DRAFT

Draft Vegetation Management Plan for The Point Solar Farm

Contract Report No. 6621h-iii

Providing outstanding ecological services to sustain and improve our environments

Wildlands

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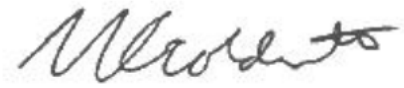

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1.0 Introduction

Far North Solar Farms Ltd (**FNSF**) is preparing an application for approval under the Fast Track Approvals Act (2024) for a proposed solar farm located near the township of Twizel in the Mackenzie Basin (**The Point**). The proposed solar farm site is located on approximately 678 hectares of flat with farmland to the north and rivers on the eastern and western boundaries. FNSF intends to install 720,048 solar panels across the site (Figure 1), with a 3.8-metre gap between each panel. The periphery will not be developed; it will be used for flora and fauna management and enhancement.

Wildland Consultants Ltd (Wildlands) has previously prepared an Assessment of Ecological Effects (AEE, Wildlands 2025a), and subsequent flora and fauna surveys, which have identified important ecological features at the site, including Threatened and At Risk birds, lizards and terrestrial invertebrates. While vegetation values on the site are low, Threatened and At Risk plants and their habitat were identified outside the site in adjoining habitats around the periphery.

The AEE identified a need for specific management plans to manage effects on flora and fauna on-site, and to inform future management strategies in the context of the development. This included the development of a Vegetation Management Plan (**VMP**) to manage indigenous vegetation at the site and minimise the risk of introducing pest plants and associated threats to biodiversity values present at the site. The Canterbury Regional Policy statement includes provisions for protecting and enhancing indigenous biodiversity.

The following management plan is one of the five management plans associated with this development (the other management plans relate to lizards, invertebrates and avifauna) and details the measures recommended for minimising the introduction and spread of pest plants at the site.

The purpose of this plan is to maintain and enhance existing indigenous vegetation values, both on and adjacent to the site through monitoring and enhancing Threatened and At Risk plant species, together with the avoidance and management of potential edge effects.

1.1 Project site and context

1.1.1 Ecological context

The proposed solar farm site is located within the Pukaki Ecological District, characterised by dry outwash plains between Lakes Tekapo and Benmore, and mostly below 600 metres above sea level. These outwash plains are a Naturally Uncommon Ecosystem (Inland Outwash Gravels; Williams et al. 2007) classified as Critically Endangered (Holdaway et al. 2012). This site is also classified a 'critically under protected' land environment, with more than 30% indigenous vegetation left and less than 10% indigenous vegetation protected (Cieraad et al. 2015).

1.1.2 Site description

The site is at the northern end of Lake Benmore, on a large flat outwash plain, approximately 10 kilometres to the southeast of Twizel township. The site is farmed and bordered by farmland to the north, with the DOC-administered river corridors of Whakatipu/Twizel River along the western boundary and the Pūkaki River and Takapō/Tekapo River along the eastern boundary.

The site is currently used for dry stock farming and subdivided into fenced paddocks for rotational grazing and cultivation for grass/hay/baleage production. There is a pivot irrigator off site to the northwest, which is used for fodder cropping. Most of the site was cultivated and/or drill seeded, as recently as 2018. This has led to a widespread distribution of improved pasture grassland, across the site. However, the eastern part of the site does not appear to have been cultivated since (based on

available aerial imagery), and the grassland in this area is now depleted and dominated by pasture weeds such as mouse-ear hawkweed (*Pilosella officinarum*), sorrel (*Rumex acetosa*) and haresfoot trefoil (*Trifolium arvense*).

1.2 Implementation of the plan

The previous Assessment of Ecological Effects (**AEE**) for the site undertaken by Wildlands includes the following reports:

- Wildland Consultants (2023). *Ecological Assessment for Two Solar Farm Sites in the Mackenzie District, South Canterbury*. Wildland Consultants Contract Report No. 6621. Prepared for Far North Solar Farms Ltd. 45pp.

- Wildland Consultants (2025a). *Assessment of Ecological Effects for the Proposed Solar Farm Between the Lower Reaches of the Tekapo and Twizel Rivers, Mackenzie District.* Wildland Consultants Contract Report No. 6621c. Prepared for Far North Solar Farms Ltd. 57pp.

Further measures to address effects on indigenous vegetation are detailed in the following plans, which are intended to be implemented in conjunction with the draft VMP:

- Wildland Consultants (2026). *Draft Lizard Management Plan for the Point Solar Farm, Twizel*. Wildland Consultants Contract Report No. 6621h-v. Prepared for Far North Solar Farms Ltd. 48pp

- Wildland Consultants (2026a). *Draft Pest Mammal Management Plan for The Point Solar Farm, Twizel.* Wildland Consultants Contract Report No. 6621h-iv. Prepared for Far North Solar Farms Ltd. 29pp.

Wildland Consultants (2026b). *Draft Terrestrial Invertebrate Management Plan for The Point Solar Farm, Twizel.* Wildland Consultants Contract Report No. 6621h-ii. Prepared for Far North Solar Farms Ltd. 31pp.

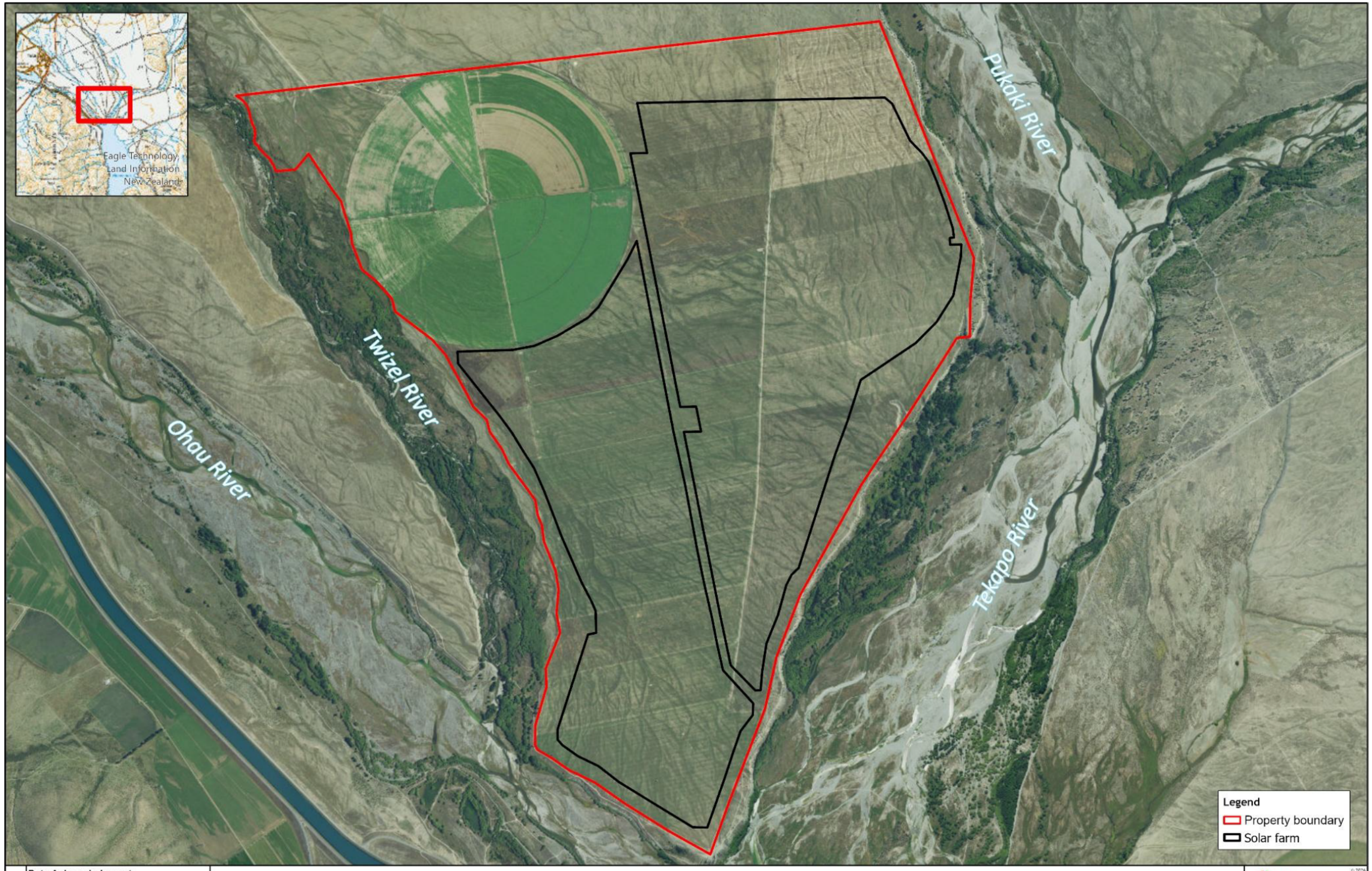

Figure 1. Location of the proposed Point Solar Farm, MacKenzie Basin

2.0 Summary of Indigenous Vegetation Values

Results of the quantitative vegetation survey (provided in a separate memo, 6621h-vi)) confirm findings of earlier surveys undertaken in May 2023 and 20 January 2026 (Wildlands 2024, 2026) that there is little indigenous vegetation present within the footprint of the proposed solar array. As stated above, most of the site has been substantially modified by cultivation and clearance of indigenous vegetation and is now improved pasture and depleted (or low-producing) grassland.

The least modified areas of the site are around the periphery, where small pockets of indigenous dryland and shrubland vegetation persist. The most significant of these areas comprise two gullies on the eastern side of the site. The shrublands in these gullies meet the Mackenzie District Plan (MDP) definition of indigenous vegetation, while the dry shoulders at the top of gully slopes support habitat of significant dryland plant species. Maniototo peppercress (*Lepidium solandri*, Threatened - Nationally Critical) was found on margins of the southern gully during the targeted threatened plants survey in February 2026.

Three other At Risk species, mat daisy (*Raoulia australis*; At Risk - Declining), *Carmichaelia vexillata* (At Risk – Declining)[1], and resurrection lichen (*Xanthoparmelia semiviridis*; At Risk - Declining) were also recorded in these periphery areas.

Several other Threatened and At Risk species typical of indigenous drylands and Inland Outwash Gravel terraces are present on the surrounding terrace edges, outside, but adjacent to the site. This includes a nationally significant population of Maniototo peppercress that occurs along the southern and eastern terrace edges, within 20 to 150 metres of the site boundary.

3.0 Vegetation Management

3.1 Management strategy

Ecologically appropriate indigenous planting is proposed within the Lizard Management Plan (**LzMP**), Terrestrial invertebrate Management Plan (**TIMP**), and Landscape Management Plan (**LMP**). Given the low vegetation values within the works footprint and negligible effects on indigenous plants (within the footprint), as well as difficulty associated with planting in this environment, further planting is not recommended for vegetation management.

Instead, vegetation management will focus on the enhancement and monitoring of existing indigenous dryland habitats on the periphery and adjoining DOC land through targeted weed control, seasonal grazing, experimental scrape trails (to remove patches of dense exotic grass), and management of edge effects.

[1] Threat rankings for vascular plants are from de Lange et al. (2024).

3.2 Threatened plant monitoring and management

3.2.1 Maniototo peppercress

The Maniototo peppercress populations on and around the site require detailed monitoring and adaptive management to ensure populations on the site are enhanced and potential cross-boundary edge effects are avoided.

Maniototo peppercress is a small, long-lived (>10 years) perennial dioecious herb (Plate 1). Its habitat includes short and tall tussock grassland, bare hillsides, salt pans, grey scrub, and other poorly vegetated ground as well as open clay or salt pans, limestone talus, gravel veneers overlying schist, mudstone, or eroded silts and clays[2].

Plate 1 – Maniototo peppercress near the western boundary of the site (December 2022).

Flowering is September–January and fruiting September–February. It has mucilaginous (gel-like coating/mucilage) seeds, which are dispersed by attachment and possibly wind and water (Thorsen *et al.*, 2009). Plants can be propagated from fresh seed.

Threats

There are less than 1,000 plants are known in the wild and it is threatened by lack of habitat protection, weed competition, animal browsing, and for most sites changes in land-use management.

3.2.2 Baseline survey

Considerable search effort has been undertaken for threatened plants on the site. However, a further baseline survey is required to consolidate known records, check for additional plants, and record location and condition of plants on the site, and surrounding terrace edge (off site). Additionally, the baseline survey will record other threatened plants associated with indigenous dryland communities and map potential habitat extent on and off the site.

[2] https://www.nzpcn.org.nz/flora/species/lepidium-solandri/

The baseline survey will be undertaken in spring/summer during the flowering season by a suitably qualified botanist or ecologist. Prior to undertaking the survey, a detailed methodology will be developed, which is recommended to include and record:

- Condition and sex of Maniototo peppercress plants.
- GPS and mark location of Maniototo peppercress plants[3].
- Habitat and soil type/condition.
- Location and species of any other Threatened of At Risk plants.
- Habitat mapping, i.e. extent of suitable habitat.
- Photopoints (establishment and recording).
- Immediate and potential threats (e.g. weeds, browse, human activities, no immediate threats).
- Management actions (if any).

3.2.3 Maniototo peppercress enhancement

Seed collection and propagation

All New Zealand *Lepidium* species are known to be easily cultivated from fresh seed (Allen 2000) and the species has considerable potential for recovery via transplanting cultivated plants into the wild. However, there are limiting factors for this recovery method, including lack of suitable habitat for planting and potential lack of genetic variation (e.g. increased risk of catastrophic loss from pests, diseases, etc.).

Therefore, it is recommended that seed is collected not only from plants on site but those off site as well, including the surrounding DOC land (which will require a permit). Plants should then be propagated locally under site-matched conditions before being transplanted within suitable habitat at the site.

Identify habitat for planting

Suitable habitat mapped during the baseline survey will used to identify potential planting areas. These should be areas without existing Maniototo peppercress plants.

Planting targets

A minimum of 50 plants should be propagated and planted in suitable habitat on the site every year. Planted Maniototo peppercress should be marked with GPS and monitored annually for establishment success as per Section 3.2.4.

3.2.4 Ongoing monitoring

Maniototo peppercress plants identified during the baseline survey along with those planted on site as part of the recovery programme should be monitored. Monitoring for Maniototo peppercress should initially be undertaken annually and ideally in conjunction with other restoration monitoring.

[3] To avoid disturbance and drawing unwanted attention to their presence, Maniototo peppercress plants will be marked with a steel peg 0.3 metres to the north. If the plant cannot be found in subsequent monitoring, the peg shall be located with a metal detector to confirm absence of the plant. No other marking will be used, unless required to alert other management activities, e.g. planting and weed control, where flagging tape will be temporarily attached to the peg.

Monitoring will be conducted by a suitably qualified botanist or ecologist using a range of methods including:

- Establishing representative photopoints.
- Walk-through surveys to monitor:
  - Plant health (e.g. die back and disease).
  - Location of and abundance of weeds (using GPS waypoints).
  - Animal browse damage and sign (e.g. faecal pellets, paw prints, etc).
- Establishing permanent monitoring transects.

More detail on monitoring is discussed in Section 8 of this report.

3.2.5 Responses to monitoring

Potential edge effects

If monitoring indicates edge effects are occurring, the following measures will be implemented:

- Review cause of edge effects and:
  a) Reduce watering of landscape screening plants and reduce or cease watering if required.
  b) Increase light grazing (within footprint and periphery) to reduce/control exotic grass cover.
  c) Intensify control of invasive weeds that compromise dryland plant communities (including exotic grasses).

Maniototo peppercress plantings

When monitoring indicates that planting success is low (e.g. high seedling mortality) the recommended responses are:

- Review cause of planting failures and:
  a) Modify planting technique (e.g. use larger grade plants, improved soil preparation).
  b) Change planting locations (e.g. survey and select new suitable habitat/planting sites).
  c) Intensify weed control for invasive weeds, that compromise dryland plant communities (including exotic grasses).
  d) Control of browsing pest animal (e.g., rabbits, deer, possums).
  e) Increase propagation and planting of Maniototo peppercress.

3.3 Adaptive seasonal grazing

Indigenous shrubland and grassland require different management techniques. For example, grazing by sheep may be beneficial to indigenous dryland grasslands and herbfields. In contrast, year-round grazing adversely affects shrubs while grazing in spring and summer may benefit some shrubs by controlling rank grass.

The grassland around the periphery also needs to be managed for fire risk, although it is not known how the grasslands on the site will respond without active management (e.g. fertilization, cultivation etc.). However, based on survey observations, the cultivated grassland areas are expected to transition into depleted grassland habitat similar to the eastern side of the site (Wildlands 2026). In grazed areas without adequate grass or clover, sheep will begin to target indigenous herbs and shrubs that may be regenerating at the site. Additionally, the rabbit-proof fence around the site boundary is current in disrepair and inadequate for rabbit/hare exclusion.

Therefore, adaptive seasonal grazing should be implemented around the site's periphery, beyond the panel footprint. This area will be subdivided with fences that connect east-west between the boundary and the security fences (Figure 2). The grassland is already quite depleted in many of these paddocks, especially along the east of the site, and initially sheep should be grazed rotationally over the spring-summer growing season. Sheep should then be excluded for these areas from late autumn to early spring (May to September inclusive).

Grass growth/cover abundance should be monitored annually (during late summer/early autumn) to adapt the grazing regime as required. If grass exceeds 50% in paddock or presents a fire risk, then it should be grazed with sheep. Cattle grazing should be avoided due to effects of their trampling on both soils and indigenous vegetation. The impacts of grazing on vascular plants will also be monitored (refer Section 8).

3.4 Monitoring and management of edge effects

Edge effects occur where environmental conditions change at the boundary between different habitats. Modifications associated with the solar farm could alter local microclimate conditions (e.g. soil moisture, sunlight, and wind exposure) and potentially influence adjacent dryland habitats.

Solar panels may locally modify surface conditions. Shading beneath panels could create cooler, more humid conditions that favour grass and exotic weed growth. Conversely, panels may intercept rainfall during light events, which—combined with evaporation—could reduce soil moisture beneath the arrays and limit plant growth. These effects may vary seasonally and could influence adjacent habitats where hydrological connectivity exists or where on-site habitat conditions change substantially.

Landscape planting required for visual screening will also require irrigation during establishment. If applied excessively, or during strong winds, irrigation could potentially affect adjacent dryland habitats where hydrological connectivity occurs.

Overall, the likelihood of these activities generating measurable edge effects is considered low, given the proposed management measures and the highly permeable outwash gravel substrate. In addition, it is important to note that solar panels will not be positioned near the edge of the site. However, as a precaution, monitoring for edge effects will be undertaken, with adaptive management responses implemented if monitoring indicates adverse changes (refer Section 8). Landscape planting will use drought-tolerant species that are hardened to local conditions prior to planting, thereby minimising irrigation requirements.

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Data Acknowledgment

Map contains data sourced from LINZ
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Figure 2. Vegetation management and monitoring, The Point Solar Farm, Mackenzie Basin

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4.0 Weed Management

4.1 Weeds and pest plants detected around the site

Seven plant species recorded around the site[1] are listed as either 'Pest' or 'Organisms of Interest' (OoI) in Environment Canterbury's Regional Pest Management Plan (CRPMP 2018-2038; Table 1). An additional sixteen plants have been identified as ecological weeds (McAlpine and Howell 2024), which include several common pasture grasses. Three species found at the site are also listed as unwanted organisms under the Biosecurity Act 1993 (The National Pest Plant Accord; NPPA).

Table 1 – Ecological weeds, Pest plants, Organisms of Interest and unwanted organisms (Weed, Pest OoI and NPPA respectively) listed in McAlpine and Howell (2024), the CRPMP and NPPA that were recorded at the site.

Scientific Name	Common Name(s)	Growth Form	Pest Status
CRPMP Pests and Organisms of Interest			
Cytisus scoparius	Broom	Shrub	Pest
Echium vulgare	Vipers' bugloss	Herb	OoI
Hypericum perforatum	St John's wort	Herb	OoI
Lupinus polyphyllus	Russell lupin	Herb	Pest
Pilosella officinarum	Mouse-ear hawkweed	Herb	NPPA/OoI
Pinus contorta	Lodgepole pine/wilding conifer	Tree	NPPA/Pest
Pseudotsuga menziesii	Douglas fir/wilding conifer	Tree	Pest
Environmental weeds			
Agrostis capillaris	Browntop	Grass	Ecological weed
Bromus tectorum	Brome	Grass	Ecological weed
Cirsium arvense	Californian thistle	Herb	Ecological weed
Cotoneaster franchetii	Franchet's coteoneaster	Shrub	Ecological weed
Cytisus scoparius	Broom	Shrub	Ecological weed
Dactylis glomerata	Cocksfoot	Grass	Ecological weed
Echium vulgare	Viper's bugloss	Herb	Ecological weed
Festuca rubra	Red fescue	Grass	Ecological weed
Hypericum perforatum	St John's wort	Herb	Ecological weed
Lolium arundinaceum	Tall fescue	Grass	Ecological weed
Lolium perenne	Ryegrass	Grass	Ecological weed
Sedum acre	Stonecrop	Herb	Ecological weed
Verbascum thapsus	Woolly mullein	Herb	Ecological weed
Rosa rubiginosa	Sweet brier	Shrub	Ecological weed
Populus alba	White poplar	Tree	Ecological weed
Salix × fragilis	Crack willow	Tree	NPPA/Ecological weed

[1] Within or on land immediately adjacent.

4.2 Ecological weeds and pest plants in the surrounding area

Some ecological weeds and pest plants that are not currently found at the site are likely to be present in the surrounding area. The proximity of the site to the township of Twizel provides an increased risk of novel ecological weed invasions of species originating from domestic gardens, where species such as rowan (*Sorbus aucuparia*; OoI), and silver birch (*Betula pendula*; OoI) have been widely planted.

4.3 Key threats

The proposed solar farm will result in a change in current land-use and management. The proposed panel area will no longer be grazed or cropped for hay/baleage; however, FNSF intends to graze sheep between the solar panels and around parts of the periphery for fire risk management but exclude livestock/grazing from indigenous plantings and fauna management areas. Currently, grazing and cropping are likely to be limiting the establishment and spread of woody weeds. Although the panel area will remain grazed, this is still considered a change in land use. The change in land use and management combined with construction related vegetation clearance and soil disturbance has the potential to accelerate the spread of woody weeds at the site.

Woody species pose the greatest threat to the ecological values present. The establishment of woody weeds has the potential to displace and out-compete indigenous plants present through shading. Wilding conifers are present in the surrounding adjacent habitat and will continue to spread and may become a seed source at the site[1].

Six[2] woody ecological weed species have been detected on the site to date:

- Broom
- Wilding conifers (lodgepole pine, Douglas fir)
- Sweet brier
- White poplar
- Crack willow
- Cotoneaster

Wilding conifers are referred to in the CRPMP, which covers multiple species that include pines (*Pinus* spp.), larch (*Larix decidua*), and Douglas fir. Wilding conifers can have significant ecological impacts on indigenous ecosystems, particularly in low-stature vegetation where they outcompete indigenous vegetation. Wilding conifers can spread through open environments quickly (especially lodgepole pine) and can have negative impacts on soils and indigenous flora and fauna. They can also affect the hydrology of wetlands and other aquatic habitats and increase the risk of wildfires (CRPMP 2018).

Sweet brier and broom occur throughout the site, while wilding conifers and cotoneaster are present on the site margins and adjacent land. If uncontrolled, these species could spread within the panel area and into habitat restoration areas and/or areas with ecologically significant vegetation. Threatened and At Risk plants have been detected around the edges of the panel area (Wildlands 2024, Wildlands 2026); species such as Maniototo peppercress, *Raoulia australis*, and *Carmichaelia vexillata* are low-growing and particularly susceptible to shading by woody weeds.

[1] From an operational perspective, FNSF is also likely to prevent the establishment of tall woody weeds within the panel area to ensure there is no shading of solar panels.

[2] All wilding conifers (including the species found in survey) are counted as one species for pest management.

Crack willow and white poplar are present just outside of the site boundary. These species both spread from propagules, by suckering, and from dumped material. Crack willow prefers damper conditions around old river channels and wetlands (which are not present on the site) and is not consider a biosecurity risk in the context of the site. White popular will tolerate conditions on the site (e.g. drought, poor soils, little shade), although there is no evidence of current spread into the panel, restoration reserve areas, or significant dryland habitats. If the spread of white popular or any other exotic tree not listed is detected, control should be undertaken.

Russell lupin is a significant threat in dryland habitats and braided rivers in Canterbury and may pose a threat to habitat restoration and significant dryland habitats adjacent to the site if it becomes more widespread. Based on previous site visits it is not anticipated to be a key threat, however, this should be monitored and controlled if it appears to become more widespread across the site or is considered to provide a seed source to the surrounding area.

4.4 Weed and pest plant control methods

4.4.1 Search and control

Searches of the development area should be undertaken every three years to locate and control wilding conifers and other woody weeds, commencing one year following the beginning of development at the site. Non-woody species such as Russell lupin should be considered for control when observed, especially if they appear to be increasing in number. The search area needs to include the panel footprint and periphery (Figure 2). The wider panel area should be searched by systematically walking north to south. An appropriate distance between lines walked is 30-50 metres, which will allow for weeds to be observed either side of the line walked. Areas around At Risk plants should also be searched for woody weedy establishing close to At Risk plants (Figure 2).

The search will need to be undertaken at a fine resolution and the entirety of the areas where At Risk plants are located will need to be searched. An appropriate distance between lines for finer resolution searches is 5-10 metres. When woody weeds are detected, control should be undertaken using the methods outlined below. Pest plant surveillance and control should be undertaken at least every three years. Wilding conifers produce cones every three to four years, so regular control will reduce the risk of spread from the site into the wider environment.

4.5 Control methods

4.5.1 Wilding conifers

Wilding conifers can be controlled through manual pulling, cut and pasting stems, or drilling and filling, depending on the size (Table 2). Small seedlings (<2cm diameter at the base and typically <0.5m tall) can be hand pulled, ensuring the whole plant is removed including roots.

Medium-sized saplings and trees (2-20 cm diameter at breast height) can be removed by either cutting or sawing at the base of the trunk as close to the ground as possible and applying a Glyphosate based gel to the entirety of the cut trunk.

It is unlikely that large trees will be detected in the future on site as small and medium trees will be detected and removed before they reach >20cm diameter at breast height, provided surveillance and control is undertaken every three years. Removal of large trees can be achieved through either drilling and poisoning or felling techniques. A chainsaw or a large drill bit should be used for drilling, with cuts/holes bored into the trunk, through the bark and into the cambium of the tree. The cuts/drill holes should be then filled with Glyphosate, poisoning the tree. Poisoned trees can be left in situ to break down, however, depending on the location and proximity to solar panels, removal by an arborist may be required to ensure infrastructure is not damaged.

Hand-pulling, cut and paste, and drilling are preferable methods for control to reduce impacts on lizards and invertebrates present on the site. Other methods such as spraying will result in more herbicide being released into the environment, which could cause injury or death to lizards and invertebrates present.

Table 2 – Wilding conifer size guide and control methods.

Wilding Size	Diameter	Height	Control Method
Small	<2 cm at the base	<0.5m	Hand-pulling
Medium	2-20cm at breast height	Often over 1m	Cut and paste
Large	>20cm at breast height	Often taller than 10 metres	Drill and fill

4.5.2 Other ecological weeds and pest plants

Other woody weeds present such as broom and sweet brier can be controlled by the methods outlined above. If additional ecological weeds and pest plants and are detected on the site, for example novel garden escapes, the New Zealand Weedbusters website[1] should be consulted to determine the most appropriate control method for that species.

Herbicide spray should be avoided if there is any risk of it blowing onto grasshopper habitat (short-stature vegetation, bare open soil, and herbfield). Indigenous grasshoppers are highly sensitive to chemical sprays.

5.0 Experimental Dryland Restoration (Habitat Creation)

5.1 Overview

Disturbance is a natural and important feature of dryland environments (Rogers et al. 2005) and there is evidence that mechanical or artificial disturbance can be used to facilitate indigenous regeneration process in these environments (Hutchison et al. 2020). Open stoney ground with sparse vegetation cover is also the preferred habitat for some species of Threatened and At Risk grasshopper and wētā found in the Mackenzie District (Wildlands 2026b).

Accordingly, it is proposed to identify five sites with dense exotic grass or weeds around the periphery of the site which can be mechanically cleared or scraped to induce dryland habitat.

5.2 Methodology

5.2.1 Confirm treatment areas

The areas for disturbance treatment will be confirmed and refined on site prior to implementation. However, it is suggested that the 10-metre setback between landscape planting and boundary along the southern and eastern margin would be a suitable location, as it is close to existing dryland communities (for seed source) and there is a need to manage grass around the periphery of the site (Figure 2). Other suitable areas include the eastern margin close to other known Maniototo peppercress populations (Figure 2).

[1] https://www.weedbusters.org.nz/

It is recommended that each treatment area is a minimum of 200 m^2 (e.g. 10 x 20 metres).

5.2.2 Habitat assessment and mapping

Current vegetation mapping is too coarse to identify significant features requiring avoidance or inclusion in the experimental treatment. Disturbance treatment zones will therefore require further mapping to identify flora and fauna values and ensure impacts are confined to exotic-dominated areas without fauna values.

5.2.3 Establishing treatment sites

Once a treatment site is confirmed, it should be marked with metal waratahs at each corner before the topsoil is carefully scraped off to reveal the stony subsoil. The removed topsoil should be loaded into truck and removed from site.

Once established, three of the metal waratahs should be removed, leaving one as permanent marker for future monitoring. Corners should also be marked with GPS waypoints.

5.3 Measurements and reporting

5.3.1 Ecological data collection

Baseline surveys will be required before the implementation of disturbance treatments. Biodiversity indicators that should be measured during baseline data collection, as well as subsequent collections are outlined in Table 3. To accurately measure invertebrate values, invertebrate surveys will be required and should be based on methods outlined in the TIMP (Wildlands 2026b).

Data should be collected at least once every three years (for 15 years) and undertaken in conjunction with other vascular plant monitoring outlined in Section 8. Photopoints should also be established for monitoring at each disturbance site (See Section 8.2).

Table 3 – Attributes to be measured within monitoring plots prior to disturbance treatment, and for all subsequent data collection.

Biodiversity Type	Attribute	Action
Vegetation	Richness	Identify all plant species in the plot and count the number of species.
	Percentage cover	Percentage cover (a measure of relative abundance) of all plant species present.
	Recruitment	A count any new species since previous survey.
	Canopy height	Vegetative height of five random individuals in the canopy layer.
	Indigenous status	Calculate the ratio of exotic to indigenous species present.
Invertebrate	Species richness	Identify all invertebrate species in the plot and count the number of species.
	Relative abundance	Count the number of individuals per taxonomic order, e.g. Diptera (flies); Lepidoptera (butterflies and moths).
	Indigenous status	Calculate the ratio of exotic to indigenous invertebrate taxa present.

6.0 Biosecurity Management During the Development Phase

6.1 Biosecurity checks

Biosecurity checks and biosecurity cleaning of vehicles should be part of the Standard Operating Procedures (SOP) when moving vehicles between locations. Checks should be made that vehicles are not being used in locations where pests (not already present on site) or other unwanted organisms are known to be present. The use of machinery and tools on site risks the introduction of seeds of weeds not already present being transported to the site. For example, dirty tools or mud on tracks and tires could transport weeds to the site. All machinery used during works shall be checked and cleaned of debris and exotic pest species seeds prior to commencing works.

When necessary, for example when coming from outside of the Mackenzie Basin, vehicles and tyres should be checked and cleaned. Details on the distribution and risks posed by pests and other organisms within the region are managed by Environment Canterbury (ECan) through its Biosecurity programme and the CRPMP. The Official New Zealand Pest Register (ONZPR) managed by the Ministry for Primary Industries (MPI) also has the most up to date information about pests and disease-causing organisms in New Zealand.

6.2 Local materials

Gravel will likely need to be sourced for the establishment phase of the solar farm, for example building access roads. Gravel and soil will contain seeds and other potentially harmful organisms. If gravel or fill is brought in from outside the district, then there is an increased risk of introducing novel pest plants and other pathogens that are not already present at the site which could threaten the ecological values present at the site. Gravel should be sourced as locally as possible, preferably from the site. Alternatively, gravel should be sourced from as close to the site as possible, ideally from within the Mckenzie Basin, from a site where Russell lupin is not present.

6.3 Eco-sourcing plants

The Lizard Management Plan (Wildland Consultants 2026), Terrestrial Invertebrate Management Plan (Wildland Consultants 2026b), and the Landscape Mitigation Plan (RMM Landscape Architects 2026) specify the planting of indigenous vegetation at the site. The transport of plants to the site from other areas has the potential to introduce additional pest plants or pathogens not currently present on the site. This poses a potential threat to the ecological values at the site and therefore it is recommended that plants are eco-sourced from the local area.

Eco-sourcing is the propagation of indigenous plants from seeds (or sometimes cuttings) that have been collected from naturally occurring indigenous vegetation within the same ecological district (in this case the Pukaki Ecological District). The aim is to collect seed from as close to the planting site as possible to ensure that local genetic traits are maintained. The use of locally adapted plants will also help to maximise the survival rates of the restoration plantings. If eco-sourcing is not feasible, plants should be sourced as locally as possible.

7.0 Biosecurity Management During the Operational Phase

Biosecurity management during the 'operational phase' of the solar farm will require similar considerations to those outlined in the previous section relating the development phase. Protocols developed around cleaning vehicles and machinery during the development phase will still need to be followed. Additionally, monitoring and surveillance of pest plants and ecological weeds at the site are also recommended and are described in more detailed in the following section.

8.0 Monitoring and Surveillance

8.1 Vascular plant monitoring

8.1.1 Overview

The change in land use may adversely impact the vegetation values present at the site through a change in grazing regime and an increase in shade. It is recommended that vascular plant monitoring is undertaken over the proposed development area by a suitably qualified ecologist to ensure that populations of Threatened and At Risk plants are not being negatively impacted, particularly through shading by pest plants and ecological weeds. The vascular plant monitoring will have two components, walk-through qualitative monitoring and quantitative plot-based monitoring.

8.1.2 Qualitative monitoring

Qualitative monitoring will involve botanists searching areas of high-value vegetation at the edges of the panel areas and noting any observable change. This may also include noting increases or expansion of Threatened and At Risk plant populations. Within the wider site, searches should initially be undertaken annually to determine if any additional pest plants or ecological weeds that were not previously detected at the site are present and warrant control. This will also help to identify potential garden escapees from Twizel.

8.1.3 Quantitative monitoring

Maniototo peppercress

Monitoring for Critically Threatened Maniototo peppercress is detailed in Section 3.2 Threatened plant monitoring and management.

Transect monitoring

Permanent monitoring transects (with multiple quadrats) will be established running from the solar farm (including footprint and periphery buffer zone) across the adjacent terrace edges and down the terrace risers to monitor Threatened and At Risk plants and potential edge effects. A minimum of 25 transects will be established along the western, southern, and eastern edges of the site, perpendicular to the terrace edge.

The upper end of the transect will be permanently marked with a steel waratah (or similar), and an accurate sighting compass used to record the bearing that points towards the terrace edge. Each transect will have a permanent photopoint at the start and end of each transects, taken 1.5 metres above ground. A 100-metre fibreglass measuring tape will run from the start of the transect along the bearing and 2m^2 quadrat will be placed along the northern side of the tape at 25-metre intervals, starting at the waratah (i.e. 0m). Removal pegs will be used where required to secure the tape for

measurement along the transect. Some transects may be several hundred metres long and require the tape to be run multiple times.

A modified Reconnaissance (RECCE) method based on Hurst et. al (2022) will be used to estimate percentage cover and abundance of each plant species within the quadrates.

Plant community composition and structure will be measured by foliar cover of all plant species in five height tiers (5-12m, 2-5m, 1-2m, 0.3-1m, and <0.3m). Within each height tier, the percentage cover of foliage for each species will be estimated visually using six cover classes (<1%; 1-5%; 6-25%; 26-50%; 51-75%; 76-100%). Ground cover will be estimated (percent vegetation, non-vascular plants, litter, bare ground, rock), and representative quadrate photographs for each vegetation type will be taken. Orthogonal widths and heights will be taken for any woody species.

8.1.4 Timing

Vascular plant monitoring and transects should be established and measured prior to work commencing at the site to capture baseline data. The first transect remeasure and monitoring survey should take place one year after works begin at the site, with subsequent remeasurement/monitoring every three years thereafter for the first 15 years. After 15 years the frequency and need for further monitoring will be reviewed.

8.1.5 Triggers and adaptive management

The transect measurements and vascular plant monitoring will be used to inform whether current management and pest plant control are effective and determine if changes to the pest plant control methods, timing, or search effort require amendments. Specifically, if a detectable increase in pest plants and ecological weeds occurs, FNSF will be notified and will ensure additional control effort occurs at the site. Similarly, if a new ecological weed or pest plant occurs at the site and is not being managed, FNSF will be notified to ensure contractors are aware of the issue and will control the spread of the plant.

If a statistically significant decline (i.e. >20% decline over two monitoring cycles) in the abundance of an indigenous dryland species and/or Threatened or At Risk plant species is detected at the site a management response will be triggered. Additionally, if a decline is observed by the ecologist during qualitative monitoring, extra days will be spent monitoring to determine the nature of the decline, and the appropriate management.

Adaptive management will inform the approach taken. If the cause in decline is obvious, for example pressure from weeds/pest plants, then additional control will be undertaken. If the cause is less obvious, further investigation will be undertaken, likely including consultation with DOC and/or engaging a consultant who specialises in dryland plants and management to determine the best course of action. An adaptive management approach will be implemented due to uncertainty regarding plant community responses to land-use change, potential reductions in rabbit browse pressure, and the factors contributing to any decline in Threatened or At Risk plant species at the site.

8.2 Photopoints

8.2.1 Overview

In addition to the photopoints established with the monitoring transects a network of general photopoints will be established throughout the site to help track changes over time. Ideally, the photopoints will help to demonstrate that the interventions outlined in previous sections are successful and no extensive spread of pest plants or ecological weeds has occurred.

Photopoints are photographs taken at regular intervals at the same location. Photographs are taken in the same direction and thus have the same composition. This allows relatively slow processes, such as plant growth and changes to habitats, to be monitored over time. Photopoints are simple to interpret and are therefore ideal for monitoring in situations where it is desirable to track changes in vegetation over any timeframe. Once a series of photopoint photographs has been recorded over several years, any incremental but substantial changes can easily be seen.

8.2.2 Creating Photopoints

Photopoints are easy to establish, following some basic principles.

- Select a photopoint taken from a location marked by a solid object such as a gate or fence post that is not likely to be moved. Mark the photopoint location for easily locating the site in the future and record the coordinates of the location on a topographic map, with a GPS unit, or as a sketch.

- Select a frame that will show the item of interest or that you think will be suitable to document change at the site. Make sure it is a frame that can easily be repeated in the future and that will enable the perspective to be maintained over the years. This can be achieved by including a significant object in the picture such as a large rock, a fence post or stream along one edge, hills or buildings in the background, or a fence post or gate.
- Pictures should be taken annually on the same date each year (or as close as possible to the annual date), and at the same time of day. Minimising shadows is desirable to obtain a good quality picture, so if possible, take the photograph on overcast or cloudy days rather than sunny days.

- When repeating the photopoint, take a copy of the last photograph to confirm the location and frame. Retaking photographs is relatively easy if a simple frame is set up the first time with a long-term reference point in the centre or edge of the frame. A minimum of two to three photographs should be taken at each photopoint and label each photograph with the location and date taken.

Photopoint pictures do not provide quantitative data but the images can be used to intuitively show the changes occurring at a site and can be linked to descriptive information.

- In addition to the photopoints undertaken for Maniototo peppercress monitoring, six locations throughout the site have been identified as potential locations for establishing photopoints (Figure 2. If required, additional photopoints can be established to monitor restoration planting areas or areas with higher value indigenous biodiversity at the site.

9.0 Summary of Vegetation Management and Timing

The requirements for vegetation management for the duration of the solar farm's construction and operational phases are summarised in Table 4. Prior to the commencement of works on the site, management needs to be implemented to avoid and monitor effects on threatened vegetation including baseline monitoring, enhancement (propagation and planting), seasonal grazing, habitat creation, and weed control.

During the development phase, biosecurity controls and will need to be established prior to work commencing at the site. During the development phase, all machinery (including vehicles) should be checked and cleaned and any plants or materials being used at the site should be sourced locally. Photopoints should be established before work at the site commences.

Throughout the operational phase, biosecurity protocols and spill and fire management protocols will need to be followed, and any additional materials or plants bought to the site during the operational phase should be sourced locally. Weed control should be undertaken every three years starting one year after site establishment begins. Vascular plant monitoring should be undertaken every three years, starting one year after site establishment begins, with plots established prior to works commencing. Photopoint monitoring is to occur annually.

Table 4 – Summary of biosecurity management procedures to be undertaken throughout the development and operational phases of the proposed solar farm.

Action	Timing
Pre-development Phase	
Maniototo peppercress - baseline survey	Spring/summer before the commence of works.
Baseline survey of disturbance treatment sites	Spring/summer before the commence of works.
Eco-sourcing plants	At least one year prior to planting and ongoing (whenever plants are sourced for planting).
Development Phase	
Maniototo peppercress – seed collection and propagation	Spring/summer.
Adaptive seasonal grazing	Grazed during spring-summer, excluded during May-September
Vascular plant monitoring - establish and measure permanent monitoring transects.	Monitoring commencing during the spring/summer of the first year of the development phase (prior to any planting or enhance actions - to inform a baseline).
Habitat creation (disturbance treatment sites)	Late winter to early spring to coincide with landscape and restoration planting.
Maniototo peppercress – planting	Late winter to early spring to coincide with landscape and restoration planting.
Establishment of biosecurity controls and checks. This means ensuring all staff working on the site are familiar with when and how to undertake biosecurity checks and clean.)	Controls and protocols established prior to works commencing at the site and throughout development.
Check/ clean all machinery	Throughout development in a dedicated area for machinery arriving onsite.
Eco sourcing materials	Ongoing - whenever aggregates and other materials that present a biosecurity risk are source for the site.
Establishment of spill and fire management protocols	Controls and protocols established prior to works commencing at the site and followed throughout development.
Establishment of photopoints	Establish before work commences onsite.
Operational Phase	
Biosecurity controls	Continue to follow biosecurity controls and management protocols outlined above throughout the operational phase.
Pest plant control and monitoring	Control to be undertaken every three years, commencing one year after development begins.
Vascular plant monitoring	Monitoring to be undertaken every three years, following the baseline survey (for at 15 years, before review).
Photopoint monitoring	General photopoints are retaken annually, other monitoring photopoints untaken during surveys (e.g. every three years)

10.0 Conclusion

The proposed solar farm provides habitat to Threatened and At Risk birds, lizards, terrestrial invertebrates and plants, previously detailed by Wildland Consultants (2024) and subsequent surveys and management plans, including the Nationally Critical endemic herb Maniototo peppercress. The change in land use and the introduction and spread of pest plants and ecological weeds at the site has been identified a key threat to existing indigenous vegetation values on the site.

A nationally significant population of Maniototo peppercress occurs on surrounding terrace edges adjacent to the site, as well as several other At Risk plants typical of indigenous drylands and Inland Outwash Gravel terraces. Maniototo peppercress plants on and off the site, together with associated indigenous dryland species, require comprehensive monitoring and adaptive management within consent conditions to ensure their survival and potential cross-boundary edge effects are avoided.

The baseline monitoring, management measures, and biosecurity protocols set out in this management plan need to be implemented prior to the commencement of works on the site. Effects on threatened vegetation will need to be managed through monitoring, enhancement (propagation and planting), seasonal grazing, habitat creation, and weed control. Adaptive management may be required if threatened plant populations at the site or on adject land are observed as in decline.

During development biosecurity risks will need to be managed through protocols, cleaning, and ensuring materials and plants are sourced locally. Weed control should be undertaken regularly once work has begun on site with a particular focus on woody weeds and the protection of Threatened and At Risk plants.

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