Groundcover Management Plan

Culcairn Solar Farm

January 2025

Project Number: 240896

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Acronyms and abbreviations

Term / Abbreviations	Definition / Expanded Text
AC	Alternating current
BESS	Battery Energy Storage System
Biosecurity Act	*Biosecurity Act 2015* (NSW)
BMP	Biodiversity Management Plan
BOM	Australian Bureau of Meteorology
CoA	Condition of Approval
Cth	Commonwealth
DAFF	Department of Agriculture, Fisheries and Forestry
DPE	Department of Planning and Environment (NSW)
DPHI	Department of Planning, Housing and Infrastructure
DPI	Department of Primary Industries
DTT	Down The Tube
EIS	Environmental Impact Statement
EMS	Environmental Management Strategy
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPC	Engineering, Procurement and Construction
ESP	Exchangeable Sodium Percentage
EWMS	Environmental Work Method Statements
GMP	Groundcover Management Plan
GWMA	Groundwater Management Area
IPC	Independent Planning Commission
Km	Kilometre
kV	Kilovolts
LEP	Local Environmental Plan
LGA	Local Government Area

Term / Abbreviations	Definition / Expanded Text
LLS	Local Land Services
m	metres
MW	Megawatt
MWh	Megawatt hours
NEM	National Electricity Market
NSW	New South Wales
OEH	(Former) Office of Environment and Heritage (NSW)
PFC	percent foliage cover
PV	Photovoltaic
PWMP	Pest and Weed Management Plan
RUSLE	Revised Universal Soil Loss Equation
SEA	Site Environmental Advisor
SSD	State Significant Development
SWMP	Soil and Water Management Plan
TMP	Traffic Management Plan

1. Introduction

1.1. Background

Neoen Australia Pty Ltd (Neoen) (the Proponent) have approval for construction, operation and decommissioning of a 350 megawatt (MW) alternating current (AC) / 402.5 MW direct current (DC), photovoltaic (PV) solar farm, referred to as Culcairn Solar Farm (the Project). The Project is located on rural land, approximately 4 kilometres (km) southwest of Culcairn, New South Wales.

The Project was assessed in an Environmental Impact Statement (EIS) in accordance with Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and Schedule 2 of the Environmental Planning and Assessment Regulation *2021* (EP&A Regulation). It is considered State Significant Development (SSD). The Proponent received approval for the Project on 25 March 2021 from the Independent Planning Commission (IPC).

Modification Report 1 (SSD-10288 – Mod 1) was prepared and submitted to former Department of Planning and Environment (DPE) (now referred to as Department of Planning, Housing and Infrastructure (DPHI)) October 2023 and was determined on the 22 December 2023 with consolidated Conditions of consent issued. The modification to the Project was for minor alignment revisions and widening of the Project's Development Footprint along Weeamera Road and at two creek crossings. The modification was also for minor amendments to the definitions and wording of Schedule 3 Condition 2 – Transport.

Modification Report 2 (SSD-10288-Mod-2) was prepared and submitted to the DPHI October 2024 and determined 19 December 2024 with consolidated Conditions of Consent issued. The modification was for the expansion of the Battery Energy Storage System (BESS) from 10 MW /200 Megawatt hours (MWh) up to 350 MW/800 MWh at the point of connection.

The EIS assessed the impacts of the Project on soils and the site's land capability. The Project will involve the removal of groundcover (grazed pasture/ crops, predominantly wheat and barley) and disturbance of soils during construction, which can result in decrease stability of soil and increase their susceptibility to erosion. During operation the primary risk of erosion is from concentrated runoff from the panels. Reducing these risks and impacts will assist with returning the site back to its pre-Project land capability following decommissioning.

This Groundcover Management Plan (GMP) outlines the management principles, mitigation measures and monitoring requirements during construction and operation of the Project, to ensure potential impacts from erosion and loss of land capability are minimised.

1.2. The Project

The Project will involve the construction and operation of a ground-mounted PV solar tracking array generating approximately 350 MW AC / 402.5 MW DC of renewable energy. The power generated will be exported to the national electricity grid.

Key development and infrastructure components will include:

- Single axis tracker PV solar panels mounted on steel frames over most of the site (maximum tilt 4.2 metres (m) in height)
- Onsite BESS with a capacity of 350 MW/800 MWh and up to 244 containerised battery storages of lithium-ion batteries
- Underground and overground electrical conduits and cabling to connect the arrays to the inverters and transformers
- Systems of invertor units and voltage step-up throughout the arrays
- National Electricity Market (NEM) compliant metering arrangements for all energy exported to the grid as well as internal metering to measure battery and solar output
- On site substation, connecting to the existing 330 kilovolt (kV) TransGrid transmission line

- Site office and maintenance building, vehicle parking areas, material laydown area, internal access tracks and perimeter security fencing
- Site access track off Weeamera Road
- Road crossing and easement electrical crossing through underground and/or overhead lines, of Cummings Road and Schoffs Lane
- Vegetative screening at impacted visual receivers and at the intersection of public roads.

The approved Project layout is provided in Figure 1-1.

Neoen is the applicant and proponent for the Culcairn Solar Farm. Neoen will engage contractors to undertake the construction activities. There would be at least two contractors engaged during the construction phases of the Project:

- Solar Farm Contractor: undertake all works associated with the development including clearing across the site, earthworks, panel installation and associated solar farm works with the exception of the construction of the BESS
- BESS Contractor: earthworks and construction related to the BESS.

Where relevant, they will be referred to as Solar Farm Contractor and BESS Contractor. For all works that are applicable to all contractors they will be referred to as Engineering, Procurement and Construction (EPC) Contractors or specific roles as outlined in Section 4.9 of the EMS.

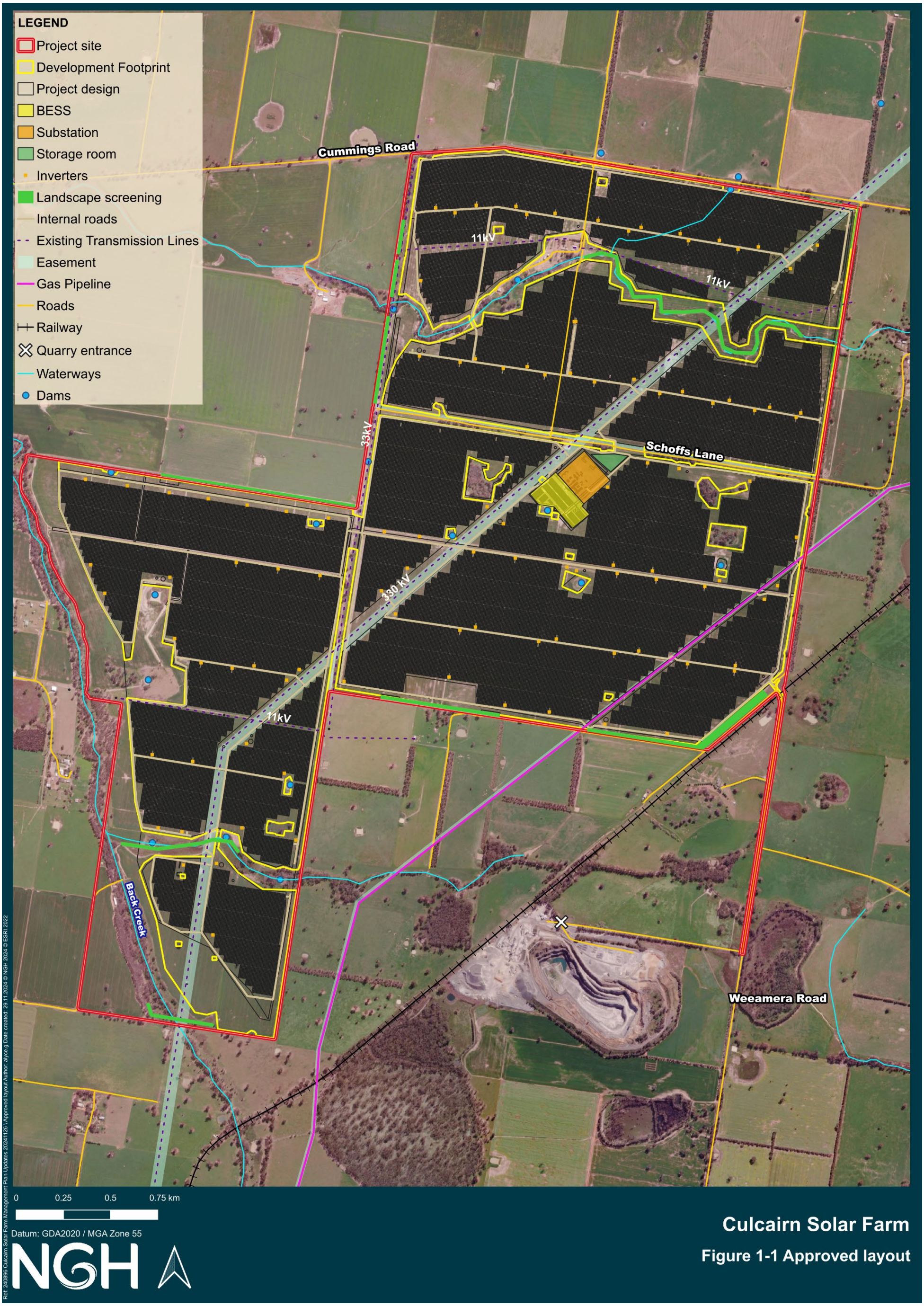

Figure 1-1 Approved Project layout

1.3. Environmental Management Strategy

The GMP is part of the Project's overall Environmental Management Strategy (EMS). Mitigation measures identified in this GMP will be incorporated into activity-specific Environmental Work Method Statements (EWMS) required to be prepared prior to the commencement of work. The requirement for EWMS are further detailed in Section 4.6 of the EMS.

The overarching EMS, GMP and other subplans (for example Pest and Weed Management Plan, a subplan of Biodiversity Management Plan) and the EWMS, identify the necessary environmental mitigation measures that must be undertaken by Neoen's personnel and contractors for all stage of the Project's lifecycle. The suite of management plan documents are described in more detail in Section 4.4 of the EMS.

1.4. Groundcover Management Plan development

This GMP has been prepared by Amanda Conley (Environmental Consultant, NGH). Amanda is an environmental scientist and agroecologist with experience in agronomy and soil science. Her qualifications included Bachelor of Applied Science (Viticulture), Bachelor of Science (Animal Production) and Graduate Certificate in Environmental Management. The Plan has been reviewed by Jane Love (Technical Lead – Environmental Management). Jane is experienced in the preparation and implementation of management plans and erosion and sediment controls. Jane has Bachelor of Environmental Science (Land and Water) and Master of Environmental Management.

Reviews and updates to this GMP will be undertaken as required, in accordance with Section 11 of the EMS.

2. Purpose and objectives

2.1. Purpose

The purpose of this GMP is to outline mitigation measures to be implemented for the Project site during construction and operation. The guiding principle of the GMP is to stabilise the soil surface, protecting it from erosion, weed infestation and a loss of soil capability. The plan aims to retain as much perennial grass cover as possible as this provides long term resilience and improved ecosystem functionality.

The measures outlined in this GMP are to be used as a guideline to achieve the objectives set out in Section 2.2. The parties agree that the measures may be amended as appropriate to meet the objectives.

2.2. Objectives

The key objective of the GMP is to ensure all conditions, mitigation measures and licence/permit requirements relevant to groundcover management are described, scheduled, and assigned responsibility as outlined in:

- The Project EIS (NGH, 2020)
- The Project Submissions Report (NGH, 2020)
- The Project Amendment Report (NGH, 2020)
- Modification Report 1 (NGH, 2023)
- Modification Report 2 (Umwelt, 2024)
- DPHI Consolidated Development Consent (determined 19 December 2024).
- DPE letter correspondence amendment to mitigation measure S02 21/11/2023 (refer Appendix B).

The Project will be carried out generally in accordance with the EIS and the Conditions of Approval (CoA), if there is any inconsistency between the documents the conditions of the consent will prevail.

3. Planning

3.1. Relevant legislation and guidelines

3.1.1. Legislation

Legislation relevant to the development and implementation of the GMP includes:

- *Environmental Planning and Assessment Act 1979 (NSW)* (EP&A Act)
- *Pesticides Act 1999*
- *Biosecurity Act 2015*
- *Local Land Services Act 2013.*

How this legislation is relevant to the BMP and Project is outlined in Appendix B of the EMS.

3.1.2. Guidelines and standards

Guidelines and standards relevant to the development and implementation of the GMP include:

- Groundcover Monitoring for Australia (DAFF, 2023)
- "Ag Facts" Maintaining groundcover to reduce erosion and sustain production (DPI, 2005)
- NSW Weed Wise (DPI, 2023).

3.1.3. Conditions of Approval

The Conditions of Approval (CoA) and mitigation measures relevant to the GMP are listed in Table 3-1 below. A cross reference is also included to indicate where the requirement is addressed in this Plan.

Table 3-1 Project conditions of approval and mitigation measures relevant to the GMP

Reference number	Condition requirement	Document reference
Conditions of Approval		
Schedule 3 CoA 12	**Land Management** The Applicant must maintain the agricultural land capability of the site, including: (a) Establishing the groundcover of the site within 3 months following completion of any construction or upgrading (b) Properly maintaining the groundcover with appropriate perennial species and weed management (c) Maintaining grazing within the development footprint, where possible, unless the Planning Secretary agrees otherwise in writing.	Section 6.3 Section 6.4 Section 6.4
Mitigation measures		

Reference number	Condition requirement	Document reference

SO2	A Groundcover Management Plan will be developed in consultation with a soil scientist and an agronomist and taking account of soil survey results to ensure perennial ground cover is established across the site as soon as practicable after construction and maintained throughout the operation phase. The plan will cover:
	• Soil restoration and preparation requirements
	• Species selection
	• Soil preparation
	• Establishment techniques
	• Maintenance requirements
	• Perennial groundcover targets, indicators, condition monitoring, reporting and evaluation arrangements:
	  ○ Ground cover will be targeted to be maintained at or above 70% to protect soils, landscape function and water quality, subject to seasonal and climatic conditions.
	  ○ Any grazing stock will be removed from the area of concern when cover falls below this level.
	  ○ Grass cover will be monitored on a fortnightly basis using an accepted Methodology including:
	  ▪ Contingency measures to respond to declining soil or groundcover condition.
	  ▪ Identification of baseline conditions for rehabilitation following decommissioning.
		This Plan has been prepared by authors experienced in soil science and agronomy, no further consultation required (refer to Section 1.4)
		The plan has considered to the soil survey results refer to Section 4.1 and 6.3
		Section 6.1
		Section 6.5 and Appendix A

4. Existing Environment

Site environmental features are detailed within the Project EIS (NGH, 2020). A summary of characteristics that have the potential to influence erosion potential and groundcover success, are detailed below.

4.1. Soil characteristics

Geology of the site is largely comprised of unconsolidated sedimentary rock of the Shepparton Formation. Soils within the Project site are classified as Chromosols under the Australian Soil Classification system (Isbell, 1996) .Topsoils within the Project site consist of moderately granular light brown silty loams and white silts. Subsoils consist of medium clays and sandy silty clays. Landscape limitations associated with Chromosols are outlined in Table 4-1.

Table 4-1 Soil characteristics within the Project site

Soil type	Location	Erosion hazard	Salinity risk	Acid soil	Waterlogging risk	Acid sulfate soil	Infrastructure risk
Chromosol	Predominant	Low	Low	Yes	Moderate	No	Low

Acid sulfate soils are associated with Chromosols; however, acid sulfate soils were not identified on-site and are unlikely to occur due to lack of appropriate landscape characters. A soil analysis was prepared by McMahon Earth Science (2018) for the Project site, refer to Table 4-2.

Table 4-2 Analysis of soils within Project site

Description	pH	Salinity rating (EC)	Cation exchange capacity	Exchangeable Sodium Percentage (ESP)	Dispersion	Plant available phosphorus	Phosphorus buffering index	Calcium: magnesium ratio	Soil infiltration /water holding capacity
Topsoil	Moderately acidic 5.4 - 5.9	Very low	Very low to low 3.1 – 11.6 cmol (+)/kg	Non-sodic 1.7% - 4.7%	Low	Very high 41 to 170 mg/kg	Very low - low 33 to 110	1.9 to 5.9	Moderate - high 50 - 90mm/hr
Subsoil	Moderately acidic 4.6 to 6.4	Very low	-	-	Low	-	-	-	Very slow (<5 mm/hr), liable to waterlogging where there is limited topsoil horizon

4.2. Groundwater

The Project site is situated within an outcropped area of the Lachlan Fold Belt Murray-Darling Basin Groundwater Source and falls under the Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources (DPI, 2012), refer to Figure 4-1.

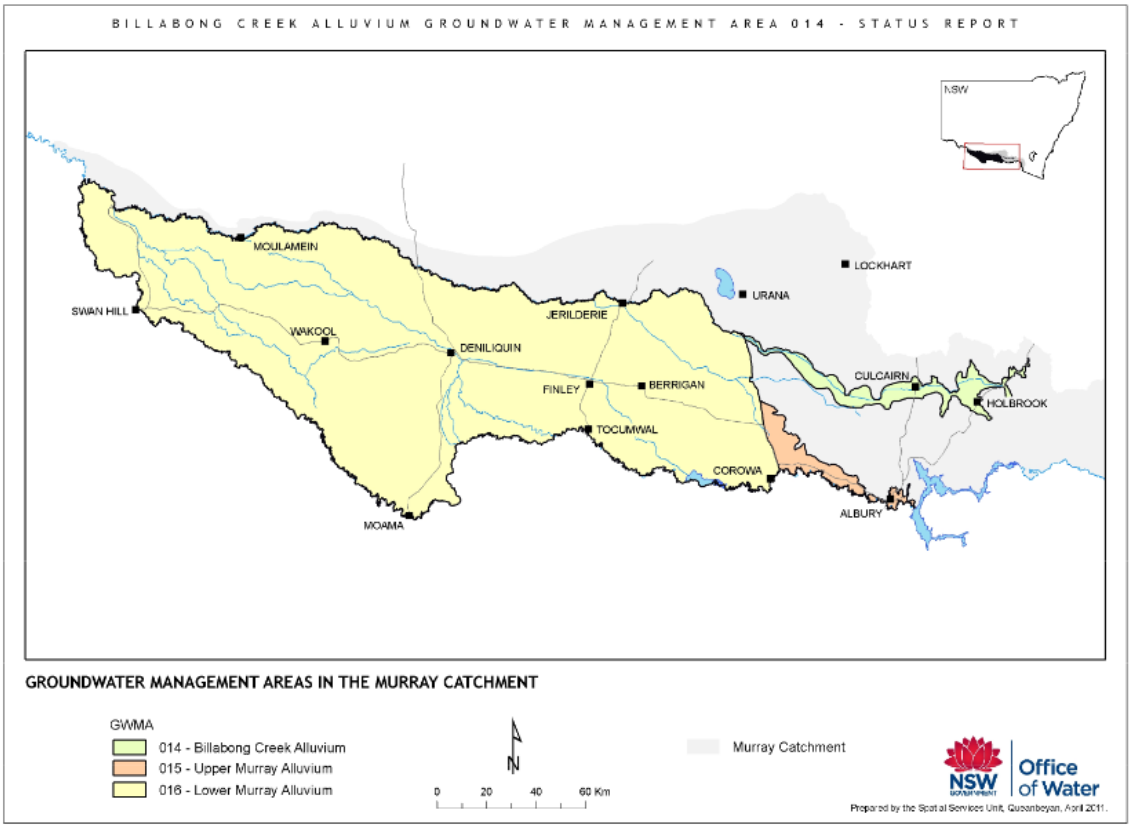

Figure 4-1 Groundwater Management Areas in the Murray Catchment (DPI, 2012)

Groundwater occurs to a depth of around 100 m and includes three main productive aquifers within the alluvial formation. There are four (4) groundwater bores located within the Project site that fall within a designated Groundwater Management Area (GWMA) of NSW.

Table 4-3 Groundwater bores located within the Project site

Bore ID	Status	Purpose	Bore Depth (m)	Drill date
GW005333.1.1	Non-functional	Unknown	25.60	Unknown
GW015459.1.1	Unknown	Water supply	24.40	01/12/1956
GW005205.1.1	Unknown	Unknown	50.90	01/05/1911
GW029954.1.1	Unknown	Stock and domestic	27.40	01/01/1968

4.3. Rainfall and Climate

The Greater Hume Local Government Area (LGA) is part of the Lower Slopes subregion within the NSW South Western Slopes Bioregion. This bioregion is dominated by a sub-humid climate that generally experiences hot summers and cool wet winters, refer to Figure 4-2 (OEH, 2016).

The Bureau of Meteorology (BoM, 2023) temperature records available from the nearest long-term climate station at Albury Airport AWS (072160) indicate a mean summer maximum of 32.4 °C (January) and a mean winter maximum of 13.2 °C (July)

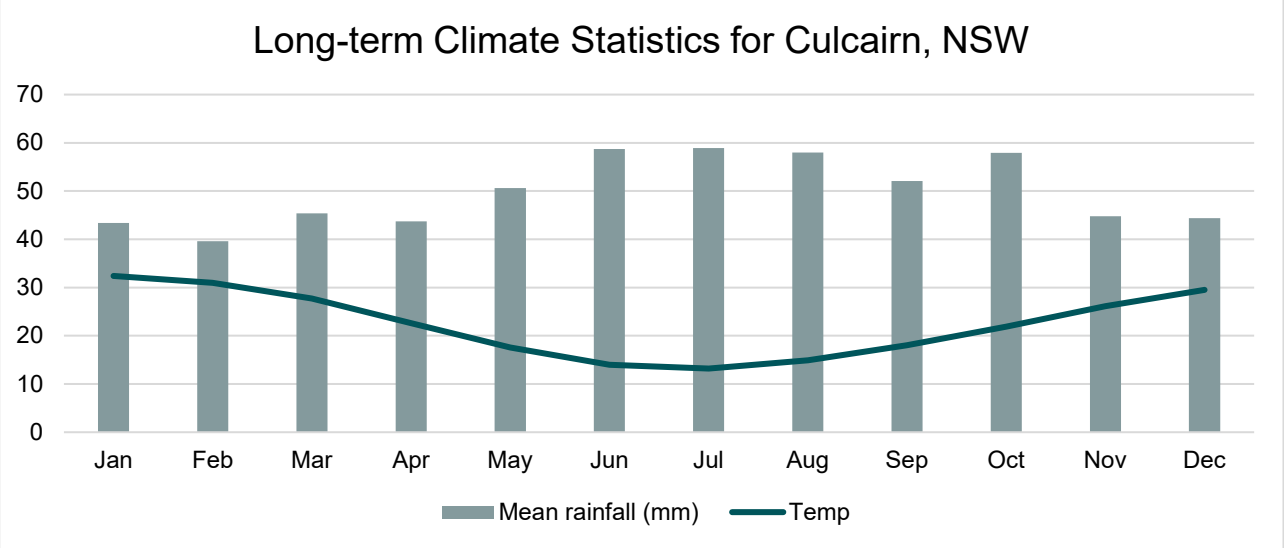

Figure 4-2 Mean rainfall and temperature statistics for Culcairn, NSW (BoM, 2023)

4.3.1. Rainfall erosivity factor

The Rainfall Erosivity Factor is a measure of the ability of rainfall to cause erosion (referred as “R” in the Revised Universal Soil Loss Equation - RUSLE). The Rainfall Erosivity Factor is used to determine the soil loss in tonnes per hectare over one year and is used in calculations when sizing construction sediment basins.

The Project has a Rainfall Erosivity Factor of 1483 SI units. Albury is the closest location with detailed R-factor data and is detailed below in Table 4-4 below.

Table 4-4 Monthly % and annual rainfall erosivity (R - factor) values for Albury, NSW (IECA, 2008)

Monthly % and annual rainfall erosivity (R – factor) values													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Year**
%	8.4	9.4	9.8	8.3	7.6	8.5	6.7	6.7	6.5	10.5	8.4	9.2	1483
R - Value	125	139	145	123	113	126	99.3	99.3	96.4	156	125	136	1483

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5. Environmental aspects and impacts

5.1. Construction and operation activities

A variety of construction activities that have the potential to impact upon soils and groundcover will be undertaken as part of the Project. These activities include, but are not limited to:

- Clearing and grubbing of vegetation
- Earthworks including topsoil stripping
- Construction of access tracks
- Construction of inverter stations and substation
- Trenching for underground cabling
- Pile driving for frames
- Use of plant and equipment.

During operation, the placement of the solar panels has potential to result in concentrate runoff from the panels. Additionally, traffic and maintenance activities during operation may result in soils and groundcover disturbance.

5.2. Impacts

The potential for impacts on soils and groundcover will depend on a number of factors including the nature, extent and magnitude of construction activities and their interaction with the natural environment. Potential impacts attributable to construction and operation activities could include:

- Exposure of soils during construction vegetation clearing and earthworks resulting in erosion
- Erosion underneath panels during operation from concentrated runoff from panels
- Potential loss of seedbank when topsoil is removed during construction or due to poor management during operation
- Potential compaction of soil in trafficable areas
- Invasion and spread of terrestrial weeds and pest fauna species
- Reduce land capability.

6. Groundcover Management

To manage impacts on groundcover as a result of the construction and operation of Culcairn Solar Farm, five (5) Procedures have been developed. The Procedures aim to identify specific mitigation measures during pre-construction, construction and post-construction/ operational phases to prevent damage and/ or restore groundcover.

These Procedures are listed below with the corresponding phase of the Project listed:

1. Groundcover Establishment Procedure: pre-construction and construction
2. Weed Control Procedure: required throughout construction and operation
3. Pasture and Groundcover Rehabilitation Procedure: construction and operation
4. Monitoring Procedure: required throughout construction and operation
5. Grazing Procedure: Operational activities

Note, this plan is specific to soil and groundcover management in regard to maintaining and restoring land capability. Further management of soils including erosion and sediment controls for construction are addressed in the Project Soil and Water Management Plan (NGH, 2024c). In addition, rehabilitation practices within retained areas of remnant native vegetation are addressed in the Project Biodiversity Management Plan and Rehabilitation Plan (NGH, 2024a).

6.1. Groundcover Establishment Procedure

This procedure applies to planning elements to be carried out at pre-construction phase; and also mitigation measures to be implemented during construction.

Objectives	**Establish thick and continuous groundcover**
	Minimise disturbance to groundcover
	Return groundcover within 3 months following disturbance

The following table (Table 6-1) outlines mitigation measures to preserve soil condition and to minimise disturbance to groundcover.

Table 6-1 Ground disturbance mitigation measures

ID	Activity	Mitigation measures	Responsibility
1	Training and awareness, Management Plans	• Prior to mobilisation/ prior to site works (pre-construction), a Traffic Management Plan (TMP, Amber 2024) will be prepared that identifies access routes and parking areas for all vehicles. Traffic on site shall be controlled to minimise ground disturbance and reduce compaction, outside of the designated traffic and parking areas, • Prior to mobilisation/ prior to site works (pre-construction), a Site Induction is to be prepared that covers: the importance of maintaining groundcover (ensure ongoing perennial groundcover across site); minimising disturbance (reducing erosion potential); and Environmental (No Go) Exclusion Zones (areas	EPC Site Supervisor EPC Site Environmental Adviser (SEA)

ID	Activity	Mitigation measures	Responsibility
		retained in good condition).	
2	Site preparation	• Prior to construction, soil sampling shall be carried out across the site, in order to inform soil amelioration practices, that will improve the pH and soil nutrient status. A qualified person (agronomist/ environmental scientist appointed by the proponent) will be consulted to establish the sampling regime. • Soil amelioration to be undertaken will be informed by the proponent's appointment agronomist. This step may also include ripping and grading as directed by the recommendations of the soil sampling results. This step will support the establishment of perennial pasture species to assure long term pasture success and contribute to achieving the objectives of this GMP. • Source a mix of exotic species including but not limited to perennial rye grass, Lucerne, sub-clovers, chicory and plantain, as these are suitable for this location and the soil types.	Solar Farm Contractor SEA Solar Farm Contractor Site Supervisor NGH Landowners
3	Establishing groundcover: under PV array	• At mechanical completion, sow exotic mix (i.e. hydroseed) as soon as reasonably practicable within the PV array paddocks (refer to Figure 1-1) • The seeded areas will be monitored as per Section 6.5 "fortnightly survey" with mitigation measures implemented where groundcover percent foliage cover (PFC) drops below 70% PCF as per Section 6.3 below "post-construction". • Ground cover will be targeted to be maintained at or above 70% to protect soils, landscape function and water quality (subject to seasonal and climatic conditions).	Solar Farm Contractor Site Supervisor Solar Farm Contractor SEA Solar Farm Contractor Landowners
4	Maintaining groundcover: other areas within the Project Site	• All Project vehicles (heavy and light), equipment and machinery will be parked in disturbed areas, in accordance with areas identified in the TMP (Amber, 2024). • Temporary equipment laydown areas and stockpiles required during construction, will be confined to crop/exotic pasture areas. • Areas will be progressively rehabilitated during construction in accordance with Section 6.3 below. • Works will be avoided during and immediately following heavy rainfall events (>20mm in 24 hr period and/or where there is pooling of water or flooding evident), to protect soils and vegetation at the site, except where the Contractor can establish there is no increased risk of disturbance to the soils	Solar Farm Contractor Site Supervisor Solar Farm Contractor SEA

ID	Activity	Mitigation measures	Responsibility
		or vegetation.	

6.2. Weed Control Procedure

The Procure below details weed control mitigation measures that will be followed during the construction and operation of Culcairn Solar Farm. This Procedure is applicable to the entire Project site. Ongoing operational weed monitoring will also be undertaken as part of the Groundcover Monitoring Procedure (Section 6.5 below).

Objectives	**Eradicate existing priority weeds**
	Minimise the potential for new priority weed infestations

ID	Activity	Mitigation measures	Responsibility
5	Establish baseline data, maintain records	• Prior to construction commencement, a map will be prepared identifying the locations of existing priority weed infestations, as per baseline surveys outlined in the Project Pest and Weed Management Plan (NGH, 2024b).	Solar Farm Solar Farm Contractor SEA
6	Treat existing infestations	• Treat and manage existing weed infestations in accordance with the Project Pest and Weed Management Plan. • Herbicides will be selected to minimise impacts on non-target species. A qualified person (agronomist) will be consulted to determine suitable herbicides based on the weeds present at the site prior to treatment. • Laydown sites for excavated spoil, equipment and construction materials are to be weed–free. Where this is not achievable, they will be treated for weeds prior to use (to minimise dispersal of weeds).	Solar Farm Solar Farm Contractor SEA
7	Maintain records	• Methods used for weed control and the timing of weed control activities will be documented in accordance with the Pest and Weed Management Plan (NGH, 2024b); and as required under the Pesticides Amendment Regulation 2001 (application records).	Solar Farm Solar Farm Contractor SEA
8	Minimise new infestations	• Imported fill will be weed free (confirmed by the supplier). • Vehicle and machinery movements and	Solar Farm Contractor Site

ID	Activity	Mitigation measures	Responsibility
		temporary storage of equipment/materials will be confined to disturbance areas and defined tracks in accordance with the TMP (Amber, 2024). • Vehicles and machinery will be cleaned (tyres brushed or washed down) on entry and exit in areas of the Project site where priority weeds have been identified. • Following completion of works, areas will be progressively rehabilitated in accordance with Section 6.3 below.	Supervisor Solar Farm Contractor SEA
9	Ongoing weed monitoring and control	• Follow up weed mapping will be carried across the entire site after the completion of construction works. This will establish the basis for ongoing weed control where, priority or invasive species are recorded. • Regular monitoring will be undertaken during late spring/early summer and remedial action taken as required, as per Section 6.5 below	Solar Farm Contractor SEA Neoen

6.3. Pasture Establishment and Rehabilitation Procedure

The following Procedure will be implemented during construction to maximise the success of pasture establishment and to rehabilitate areas that have been temporarily disturbed (i.e. laydown area and temporary access routes). The objectives of this Procedure are to establish pasture cover following disturbance, to ensure the ground surface is resistant to erosion and weed ingress.

Objectives	**Establish pasture cover to protect soil structure and reduce erosion potential**
	Progressively rehabilitate areas disturbed by construction

ID	Activity	Protocol	Responsibility
10	Prior to construction works	• The proponent appointed agronomist will assist with planning (siting) construction activities, such that topsoil is protected during construction phase. Careful planning will protect topsoils and therefore maintain the agricultural land capability of the site following completion of the works.	Solar Farm Contractor Site Supervisor Solar Farm Contractor SEA Project agronomist
11	During construction works	• In areas required to be grubbed, whole sods of pasture will be removed with an excavator. Sods will be stored in moist shaded conditions (e.g. damp geofabric,	Solar Farm Contractor SEA

ID	Activity	Protocol	Responsibility

		monitored each day and re-sprayed with water to maintain moisture). Such sods shall be reused in rehabilitation and watered in, to maximises the chance of reestablishment. This step is recommended as far as reasonably practicable as the sods represent a cost effective and rapid way to achieve 70% PCF. If this sod retention and replacement option is not pursued during the construction of the Project, steps specified below will be required in order to achieve target cover for soil protection (>70% PFC) and compliance with conditional requirements (i.e. S02).
		• Any valuable topsoil identified by the proponent appointed agronomist prior to construction (i.e. ID# 11 above), will be removed and stockpiled separately for later use in rehabilitation. This includes areas that will be heavily trafficked and/ or permanent hard stand areas (i.e. buildings, transformers, parking bays).
		• Trenches will be backfilled to restore soil structure and composition, such that topsoil will be respread above subsoil.
		• Disturbed areas shall be rehabilitated, to achieve the establishment of groundcover within three months of the cessation of works at the relevant area. Refer to Section 6.5 “fortnightly inspections” for monitoring requirements.
		• The below success criteria shall be used for rehabilitated areas:
		  ○ Percentage of ground cover – 70% is the target for permanent areas (i.e. excluding internal access tracks/ roads and ancillary facilities).
		  ○ No exposed bare ground with visibly active soil erosion for rehabilitated areas (susceptible to erosion and weed infestation).
		Where these criteria are not met, steps detailed below shall be carried out.	

12	Post Construction	• Following the completion of construction, tracks not required for normal farming practice or PV array maintenance will be rehabilitated.
		• In areas with limited topsoil, hydromulch or imported weed free topsoil will be used.
		• Within PV array area, where determined to be required (i.e. if infilling sowing is required to achieve the required 70% PFC), sow a mix of summer and winter tolerant species for reseeding. Species may include perennial ryegrass, annual ryegrass, sub clover, Lucerne, plantain and Chicory.
		• Pasture shall be sown with a suitable species such as:
		  ○ 30 kg/ha perennial ryegrass
		  ○ 2 kg/ha persian clover
			Solar Farm Contractor SEA
			Neoen

ID	Activity	Protocol	Responsibility
		○ 2 kg/ha arrowleaf clover ○ 2 kg/ha chicory (has long seedheads, may need slashing post seed set) ○ 2 kg/ha plantain • In rehabilitation areas that are actively grazed, stock will be restricted until a stable surface (70% ground cover) is achieved. • Rotate livestock to ensure grazing pressure is reduced in the first 12 months of pasture establishment. • Allow pasture species to seed (to build a seed bed) then reintroduce grazing (or slash). In the event of unseasonal climactic conditions (i.e. periods of drought) remove/ significantly restrict livestock grazing to paddocks. • The following may be applied to maintain restore cover during drought periods (as advised by proponent appointed agronomist and agreed DPHI): ○ Soil binder (e.g. stone-wall) ○ Straw fibre hydro mulch ○ Compost blanket	

6.4. Grazing Management

Grazing by sheep within the development footprint is recommended to control biomass (to control pasture growth) during the operational phase of the Project. The grazing strategy to be implemented will depend on the condition and composition of the pasture at the time (prior to commencement of operations and the state of the Project site at that time) and shall be informed by a professional agronomist.

Objectives	**Maintain active grazing within the Project site**
	Maintain groundcover (pasture)
	Reduce the occurrence of noxious, priority and other weeds

ID	Activity	Protocol	Responsibility
13	Determine and implement suitable grazing, slashing or spraying strategies.	• Prior to operation, consult with an agronomist and the landowner to determine the most suitable Grazing Strategy for the Development footprint. • Document the recommended strategy and append to this GMP. The Strategy must detail frequency of monitoring to gauge the impact of the grazing (in addition to annual groundcover monitoring). • If stock are brought into the area, they will come off pastures free of any priority weeds or from areas	Neoen Grazier

ID	Activity	Protocol	Responsibility
		subject to regular weed control. Preferably held in a "quarantine" paddock for 3 days before releasing into the main array area. This will allow for the passage of any consumed weed seeds to be deposited in this area and any emerging weeds managed within the quarantine yard.	

14	Adapt grazing strategies to changing grassland condition and composition	• Regular consultation with agronomist shall be undertaken, as identified in the Grazing Strategy that is developed. This should be done at least bi-annually and when unfavourable climatic conditions are encountered (drought) to discuss the suitability of existing grazing regimes and adapt if recommended,
		• Document any updates/ alterations to the strategy in accordance with document review process (Section 11 of the EMS) .
		• Implement changes proposed by the agronomist to improve the on-ground results of the strategy.
		• Remove stock if the following conditions occur
		  ○ Pasture is grazed at or below 5cm in height.
		  ○ Groundcover is 70% or less.
		  ○ Signs of erosion (exclude stock from these areas and rehabilitate)
		• Stock will not be returned (re-stocking of livestock shall not occur) until pasture has recovered and groundcover percentage has been restored above 70%.
			Neoen
			Grazier

15	First 12 Month grazing strategy	• Allow for pasture establishment. • Introduce grazing, as identified by the Grazing Strategy (once developed). • Allow for pasture species to go to seed. • Following pasture seed set, agronomist to review Grazing Strategy and pasture establishment and advise if any changes are required. • Monitor pasture establishment as per Section 6.5 requirements fortnightly, implemented corrective actions as per Section 6.5 as required, in consultation with agronomist.	Neoen Grazier

6.5. Groundcover monitoring

6.5.1. Percent Foliage Cover

Ground cover will be targeted to be maintained at or above 70% to protect soils, landscape function and water quality, however it is recognised that 70% PFC may not be maintained at all times due to seasonal climactic conditions (drought). Groundcover monitoring will continue after mechanical completion to achieve this requirement, and the monitoring requirements for the Project are details below.

6.5.2. Post-construction ground cover establishment

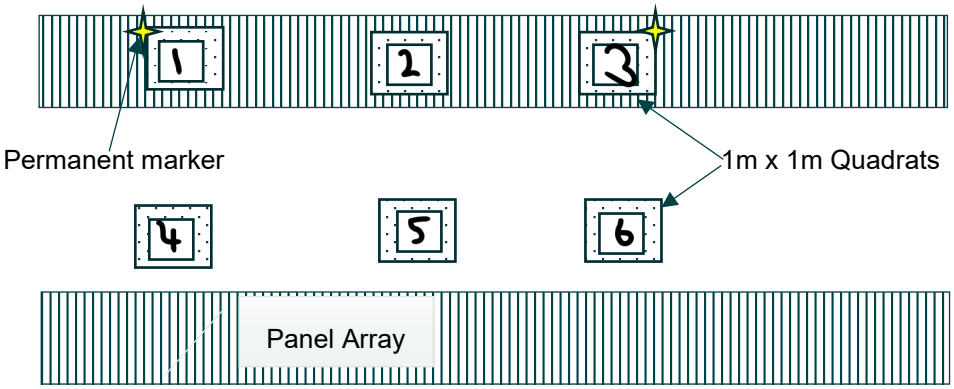
Establishing the groundcover of the site within 3 months following completion of construction or upgrading is also required, and monitoring for this target will commence in the later stages of construction, after the PV panels have been installed and pasture seeds have been sown (as required by Section 6.1 above). Post-construction monitoring will commence in the first winter following mechanical completion and occur every two weeks for the first 12 months and can be conducted by the Solar Farm Contractor SEA, who will be competent in the identification of common pasture species.

Following the initial 12 months of fortnightly monitoring, monitoring shall continue twice a year (June and December). This timing is considered most suitable as pasture growth is generally lower, but remnant reproductive material (flowers, seeds) may still be present which will enable identification of species. Assessing the groundcover during this time provides for a better indication of the health of the groundcover as growth rates are down and climatic stresses (including shading from solar arrays) are generally higher.

Monitoring shall continue twice a year for the operational life of the Project and reported on annually, initially for five (5) years. Following the completion of the 5 year monitoring period, an assessment as to frequency and duration of further monitoring will be made, as determined in consultation with an agronomist (i.e. success of pasture establishment will determine the requirement for further monitoring and frequency).

Objectives	**To minimise impacts on disturbed areas**
	Successfully revegetate with appropriate pasture species

Action	Description
Fortnightly Survey of areas hydro-seeded	• Monitoring will occur on the same day each fortnight and at a similar time of day. • A portable 30 cm x 30 cm square transect will be used for rapid assessment of groundcover. • Photographic evidence of each transect will be taken at each site and saved in an accessible folder. • A representative photo will be used and inserted to the monitoring sheet. • A data recording sheet has been included in Appendix A. • This can be performed by the Solar Farm Contractor SEA
Annual Survey	• Permanent 5 m x 1 m monitoring plots will be established throughout the PV array area post construction. At each monitoring location there will be two plots within each placed in the following areas. ○ In permanent shade, directly beneath panels.

Action	Description
	○ Between panels that will receive the most sun. • Each plot will consist of a series of three 1 m x1 m quadrates each spaced one metre apart. The top left-hand corner and the top right hand corner of the plot under the arrays will be permanently marked with a steel stake or similar. These will serve as reference points for placing quadrats. From these points, tape measures could be used to place each quadrate. It is not recommended that the plot in the int-row spaces be permanently marked as it is likely to be subject to occasional vehicular traffic. The distance from the plot under the array to that in the inter row space will be depended on the final construction layout and will be recorded during the monitoring. The arrangement at each monitoring location is illustrated below.  • It is suggested that monitoring plots be established at a minimum 10 locations across the array area. For each quadrat at a monitoring location the following will be recorded: ○ Total alive and dead leaf litter vegetative cover using percentage covering 5% intervals. ○ Total cover of bare ground using percentage cover estimates in 5% intervals. ○ Dominant five species in each quadrant (or less if fewer species are present) and their percentage contribution to the living plant covering each quadrat. ○ Total biomass using the rising plate method. Measurements will be taken at the centre of each quadrat. ○ A digital photographic image. ○ Data recorded from each of the quadrats will be averaged to provide a single value for each plot. Only one physical quadrat should be required which can be moved to the correct location in each plot using the refence points and a tape measure. The actual distance from the reference points back to the inter-row plot will also be recorded on the data sheets to allow for accurate replication. ○ In addition to the plot data recorded above, incidental records of any priority weeds will also be recorded across the broader site. Refer to Estimating Groundcover (DPI, 2005) for visualising groundcover percentages. This will be performed by the proponent's appointed agronomist.

Action	Description
Analysis and interpretation of data	• The data can be simply analysed by plotting the variable recorded over time to identify trends in declining or increasing cover and biomass. The relative abundance of certain species could also be plotted over time to gain an understanding of species that are successful or declining. The data will be used to inform the requirement for management actions such as weed control, alterations to grazing regimes or seeding/planting as outlined in response to monitoring protocol.
Success criteria	• Percentage of grass cover – 70% is the target for rehabilitated areas (i.e. excluding internal access tracks/ roads and ancillary facilities). • No exposed bare ground for rehabilitated areas (susceptible to erosion and weed infestation). • No visibly active soil erosion for rehabilitated areas. • A data sheet including these indicators is provided in Appendix A.
Corrective actions	• Where success criteria are not met, steps detailed within Section 6.3 “Post Construction” shall be implemented.
Reporting requirements	• Fortnightly – recording sheet • Annual report

Response to results	• Management protocols will be adapted and implemented as required
	  ○ Weed control activities will be undertaken as per the weed control protocol.
	  ○ An agronomist will be consulted to determine if an effective approach to maintaining groundcover greater than 70% if this target is not being met.
	  ○ Trials may be considered where information gaps are identified.

7. Compliance management

7.1. Roles and responsibilities

Section 4.8 of the EMS describes the roles and responsibilities of the environmental management team for the Project. Specific responsibilities for the implementation of environmental controls are detailed in Section 6.

7.2. Training

All employees, contractors and utility staff working on site will undergo site induction training relating to the importance of maintaining groundcover (ensure ongoing perennial groundcover across site); minimising disturbance (reducing erosion potential); and the location of Environmental (No Go) Exclusion Zones (areas retained in good condition). The induction training will address elements related to the establishment and maintenance of groundcover including:

- Information on key pasture species within the Project area
- Information on key weeds know form the Project area and surrounds, and weed management
- CoA that relate to groundcover management and where to access information relevant to conditions, licenses, approvals and management plans

Further details regarding staff induction and training are outlined in Section 7 of the EMS.

7.3. Monitoring and inspections

Requirements and responsibilities in relation to monitoring and inspections are documented in Section 10 of the EMS. Monitoring and inspections required for this GMP are outlined in Section 6.

7.4. Auditing

Audits (both internal and external) will be undertaken to assess the effectiveness of environmental controls, compliance with this sub plan, infrastructure approval and other relevant approvals, licences, and guidelines. Audit requirements are detailed in Section 10.3 of the EMS.

7.5. Reporting

Reporting requirements and responsibilities are documented in Section 10.4 of the EMS.

An annual report will be provided and will include:

- Pasture and groundcover monitoring results
- Weed management results
- Grazing management decisions in response to groundcover monitoring results
- Rehabilitation actions in response to groundcover monitoring results.

7.5.1. Incident reporting

In accordance with Condition 7 of Schedule 4 of the Development Consent, the Planning Secretary must be notified in writing via the Major Projects website immediately after Neoen becomes aware of an incident.

Written notification of an incident must:

a) Identify the development and application number
b) Provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident)
c) Identify how the incident was detected
d) Identify when the applicant became aware of the incident
e) Identify any actual or potential non-compliance with conditions of consent
f) Describe what immediate steps were taken in relation to the incident
g) Identify further action(s) that will be taken in relation to the incident
h) Identify a project contact for further communication regarding the incident.

As per Appendix 7 of the CoA (Incident Notification and Reporting Requirements), within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, the Applicant must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.

The Incident Report must also include:

a) A summary of the incident
b) Outcomes of an incident investigation, including identification of the cause of the incident
c) Details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence
d) Details of any communication with other stakeholders regarding the incident.

All written requirements of the Planning Secretary or relevant public authority, which may be given at any point in time, to address the cause or impact of an incident must be complied with, within any timeframe specified by the Planning Secretary or relevant public authority.

Non-compliances

Non-compliances will be reported in accordance with Section 10.4 of the EMS, and the Planning Secretary (DPHI) must be notified in writing via the Major Projects website within seven days after the Applicant becomes aware of any non-compliance.

A non-compliance notification must identify:

- The development and the application number for it,
- Set out the condition of consent that the development is non-compliant with,
- The way in which it does not comply
- The reasons for the non-compliance (if known) and
- What actions have been, or will be, undertaken to address the non-compliance.

It should be noted that as per the requirements of Schedule 4, Condition 10, a non-compliance which has been notified as an incident, does not need to also be notified as a non-compliance.

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8. Review and improvement

8.1. Continuous improvement

Continuous management performance against environmental policies, objectives and targets for the purpose of identifying opportunities for improvement.

The continuous improvement process will be designed to:

- Identify areas of opportunity for improvement of environmental management and performance
- Determine the cause or causes of non-conformances and deficiencies
- Develop and implement a plan of corrective and preventative action to address any non-conformances and deficiencies
- Verify the effectiveness of the corrective and preventative actions
- Document any changes in procedures resulting from process improvement
- Make comparisons with objectives and targets.

8.2. GMP updates and amendments

A document review process ensures that environmental documentation including this GMP is updated as appropriate for the specific works that are occurring on-site. Reviews of the GMP are expected to be triggered as relevant, by:

- Independent Environmental Audit
- Internal audits
- Additional environmental aspects and risks
- Environmental near misses and incidents
- Project stage change between construction, operation, and decommissioning.

Should the document review process identify any issues or items within the documents that are either redundant or in need of updating, it is the responsibility of the Neoen Project Manager or delegate to prepare the revised documents.

In accordance with Condition 2 of Schedule 4 of the Development Consent, within 1 month, unless otherwise agreed with the Planning Secretary, of:

- The submission of an incident report under Condition 7 of Schedule 4
- The submission of an audit report under Condition 11 of Schedule 4
- Any modification to the conditions of this consent.

The Neoen Project Manager or delegate must review, and if necessary, revise the strategies, plans, and programs required under the Development Consent to the satisfaction of the Planning Secretary.

Where this review leads to revisions in any such document, then within four weeks of the review, the revised document will be submitted to the Planning Secretary for review and approval, unless otherwise agreed with the Planning Secretary.

In accordance with Condition 3 of Schedule 4 and agreement of the Planning Secretary, revised strategies, plan or programs may be prepared without undertaking consultation with all parties nominated under the applicable condition in this approval.

Only the Neoen Project Manager, or delegate, has the authority to change any of the environmental management documentation.

In addition, the processes described in Section 11 of the EMS may result in the need to update or revise this Plan. This will occur as needed.

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure – refer to Section 12.2 of the EMS.

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Appendix A Groundcover monitoring protocols

Bi-Annual Monitoring sheet

Quadrat observations

Quadrat 1		Quadrat 2		Quadrat 3	
Percent total living cover:		Percent living cover:		Percent living cover:	
Percent total litter/dead cover:		Percent total litter/dead cover:		Percent total litter/dead cover:	
Percent bare ground:		Percent bare ground:		Percent bare ground:	
Dominant species 1. 2. 3. 4. 5.	% cover	Dominant species 1. 2. 3. 4. 5.	% cover	Dominant species 1. 2. 3. 4. 5.	% cover
Rising plate reading:		Rising plate reading:		Rising plate reading:	
Image reference:		Image reference:		Image reference:	
General notes, priority weeds etc:					

Fortnightly groundcover monitoring

Guidance on monitoring groundcover

Step 1

Select the areas to monitor.

This should include 15 assessment locations (and 5 rapid assessments at each point), that is for each point you will walk 10 steps, stop and assess the quadrat, repeat this for a total of 5 assessments at each point. This is a more rapid approach to the Annual monitoring points. The approach is to enable staff to identify areas of decline and take reparative actions. The sites should include the Annual monitoring points, as well as but may also include “tracked” areas where the sheep are walking or camping.

Step 2

Note on the Farm plan where you have made these assessments.

Step 3

Make a 30cm x 30cm square. Visually assess the groundcover in this square and compare it with photo standards. Record the assessments in the proforma table provided.

Step 4

Photographic records.

Photographic records can be used in conjunction with the visual assessment as a permanent reminder of what the pasture cover was like when being assessed. It is important to take the photos in the same spot each time and are taken approximately at the same times of the day.

Step 5

Calculate the average for each assessment location (Add all 5 percentages together/5).

Groundcover record assessment

Assessment location	Date of assessment	Sample number *(e.g., 1, 2, 3 etc.)*	Percentage groundcover	Average Percentage groundcover	Photographic Reference
1	20/04/2023	1	70	=(70+90+55+60+75)/5 = 350/5 **= 70%**	
		2	90		
		3	55		
		4	60		
		5	75		

Appendix B Department of Environment and Planning - amendment to Mitigation Measure S02

Department of Planning and Environment

Our ref: SSD-10288

Alexis Good
Project Manager
Neoen Australia Pty Ltd
Level 6 / 16 Marcus Clarke Street
Canberra, ACT, 2601

21/11/2023

Subject: Culcairn Solar – Ground cover management during operations

Dear Ms. Good

I am writing in response to your correspondence of 31 October 2023 regarding groundcover management during the operation phase of the Culcairn Solar Farm.

The Department has carefully considered the information provided and notes the following:

- The Ground Cover Management Plan (GWP) forms part of the environmental management system for the project but does not require approval by the Planning Secretary;
- The proposed amended language to mitigation measure S02 suggested in your correspondence is reasonable. However:
  - careful planning during the construction phase is needed to help protect topsoil and maintain the agricultural land capability of the site;
  - where possible, topsoil should be salvaged from areas that will be heavily trafficked and/or permanently accommodate buildings, transformers, car parks etc. Salvaged topsoil should be used on site to reinstate disturbed areas;
  - construction work should be planned to minimise the compaction of soils by keeping vehicle and equipment movements to essential movements;
  - in addition to setting a minimum ground cover rate for destocking, it is recommended that the rate also be applied when restocking areas; and
  - seasonal considerations should be taken into account when stocking and oversight by Neoen will be necessary to check the site is not overstocked and ground cover maintained.

As you have noted, the requirements of Condition 12 of Schedule 3 of the development consent apply and will not be modified by the GWP:

> *The Applicant must maintain the agricultural land capability of the site, including:*
> *(a) establishing the ground cover of the site within 3 months following completion of any construction or upgrading;*
> *(b) properly maintaining the ground cover with appropriate perennial species and weed management; and*
> *(c) maintaining grazing within the development footprint, where practicable,*

unless the Planning Secretary agrees otherwise.
You are reminded that if there is any inconsistency between the GMP and the Development Consent, then the requirements of the Development Consent prevail.

If you have any questions, please contact Keren Halliday, who can be contacted on 0282896444.

Yours sincerely

Iwan Davies
Director
Energy Assessments

As nominee of the Planning Secretary