYCLED PRODUCT SHALL BE CLEARLY INDICATED.
12. WHERE NOTED ON THE DRAWINGS THAT WORKS ARE TO BE CARRIED BY OTHERS, (eg. ADJUSTMENT OF SERVICES), THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE CO-ORDINATION OF THESE WORKS.

SURVEY NOTES

THE EXISTING SITE CONDITIONS SHOWN ON THE FOLLOWING DRAWINGS HAVE BEEN INVESTIGATED BY MONEATH & POWYS REF; 18/-127 (2/11/2018), BEING REGISTERED SURVEYORS. THE INFORMATION IS SHOWN TO PROVIDE A BASIS FOR DESIGN. STANTEC DOES NOT GUARANTEE THE ACCURACY OR COMPLETENESS OF THE SURVEY BASE OR ITS SUITABILITY AS A BASIS FOR CONSTRUCTION DRAWINGS.
SHOULD DISCREPANCIES BE ENCOUNTERED DURING CONSTRUCTION BETWEEN THE SURVEY DATA AND ACTUAL FIELD DATA, CONTACT THE SUPERINTENDENT (THE FOLLOWING NOTES HAVE BEEN TAKEN DIRECTLY FROM THE ORIGINAL SURVEY DOCUMENTS.)

IMPORTANT NOTES:

1. ONLY VISIBLE SERVICES HAVE BEEN LOCATED BY SURVEY.
2. NOT ALL SERVICE INFORMATION MAY BE SHOWN DUE TO UNAVAILABILITY OF SERVICE PLANS OR CURRENT OR CURRENT INFORMATION.
3. INDEPENDENT INQUIRIES FOR UP TO DATE SERVICE LOCATIONS THROUGH THE RELEVANT AUTHORITIES MUST BE UNDERTAKEN PRIOR TO COMMENCEMENT OF ANY WORKS/EXCAVATION. EXACT SERVICE POSITIONS SHOULD BE ESTABLISHED BY APPROPRIATE MEANS. WE RECOMMEND PROFESSIONAL SERVICE LOCATIONS.
4. THE BOUNDARIES ON THIS PLAN HAVE BEEN COMPILED FROM SURVEY PLANS, DP1042612, DP789310, DP809376. CP5084-1096 ON PUBLIC RECORD. NO FIELD SURVEY HAS BEEN UNDERTAKEN TO DETERMINE THE ACCURACY OF THE BOUNDARIES AS SHOWN. AS SUCH THESE DIMENSIONS COULD BE OUT OF DATE AND INCORRECT BY MODERN STANDARDS. THIS PLAN SHOULD NOT BE USED FOR BUILDING WORKS CLOSE TO OR ON THE BOUNDARY, OR TO BE PROSCRIBED SET-BACKS WITHOUT FURTHER SURVEY INVESTIGATION.
5. ALL TREES ARE DIAGRAMMATIC ONLY.
6. CONTOURS SHOWN DEPICT THE TOPOGRAPHY. CONTOURS DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT, EXCEPT AT SPOT LEVELS SHOWN.
7. THIS PLAN MUST REMAIN UNALTERED AS ISSUED BY MONTEATH AND POWYS. ALTERING ANY PART OF THIS PLAN DESTROYS THE INTEGRITY OF THE PLAN. ANY REVISIONS REQUESTED MUST BE ISSUED BY MONTEATH AND POWYS.
8. THESE NOTES ARE AN INTEGRAL PART OF THIS PLAN. REPRODUCTION OF THIS PLAN OR ANY PART OF THIS PLAN WITHOUT THE NOTES BEING INCLUDED WILL RENDER THE INFORMATION SHOWN ON SUCH REPRODUCTION INVALID AND NOT SUITABLE FOR USE.

LEGEND:

OHE — OVERHEAD ELECTRICITY CABLE.

BULK EARTHWORKS NOTES

1. ORIGIN OF LEVELS: REFER SURVEY NOTES
2. STRIP ALL TOPSOIL/ORGANIC MATERIAL FROM CONSTRUCTION AREA AND REMOVE FROM SITE OR STOCK PILE AS DIRECTED BY SUPERINTENDENT.
3. EXCAVATED MATERIAL TO BE USED AS STRUCTURAL FILL PROVIDED THE PLACEMENT MOISTURE CONTENT OF THE MATERIAL IS +/- 2% OF THE OPTIMUM MOISTURE CONTENT.
4. COMPACT FILL AREAS AND SUBGRADE TO NOT LESS THAN:

LOCATION	STANDARD DRY DENSITY (AS 1289 5.1.1.)
UNDER ROADS	98%
LANDSCAPED AREAS UNLESS NOTED OTHERWISE	95%

5. FOR NON COHESIVE MATERIAL, COMPACT TO 75% DENSITY INDEX.
6. BEFORE PLACING FILL, PROOF ROLL EXPOSED SUBGRADE WITH AN 12 TONNE (MIN) DEADWEIGHT SMOOTH DRUM VIBRATORY ROLLER TO DETECT THEN REMOVE SOFT SPOTS (AREAS WITH MORE THAN 2mm MOVEMENT UNDER ROLLER).
7. FREQUENCY OF COMPACTION TESTING SHALL BE NOT LESS THAN :-
   (A) 1 TEST PER 500m² OF FILL PLACED PER 300 LAYER OF FILL.
   (B) 3 TESTS PER VISIT
   (C) 1 TEST PER 2500m² OF EXPOSED SUBGRADE "LEVEL 1" TESTING SHALL BE TESTING IN ACCORDANCE WITH AS 3798 (1996).
8. FILLING TO BE PLACED IN MAXIMUM 150mm - LOOSE LAYERS AND COMPACTED AS SPECIFIED
9. NO FILLING SHALL TAKE PLACE TO EXPOSED SUBGRADE UNTIL THE AREA HAS BEEN PROOF ROLLED IN THE PRESENCE OF STANTEC AND APPROVAL GIVEN IN WRITING THAT FILLING CAN PROCEED.

EROSION AND SEDIMENT CONTROL NOTES

GENERAL INSTRUCTIONS

1. THE CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR THE CONTROL OF EROSION AND SEDIMENTATION TO THE SATISFACTION OF COUNCIL, NSW OFFICE OF WATER, OFFICE OF ENVIRONMENT AND HERITAGE, THE EROSION AND SEDIMENTATION CONTROLS SHOWN ON THE DRAWINGS SHALL ONLY BE USED AS A GUIDE BY THE CONTRACTOR, AND SHALL REPRESENT THE MINIMUM REQUIREMENT ONLY.
2. THE CONTRACTOR SHALL ENSURE THAT ALL SOIL AND WATER MANAGEMENT WORKS ARE LOCATED AS DOCUMENTED OR AS OTHERWISE DIRECTED BY THE SUPERINTENDENT.
   ALL WORK SHALL BE GENERALLY CARRIED OUT IN ACCORDANCE WITH
   a. LOCAL AUTHORITY REQUIREMENTS
   b. EPA REQUIREMENTS
   c. NSW DEPARTMENT OF HOUSING MANUAL "MANAGING URBAN STORMWATER, SOILS AND CONSTRUCTION", 4th EDITION, MARCH 2004.
3. MAINTAIN THE EROSION CONTROL DEVICES TO THE SATISFACTION OF THE SUPERINTENDENT AND THE LOCAL AUTHORITY.
4. WHEN STORMWATER PITS ARE CONSTRUCTED, PREVENT SITE RUNOFF ENTERING UNLESS SEDIMENT FENCES ARE ERECTED AROUND PITS.
5. CONTRACTOR IS TO ENSURE ALL EROSION & SEDIMENT CONTROL DEVICES ARE MAINTAINED IN GOOD WORKING ORDER AND OPERATE EFFECTIVELY. REPAIRS AND OR MAINTENANCE SHALL BE UNDERTAKEN AS REQUIRED, PARTICULARLY FOLLOWING STORM EVENTS.

LAND DISTURBANCE

6. WHERE PRACTICAL, THE SOIL EROSION HAZARD ON THE SITE WILL BE KEPT AS LOW AS POSSIBLE. TO THIS END, WORKS SHOULD BE UNDERTAKEN IN THE FOLLOWING SEQUENCE:
   a. INSTALL A SEDIMENT FENCE ALONG THE BOUNDARIES AS SHOWN ON PLAN. REFER DETAIL.
   b. CONSTRUCT STABILISED CONSTRUCTION ENTRANCE TO LOCATION AS DETERMINED BY SUPERINTENDENT/ENGINEER. REFER DETAIL.
   c. INSTALL SEDIMENT BASIN AS SHOWN ON PLAN (D) INSTALL SEDIMENT TRAPS AS SHOWN ON PLAN.
   d. UNDERTAKE SITE DEVELOPMENT WORKS IN ACCORDANCE WITH THE ENGINEERING PLANS. WHERE POSSIBLE, PHASE DEVELOPMENT SO THAT LAND DISTURBANCE IS CONFINED TO AREAS OF WORKABLE SIZE.

EROSION CONTROL

7. DURING WINDY WEATHER, LARGE, UNPROTECTED AREAS WILL BE KEPT MOIST (NOT WET) BY SPRINKLING WITH WATER TO KEEP DUST UNDER CONTROL.
8. FINAL SITE LANDSCAPING WILL BE UNDERTAKEN AS SOON AS POSSIBLE AND WITHIN 20 WORKING DAYS FROM COMPLETION OF CONSTRUCTION ACTIVITIES.

SEDIMENT CONTROL

9. STOCKPILES WILL NOT BE LOCATED WITHIN 2 METRES OF HAZARD AREAS, INCLUDING LIKELY AREAS OF CONCENTRATED OR HIGH VELOCITY FLOWS SUCH AS WATERWAYS. WHERE THEY ARE BETWEEN 2 AND 5 METRES FROM SUCH AREAS, SPECIAL SEDIMENT CONTROL MEASURES SHOULD BE TAKEN TO MINIMISE POSSIBLE POLLUTION TO DOWNSLOPE WATERS, E.G. THROUGH INSTALLATION OF SEDIMENT FENCING.
10. ANY SAND USED IN THE CONCRETE CURING PROCESS (SPREAD OVER THE SURFACE) WILL BE REMOVED AS SOON AS POSSIBLE AND WITHIN 10 WORKING DAYS FROM PLACEMENT.
11. WATER WILL BE PREVENTED FROM ENTERING THE PERMANENT DRAINAGE SYSTEM UNLESS IT IS RELATIVELY SEDIMENT FREE, I.E. THE CATCHMENT AREA HAS BEEN PERMANENTLY LANDSCAPED AND/OR ANY LIKELY SEDIMENT HAS BEEN FILTERED THROUGH AN APPROVED STRUCTURE.
12. TEMPORARY SOIL AND WATER MANAGEMENT STRUCTURES WILL BE REMOVED ONLY AFTER THE LANDS THEY ARE PROTECTING ARE REHABILITATED.
13. ACCEPTABLE RECEPTORS WILL BE PROVIDED FOR CONCRETE AND MORTAR SLURRIES, PAINTS, ACID WASHINGS, LIGHT-WEIGHT WASTE MATERIALS AND LITTER.
14. ANY EXISTING TREES WHICH FORM PART OF THE FINAL LANDSCAPING PLAN WILL BE PROTECTED FROM CONSTRUCTION ACTIVITIES BY:

OTHER MATTERS

a. PROTECTING THEM WITH BARRIER FENCING OR SIMILAR MATERIALS INSTALLED OUTSIDE THE DRIP LINE
b. ENSURING THAT NOTHING IS NAILED TO THEM
c. PROHIBITING PAVING, GRADING, SEDIMENT WASH OR PLACING OF STOCKPILES WITHIN THE DRIP LINE EXCEPT UNDER THE FOLLOWING CONDITIONS.

(I) ENCROACHMENT ONLY OCCURS ON ONE SIDE AND NO CLOSER TO THE TRUNK THAN EITHER 1.5 METRES OR HALF THE DISTANCE BETWEEN THE OUTER EDGE OF THE DRIP LINE AND THE TRUNK, WHICH EVER IS THE GREATER
(II) A DRAINAGE SYSTEM THAT ALLOWS AIR AND WATER TO CIRCULATE THROUGH THE ROOT ZONE (E.G. A GRAVEL BED) IS PLACED UNDER ALL FILL LAYERS OF MORE THAN 300 MILLIMETRES DEPTH
(III) CARE IS TAKEN NOT TO CUT ROOTS UNNECESSARILY NOR TO COMPACT THE SOIL AROUND THEM.

PROPOSED WORKS LEGEND

EXISTING (REFER SURVEY NOTES)

PROPOSED

- B131.7 — BULK EARTHWORK LEVEL
- F131.5 — FINISHED SURFACE LEVEL
- ASSET PROTECTION ZONE BOUNDARY
- ELECTRICAL EASEMENT
- 140 — PROPOSED CONTOUR
- TES — TIMBER EDGE STRIP
- Ø 450 — STORMWATER LINE
- E — UNDERGROUND ELECTRICAL CABLE
- GRASS LINED SWALE
- CONCRETE HEADWALL.
- ROCK SCOUR PROTECTION.
- EXISTING TREE TO BE RETAINED
- EXISTING TREE TO BE REMOVED WHERE REQUIRED. CONTRACTOR TO CONFIRM WITH SUPERINTENDENT THAT TREE RETENTION IS NOT POSSIBLE PRIOR TO ANY DEMOLITION.
- 1 / 4 — BATTER SLOPE

STORMWATER DRAINAGE NOTES

1. STORMWATER DESIGN CRITERIA:
   (A) ANNUAL EXCEEDANCE PROBABILITIES (AEP):
   20% (1 IN 5) MINOR (PIPED) NETWORK
   1% (1 IN 100) MAJOR (OVERLAND FLOW) SYSTEM
   (B) RAINFALL INTENSITIES:
   ARR 2016
   RAINFALL FROM BUREAU OF METEOROLOGY WEBSITE
   (C) HYDROLOGIC METHOD:
   DRAINS WITH ARR 2016 PROCEDURES AND ILSAX HYDROLOGY MODEL.
2. PIPES 375 DIA. AND LARGER TO BE REINFORCED CONCRETE CLASS '2' APPROVED SPIGOT AND SOCKET WITH RUBBER RING JOINTS. U.N.O.
3. PIPES 300 DIA AND LESS SHALL BE DWV GRADE (CLASS SN8) uPVC WITH SOLVENT WELDED JOINTS.
4. EQUIVALENT STRENGTH FRC PIPES MAY BE USED.
5. ALL PIPES ARE TO BE UNIFORMLY SUPPORTED ALONG THE LENGTH OF THE BARREL BY SUITABLE FILL MATERIAL. REFER TO BEDDING SUPPORT TYPE.
6. PIPES WITH SOCKETS SHALL BE LAID IN BEDDING WHERE SUITABLE RECESSES HAVE BEEN PROVIDED TO ENSURE PIPES DO NOT BEAR ON THEIR SOCKETS.
7. ALL STORMWATER DRAINAGE LINES UNDER PROPOSED BUILDING SLABS TO BE uPVC PRESSURE PIPE GRADE 6. ENSURE ALL VERTICALS AND DOWNPIPES ARE uPVC PRESSURE PIPE, GRADE 6 FOR A MIN OF 3.0m IN HEIGHT.
8. PIPES TO BE INSTALLED TO TYPE HS1 SUPPORT IN ACCORDANCE WITH AS 3725 (2007) IN ALL CASES BACKFILL TRENCH WITH SAND TO 300mm ABOVE PIPE. WHERE PIPE IS UNDER PAVEMENTS BACKFILL REMAINDER OF TRENCH TO UNDERSIDE OF PAVEMENT WITH SAND OR APPROVED GRANULAR MATERIAL COMPACTED IN 150mm LAYERS TO MINIMUM 98% STANDARD MAXIMUM DRY DENSITY IN ACCORDANCE WITH AS 1289 5.2.1. (OR A DENSITY INDEX OF NOT LESS THAN 75).
9. REFER TO AS/NRS 3725:2007 TABLE B1 FOR REQUIRED FILL DEPTHS ABOVE PIPE BARREL PRIOR TO USE OF COMPACTION MACHINERY OR TRAVERSING OF PIPES BY GENERAL SITE EQUIPMENT.
10. WHERE WORKING METHODS REQUIRE HIGHER CLASS PIPE, THE CONTRACTOR SHALL REFER TO AS 3725 (2007) TO DETERMINE THE APPROPRIATE PIPE CLASS. PROPOSED PIPE CLASS SHALL BE REVIEWED BY STANTEC PRIOR TO INSTALLATION.
11. ALL INTERNAL WORKS WITHIN PROPERTY BOUNDARIES ARE TO COMPLY WITH THE REQUIREMENTS OF AS/NZS 3500.3:2015.
12. PRECAST PITS MAY BE USED EXTERNAL TO THE BUILDING SUBJECT TO APPROVAL BY STANTEC.
13. ENLARGERS, CONNECTIONS AND JUNCTIONS TO BE PREFABRICATED FITTINGS WHERE PIPES ARE LESS THAN 300 DIA.
14. WHERE SUBSOIL DRAINS PASS UNDER FLOOR SLABS AND VEHICULAR PAVEMENTS, UNSLOTTED uPVC SEWER GRADE PIPE IS TO BE USED.
15. CARE IS TO BE TAKEN WITH LEVELS OF STORMWATER LINES. GRADES SHOWN ARE NOT TO BE REDUCED WITHOUT APPROVAL.
16. GRATES AND COVERS SHALL CONFORM TO AS 3996.
17. ALL BOX CULVERTS SHALL BE STRUCTURALLY DESIGNED BY THE MANUFACTURER AND DELIVERED TO SITE AS FIT FOR PURPOSE.
18. AT ALL TIMES DURING CONSTRUCTION OF STORMWATER PITS, ADEQUATE SAFETY PROCEDURES SHALL BE TAKEN TO ENSURE AGAINST THE POSSIBILITY OF PERSONNEL FALLING DOWN PITS.
19. ALL EXISTING STORMWATER DRAINAGE LINES AND PITS THAT ARE TO REMAIN ARE TO BE INSPECTED AND CLEANED. DURING THIS PROCESS ANY PART OF THE STORMWATER DRAINAGE SYSTEM THAT WARRANTS REPAIR SHALL BE REPORTED TO THE SUPERINTENDENT/ENGINEER FOR FURTHER DIRECTIONS.

Key Plan: (NTS)

Issued/Revision	By	Appd	
A ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.09 YYYY.MM.DD

Issue Status

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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-007-001.DWG	Dwn.	Dsgn.	Chkd.	02/11/2023 YYYY.MM.DD

Title
GENERAL NOTES

Project No. 301351404

Scale NOT TO SCALE

Revision A

Drawing No. **CI-007-001**

Plotted: 09-Nov-23 10:29:35 AM By: TODD.LAURIN
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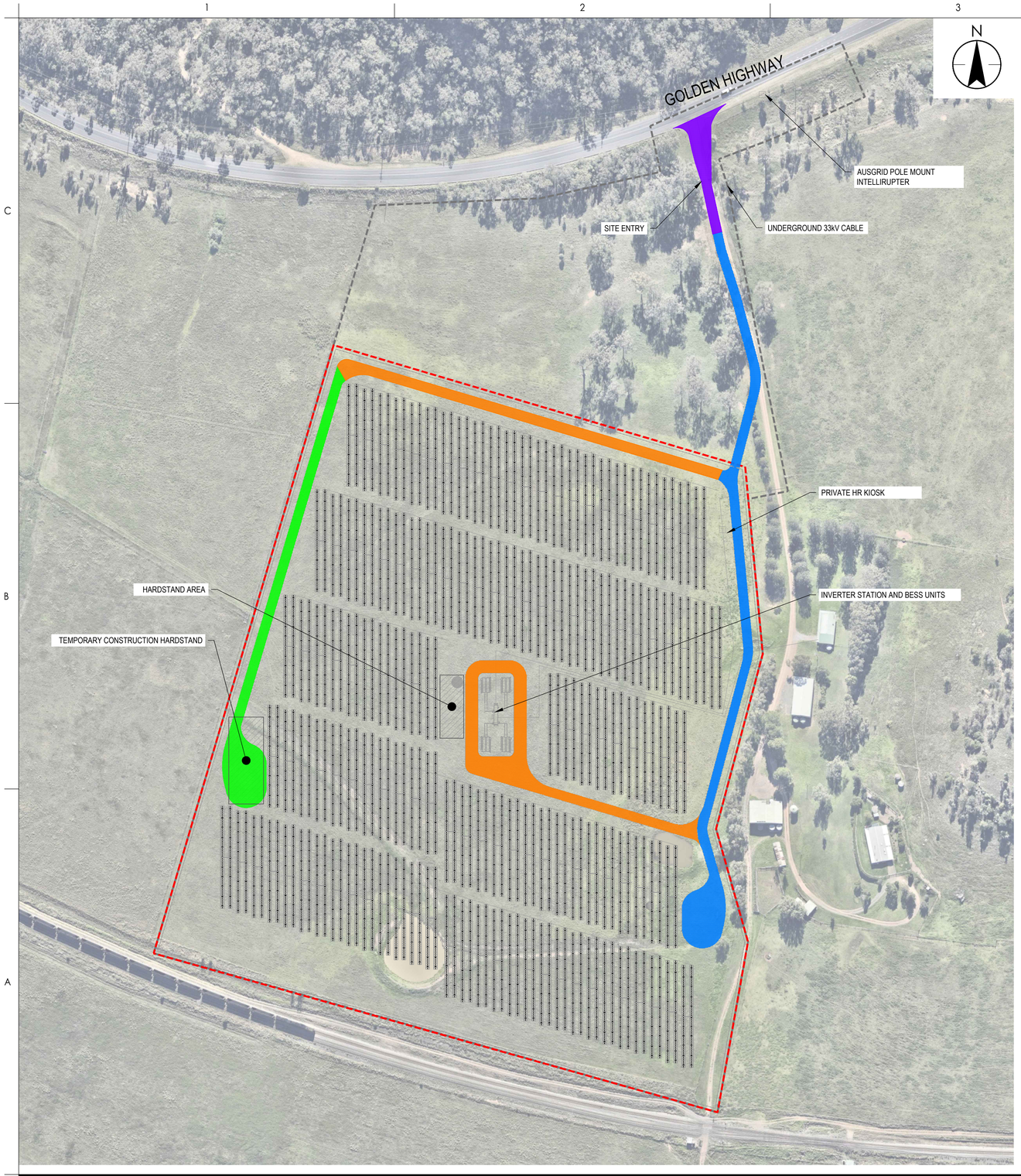
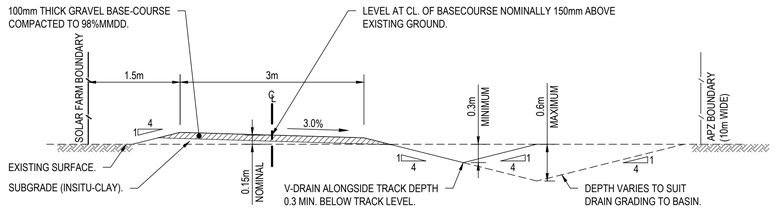
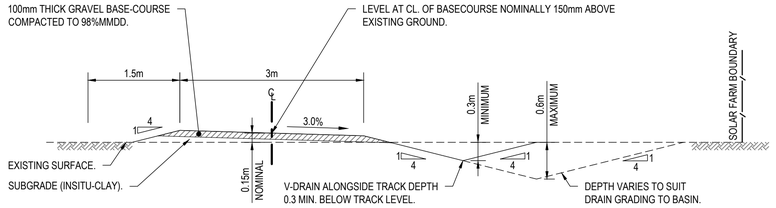




SECTION 1 (060-001) — SCALE 1:50 — (TYPE 1)



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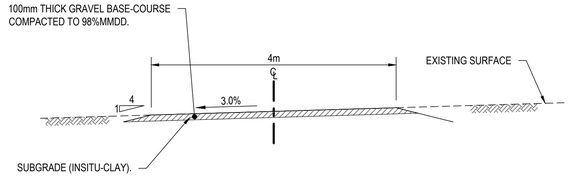

SECTION 3 (060-001) — SCALE 1:50 — (TYPE 3)

0 1 2 3 4 5m
SCALE 1:50 @A1
0 50 100 150m
SCALE 1:1500 @A1

NOTE:

SUB-GRADE FILL MATERIAL FOR TRACK TO BE OBTAINED BY CUTTING IN-SITU MATERIAL FROM V-DRAIN. TRACK SUB-GRADE LEVEL SET BY CUT TO FILL BALANCE OF TRACK AND V-DRAIN.
PAVEMENTS HAVE BEEN DESIGNED USING DESIGN SUBGRADE CBR 3%. CBR TO BE CONFIRMED ON SITE AFTER ROAD BOXING. FOR CBR LESS THAN 3%, PAVEMENT REDESIGN REQUIRED (NOTIFY SUPERINTENDENT PRIOR TO TREATMENT FOR CONFIRMATION DESIGN).

LEGEND:

- ROAD SECTION TYPE 1
- ROAD SECTION TYPE 2
- ROAD SECTION TYPE 3
- ENTRY WIDENING

Key Plan: (NTS)

A ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.09
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File Name: 301351404-CI-050-001.DWG	-	-	-	----
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
GENERAL ARRANGEMENT PLAN

Project No. 301351404
Scale 1:200
Revision A
Drawing No. **CI-050-001**

Plotted: 09-Nov-23 2:16:02 PM By: TODD, LAUREN
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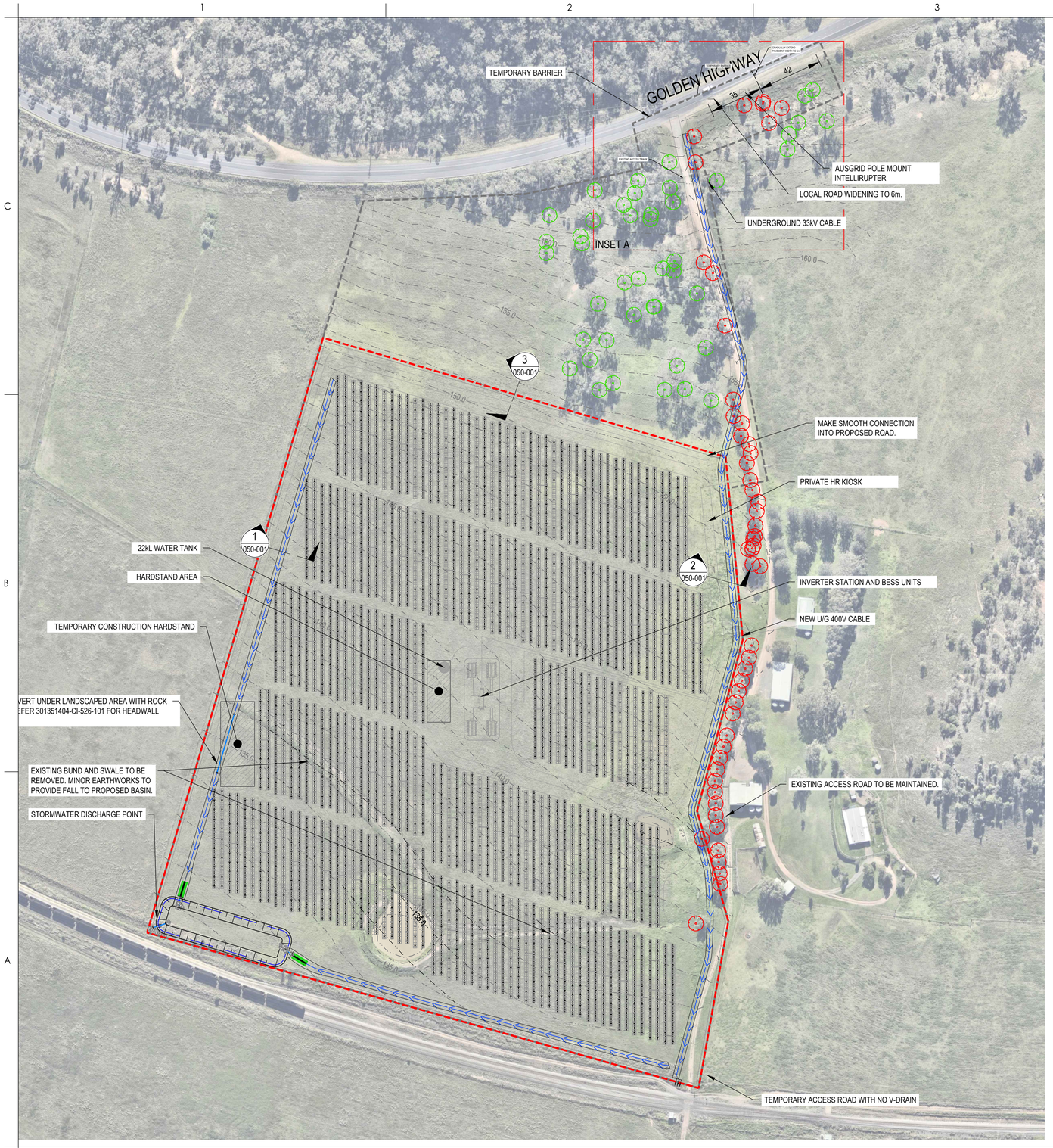

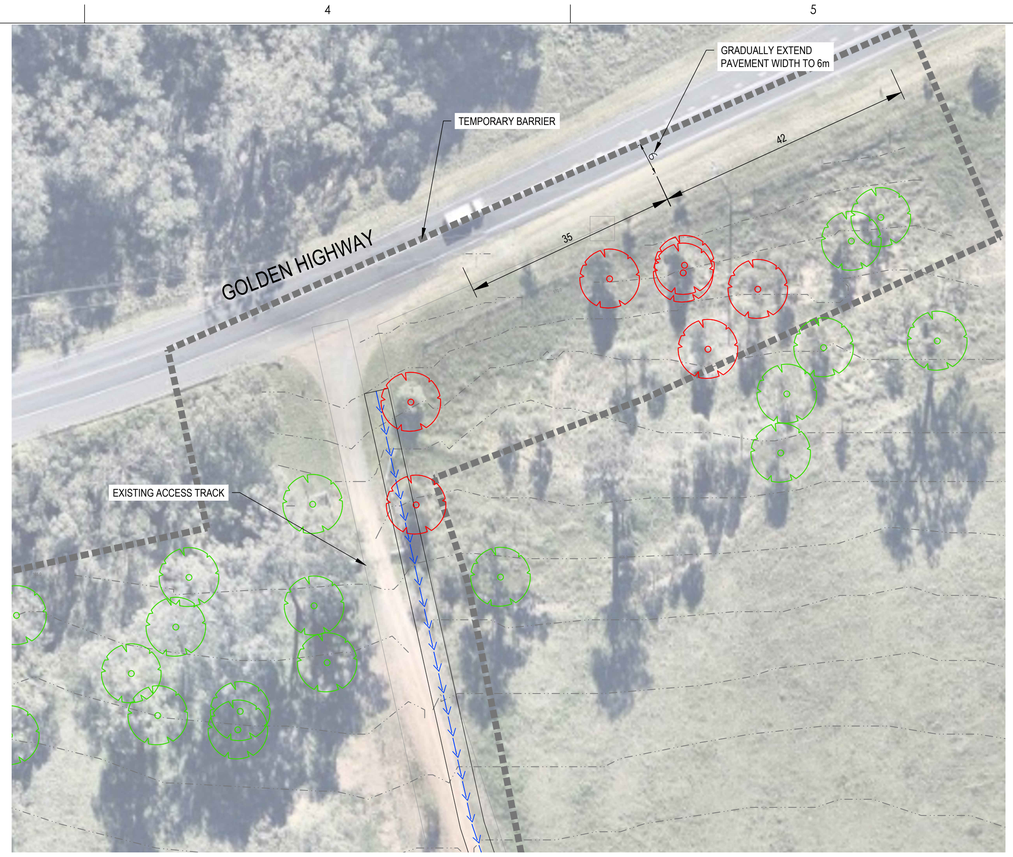

INSET A

SCALE 1:500

N

0 10 20 30 40 50m

SCALE 1:500 @A1

0 50 100 150m

SCALE 1:1500 @A1

Key Plan: (NTS)

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File Name: 301351404-CI-060-001..DWG	-	-	-	---
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title

SITEWORKS PLAN

Project No.	Scale
301351404	AS SHOWN
Revision: A	Drawing No.: CI-060-001

Plotted: 09-Nov-23 10:34:15 AM By: TODD, LAUREN
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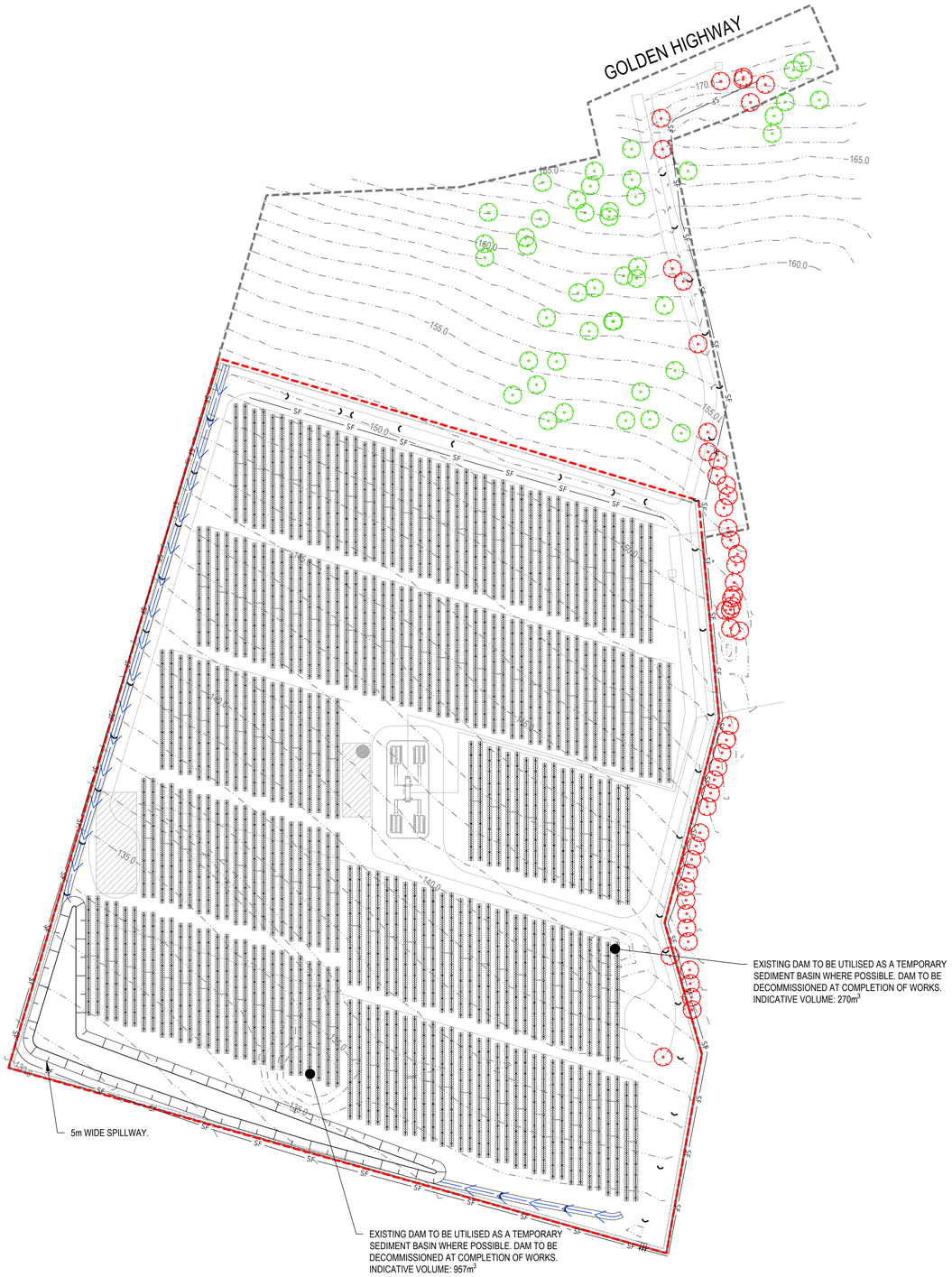

N

LEGEND:

- SF — SEDIMENT FENCE
- STRAW BALE SEDIMENT FILTER
- LEVEL SPREADER

0 50 100 150m

SCALE 1:1500 @A1

Key Plan: (NTS)

Issued/Revision	By	Appd	YYYY.MM.DD
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File Name: 301351404-CI-070-001.DWG	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	-	-	-	---

Title
EROSION AND SEDIMENT CONTROL PLAN

Project No. 301351404

Scale AS SHOWN

Revision A

Drawing No. **CI-070-001**

Plotted: 29-Nov-23 10:53:02 AM By: TODD, LAUREN
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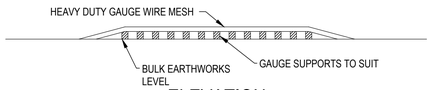
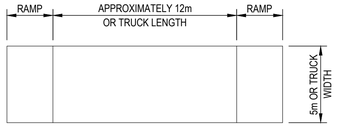


ELEVATION

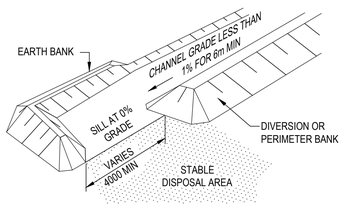


PLAN

TEMPORARY CONSTRUCTION EXIT (WASH DOWN DETAIL)

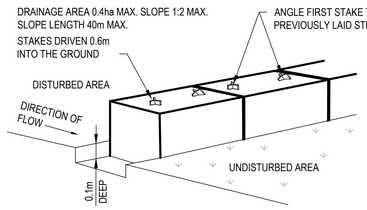
SCALE 1:200

THE EXIT SHALL BE MAINTAINED IN A CONDITION WHICH PREVENTS TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS OF WAY. THIS MAY REQUIRE REPAIR AND OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS OF WAY MUST BE REMOVED IMMEDIATELY.



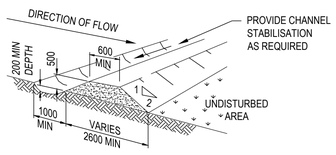
LEVEL SPREADER

NOT TO SCALE



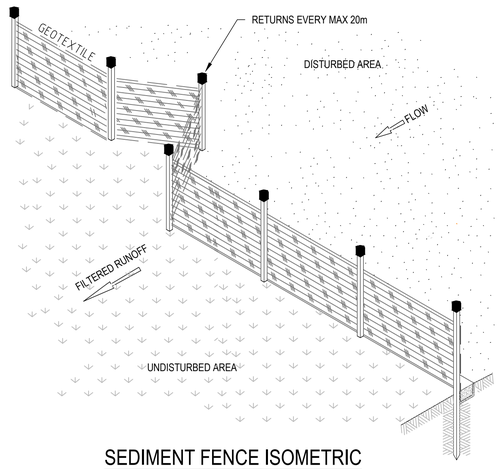
STRAW BALE SEDIMENT FILTER

NOT TO SCALE



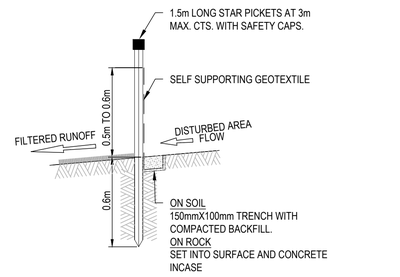
DIVERSION BANK (WITH CHANNEL)

NOT TO SCALE



SEDIMENT FENCE ISOMETRIC

NOT TO SCALE



SEDIMENT FENCE SECTION

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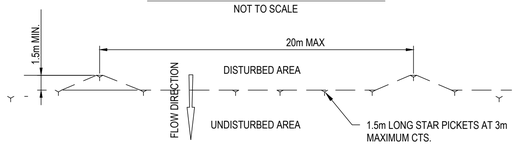
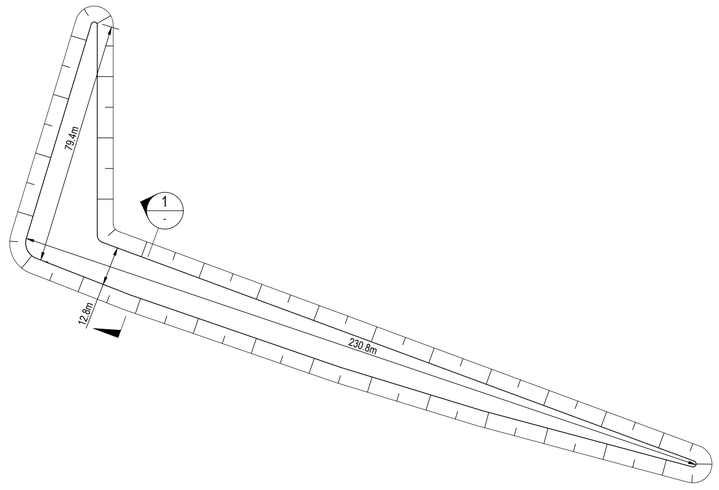


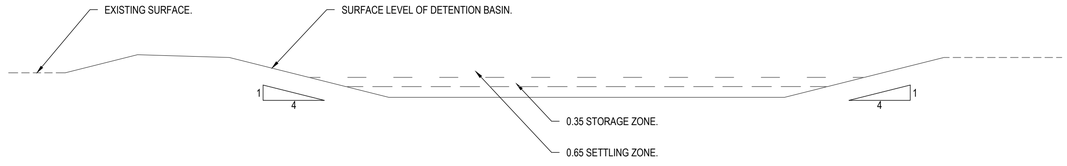
SEDIMENT FENCE PLAN

NOT TO SCALE



TEMPORARY SEDIMENT BASIN

SCALE 1:1000



SECTION 1 / SCALE 1:100 (1 / -)

1. Site Data Sheet

Site name: Sandy Hollow Solar Farm

Site location: Muswellbrook Shire Council

Precinct: Sandy Hollow Solar Farm

Description of site: Renewable Energy project

Site area	Site						Remarks
	1	2	3	4			
Total catchment area (ha)	17.347						
Disturbed catchment area (ha)	17.347						

Soil analysis

Soil landscape							DIPNR mapping (if relevant)
Soil Texture Group	F						Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5						See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80						See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	22.6						See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	6.07						See IFD chart for the site
Rainfall erosivity (R-factor)	1040						Automatic calculation from above data

SWMP Commentary, Standard Calculation

3. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day}\ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.51	22.6	17.3471	1999.42675	1000	2999.14012

NOTE:

1. TEST ANY STORED WATER AND FLOCCULATE AS REQUIRED TO ENSURE WATER QUALITY MEETS THE REQUIREMENTS OF COUNCIL PRIOR TO PUMPING FOR DUST CONTROL. REFER TO APENDIX E OF 'BLUE BOOK' FOR FLOCCULATION DETAILS.
2. TEMPORARY BASIN IS REFERRED TO AS 'SITE 1' IN BASIN CALCULATIONS

0 1 2 4 6 8 10m
SCALE 1:100 @A1

0 5 10 15 20m
SCALE 1:200 @A1

0 20 40 60 80 100m
SCALE 1:1000 @A1

Key Plan: (NTS)

A ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.09
Issued/Revision	By	Appd	YYYY.MM.DD

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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-076-001.DWG	-	-	-	02/11/2023
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
EROSION AND SEDIMENT CONTROL DETAILS

Project No.	Scale
301351404	NOT TO SCALE
Revision: A	Drawing No.: CI-076-001

Plotted: 09-Nov-23 10:53:28 AM By: TODD, LAUREN
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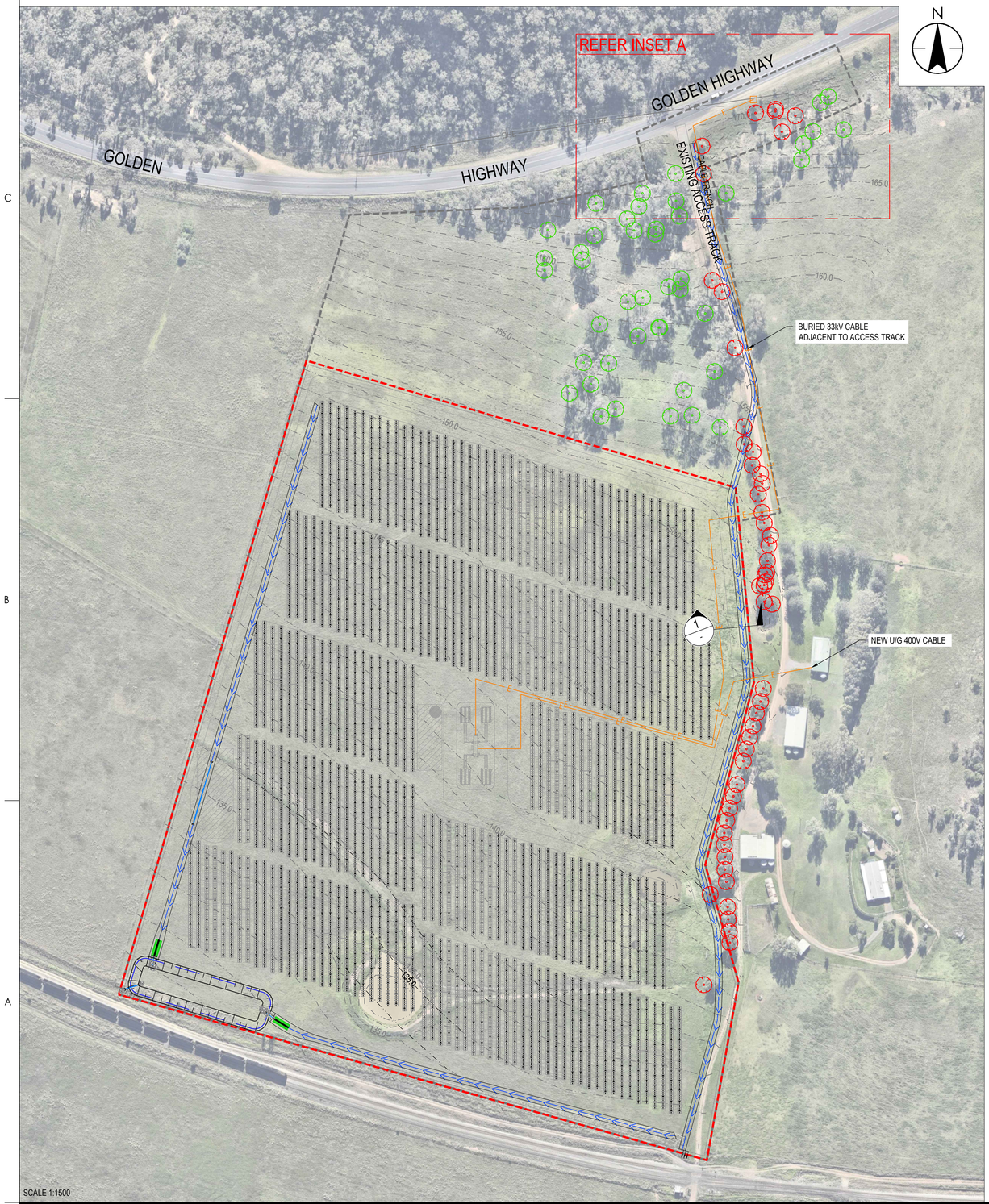
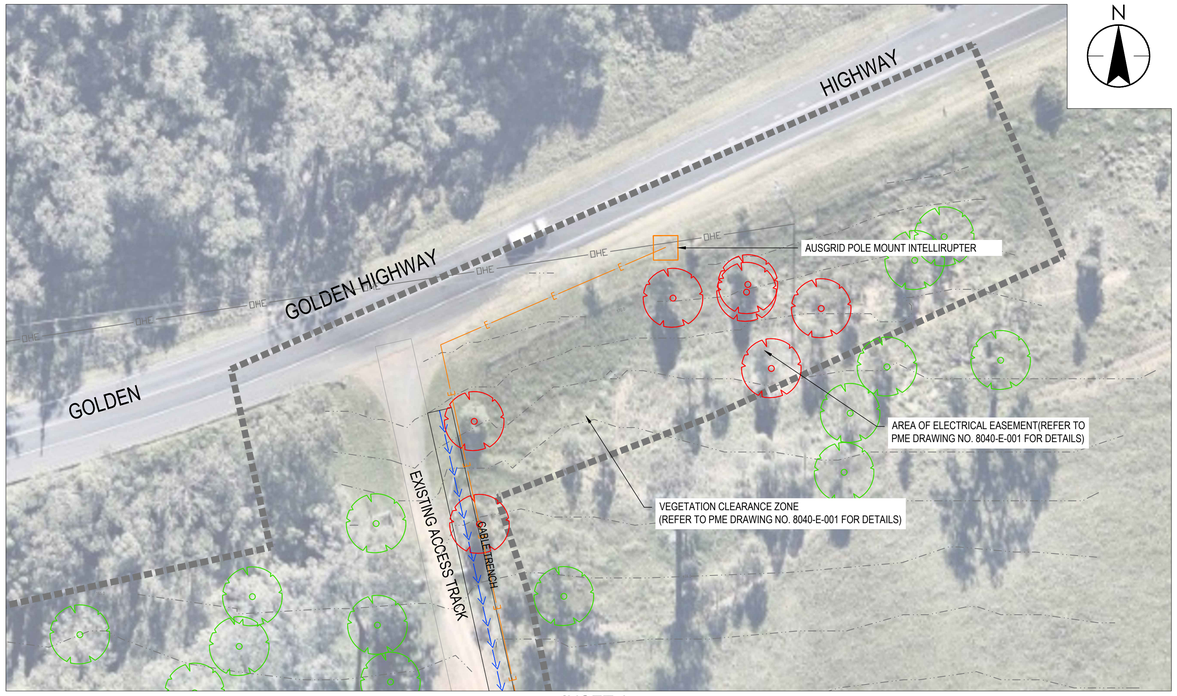
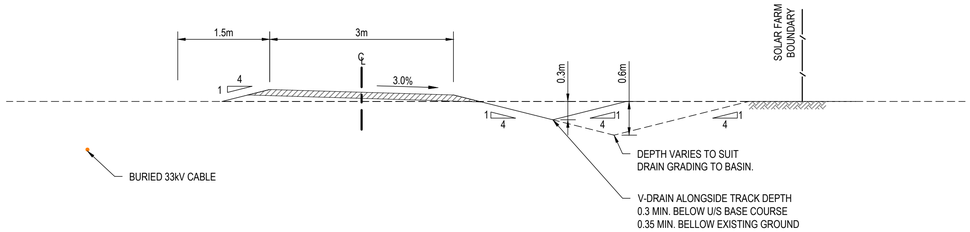




INSET A
SCALE 1:500



SECTION 1 -
SCALE 1:50

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SCALE 1:50 @A1

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SCALE 1:500 @A1

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SCALE 1:1500 @A1

Key Plan: (NTS)

B	RE-ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.30
A	ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.09
Issued/Revision		By	Appd	YYYY.MM.DD

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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-080-001.DWG | - Dwn. | - Dsgn. | - Chkd. | ---- YYYY.MM.DD

Title
UTILITIES COORDINATION PLAN

Project No.
301351404

Scale
AS SHOWN

Revision
B

Drawing No.
CI-080-001

Plotted: 30-Nov-23 9:33:37 AM By: TODD, LAUREN
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ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD

Key Plan: (NTS)

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Issued/Revision	By	Appd	YYYY.MM.DD

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511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-500-001.DWG

Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
-	-	-	----

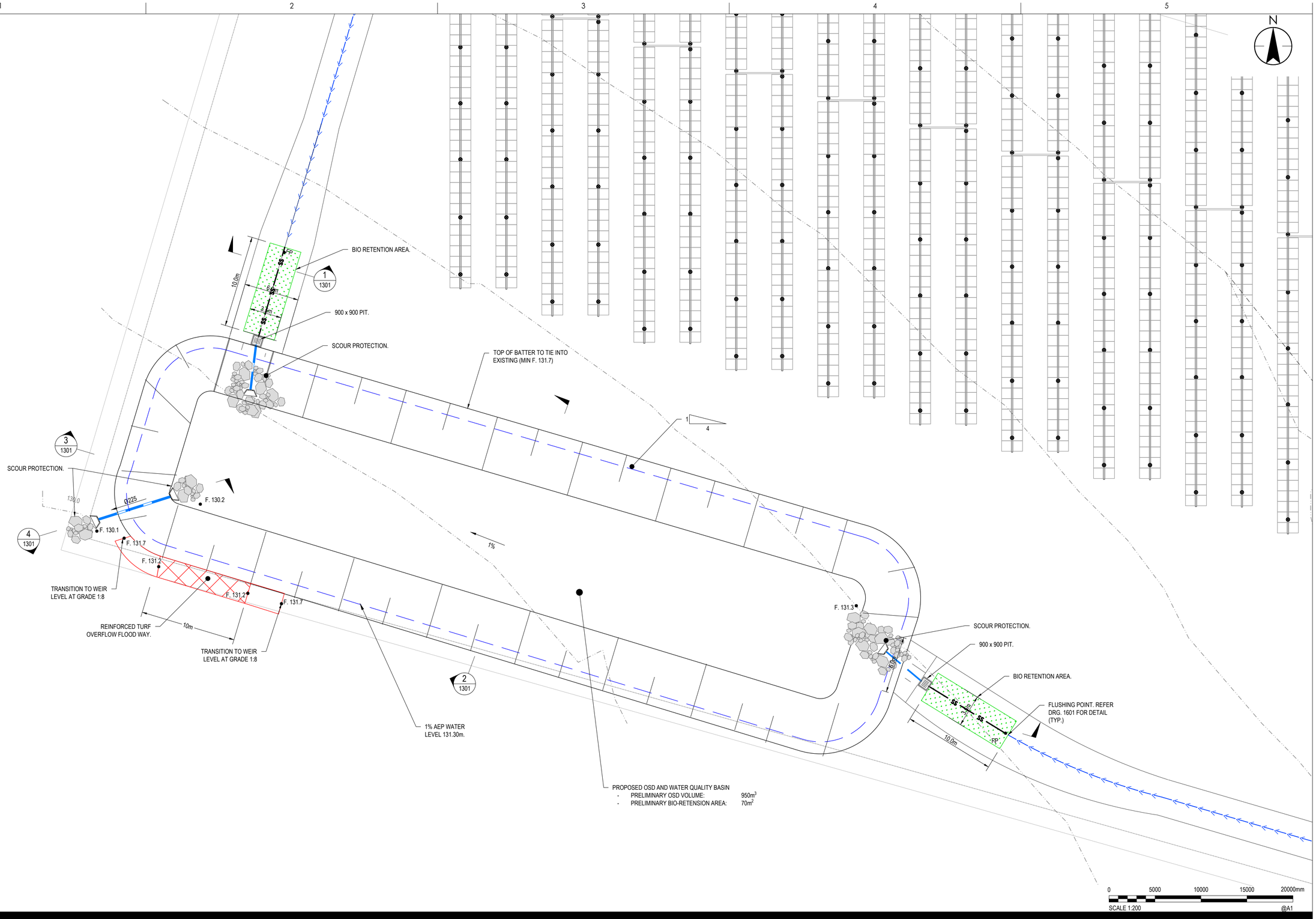
Title
CATCHMENT PLAN

Project No. 301351404

Scale AS SHOWN

Revision A

Drawing No. **CI-500-001**



Key Plan: (NTS)

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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-520-001..DWG	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD
	-	-	-	---

Title
OSD BASIN PLAN

Project No.
301351404

Scale
AS SHOWN

Revision
A

Drawing No.
CI-520-001

Plotted: 09-Nov-23 10:38:34 AM By: TODD, LAUREN
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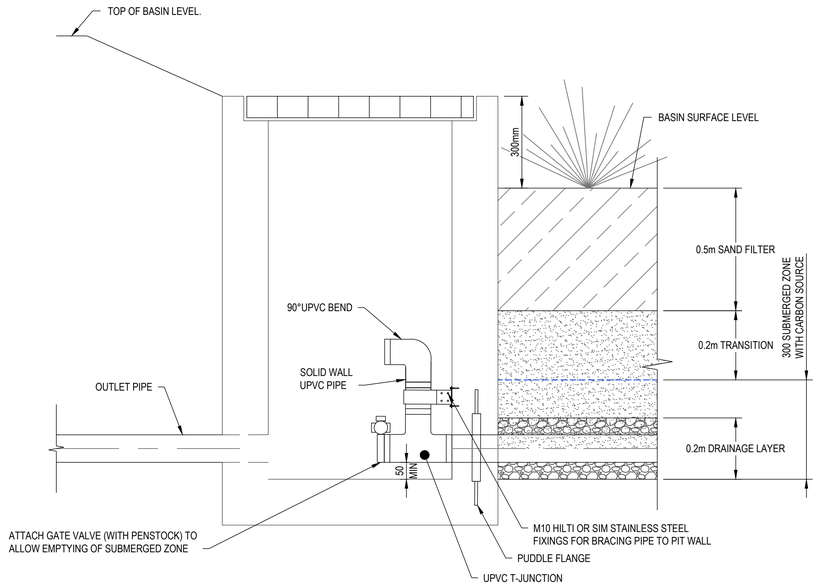
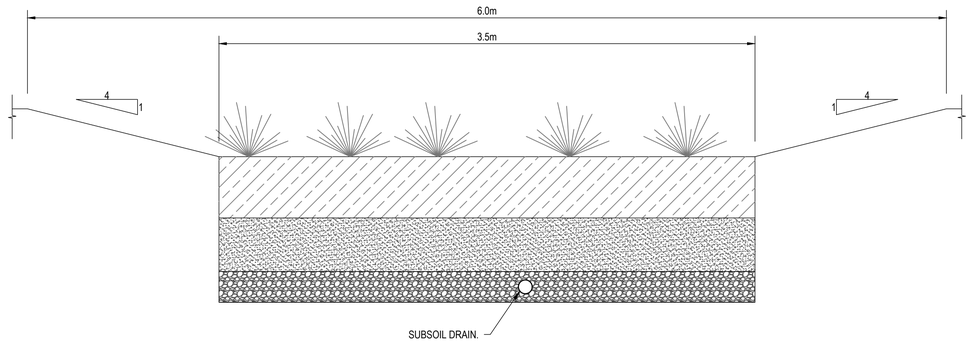


BIO-RETENTION BASIN OUTLET PIT DETAILS

SCALE 1:10



SECTION 1
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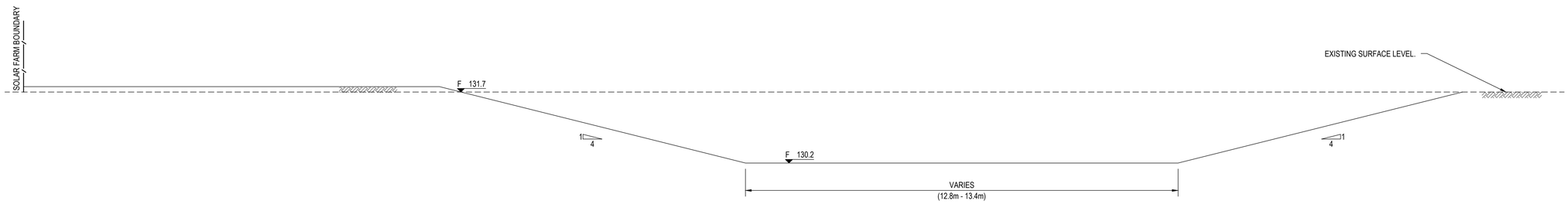
520-001



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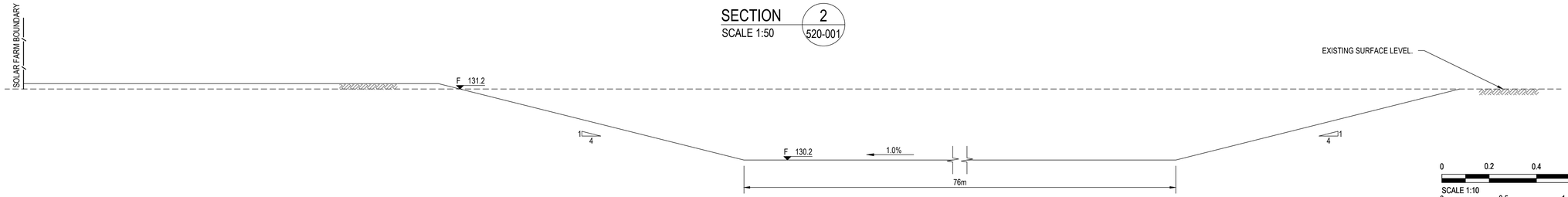

SECTION 3
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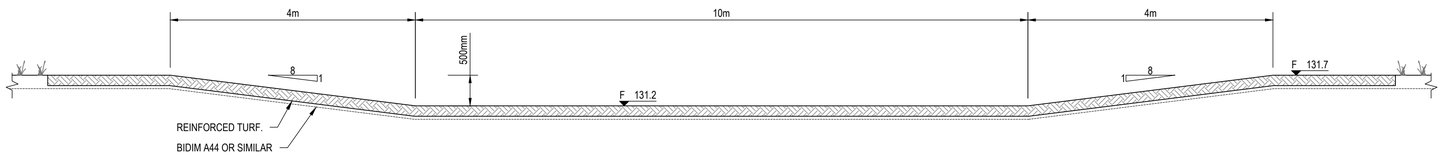
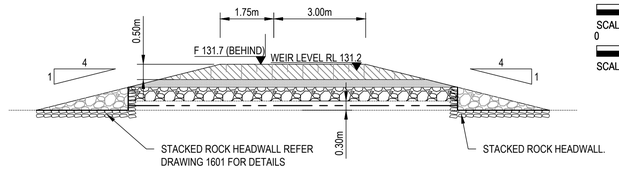
520-001



OSD BASIN OUTLET

SCALE 1:50



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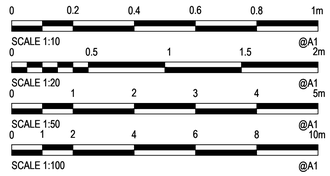

Key Plan: (NTS)

A ISSUE FOR DA APPROVAL	LPT	RKP	2023.11.09
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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-526-001.DWG	-	-	-	02/11/2023
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
BASIN DETAILS

Project No.
301351404

Scale
NOT TO SCALE

Revision
A

Drawing No.
CI-526-001

Plotted: 29-Nov-23 10:38:54 AM By: TODD, LAUREN
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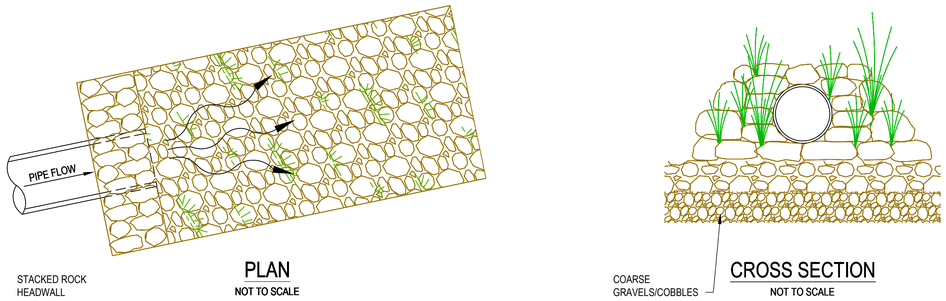
ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD

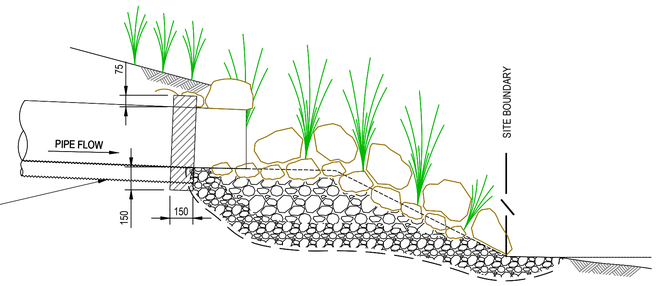


STACKED ROCK HEADWALL

PLAN
NOT TO SCALE

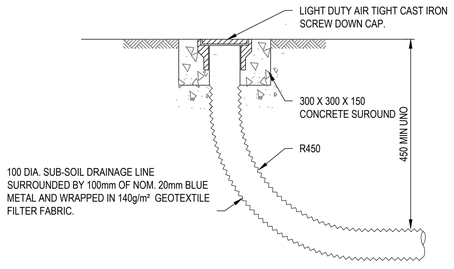
COARSE GRAVELS/COBBLES

CROSS SECTION
NOT TO SCALE



PROVIDE 3.0m LENGTH OF Ø100 SUBSOIL WRAPPED IN GEOFABRIC SOCK

ROCK HEADWALL - TYPICAL ARRANGEMENT
NOT TO SCALE



FLUSHING POINT
SCALE 1:10

NOTE:
SUB-GRADE FILL MATERIAL FOR TRACK TO BE OBTAINED BY CUTTING IN-SITU MATERIAL FROM V-DRAIN. TRACK SUB-GRADE LEVEL SET BY CUT TO FILL BALANCE OF TRACK AND V-DRAIN.
PAVEMENTS HAVE BEEN DESIGNED USING DESIGN SUBGRADE CBR 3%. CBR TO BE CONFIRMED ON SITE AFTER ROAD BOXING. FOR CBR LESS THAN 3%, PAVEMENT REDESIGN REQUIRED (NOTIFY SUPERINTENDENT PRIOR TO TREATMENT FOR CONFIRMATION DESIGN).

0 0.2 0.4 0.6 0.8 1m
SCALE 1:10 @A1

0 1 2 3 4 5m
SCALE 1:50 @A1

Key Plan: (NTS)

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SANDY HOLLOW SOLAR FARM

511 RICHMOND GROVE ROAD, SANDY HOLLOW, NSW 2333

File Name: 301351404-CI-526-101.DWG	-	-	-	02/11/2023
	Dwn.	Dsgn.	Chkd.	YYYY.MM.DD

Title
SITEWORKS AND STORMWATER DETAILS

Project No.
301351404

Scale
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Revision
A

Drawing No.
CI-526-101

Plotted: 09-Nov-23 10:28:23 AM By: TODD.LAUREN
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ORIGINAL SHEET - ISO A1 COORD - MGA/YY-Zone DATUM - mAHD

Appendix B Flood Assessment

Our Ref: 80219037:AR
Contact: Andrew Reid

16 May 2019

Cardno

Attention: Rafal Piwonski

Email: rafal.piwonski@cardno.com.au

Cardno (NSW/ACT) Pty Ltd
ABN 95 001 145 035

Level 9 - The Forum
203 Pacific Highway
St Leonards NSW 2065
Australia

Phone +61 2 9496 7700
Fax +61 2 9439 5170

www.cardno.com

Dear Rafal,

SANDY HOLLOW SOLAR FARM – FLOOD ASSESSMENT

The Goulburn River is located to the south of the site. We have reviewed the potential flood affectation on the site for the proposed solar farm. A 1% Annual Exceedance Probability (AEP) mainstream flood level has been estimated from available information and preliminary modelling which is sufficient for this assessment. The flood extent for an extreme event (such as Probable Maximum Flood) is not covered in this assessment.

Flood Data

Council

Council advised – "*..that the site is not considered flood prone. The Goulburn River is a reasonable distance from the development site. There is no flood study for the Goulburn River and no flood mapping (either riverine or overland flow flooding) for the Sandy Hollow area. There is no further information Council can provide in this regard.*"

Muswellbrook Shire Local Flood Plan (by NSW State Emergency Service, 2013)
This report lists river gauges and peak heights for historic flood events. The 1955 event is estimated to represent the 1% AEP event at the Muswellbrook and Denman gauges. The nearest gauge to the site is at Sandy Hollow about 1.5km upstream of the site (shown on the attached sketch). A flow height of 10.90m was recorded at the Sandy Hollow gauge for the 1955 event.

NSW Hunter and Central Coast Flood Summary April – May 2015 (by Manly Hydraulics Laboratory, 2015)
This report indicates a gauge zero level of 113.448 m AHD at the Sandy Hollow Gauge.

# Station	Station Name	Latitude	Longitude	Gauge Zero (m AHD)
210031	Goulburn River At Sandy Hollow	-32.3452	150.5743	113.448

Summary
Assuming the 1955 flood height at Sandy Hollow is also representative of the 1% AEP event, a flood level (1% AEP event) of 124.4m AHD is estimated. This estimate is potentially conservative as the site is downstream of the gauge.

Preliminary Flood Modelling

Simplified hydrologic and hydraulic models (XP-RAFTS and HEC-RAS) were established for a rough estimate of the 1% AEP peak flood level in the Goulburn River. Hydrologic subcatchment data was extracted from the Hunter River Flood Study (Muswellbrook to Denman) of 2014 by WorleyParsons. Cross-sections for a 1.5km reach of the Goulburn River near the site was modelled in HEC-RAS based on LiDAR elevations.

Based on this modelling, an estimate of the 1% AEP peak flood level at the site (south-west corner) is 124.7m AHD.

Assessment

A detailed flood study of the Goulburn River is not available so an estimate of the flood extent has been compiled from available information and preliminary modelling. Based on these limitations, a peak 1% AEP flood level at the site is estimated as around 124.4 – 124.7m AHD.

The attached sketch shows an approximate extent of the 124.4m AHD and 124.7m AHD extent based on topography from LiDAR.

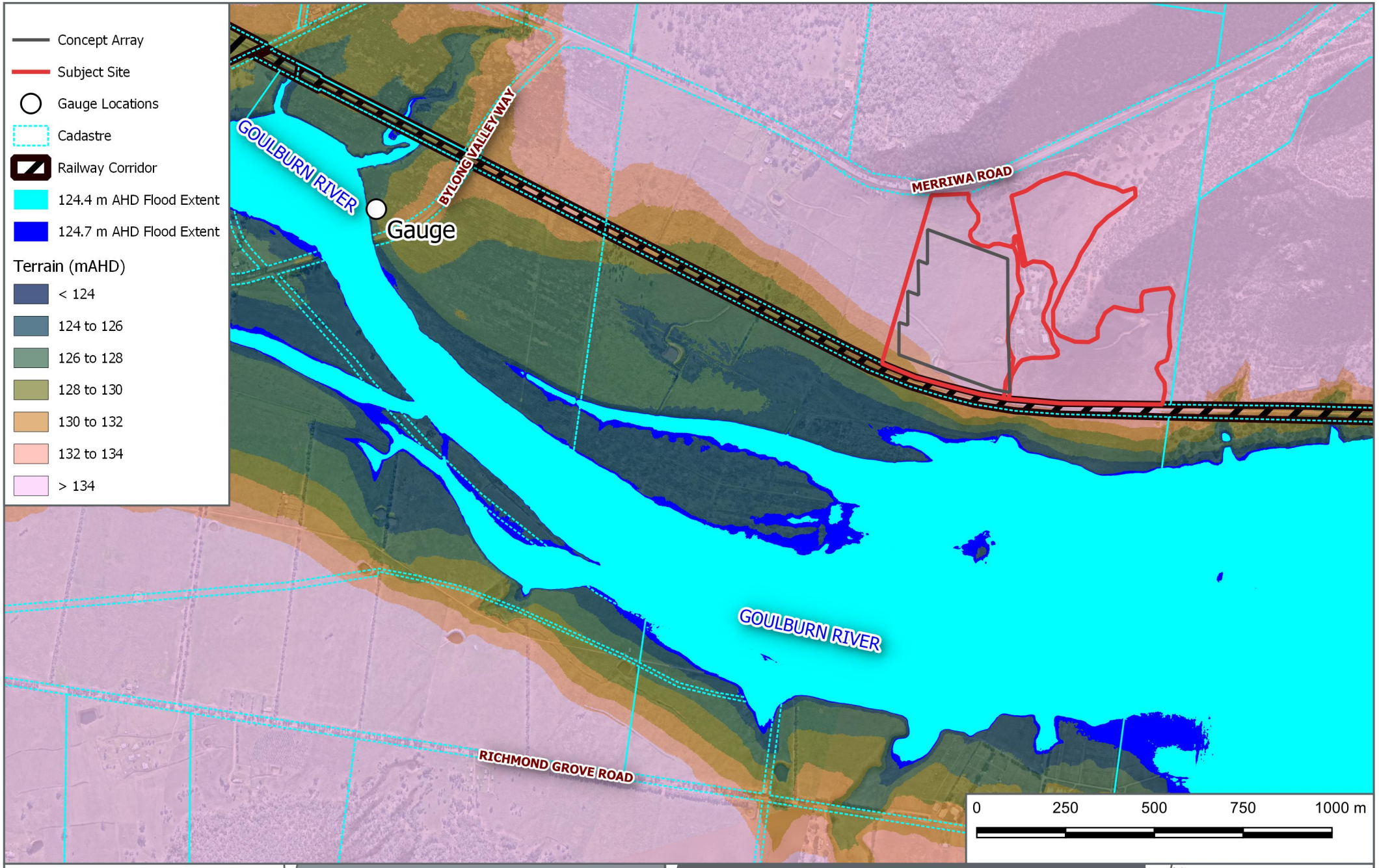
Survey of site by Monteath & Powys (dated 2/11/18) for the proposed solar array area (to the railway land) indicates an elevation of 129.90m AHD (at the south-western corner) to 134.1m AHD. The site is therefore considered to be several metres above the estimated extent of the 1% AEP event.

This assessment reviews potential mainstream flood inundation from the Goulburn River. Design of the solar farm on the site will need to consider potential overland flood implications from local catchments and channels on the site.

Yours sincerely,

Andrew Reid
Senior Engineer
for Cardno
Direct Line: +61 2 9496 7855
Email: andrew.reid@cardno.com.au

Enc: Figure showing estimated flood extent (1 page)



Cardno

Sandy Hollow Solar Farm

Figure 1

Best Estimate 1% AEP Flood Extent

Map Produced by Cardno Water & Environment
Date: 10/5/2019
Coordinate System: MGA Zone 56
Project: 80219037

Design with
community in mind

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