

**BEFORE AN EXPERT PANEL
THE POINT SOLAR FARM**

FTAA-2508-1100

Under the **FAST-TRACK APPROVALS ACT 2024**

In the matter of an application for resource consent approvals for The Point Solar Farm

By **Far North Solar Farm Ltd**
Applicant

**STATEMENT OF EVIDENCE OF RACHEL KATHERINE MCCLELLAN
FRESHWATER BIRDS
19 February 2026**

Royal Forest and Bird Protection Society of New Zealand

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Introduction

1. My full name is Rachel Katherine McClellan.
2. I have been asked by the Royal Forest and Bird Protection Society to provide expert evidence on the freshwater bird values that are potentially affected by the construction and operation of The Point Solar Farm, Mackenzie Basin.
3. This brief of evidence follows on from the evidence that I provided for the Royal Forest and Bird Protection Society for the Haldon Solar Farm. Much of my evidence for that proposal is relevant to this proposal, given the proximity of the two solar farms and the associated bird habitats. As such, there is considerable replication, but I make it clear where my assessments differ.

Qualifications and experience

4. I am a self-employed consultant specialising in bird ecology.
5. I have the qualifications of PhD in Zoology from Otago University for research on the ecology and management of tarāpuka | black-billed gull in Southland (2009), a Master of Conservation Science from Victoria University for research on the breeding biology of toanui | flesh-footed shearwater on Karewa Island, Bay of Plenty (1996), and degrees in both plant and animal ecology (1994).
6. I have been a consultant since 2009. I was Office Manager and Senior Ecologist with Wildland Consultants in Christchurch, and later, Principal Ecologist Avifauna based in Wellington. I have been self-employed since 2022. I have worked for BirdLife International, in Cambridge, UK, where I was a researcher, co-author, and sub-editor for the book 'Threatened Birds of the World', published in 2000. I have worked for the Department of Conservation in Northland and the West Coast.
7. I have considerable experience with braided river and wetland birds. My doctoral research on black-billed gull examined population trends, impacts of introduced and native predators, nesting habitat availability and the threat of weed infestation on gravel-bedded rivers, and the species' relationship with agricultural systems. I have presented evidence at the Oreti River and Ngaruroro River Conservation Order tribunals, and at the Environment Court hearing for Meridian Energy's North Bank Tunnel proposal for the Waitaki River. I had a guest advisory role on the Department of Conservation's Braided River Technical Advisory Group. I have co-authored a braided river management plan for the Waimakariri River Regional Park, and an analysis of population trends of black-billed gulls in the South Island from 1962-2014. I was part of a team that developed ecological significance criteria for significant indigenous vegetation and significant habitat of indigenous biodiversity. Most recently, I have provided evidence at the Environment Court hearing for the consenting of the Waitaki Power Scheme, and under the Fast-Track Approvals Act 2024 for consenting of the Tekapo Power Scheme.

8. I have experience assessing the interactions of bird species with infrastructure, in particular, bird strike at multiple wind farms in New Zealand for power generators, councils, and as a member of an expert panel reviewing collision monitoring results. Work for developers has included designing collision monitoring protocols. I have also provided evidence for councils at hearings on district plans regarding bird strike at Wellington, Rotorua, and Christchurch international airports. More recently, I have provided advice on the impacts of solar power installations on birds.
9. I am a member the Ornithological Society of New Zealand (Birds New Zealand).
10. In preparing this statement of evidence I have reviewed the following documents where they apply to my area of expertise:
 - Williamson Water and Land Advisory: The Point Solar Farm – Substantive Application for a Listed Project under the Fast Track Approvals Act 2024. Prepared for Far North Solar Farm Ltd. 122p. Referred to as the Substantive Application.
 - Wildland Consultants 2023: Assessment of ecological effects for the proposed solar farm between the lower reaches of the Tekapo and Twizel rivers, Mackenzie District. Contract report No. 6621c. Prepared for Far North Solar Farms Ltd. 56p.
 - ecoLogical Solutions 2024: Peer Review of Dr Colin O’Donnell, Department of Conservation Principal Science Advisor’s paper on the potential impacts of proposed ‘The Point’ solar farm near Twizel on threatened birds.
 - Green Inc. 2024: Potential effects of The Point Solar Farm on birds.
11. I have also taken into consideration the following documents:
 - Wildland Consultants 2026: Vegetation and habitat survey of The Point Solar Farm, January 2026.
 - Wildland Consultants 2025: Ecological Enhancement Plan for The Point Solar Farm, Twizel. Contract Report No. 6621g. Prepared for Far North Solar Farms Ltd.
 - Wildland Consultants 2026: The Point Solar Farm: Response to ecological issues raised by the Panel.
 - Wildland Consultants 2026: The Point Solar Farm – Proposed ecological enhancement approach. (Appendix 9).

- AgScience Limited 2025: Haldon Solar Project – Ecological Impact Assessment. Prepared for Lodestone Energy Limited. 52p. Referred to as the Ecological Assessment.
- O’Donnell C. 2024: Initial briefing – potential impacts of proposed ‘The Point’ solar farm near Twizel on threatened birds. Department of Conservation unpublished report.
- Evidence filed by the Department of Conservation in relation to the Glorit Solar Farm Fast Track consenting process¹.

Code of Conduct

12. I have read the code of conduct for expert witnesses contained in the Environment Court's Practice Note 2023 (the Code). I have complied with the Code when preparing this written statement of evidence. The data, information, facts, and assumptions I have considered in forming my opinions are set out in my evidence. Unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions that I express.

Scope

13. I have been asked by the Royal Forest and Bird Protection Society to provide expert evidence on indigenous birds in response to the application by Far North Solar Farms Ltd. under the Fast-track Approvals Act 2024 for resource consents for a photovoltaic solar farm in the Mackenzie Basin.
14. This evidence addresses the potential effects of the proposed The Point Solar farm on indigenous bird species.

Summary

15. The Point Solar Farm is proposed for a location in the Mackenzie Basin at the head of Lake Benmore, next to the river delta where the Takapō, Pūkaki and Ōhau rivers enter the lake. These rivers and others in the Mackenzie Basin are a stronghold for Nationally Threatened and At Risk braided river species such as kakī | black stilt, black-fronted tern, wrybill, black-billed gull, banded dotterel, and South Island pied oystercatcher. Kakī, one of the world’s rarest bird species numbering some 140 birds, is now restricted to the Mackenzie Basin.
16. The proposed location for the facility is bounded on two sides by an Important Bird Area, an internationally recognised habitat of importance. A total of 33 Nationally Threatened and At Risk bird species has been recorded from the Takapō delta and

¹ <https://www.epa.govt.nz/fast-track-consenting/nbea-fast-track-projects/glorit-solar-farm/>

immediate surrounds, directly adjacent to the proposed solar farm. In addition to kakī, two other Nationally Critical bird species – white heron and Australasian bittern – have also been recorded in this location. The Takapō River and the Ōhau River regularly support more than 5% of the national population of black-fronted tern, and possibly over 10% in some years. Recent research has demonstrated that the delta is used as an overnight roost by hundreds of black-fronted terns during the breeding season. GPS tracking data shows flight routes next to and over the proposed facility.

17. The ecological assessment included a day of observations for birds. The assessment listed 29 indigenous bird species that were either observed at the site, or were highly likely, or likely, to use the site, including six Nationally Threatened and seven At Risk bird species. These included kakī, black-fronted tern, banded dotterel, black-billed gull, South Island pied oystercatcher, and New Zealand pipit. However, the assessment is limited to a presence/absence summary and does not provide an evaluation of the site's importance for these and other species. It nevertheless classified all habitats present as ecologically significant against criteria in the Canterbury Regional Policy Statement based on the presence of these and other species.
18. Species using the site may be affected by construction activities, but this can be adequately addressed through conditions. Operation of the solar farm, combined with stocking changes, pest control, and indigenous planting will cause vegetation changes at the site which are difficult to predict. Bird use of the site will almost certainly alter in response, with effects varying by species.
19. Of much greater concern is the potential for adverse effects from interactions with panels and other infrastructure. Overseas evidence demonstrates that birds are killed by colliding with solar panels, or indirectly, for example by becoming disorientated and being unable to forage. Many species are affected, from most bird families. Waterbirds comprise a proportion of species found dead. Birds do not need to use the facility directly to be at risk; many species overseas have been migratory.
20. A considerable amount of published literature is available on this subject. However, the ecological assessment did not evaluate this risk in any detail. Instead, it is proposed that a literature review will be conducted once approval has been granted.
21. During the breeding season, hundreds if not thousands of bird movements are occurring next to, and sometimes within or over, the site of the proposed solar farm. Out of the breeding season, kakī will continue to forage across the landscape. No information is available on the vulnerability of New Zealand bird species.

22. The Point Solar Farm will be adjacent to the proposed Haldon Solar Farm, approximately 2.5 km distant at their closest points. The presence of two solar farms compounds the risk to bird species.
23. We cannot be certain that the risk to Threatened and At Risk bird species is minor – there is no evidence to support this assumption. Solar farms in the Mackenzie Basin present a novel threat for multiple bird species already threatened by introduced predators, extensive modification of rivers by hydrological management, and ongoing weed invasion of rivers and development of terrestrial habitats. Additional mortality caused through interactions with the proposed solar farm would be potentially catastrophic for kakī and compound the challenge to reverse population declines for other Threatened and At Risk species.

The Point Solar Farm location and proposal

24. The Point Solar Farm is proposed for a location at the head of Lake Benmore in the Mackenzie Basin (Figure 1). The Lower Ōhau, Pūkaki, and Takapō rivers all enter Benmore at this point, forming a delta across the northern end of the lake that I will refer to as the Takapō delta (it is referred to by multiple names including Ōhau delta, Takapō/Benmore delta etc.).

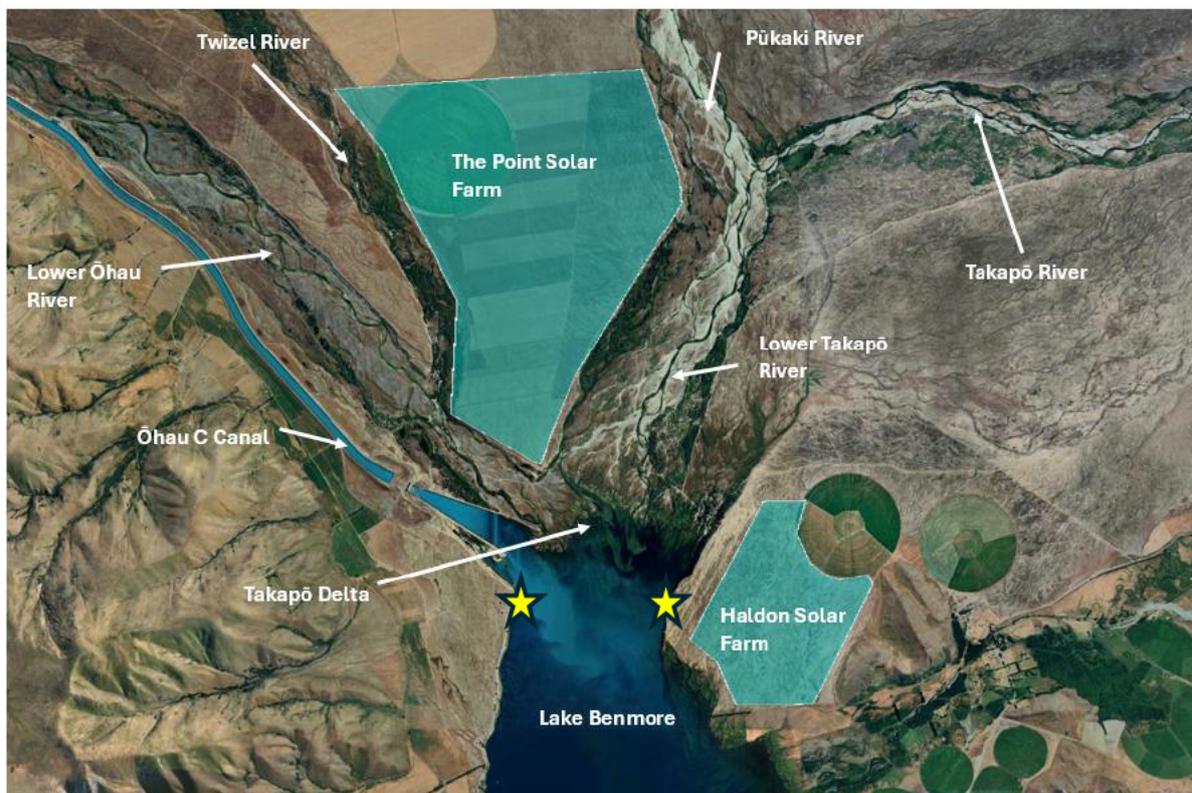


Figure 1: Aerial photography of the head of Lake Benmore and the mid-Waitaki catchment rivers showing the approximate locations of the proposed The Point Solar Farm and the Haldon Solar Farm. The distance between the two yellow stars is approximately 1.8 km (Google Earth).

25. The Ōhau (Upper and Lower), Pūkaki, and Takapō rivers were large, braided river ecosystems but are now fully diverted as part of catchment-wide hydroelectric schemes. Water in the Lower Ōhau is via ground water seepage, and in the Pūkaki and Takapō, via tributaries. Occasional dam releases also provide flow. Lake Benmore is one of several hydro lakes created by the multiple dams located through the mid and lower Waitaki Catchment.
26. Despite vast, landscape-level hydroelectric modification and widespread agricultural use, the braided rivers and dryland ecosystems of the Mackenzie Basin support nationally significant bird populations and have been the subject of decades of research and conservation work.
27. The Substantive Application does not specify the approximate number of solar panels that will be installed. However, the ecological assessment states that the proposal is for 736,866 solar panels across the site. The Substantive Application states that the rows of panels will be mounted on driven piles that are spaced 6 m apart, which results in a 4 m gap between rows of panels. The movement of the panels during the day is explained in Section 4.2 of the Substantive Application, and states that the greatest angle of the panels is likely to be 65 degrees. The ecological assessment states that the panels will be 2.1 m off the ground at the highest point. However, Condition 72 states that the panels and array tables must have a maximum tilted height of no more than 4.5 m.
28. The Substantive Application states that the panels are expected to cover approximately 33% of the site. The ecological assessment states that coverage will be approximately 60%. Presumably the substantive application, being the more recent of the documents, will be correct. Solar panel cabling will be trenched.
29. The Substantive Application does not specify the number of inverters on site, though it notes that they are similar in size to a 20-foot shipping container. The ecological assessment states that there will be 41, as well as 25 4.5 x 3.5 metre water tanks. A central facility will be constructed approximately 1 ha in size comprising two substation areas, a switchyard, control room buildings, fencing, onsite stormwater management and disposal systems, vehicle accessways, and onsite parking.
30. Earthworks are expected to cover approximately 20 ha of the site. Internal accessways will be upgraded and maintained, and site will have a barbed wire perimeter fence up to 1.8 m high.

Adequacy of information on bird populations and bird habitats

31. Mr Nicholas Head provided detailed description of the nationally important Takapō-Haldon outwash ecosystem in his evidence for the proposed Haldon Solar Farm. I

understand that The Point is also located on this outwash plain but is considerably more modified than the habitats present at Haldon.

32. The ecological assessment by Wildland Consultants of habitats present was completed on either 12 or 13 December 2022 (the date differs in reports). Agscience undertook a site visit on 17 December 2025 – this has not been viewed. Wildlands completed a second site survey on 20 January 2026 to update information on habitats at the site after recent cultivation. Wildlands’ conclusion was that vegetation cover “remains predominantly grazed exotic grassland and cropland, with some small remnants of indigenous dryland and shrubland communities around the margins”, and that the site showed “only very minor changes in vegetation and habitats since the 2022 survey...”.
33. This 2026 reassessment also stated that the conclusions regarding birds in the original assessment remained applicable. The reassessment provided no new information on birds present.
34. The original ecological assessment involved a single set of bird observations on 14 December 2022 along three “discrete continuous transects” that covered all habitat types at the site. The locations or routes of the transects are not provided in the assessment, and the amount of time spent observing birds is not documented. It is very likely that the survey has not used a standardised method that can be replicated and therefore used as part of a baseline of the diversity and abundance of bird species that use the site. It follows that any changes that may occur as part of construction or ongoing operation of the solar farm cannot be documented using these data.
35. Fifteen indigenous species and 15 introduced species were observed during the field survey. This compares to eight indigenous species and seven introduced species recorded at the Haldon Solar Farm site. The discrepancy could be due to several factors, including the greater variety of habitats present at The Point, the smaller size of the proposed Haldon solar farm site, or the very small amount of time (less than two hours) spent on bird observations at the Haldon site.
36. The 15 indigenous bird species observed at the site on 14 December included the following Threatened and At Risk bird species:
 - Tarāpirohe | black-fronted tern (Threatened-Nationally Endangered)
 - Pohowera | banded dotterel (At Risk-Declining)
 - Tarāpuka | black-billed gull (At Risk-Declining)
 - Māpunga | black shag (At Risk-Relict)
 - Kawaupaka | little shag (At Risk-Relict).

37. However, the assessment does not provide information on the relative abundances of the indigenous species present. It also does not document the habitat use of most species. For example, was one black-fronted tern seen flying over the site, or 20 black-fronted tern seen foraging in the irrigated field? I presume that both species of shag would have been observed flying over the site, as neither are likely to use the habitats present at the site.
38. The assessment does note, however, that “banded dotterel were observed feeding in the cocksfoot grassland, brome-hawkweed-sheep sorrel grassland/herbfield, and brassica cropland”. These are three of the four exotic-dominated habitats identified in the original survey and demonstrate this species’ use of modified habitats. Black-fronted tern and black-billed gull also forage in modified pastoral habitats, which I will discuss further.
39. The assessment’s Figure 1 shows only two bird locations in the site which is clearly incorrect. The meaning of these two locations for birds is not explained in the text.
40. The assessment’s reliance on a single day of surveys late in the breeding season in December means that it may have missed possible breeding activity. Juveniles may have been present, but only if nests were successful (most nests of indigenous bird species are likely to fail in the absence of predator control). Banded dotterel will likely breed at the site, as may several other Threatened and At Risk bird species such as tōrea | South Island pied oystercatcher, pīhoihoi | New Zealand pipit, and even kaki | black stilt.
41. Very limited survey, combined with lack of descriptive detail, means it is not possible to assess the site’s importance for indigenous bird species with confidence. The assessment makes no attempt to describe the relevant importance of the site for indigenous bird species in relation to other terrestrial habitats in the Mackenzie Basin. More data including more meaningful descriptions of those data would have provided important information on the bird values of the site.
42. Usefully however, the assessment has undertaken a full review of bird species present in the wider area (within 5 km) using the eBird database². The document also provides a list of indigenous species with their “likelihood of presence at Site” in their Table 2. This contrasts with the Haldon ecological assessment which made no attempt to define which species may have been missed by the very limited bird survey.

² eBird is an online global database of bird lists obtained by citizen scientists (both amateurs and environmental professionals alike) into which ~100 million bird sightings are uploaded annually. Over 800,000 checklists have now been submitted for New Zealand birds. The data are an immensely valuable resource that can be used to better understand distributions and abundances of many species. However, eBird data comes with biases and possible inaccuracies, and should be used with care.

43. In addition to the five Threatened and At Risk bird species observed during the field survey, a further four Threatened and three At Risk species were considered by the ecological assessment to be either 'Highly Likely' or 'Likely' to be present at the site:
- Kaki – highly likely (Threatened-Nationally Critical)
 - Caspian tern – highly likely (Threatened-Nationally Vulnerable)
 - Grey duck – likely (Threatened-Nationally Vulnerable)
 - Wrybill – likely (Threatened-Nationally Increasing)
 - Marsh crake – likely (At Risk-Declining)
 - Pipit – likely (At Risk-Declining)
 - South Island pied oystercatcher – likely (At Risk-Declining).
44. In addition to the five Threatened and seven At Risk species that were either observed, or highly likely/likely to be present at the site, a further three Threatened and one At Risk bird species were listed as being present within 5 km of the site:
- Matuku hūrepo | Australasian bittern (Threatened-Nationally Critical)
 - Kotuku | white heron (Threatened-Nationally Critical)
 - Pūteketeke | Australasian crested grebe (Threatened-Nationally Vulnerable)
 - Australian coot (At Risk-Naturally Uncommon).
45. Of the eight Threatened and eight At Risk bird species listed above, all except two (white heron and Caspian tern) have been observed at the Ōhau C Ponds, an eBird Hotspot³ located approximately 500 m from the edge of the site.
46. The ecological assessment discusses the ecological context of the site, noting that the site is surrounded by an internationally recognised Important Bird Area (Figure 2: I discuss this in my paragraph 81). The assessment acknowledges the importance of the surrounding braided rivers, associated delta, and wetlands for multiple Threatened and At Risk bird species, but not Lake Benmore.

³ eBird Hotspots are designated locations frequently visited by observers. Hotspots are only supposed to be used when an entire checklist was obtained within that hotspot.

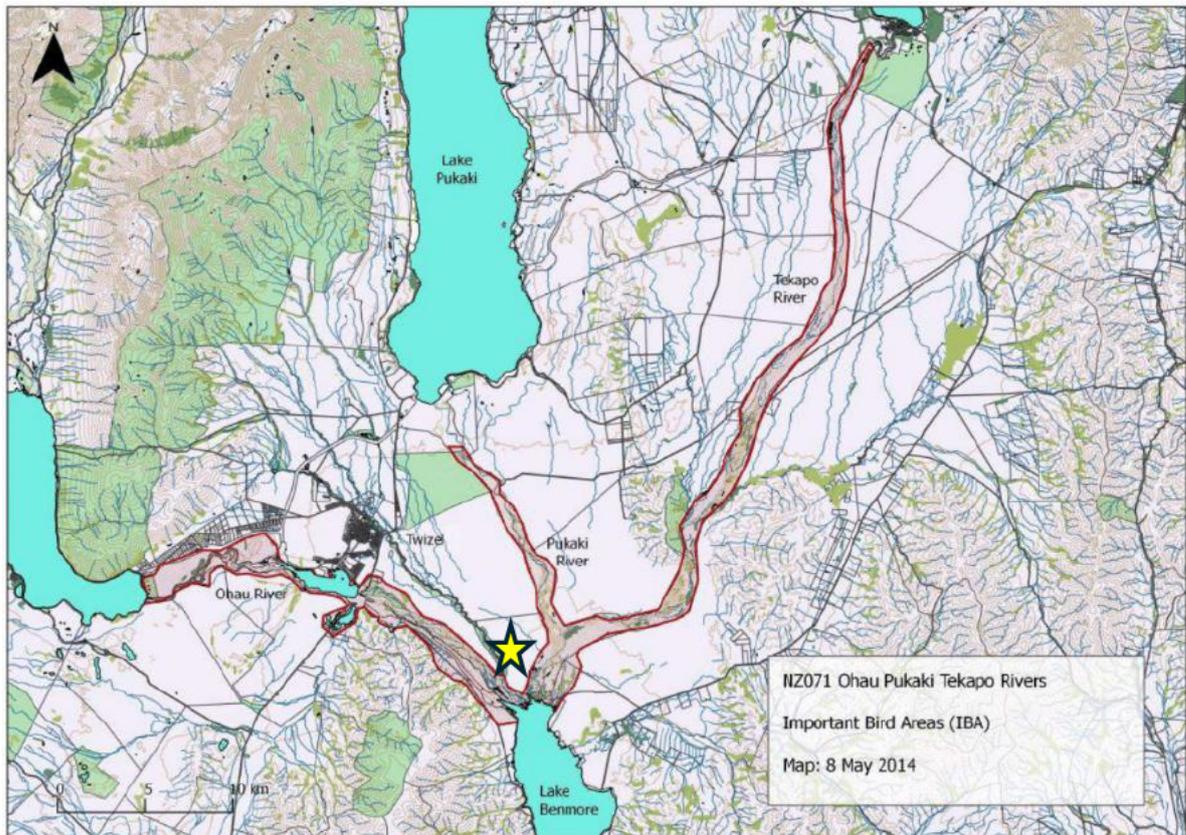


Figure 2: Important Bird Area NZ071 Ohau Pukaki Tekapo Rivers. The red boundary shows the extent of the IBA. The yellow star shows the proposed location of The Point Solar Farm.

47. Finally, the ecological assessment summarises (p22) that black-fronted tern and banded dotterel forage within the site, banded dotterel may breed at the site, and New Zealand pipit and South Island pied oystercatcher may also forage and breed within the site. This conclusion does not align with the assessment’s Table 2 which lists the observed, ‘Highly Likely’, or ‘Likely’ presence of 29 indigenous bird species at the site, including six Nationally Threatened and seven At Risk bird species.

48. I summarise this list of species in Table 1, alongside species recorded in the three eBird ‘Hotspots’ located within a few kilometres of the proposed solar farm (Figure 3). The ‘Ōhau C ponds’ Hotspot has 223 checklists and is approximately 400 m from the edge of The Point site. The ‘Lake Benmore-Ōhau River delta’ (or Takapō delta) Hotspot has 38 checklists, and the ‘Lake Benmore-Haldon Boat Harbour’ has five checklists.

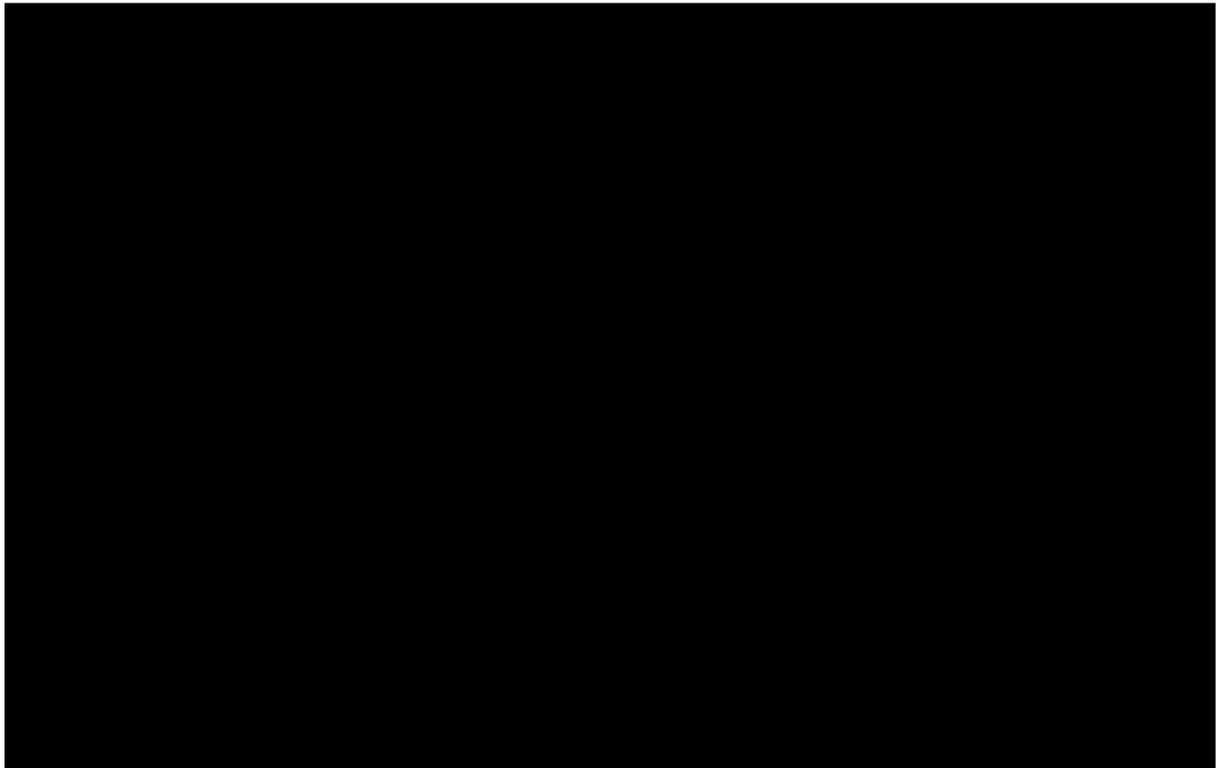


Figure 3: Aerial photography of the head of Lake Benmore showing the approximate locations of The Point Solar Farm (top) and Haldon Solar Farm (right) in relation to the three closest eBird 'Hotspots' (yellow markers) (Google Earth).

Table 1: Native and endemic bird species recorded on 12 December 2022 at The Point Solar Farm (P), and those considered 'Highly likely' or 'Likely' to be present (L), and those recorded at three nearby eBird hotspots. An asterisk denotes a species record obtained since the beginning of 2022; a hyphen denotes older records within the last 10 years. Two species marked with a double asterisk are from a separate eBird checklist (see text). Species and Te Reo Māori names are provided in Appendix 1.

Species	Threat Classification	The Point Solar Farm	Ōhau C Ponds	Haldon Boat Harbour	Ōhau Delta
Waterfowl					
Australasian crested grebe	Nationally Vulnerable		*	*	*
Australasian little grebe	Coloniser			-	
Black swan	Not Threatened	P	*	*	*
Grey Duck	Nationally Vulnerable	L	*	*	
Mallard/grey duck hybrid	Not Threatened	P	*	-	-
Grey teal	Not Threatened	L	*	*	
Australasian shoveler	Not Threatened	L	-	*	*
Paradise shelduck	Not Threatened	P	*	*	*
New Zealand scaup	Not Threatened		*	*	*
Shags					
Black shag	Relict	P	*		*
Pied shag	Recovering				*
Little shag	Relict	P	*	*	*

Species	Threat Classification	The Point Solar Farm	Ōhau C Ponds	Haldon Boat Harbour	Ōhau Delta
Hérons and spoonbills					
Australasian bittern	Nationally Critical		*		
White heron	Nationally Critical	L		**	
Royal spoonbill	Naturally Uncommon			**	
White-faced heron	Not Threatened	P	*	*	*
Rails and coots					
Australian coot	Not Threatened		-	*	*
Marsh crake	Declining	L	*		*
Pūkeko	Not Threatened		*	*	-
Waders					
Kakī	Nationally Critical	L	*	-	*
Hybrid kakī	Not Threatened	L			-
Pied stilt	Not Threatened	L	*	*	*
South Island pied oystercatcher	Declining	L	*	*	-
Wrybill	Nationally Increasing	L	*		
Banded dotterel	Declining	P	*	*	*
Spur-winged plover	Not Threatened	L	*	*	*
Gulls and terns					
Karoro black-backed gull	Not Threatened	P	*	*	*
Black-billed gull	Declining	P	*	*	*
Black-fronted tern	Nationally Endangered	P	*	*	*
Caspian tern	Nationally Vulnerable	L			-
Non-wetland species					
Australasian harrier	Not Threatened	P	*	*	*
New Zealand falcon	Declining			-	
New Zealand pipit	Declining	L	*	-	*
Grey warbler	Not Threatened	P	*	*	*
Shining cuckoo	Not Threatened	P	*	*	
Sacred kingfisher	Not Threatened		*		*
Silvereye	Not Threatened	P	*	*	*
South Island fantail	Not Threatened	P	*	*	*
Welcome swallow	Not Threatened	L	*	*	*
Kereru	Not Threatened		*		
Total indigenous bird species		29	33	31	30
Threatened species		6	6	5	4
At Risk species		7	7	7	8

49. In addition to the bird records made at the three hotspots, hundreds more checklists have been obtained around the same immediate area but have been uploaded at unique locations. For example, Dr Colin Miskelly, Curator Vertebrates at Te Papa Tongarewa, uploaded incidental observations and photographs of a flock of 12 kōtuku ngutupapa | royal spoonbills (At Risk-Naturally Uncommon) and one kōtuku | white heron (Threatened-Nationally Critical) at 'Haldon Arm' on 4 March 2023⁴. These

⁴ Checklist and photographs can be viewed at <https://ebird.org/checklist/S130882849>.

species have been listed in Table 2 under the Haldon Boat Harbour Hotspot as it is the same area.

50. In summary, the ecological assessment's field survey is inadequate to fully describe the indigenous bird community that uses the proposed site. The subsequent desktop analysis provides missing information, describing the possible presence of different bird species, but is let down by inconsistencies. The assessment is limited to a presence/absence summary and does not provide an evaluation of the site's importance for indigenous bird species including Threatened and At Risk species.

Braided river birds

51. Six indigenous Threatened and At Risk bird species are characteristic of braided rivers and are a feature of the Mackenzie Basin. Kakī, black-fronted tern, wrybill, banded dotterel, black-billed gull, and South Island pied oystercatcher breed on the adjacent Takapō River. All are impacted by a complex, interrelated suite of threats in the Mackenzie Basin including introduced mammalian predators, degradation of nesting and foraging habitats by invasive weeds, hydroelectric modification of rivers, and predation by the native karoro | black-backed gull.

Wrybill

52. Wrybill (Threatened-Nationally Increasing) is the only one of the six species that does not regularly use terrestrial habitats and is unlikely to use the proposed solar farm except perhaps during floods. The ecological assessment considers that it is likely to be present. Its sideways curved bill, unique in the bird world, is perfectly adapted to search for invertebrates under riverbed stones. The Mackenzie Basin is a species stronghold. Over 20 years of intensive predator control in the Tasman River valley is maintaining numbers but has not turned the tide for the species in this location⁵. The overall trend in Mackenzie Basin rivers is of a decline, in contrast to the national trend, which is thought to be increasing.
53. Wrybill pairs breed solitarily on bare gravels during the breeding season, and after breeding, fly north to overwinter in upper North Island harbours and estuaries. The national population may number approximately 5,000 birds. Several hundred birds may nest in the alpine rivers of the Tasman, Cass, and Godley, but numbers are very low in the mid catchment rivers of the Mackenzie Basin, including the Takapō and highly modified Ōhau rivers⁶. Movements are poorly understood, except for one known flyway to and from wintering sites parallel to the Waikato west coast, both

⁵ Population analyses of all waterbird species in the Waitaki Catchment in: Whitehead A., Hoyle J. Bind J. and Sykes J. 2023: Freshwater birds and riverbed vegetation in the Waitaki catchment – Current state of knowledge. NIWA Client Report No. 2020122CH. Prepared for Meridian Energy. 171p.

⁶ I have approximated population sizes using graphs provided in Whitehead *et al.* (2023) showing linear densities by transforming recent data by the length of the various rivers.

overland and offshore⁷. Local movements, in breeding habitats like the Mackenzie Basin, are unknown. In my opinion, though the species may only infrequently use the solar farm site, it will regularly fly across the landscape, inevitably flying over the solar farm on occasion.

Kakī

54. Kakī (Threatened-Nationally Critical) is one of the rarest bird species in the world. The population numbers approximately 140 wild birds, which includes only 40 or so breeding pairs. The species is largely restricted to the Mackenzie Basin, though once nested more widely including in the North Island.
55. Though kakī primarily nest on rivers, Department of Conservation rangers have also observed breeding on farms⁸. Kakī forage in terrestrial dryland habitats in wet areas such as small permanent or ephemeral ponds. I have observed five feeding together in a paddock in approximately 4 m² of standing water on the edge of Lake Takapō.
56. The Department of Conservation has had a captive rearing facility for the species near State Highway 8, approximately 8 km from The Point Solar Farm site, for over 40 years. In recent years, over 100 juveniles are usually released annually. This intensive management maintains a relatively stable population that may be increasing slowly, but the mortality rate of juveniles remains very high.
57. Many observations of kakī and kakī-pied stilt hybrids have been observed around the Takapō delta from Haldon Arm in the east to the mouth of the Ōhau River in the west (eBird data). Birds may both breed and forage in this location. Species movements have not yet been investigated using GPS tracking technology and our understanding of fine scale movements within the landscape is limited. However, a study using old tracking technology indicated juvenile kakī regularly flew across the Mackenzie Basin⁹. In my opinion, kakī are likely to forage at the site on occasion and will regularly fly around and over it. It is possible that they nest at the site from time to time.
58. Unlike the other five braided river birds, most kakī remain in the Mackenzie Basin year round, with small numbers dispersing widely over winter. Birds will be undertaking movements year round in the Mackenzie.

⁷ Schlesselmann A.K.V., Monks A., Innes J., McArthur N. and Walker S. 2024: Conservation challenges in mobile birds. *New Zealand Journal of Ecology* 48: 1-15. This knowledge was obtained from the use of avian radar employed to assess the potential adverse impacts of the Hauāuru mā raki wind farm.

⁸ Driver G. 2023: One egg at a time - Bringing kakī back from the brink. North and South magazine <https://northandsouth.co.nz/2023/05/29/saving-black-stilt-from-extinction/> accessed January 2026.

⁹ Van Heezik Y., Maloney R.F. and Seddon P.J. 2009: Movements of translocated captive-bred and released Critically Endangered kaki (black stilts) *Himantopus novaeseelandiae* and the value of long-term post-release monitoring. *Oryx* 43: 639-647.

Banded dotterel

59. Banded dotterel (At Risk-Declining) is in decline in most rivers in the mid to upper Waitaki Catchment including the Takapō, Pūkaki, and Ōhau rivers. Numbers have increased in the Tasman, probably in response to intensive predator control¹⁰. In addition to braided rivers, the species nests in other habitats that comprise bare or sparsely vegetated gravels, such as the Mackenzie Basin dryland ecosystems.
60. Banded dotterels nesting in the Maryburn Conservation Area, part of the Takapō-Haldon outwash, to the northeast of the proposed solar farm, have been studied using GPS trackers as part of Masters research¹¹. The habitat in the Maryburn area is classified as 'depleted grassland' in the New Zealand Land Cover Database (LCDB ver.6), as is most of The Point Solar Farm site (ecological assessment Section 4.6). The LCDB defines depleted grassland as "Areas, of mainly former short tussock grassland in the drier eastern South Island high country, degraded by over-grazing, fire, rabbits and weed invasion among which Hieracium species are conspicuous. Short tussocks usually occur, as do exotic grasses, but bare ground is more prominent."¹²
61. Data were obtained from seven dotterels, which showed that birds flew up to 8.7 km from their nesting territory to forage. The author analysed habitat types within the area used by dotterels and found that 'depleted grassland' was the most utilised habitat and, along with river habitats, was preferentially selected by dotterels (Figure 4). The study found that 'high producing exotic grassland' was only used when grass length was very short, for example, after harvesting.

¹⁰ Whitehead A., Hoyle J. Bind J. and Sykes J. 2023: Freshwater birds and riverbed vegetation in the Waitaki catchment – Current state of knowledge. NIWA Client Report No. 2020122CH. Prepared for Meridian Energy. 171p.

¹¹ Gray K.E. 2024: Movements and habitat use of black-fronted terns and banded dotterels in the Mackenzie Basin. Master of Science (Ecology). University of Otago 159p.

¹² Manaaki Whenua Landcare Research 2025: New Zealand Land Cover Database (LCDB) classes at version 6. Downloaded from the LRISPortal.

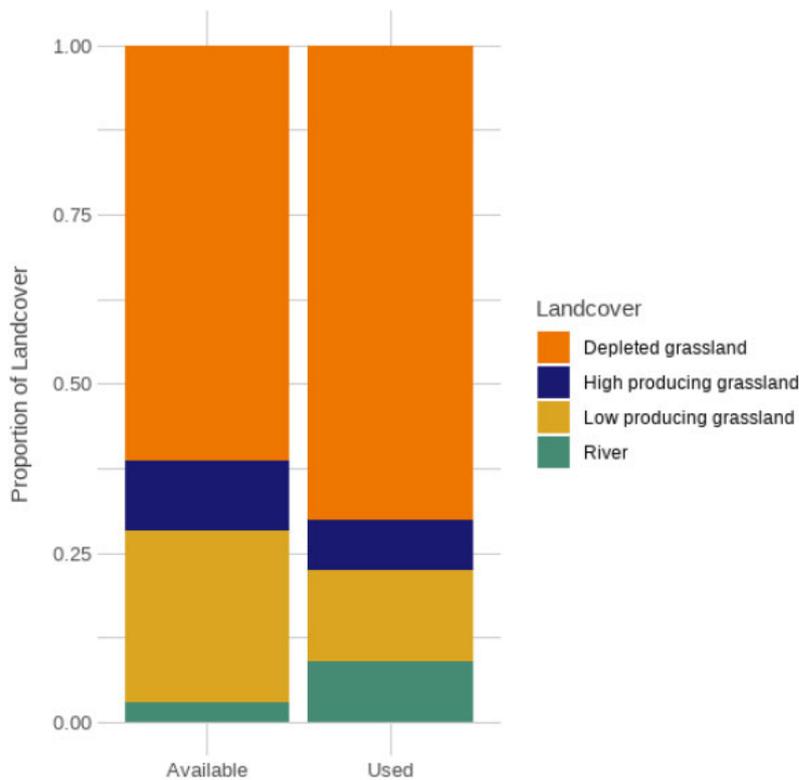


Figure 4: Difference in proportions of habitat types available within the 99% contour of banded dotterel utilisation distributions compared to proportions used by banded dotterels (Figure 3.9 in Gray 2024).

62. The ecological assessment observed banded dotterels foraging in three of the four exotic-dominated habitats at the site and considered breeding at the site was possible. I think nesting is highly likely. However, in the absence of nest searches, the importance of the site is unknown.

South Island pied oystercatcher

63. South Island pied oystercatcher (At Risk-Declining) is an endemic bird species largely restricted to the South Island when breeding. After nesting, birds disperse widely to coastal areas as far as Northland. It is relatively flexible in its choice of nesting location, breeding inland in braided rivers and farmland, but also most other open habitats from the coast to high altitude locations. Population trends have been variable over decades, but it is presently considered to be in decline. Oystercatchers will almost certainly breed at the proposed solar farm site, using both the site and adjacent rivers for foraging.

Black-fronted tern

64. Black-fronted tern (Threatened-Nationally Endangered) nests in colonies on bare gravels in braided riverbeds. Usually, these colonies establish in different locations each breeding season as the distribution of gravels changes with freshes and floods

between years. The Ōhau River (upper) and Takapō River each regularly support over 5% of the national population of black-fronted terns.

65. Black-fronted terns dip for aquatic invertebrates or dive for fish in river channels. They also forage extensively on invertebrates in pasture. I often observed individuals hunting lizards over depleted grassland that was once farmed near the upper Ōhau River (where I used to regularly stay); a population in Fiordland specialises in hunting skinks.
66. Multiple recent tracking studies of black-fronted terns in the Mackenzie Basin have been completed; two of these were Masters research projects. Of these, the first, in the 2020-21 breeding season, obtained data from 33 terns from the Tern Island colony on the Upper Ōhau River and from a colony on the Cass River, which flows into Lake Takapō¹³. The second, in both the 2022-23 and 2023-24 seasons obtained data from 54 terns tagged in one colony in the Ahuriri River, two colonies in the Tasman River, three colonies in the Takapō River, and one in a tributary, Irishman Creek¹⁴.
67. Both studies demonstrated that terns spent most time within braided river habitats but foraged in terrestrial habitats. Of these, the second study showed a preference for 'low producing grassland', followed by 'high-producing exotic grassland', and 'lakes or ponds', then 'depleted grassland' (LCDB v5.0 habitat classifications). In contrast the first study showed a strong preference for 'high producing exotic grassland'.
68. Both studies discovered that terns travelled extensively at night, including the previously unknown behaviour of terns roosting away from the colony overnight, particularly on river deltas. The first study found that, of the 24 tagged Ōhau terns, 22 used the Takapō delta, as did one of the Cass colony terns, while most Cass terns used the Cass River delta. The second study showed that terns roosted 1-50 km from their colony (traveling up to 81 km), even during incubation and chick-rearing, including at sites in different catchments. Multiple nocturnal roost sites were identified, including two at the Takapō delta.
69. Counts were undertaken at one of these roosts as terns arrived after sunset or departed at dawn on four occasions; 290, 0, 170 and 350 terns were recorded (Gray 2024). More were likely to have arrived or departed in darkness as tracking data showed that birds generally stopped arriving around 2-3am and mostly left when it became light (though some birds left throughout the night).
70. The findings of the GPS tracking studies of banded dotterels and black-fronted terns are highly relevant to the assessment of potential effects of the solar farm. Firstly,

¹³ Gurney F.E. 2022: Breeding movements and post-breeding dispersal of black-fronted terns/ tarāpirohe (*Chlidonias albobriatus*) in the Mackenzie Basin. Master of Science, Lincoln University. 87p.

¹⁴ Gray K.E. 2024: Movements and habitat use of black-fronted terns and banded dotterels in the Mackenzie Basin. Master of Science (Ecology), University of Otago. 159p.

they demonstrate the major limitations of our knowledge of the movements of bird species. Kākī, wrybill, black-billed gull, and South Island pied oystercatcher have not been studied using GPS tags, and it is very possible that similar studies on these species may demonstrate previously unknown levels of local and regional movements and habitat use. Secondly, they demonstrate that banded dotterel and black-fronted tern both use the outwash ecosystems (or ‘depleted grasslands’). Third, the Takapō delta adjacent to the proposed solar farm is a significant roost site for hundreds of black-fronted terns with birds flying over and traversing the edges of the proposed site from dusk until dawn throughout the breeding season.

71. These braided river bird species are one of the key foci of intensive restoration and conservation efforts in the Mackenzie Basin, up into the valley sides of the Tasman, Cass, Godley and Macaulay rivers. In addition to the Department of Conservation’s kākī recovery programme which has been operational for over 40 years, Project River Recovery has been undertaking landscape scale weed control throughout the region for over three decades, including the Takapō delta, and intensive predator control in the Tasman Valley and at the Ōhau River tern island colony for approximately two decades. Te Manahuna Aoraki Project launched in 2018, its project area encompassing a further 310,000 ha. One of the charitable company’s goals is that existing populations of threatened species have been protected and are flourishing. Working alongside these agencies is the volunteer group Predator Free Aoraki who service traplines in the valleys. In addition, the Department of Conservation and mana whenua launched Tū Te Rakiwhānoa Drylands in 2020, to protect the lower altitude significant habitats in the Mackenzie and Waitaki basins.
72. In all, it is likely that millions of dollars are spent annually protecting these and other species of flora and fauna and restoring their habitats.

Australasian bittern

73. Matuku hūrepo | Australasian bittern is the only one of New Zealand’s 18 Nationally Critical bird taxa that breeds throughout the mainland. The size of the population is poorly understood but is thought to be less than 1,000 mature individuals. Recent estimates are as low as 30-50 birds in Canterbury¹⁵. The species has suffered from extensive wetland clearance throughout the country and now, the ongoing deterioration and modification the wetlands that remain, in addition to threats posed by mammalian predators.
74. Discrete wetlands within the Mackenzie Basin are unlikely to support a permanent pair of bitterns. Birds are more likely to use multiple wetlands through the year and travel between them regularly to forage. Recent data from new generation GPS tags shows that males regularly move distances of more than 100 km over the year

¹⁵ <https://www.ecan.govt.nz/get-involved/news-and-events/2024/backing-the-bittern-the-bird-on-the-brink>

between wetlands, and sometimes between regions¹⁶. Breeding locations in the Mackenzie Basin are unknown. The Department of Conservation bittern database contains 106 bittern records from the Mackenzie Basin, including many sightings around the Ōhau, Twizel, Pūkaki and Takapō rivers¹⁷. eBird data provide recent evidence of bittern in the district, including an observation by a group of people at dawn who saw four individuals fly out of the Ōhau C ponds Hotspot.

75. Bittern will use vegetated farm drains to forage, and if these and other wet habitats are available at the proposed solar farm site, they may occasionally be used by bittern. Individuals almost certainly fly over the proposed site on occasion as they move between wetlands in the Mackenzie Basin.

Australasian crested grebe

76. Pūteketeke | kāmana | Australasian crested grebe (Threatened-Nationally Vulnerable) is also found in Australia where it is likewise very rare. It is a subspecies of the great crested grebe and is believed to have been in New Zealand for several thousand years. The species was once present in the North Island also, but numbers had declined to approximately 200-300 birds in the South Island only by about the 1980s. Since then, the population has been steadily increasing. Birds are mostly present on high country lakes in Canterbury and Otago.
77. Australasian crested grebe movements are not well understood. They appear to move between lakes within areas such as the Mackenzie Basin, but some individuals may also move greater distances between lakes¹⁸, or from high country lakes to the coast¹⁹. Birds generally fly at night.
78. A recent national survey for Australasian crested grebe was completed in January 2024, following previous national surveys in 1980, 2004, and 2014. One hundred and eight lakes were surveyed; grebes were counted on 53. The largest populations were found on Lakes Wanaka (160), Alexandrina (129), Hayes (110) and Benmore (89). Results indicate the total adult population is 970-980 individuals; almost half the population was found in the Mackenzie and Waitaki lakes. The 89 adults recorded on Lake Benmore compares to none recorded in 1980, 15 in 2004 and 77 in 2014. Within the lake, 68 adults and juveniles were found in the Haldon Arm, 38 in the Ahuriri Arm, and 4 in the Benmore Gorge/Dam section²⁰.

¹⁶ Willams E.M. 2024: Conservation management of the critically endangered matuku-hūrepo /Australasian bittern. Science for Conservation 341. Department of Conservation. 64p.

¹⁷ Colin O'Donnell 2024: Initial briefing – potential impacts of proposed 'The Point' solar farm near Twizel on threatened birds. Unpublished advice, 12 March 2024.

¹⁸ Sagar P.M. and O'Donnell C.F.J. 1982: Seasonal movements and population of the southern crested grebe in Canterbury. *Notornis* 29: 143-149.

¹⁹ O'Donnell, C.F.J. 2013 [updated 2022]. Australasian crested grebe | pūteketeke. In Miskelly, C.M. (ed.) *New Zealand Birds Online*. www.nzbirdsonline.org.nz

²⁰ Unpublished data, R. Snoyink and colleagues, in prep.

79. Australasian crested grebes avoid land, and birds will not use the proposed solar farm. However, individuals will fly around and across Lake Benmore and will likely traverse the site on occasion when moving between waterbodies.

Assessment of ecological significance

80. The ecological assessment has assessed the habitats present at The Point site against significance criteria in Environment Canterbury’s Regional Policy Statement (Appendix 2). It has assessed all five habitats present as meeting criteria for both rarity/ distinctiveness and ecological context. The assessment’s Appendix 2 describes how the ecological significance criteria have been met. I also consider that the habitats are ecologically significant based on ecological context given the proximity of the adjacent rivers; birds nesting at the site will forage in both the site and the river, and birds nesting in the river will forage in both the river and the site. This has been demonstrated using GPS tracking for banded dotterel and black-fronted tern elsewhere in the Pūkaki Ecological District.

Table 2: Ohau Pukaki Tekapo Rivers (NZ071) Important Bird Area showing the five trigger species (species listed as Threatened using IUCN Red List criteria) and their estimated local population sizes for the period shown.

Populations of IBA trigger species:						
Species	Season	Period	Population estimate (pairs)	IBA criteria	IUCN cat.	NZ Threat Class.
Black-billed Gull	Breeding	2009-2012	35-45	A1, A4i	EN	Nationally Critical
Black-fronted Tern	Breeding	2009-2012	218-517	A1, A4i	EN	Nationally Vulnerable
Black Stilt	Resident	1991-1994	C.10	A1, A4i	CR	Nationally Critical
Wrybill	Breeding	1991-1994	C.21	A1	VU	Nationally Vulnerable
Australasian Bittern	Resident		Present	A1	EN	Nationally Endangered

Ornithological information: Besides the trigger species the following species are confirmed or likely to be breeding: Australasian Crested Grebe, Black Shag, Little Shag, White-faced Heron, Black Swan, Canada Goose, Paradise Shelduck, NZ Shoveler, Grey Teal, Mallard, Grey Duck, NZ Scaup, Australasian Harrier, Marsh (Baillon’s) Crake, Pukeko, Australian Coot, South Island Pied Oystercatcher, Pied Stilt, Banded Dotterel, Spur-winged Plover, Southern Black-backed Gull, Caspian Tern, Rock Pigeon, Californian Quail, NZ Kingfisher, Welcome Swallow, NZ Pipit, Shining Cuckoo, South Island Fantail, Silvereye, Skylark, Hedge-sparrow, Blackbird, Song Thrush, Yellowhammer, Chaffinch, Greenfinch, Goldfinch, Redpoll, House Sparrow, Starling, Australian Magpie. Other species recorded: Chukor.

81. As I mentioned previously, the Takapō, Pūkaki, and Ōhau rivers have been assessed as an Important Bird Area or IBA (NZ071 – Ohau Pukaki Tekapo Rivers; Table 2)²¹. Important Bird Areas are sites identified as being internationally significant for the

²¹ Forest & Bird 2016: New Zealand Seabirds: Sites on Land, Rivers, estuaries, coastal lagoons & harbours. The Royal Forest & Bird Protection Society of New Zealand, Wellington, New Zealand.

conservation of birds, based on a set of standardised, data-driven criteria²². Over 13,000 Important Bird Areas worldwide have been identified to date. The table below has been taken from one of the three reports produced for New Zealand Important Bird Areas. Note that black-billed gull is no longer considered a threatened species using IUCN criteria and is therefore not an IBA trigger species.

82. In addition, the three rivers and Lake Benmore are all sites of natural significance in the Mackenzie District Plan.

Assessment of effects

83. The Substantive Application lists four potential effects of the proposed solar farm on birds and considers each to have a minor level of effect (subject to management or mitigation as set out in proposed conditions). The ecological assessment lists a fifth. However, both largely equate with the potential effects I set out in my evidence for the proposed Haldon Solar Farm, and which also apply here. I discuss the four potential effects as listed in the Substantive Application in the following paragraphs.

Habitat modification or loss

84. In my opinion, this is best considered in two steps – the modification or loss resulting from construction, and the modification or loss occurring from ongoing vegetation changes brought about by different management of the site.
85. Construction of the farm will modify a percentage of habitat on site. The Substantive Application states that earthworks will cover approximately 18 ha, which is a relatively limited area of direct habitat loss or modification.
86. However, the changes that will occur post-construction will affect the whole site. The Substantive Application states that the site is presently used for dairy grazing, green feed cropping and hay production. This will change to low intensity sheep grazing to manage weeds and fire risk. It is also intended to manage mammalian pests, including rabbits and hares. The ecological assessment notes that the shading caused by the panels is likely to affect vegetation composition. The change in farming practices, plant and animal pest control, and extensive shading over a third of the site will clearly affect vegetation structure and composition. The ecological assessment considers that non-native vegetation is likely to prefer the areas beneath the solar panels, and that banded dotterel, New Zealand pipit, and South Island pied oystercatcher will lose foraging (and potentially breeding) habitat within open grassland areas, and black-fronted tern will lose foraging habitat for large insects within open short grass areas.
87. The assessment considers that this effect is likely to be minor. I tend to agree. However, I reiterate that no information on the extent of existing use of the site by

²² <https://datazone.birdlife.org/about-our-science/ibas>.

any Threatened or At Risk bird species has been provided in the ecological assessment – a single day of observations cannot describe the changes in use of the site day by day, monthly, or seasonally. Consequently, we must assess effects based on expert opinion rather than data which is an undesirable situation.

Displacement of breeding birds

88. Threatened and At Risk birds nesting in areas intended for construction could be disturbed, potentially abandoning nests, or avoiding the area. The ecological assessment also considers that there is a high risk that disturbance from construction activities will displace Threatened and At Risk bird species “in the Ohau and Twizel Rivers and nearby wetlands”.
89. It is not clear why the assessment has not included the Takapō River and Takapō delta in this statement, which is the same distance from the proposed solar farm as the Ōhau River. The Takapō River and delta are much more significant for bird species than the Lower Ōhau which is fully diverted, or the Twizel River which has almost complete vegetation cover and is not a braided river. The assessment also does not specifically mention the Ōhau C Ponds that has recent records of six Threatened and seven At Risk bird species, including a flock of four Australasian bittern. This wetland is only a few hundred metres from the site.
90. The Substantive Application considers that this effect is likely to be minor subject to conditions. Again, data on the extent of use of the site by indigenous species are lacking, and the assessment of potential effect is tenuous.
91. The ecological assessment does not include displacement of foraging birds. This is clearly also a potential effect as individual birds or species may choose not to use the site for foraging in the presence of construction activities. This is likely to also be a minor effect, based on the presence of surrounding terrestrial habitats that remain unaffected, and in the absence of data on extent of use. Displacement of breeding or foraging birds due to construction activities is a short-term effect, lasting approximately 24-36 months.
92. The assessment also does not consider the potential for ongoing displacement, should individuals or species no longer use the solar farm for breeding or foraging due to the presence of infrastructure or the solar farm operation activities.

Death or injury during construction

93. Nesting birds present during construction could potentially be injured or killed, and nests destroyed. The Substantive Application considers that this effect is minor, subject to conditions.

Collisions with solar panels

94. The ecological assessment lists the potential for bird strike with panels as a potential ecological effect. It does not consider collision with other infrastructure (overhead cables, buildings, fences etc.) to be a potential effect.
95. The assessment has chosen to omit discussion of the effect of solar panel interactions as “there is currently no information available on the solar array layout at the proposed solar farm” (p31). However, the assessment does, in fact, summarise the solar panel array layout on the first page. It states that “more information and further investigations is required to determine direct affects at the site regarding the risk of bird strike with solar array panels [sic]”. The assessment goes on to state “The level of effect has been determined at a conservative level and may change based on final plans. Without mitigation, this effect is likely to be more than minor”.
96. The Applicant’s ecologist has undertaken further field survey and provided further advice on the proposed solar farm since the original ecological assessment. However, they have not returned to the subject of bird strike with solar panel arrays to provide an actual analysis of potential effects. This is an obvious and serious omission.
97. I will discuss the potential adverse effect on birds of collision with solar panels in detail in the following paragraphs and also refer to the peer reviews of Ecological Solutions and Green Inc. who specifically discuss the potential risk of collision with panels.

Why do birds collide with solar panels?

98. Photovoltaic solar panel installations can directly cause deaths of birds through impact trauma resulting from collisions, mostly with panels but also with other site infrastructure including transmission lines and fences. Indirect mortality is also thought to occur, possibly due to birds becoming disoriented, landing, and then being unable to resume flight or forage, or potentially being predated.
99. The exact causal mechanisms of collision and disorientation are not known and remain largely untested theories.
100. In the recent avifauna hearing for the Glorit Solar Farm on the Kaipara Harbour, the Department of Conservation provided five experts on birds. Associate Professor Dr Kristal Cain provided evidence on the possible mechanisms of bird collision with solar panels as an expert on the biology of bird vision and sensory ecology²³. She discussed how the vision of birds differs considerably from humans in multiple ways. One of

²³ Evidence of Associate Professor Kristal Cain, Integrative Organismal Biologist, on behalf of the Director-General of Conservation, 28th July 2025. For the applications for resource consents by Glorit Solar P LP for activities associated with the Glorit Power Scheme.

these is the sensitivity of birds to polarised light. I have summarised her paragraphs 56-64:

- Sunlight is partially polarised when it enters our atmosphere forming predictable patterns across the sky which both birds and other animals can use for navigation, even when the sun is obscured.
- The main source of horizontally polarised light is from light reflected off water. Solar panels reflect as much, or more than waterbodies.
- We still do not understand exactly how different groups of birds perceive and use polarised light, although we know, for example, that migratory birds use it during migration for navigation, particularly at dawn and dusk, and when it is cloudy.

101. The Lake Effect Hypothesis was proposed by researchers over 10 years ago to explain the high frequency of waterbird mortality from southern United States solar farms²⁴. It was considered that the polarisation of light caused by solar panels caused birds to mistake the solar farm for water, resulting in collisions.
102. However, species from almost all bird families have been found dead in photovoltaic facilities. The Lake Effect Hypothesis is also not relevant to most songbirds, which represent most species recorded in mortality estimates. Smallwood²⁵ provided the number of species found dead at some of these facilities, which varied from nine to 54 species (mean of 34 species from nine photovoltaic facilities), noting that over 20% of carcasses were not identified.
103. Diurnal aquatic insect species are attracted to the polarised light reflected by solar panels, with species drawn to the panels for egg laying, resulting in reproductive loss. This ecological trap for insects may lead insectivorous bird species to use the arrays as foraging opportunities. Grid patterns of white lines and nano-coatings on panel surfaces have been shown to significantly reduce the attractiveness of panels for these insect groups²⁶.
104. Management of vegetation at the solar facility may also reduce or increase invertebrate populations and/or alter invertebrate composition.
105. Research is presently being conducted by the Argonne National Laboratory, owned by the United States Department of Energy, into bird use of solar facilities. The research

²⁴ Walston J.L.J., Rollins K.E., LaGory K.E., Smith K.P. and Meyers S.A. 2016: A preliminary assessment of avian mortality at utility-scale solar energy facilities in the United States. *Renewable Energy* 92: 405-414.

²⁵ Smallwood K.S. 2022: Utility-scale solar impacts to volant wildlife *Journal of Wildlife Management* 86: doi.org/10.1002/jwmg.22216.

²⁶ Fritz B., Horváth G., Hünig R., Pereszélyi A., Egri A., Guttman M., Lemmer U., Kriska G., Schneider M. and Gomard G. 2020: Bioreplicated coatings for photovoltaic solar panels nearly eliminate light pollution that harms polarotactic insects. *PLoS ONE* 15(12): e0243296. <https://doi.org/10.1371/journal.pone.0243296>

uses AI technology to detect bird interactions but may have limited utility as camera footage is only obtained during daylight and cannot account for bird behaviour at night or during poor weather. Work is yet to be published.

106. The reality is, we do not fully understand the causal mechanisms for collisions, but we do know that several hundred bird species have been found dead at photovoltaic solar farms.

Data limitations

107. Mortality data obtained from solar farms have limitations that we need to be cognisant of, which I discuss further below. These include that:

- Most data come from the southwestern United States.
- The quality of carcass monitoring methods and analysis can vary considerably between facilities.
- Only a sample of the area within a facility is usually surveyed on each occasion.
- A large proportion of carcasses are not identified to species as they are too decomposed.
- The cause of death is not determined for most carcasses, either because they are too decomposed, and/or an autopsy is not undertaken.

108. The greatest limitation to our understanding of potential adverse effects of solar farms on bird populations is lack of data. Globally, most mortality data come from the dry inland habitats of the southwestern United States as several facilities in this region were sited on public lands and subsequently triggered that country's National Environmental Act process²⁷.

109. However, a recent presentation at a symposium in Washington compared data from 12 photovoltaic facilities in Alberta, Canada, to the data from southwestern United States. The abstract of the presentation states that species composition differed between countries, and was variable between facilities within countries, but that overall, Canadian fatality estimates fell within the range found from the US facilities, despite the different "ecoregions"²⁸. However, these data have not yet been published, and I cannot review the information further.

²⁷ Renewable Energy Wildlife Institute 2023: Solar Energy Interactions with Wildlife and Their Habitats: A Summary of Research Results and Priority Questions. Downloaded from <https://rewi.org/resources/> on 14 January 2026.

²⁸ Riser-Espinoza D., Russell K., Bartok N., Sullivan J. and Kosciuch K. 2024: Emerging trends in bird mortality at photovoltaic solar in the United States and Canada in Meeting Proceedings. Presentation

110. On top of this, the quality of available data is variable. For example, carcass monitoring protocols differ in multiple ways:

- The extent to which seasonal and annual variation in mortality is assessed.
- The percentage area of the facility that is surveyed on each occasion, how this is selected, and if it changes on each occasion. The minimum area surveyed in the southwest United States facilities was 3.3% of the ground area²⁹. One review of three of these facilities (a mix of solar types) stated “...it is difficult to know the true scope of avian mortality at these facilities. The numbers of dead birds are likely underrepresented, perhaps vastly so”³⁰.
- How the survey is conducted, for example, using people or using handlers with trained dogs, the latter of which detect a significantly greater percentage of carcasses. The rate at which ‘searchers’ detect carcasses that are present can be tested using ‘searcher efficiency trials’ which may or may not be undertaken. Several of the southwest United States facilities were searched by car³¹.
- The frequency at which surveys are conducted. The greater the interval between surveys, the more likely a dead bird will decompose or be scavenged, leaving little or no remains. The rate at which carcasses disappear from the environment can be tested using ‘carcass persistence trials’ which may or may not be undertaken. I suspect that search intervals that are too long is a key reason why such large proportions of carcasses are not identified to species.
- Ideally, searcher efficiency and carcass persistence trials are performed in each of the main habitat types present at the site (if more than one is present) as these variables may differ between habitats.
- Lastly, the way data are analysed can vary, and the use of searcher and carcass persistence trials to transform data (that is, address bias in the data from observers varying in their ability to detect carcasses, and intervals between searches). This can result in different fatality estimates from the same dataset.

given at the Solar Power and Wildlife/Natural Resources symposium. Renewable Energy Wildlife Institute, Washington.

²⁹ Smallwood K.S. 2022: Utility-scale solar impacts to volant wildlife *Journal of Wildlife Management* 86: doi.org/10.1002/jwmg.22216.

³⁰ Kagan R.A. Viner T.C., Trail P.W. and Espinoza E.O. 2014: *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*, Unpublished report. National Fish and Wildlife Forensic Laboratory.

³¹ Smallwood K.S. 2022: Utility-scale solar impacts to volant wildlife *Journal of Wildlife Management* 86: doi.org/10.1002/jwmg.22216.

111. The issue of large numbers of unidentified carcasses has been recently addressed using mitochondrial genetic data to identify the remains to species.³² Eight utility-scale solar farms in the southwestern United States were included in the study, five photovoltaic facilities, two solar trough facilities and one power tower facility. A total of 4,383 carcasses or parts of carcasses had been collected from surveys at these facilities, of which 792 (18.1%) specimens had never been identified to species. The study demonstrated that waterbirds comprised 13% of the total identified samples via morphology alone, but 20% of specimens that were identified using DNA analysis. Overall, at the five photovoltaic installations, 24% were waterbirds.
112. Lastly, the cause of death of a large proportion of carcasses is not determined. The detection of broken bones and internal haemorrhage is difficult to achieve in the field. For example, Kagan *et al.* (2014) specified that field necroscopies were undertaken for a sample of birds to determine if birds showed injuries indicative of collisions³³, but it is unclear how many other monitoring programmes did this, or if monitors were suitably qualified to do this. Long intervals between searches risks allowing carcasses to decompose or be scavenged further complicates such assessments. Sending hundreds or more carcasses for autopsy may have been avoided due to expense.

Waterbird mortality

113. Clearly, extrapolation of mortality estimates to different habitats and regions, let alone different countries and species, is fraught. However, if we are to attempt to assess the risk to New Zealand bird species, overseas data are all that is available.
114. The relevance of the Lake Effect Hypothesis was reviewed very recently by Kosciuch *et al.* (2025). The paper demonstrated that it was a single photovoltaic solar facility in the southwestern United States – Desert Sunlight – that caused a very high percentage of waterbird deaths (44% of all birds), including grebes, cormorants, herons, and stilts, and that results from this facility have been referred to in multiple papers since, in essence, amplifying the significance of the waterbird mortality from this farm³⁴.
115. This being so, it remains useful to look at this single case in more detail. Arguably, the most unusual mortality at the Desert Sunlight solar facility were the deaths of small numbers of three species of grebes. Grebes are a group of species that cannot easily

³² Gruppi C., Sanzenbacher P., Balekjian K., Hagar R., Hagen S. and Rayne C. 2023: Genetic identification of avian samples recovered from solar energy installations. *PLoS ONE* 18(9): e0289949. doi.org/10.1371/journal.pone.0289949

³³ Kagan R.A. Viner T.C., Trail P.W. and Espinoza E.O. 2014: *Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis*, Unpublished report. National Fish and Wildlife Forensic Laboratory.

³⁴ Kosciuch K., Riser-Espinoza D. and Mitchell M. 2025: Lake effect or data mirage? How accounting for technology differences at utility scale solar energy facilities can change data interpretation. *Environmental Research Letters* 20: <https://doi.org/10.1088/1748-9326/ae1e91>

walk on land as their legs are placed far back on their body, generally take off from water, and would not be expected to try to land in a solar farm. The authors who originally assessed mortality at this site theorised that the waterbirds found dead had been attracted to an existing pond at the site and were disorientated by the polarisation caused by the panels³⁵.

116. This is relevant to the assessment of risk at the proposed site as the Australasian crested grebe is resident throughout the Mackenzie Basin in small numbers and within a few hundred metres of the proposed solar farm. Kosciuch *et al.* (2025) pointed out the issues with extrapolating results from the Desert Sunlight solar facility, which used fixed tilt panels and did not use antireflective technology, to photovoltaic facilities in general. However:
- There are no international data on the effectiveness of antireflective coatings at reducing collision risk.
 - The proposed farm is within a few hundred metres of Lake Benmore.
 - Australasian crested grebes are resident in the lake and in other lakes throughout the Mackenzie Basin, and many other Threatened and At Risk waterbird species regularly use the lake for foraging, including black-fronted tern.
117. Further, a review of nine solar facilities in the southwest United States (seven in the Sonoran and Mojave Deserts, one in the Great Basin, and one in coastal California) found that taxa within the grebe family were found dead at five of the inland facilities and the coastal California facility³⁶.
118. Kosciuch *et al.* (2025) also reanalysed mortality data from the southwest United States photovoltaic facilities, and separated data into those obtained from fixed-tilt panel facilities and tracker-type panel facilities, including the transition to anti-reflective coatings, which were assumed to be absent prior to 2015, and present after 2017³⁷. The authors found that tracked solar panels were associated with significantly less mortality of waterbirds than fixed panels.³⁸ This provides some optimism that the

³⁵ Kagan R.A. Viner T.C., Trail P.W. and Espinoza E.O. 2014: Avian Mortality at Solar Energy Facilities in Southern California: A Preliminary Analysis, Unpublished report. National Fish and Wildlife Forensic Laboratory.

³⁶ Kosciuch K., Riser-Espinoza D., Geringer M., Erickson W. and Zhang J. 2020: A summary of bird mortality at photovoltaic utility scale solar facilities in the Southwestern US *PLoS One* 15 e0232034.

³⁷ Kosciuch K., Riser-Espinoza D. and Mitchell M. 2025: Lake effect or data mirage? How accounting for technology differences at utility scale solar energy facilities can change data interpretation. *Environmental Research Letters* 20: <https://doi.org/10.1088/1748-9326/ae1e91>

³⁸ This review is notably limited in scope. Authors were only able to review data published in two previous papers, Kosciuch *et al.* (2020) and Smallwood (2022) as these were the only papers that distinguished between fixed and tracker panel facilities, and where the authors could determine whether data likely came from pre or post ARC technology. Kosciuch *et al.* (2020) contained data from 10 facilities, and

newer technology of tracked panels may reduce the mortality of waterbirds. However, based on the data presented in their paper, waterbirds still accounted for 4.1-11.2% of mortality in tracked panel facilities.

119. Kosciuch *et al.* (2025) grouped those waterbirds into two classes, obligate waterbirds and birds associated with water. Water associates were species that rely primarily on aquatic habitats for foraging, reproduction, and/or roosting and could be present in the study areas based on their known range. These species can walk on and take off from land, and included most species of ducks, swans, herons, bitterns, coots, rails, plovers, stilts, gulls, and terns. Water obligate species were those that rely on water for landing or taking off, and included grebes, cormorants/shags, and diving ducks. All the Threatened and At Risk bird species present in and around the proposed site fall into these species groups.

The risk of collisions at The Point Solar Farm

120. The solar farms described in the previous paragraphs have been constructed in areas well away from important bird habitats including, as far as I am able to tell, habitats of threatened bird species. In contrast, this proposal is for a facility situated a few hundred metres from the edge of Lake Benmore, the Ōhau C Ponds, and the Takapō River and river delta, where 33 indigenous bird species have been recorded including six Threatened and eight At Risk species. These species will fly over or near the site, during the day, at dusk, dawn, and through the night, and in fine and bad weather. Flights may be infrequent, or they may several times a day, as in the case of black-fronted tern.
121. All waterbird species found at and around the proposed site come from bird groups that have been found dead at photovoltaic facilities in the southwest United States, including grebes, cormorants/shags, waders similar to kakī, banded dotterel, South Island pied oystercatcher, and wrybill, rails similar to marsh crake, bitterns, large herons, gulls and terns, and a pipit.
122. Black-fronted terns are the only species for which we have detailed movement data in this location, stemming from GPS tracking data from two Masters projects and from Department of Conservation research. Dr Colin O'Donnell's³⁹ advice on the potential impacts of The Point Solar Farm provide some of these unpublished GPS tracking data and clearly show terns traversing the proposed site. Unlike the two

Smallwood (2022) covered 11 facilities. Neither paper contained data post 2017, though data from a small number of facilities were available over the ARC transition period of 2015-2017.

³⁹ O'Donnell C. 2024: Initial briefing – potential impacts of proposed 'The Point' solar farm near Twizel on threatened birds. Department of Conservation unpublished report.

Masters projects, the department's data also show considerable use of Lake Benmore.

123. I note that the department's data are from a sample of terns from certain, unspecified colonies during a particular point in time. All three black-fronted tern GPS datasets differ from each other; it is very possible that terns from a different colony in a different year may demonstrate different flight paths and habitat use. One constant feature, however, is the use of the overnight roost at the Takapō delta.

124. The data on which O'Donnell's graphs are based are not publicly available. Instead, I have provided a graph from the Gray (2024) Masters thesis of all black-fronted tern GPS fixes (Figure 5). I have created the inset to show more detail of the Takapō delta and proposed solar farm site. The GPS trackers in this project recorded a location fix every four hours, except when batteries were at high charge, when fixes were made every 10 minutes. Therefore, they do not show every route or foraging location. They also represent the movements of a sample of terns, not the hundreds of terns that use the delta. The data show flight paths around the site, and the presence of birds over and within the site and demonstrate the visibility of the proposed solar farm to the hundreds of birds using this area.

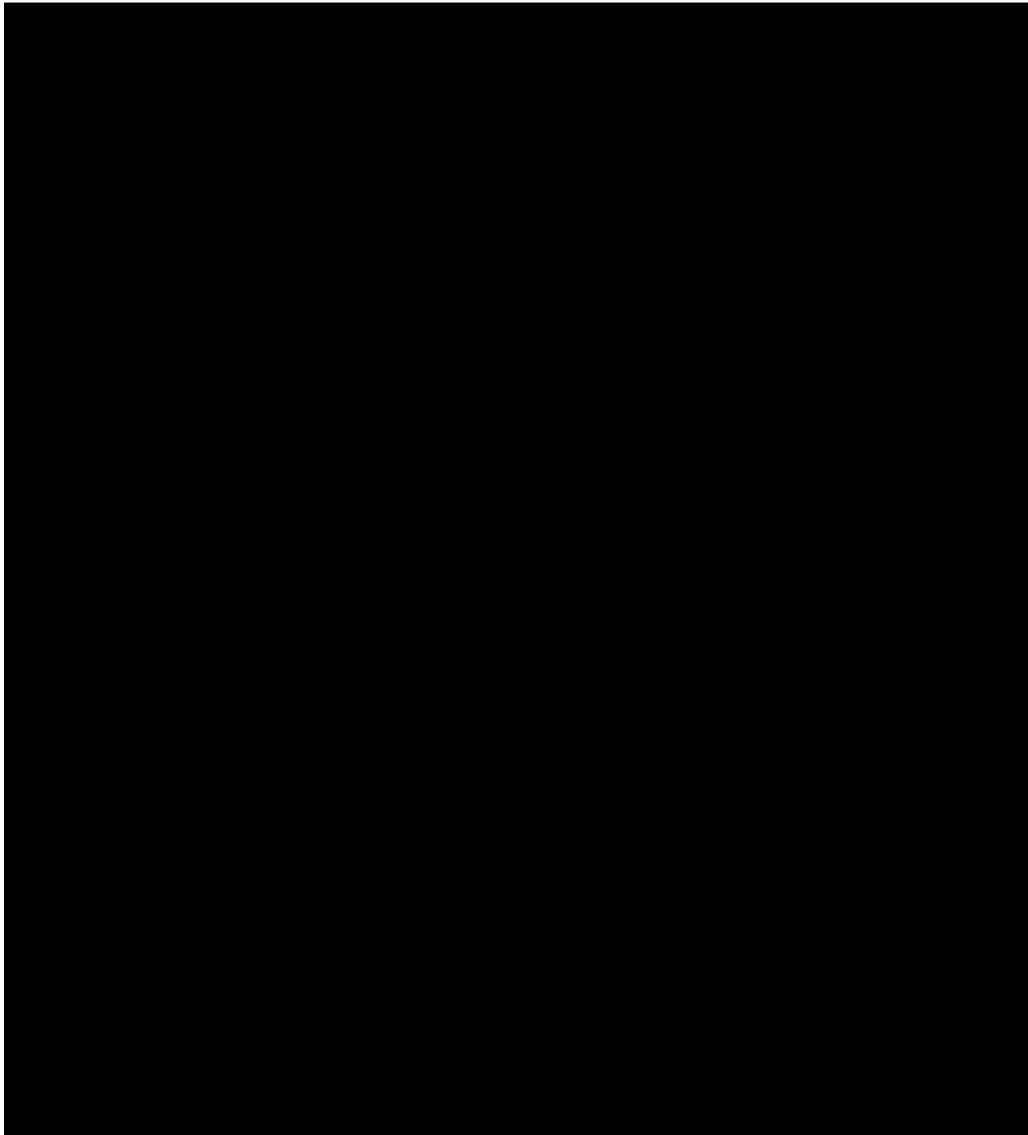


Figure 5: GPS locations (navy dots) plotted for all tracked black-fronted terns. Data show frequently used flight paths between the Tasman and Cass Rivers (A) and between the Ahuriri and Ōhau Rivers (B), and up and down rivers (from Gray 2024⁴⁰).

125. In addition, tracking studies have not addressed weather conditions during data collection; we do not know how roosting and foraging behaviour is affected by severe weather and if birds continue to forage and roost away from colonies in gales or rain. We also do not know how black-fronted terns locate themselves while flying and foraging in the dark.

126. Terns may collide with panels which stand a maximum of 4.5 m above the ground, or with fences surrounding the solar farm, or with new overhead cables; all bird species are vulnerable to collision with infrastructure to varying degrees. Terns may find the site more attractive for foraging as vegetation changes in response to shading,

⁴⁰ Gray K.E. 2024: Movements and habitat use of black-fronted terns and banded dotterels in the Mackenzie Basin. Master of Science (Ecology), University of Otago. 159p.

changes in stocking, and weed control, altering food sources. Terns may be attracted to the site if the polarising light reflected by the panels attracts aquatic invertebrates, a key prey item. Terns may be attracted to the solar farm themselves through the polarisation of light caused by the panels, both during the day and at night, even with anti-reflective coatings. We cannot predict exactly how black-fronted terns will be affected by the proposed solar farm, or to what extent. Nevertheless, the risk of collision clearly exists.

127. Black-fronted tern is just one of the 14 Threatened and At Risk bird species that are present in or adjacent to the proposed site, and that will fly next to or over the solar farm. We have no GPS tracking data for the remaining 13 Threatened and At Risk species in the vicinity of the solar farm. It is not possible to quantify the risk of collision for each species, and it is likewise not possible to confidently state that there will be no adverse effects on each species. What we do know is that an average of 29 bird species were found dead in 11 photovoltaic facilities in the southwest United States, with an overall combined total of ≥ 192 different bird species from 14 facilities (including three non-photovoltaic solar facilities)⁴¹.
128. How do we predict the risk of mortality for the Threatened and At Risk bird species that live in and around the solar farm? The fact is, we cannot. The data do not exist for any of these species, nor do comprehensive data from tracked solar facilities using anti-reflective panel coatings exist overseas. To my knowledge, no data are available from any solar facility placed this close to internationally important bird areas. In my opinion, the risk is very real, even just from the placement of novel infrastructure in the environment – overhead lines, high fences, buildings and panels – that may cause incidental collisions at night or in poor weather.
129. To highlight this point, I quote the ecological assessment, Substantive Application, Dr Gary Bramley – Ecological Solutions, and Dr John Craig – Green Inc. below:
- “...information and further investigations is required to determine direct affects at the site regarding the risk of bird strike with solar array panels” (ecological assessment).
 - “...there is a lack of international and local information on the potential bird strike” (Substantive Application).
 - “Because of the lack of local data, the level of risk to New Zealand birds posed by solar panel arrays alone is difficult to determine with confidence”, and “On the basis of existing evidence, the risk of mortality for birds using

⁴¹ Smallwood K.S. 2022: Utility-scale solar impacts to volant wildlife *Journal of Wildlife Management* 86: doi.org/10.1002/jwmg.22216.

the surrounding habitat due to the proposal would appear to be low, but given the conservation status of the birds present, further research and detailed monitoring would be appropriate” (ecoLogical Solutions).

- “...the reason for apparent collision mortalities is poorly understood” (Green Inc.).

130. Mortality of even small numbers of Threatened bird species could have regional and national population effects. Most at risk of population effects is kakī. Restricted to the region, and numbering only some 40 breeding pairs, regular deaths of one or two birds annually, particularly adults, would almost certainly impact the fragile stability of the population. The numbers of Australasian bittern pairs will be considerably lower in the region; the loss of single individuals will impact the regional population. Even the At Risk black-billed gull, numbering well over 100,000 birds in the South Island, has a very small population in the Mackenze Basin.
131. The potential for regional and national population effects from the proposed solar farm is in stark conflict to the huge investment put into managing these species in the Mackenze Basin.

Comments on ecoLogical Solutions and Green Inc peer reviews

132. Dr Bramley (ecoLogical Solutions) states that the ecological and habitat values of the site are low. This contrasts with the ecological assessment that has evaluated all five habitats as significant against criteria in Environment Canterbury’s Regional Policy Statement based on the presence of Threatened and At Risk species. Dr Bramley appears to have determined its low value because it is classified as ‘depleted grassland’ in the LCDB5. Modified habitats do not necessarily equate with low biodiversity value; research demonstrates banded dotterels select depleted grasslands for foraging in the Mackenzie⁴².
133. Dr Bramley provides his own assessment of the value of the habitats for breeding and foraging Threatened and At Risk birds in the absence of the relevant information in the ecological assessment. He notes black-fronted tern may use the site for foraging; the ecological assessment states that terns *do* use the site for foraging, as do banded dotterels. The assessment also states that kakī may breed and forage at the site.
134. Dr Bramley provides accounts of bird values associated with the solar farms themselves. As I discussed in my evidence for the Haldon Solar Farm, changes in the bird communities associated with farms are variable and possibly difficult to predict. Variability in species responses to habitat alterations caused by solar farms was

⁴² Gray K.E. 2024: Movements and habitat use of black-fronted terns and banded dotterels in the Mackenzie Basin. Master of Science (Ecology), University of Otago. 159p.

highlighted by a review on solar facility impacts on fauna⁴³. The paper reported on studies that compared bird diversity and abundance within solar facilities and adjacent reference sites from four states in the United States, South Africa, Japan, United Kingdom, Slovakia, and Poland. Results were highly variable, from little change in species diversity between the solar farm and unaffected sites, to similar levels of diversity but altered bird communities, through to increased species diversity. Reviewed studies reported lower overall abundances of birds within solar farms, unchanged numbers, and greater abundances. However, the review's conclusion was that increases in species richness and abundance were associated with facilities constructed in degraded habitats, probably due to the creation of novel habitat and increases in generalist species.

135. I consider that habitat changes due to the presence of the solar farm that result in increased diversity and/or abundance of introduced or Not Threatened bird species at the site do not constitute an improvement if concurrent use by Threatened and At Risk species declines.
136. Both Drs Bramley and Craig compare the relative impacts of bird collisions with solar farms to collisions with other infrastructure; from Dr Bramley's review, "vehicles, buildings and windows, power lines, communication towers, wind turbines, electrocutions, oil spills and other contaminants, pesticides, cat predation and commercial fishing by-catch".
137. Firstly, this is an inappropriate approach because it presumes project-related mortality is acceptable because other sources of human-induced mortality may be greater. This approach leads to ever greater impacts. Secondly, it is not relevant to the species and habitats involved. A solar farm proposal is a major, novel physical structure in the open, empty landscape of the Mackenzie Basin. This solar farm is situated within a few hundred metres of internationally recognised bird habitats.
138. Dr Craig highlights the high voltage transmission lines present across the site and the Lower Takapō River, noting that similar structures have caused fatality of threatened bird species at other electrical installations, but are generally not considered to have population level effects. He claims without evidence that the transmission lines pose no major risk; I doubt collision fatalities have been surveyed. Population-level effects are more probable when all individuals are confined to a single area, like kakī in the Mackenzie Basin.

⁴³ Fleming P.A. 2025: All that glitters – review of solar facility impacts on fauna. *Renewable and Sustainable Energy Reviews* 224: DOI: 115995.

139. Dr Bramley states that there is very limited evidence to support the Lake Hypothesis. I agree, and as I have noted above, most birds found dead at solar farms in the United States have *not* been waterbirds, clearly demonstrating there may be multiple factors leading to collisions with panels. However, incidents of waterbird fatalities—including grebes—have been documented at solar farms, and the underlying causes of these occurrences remain unclear.
140. Both Drs Bramley and Craig highlight that information on bird collisions with solar panels comes from the United States, primarily in the southwest. This is inevitable because it is largely the only data available that can be used to indicate what might be expected at The Point Solar Farm. I reiterate that the most recent paper published on the subject – not reviewed by either Drs Bramley or Craig – shows that modern tracked solar panels still cause bird mortality including waterbirds⁴⁴.
141. Neither Dr Bramley nor Dr Craig refer to recent research on the movements and habitat use of black-fronted tern in the ecological district. The Takapō delta is a major overnight roost site for black-fronted terns, leading to hundreds of movements of birds over or near the location of the proposed solar farm from dusk until dawn. Dr Bramley suggests black-fronted terns feed in farmland particularly when bare soil is exposed. However, GPS tracking demonstrates that black-fronted terns prefer high-producing grassland. Occurrences of several hundred terns feeding in pivot irrigated fields have been reported in the district⁴⁵.
142. Dr Craig suggests that the high proportion of migratory songbird deaths in southwest United States solar facilities may be because many individuals encounter the solar farm only once as they migrate across the country. I consider that this same reasoning should apply to naïve juvenile birds of any species in the habitats surrounding the solar farm in their first encounters with the solar panels.
143. Dr Bramley notes that additional mortality caused through solar panel collision could be sufficient to cause a population decline for one or more of the species present given their threat status. He then suggests that this will not be an issue given “...most of the species present, including the species of most concern, are not using the habitats within the footprint directly and would be most at risk if they collided with panels resulting in injury or death”. Birds do not need to use the footprint of the farm

⁴⁴ Kosciuch K., Riser-Espinoza D. and Mitchell M. 2025: Lake effect or data mirage? How accounting for technology differences at utility scale solar energy facilities can change data interpretation. *Environmental Research Letters* 20: <https://doi.org/10.1088/1748-9326/ae1e91>

⁴⁵ For example, 267 terns observed from the Twizel highway on 6 April 2015 <https://ebird.org/checklist/S22713000>, and almost 600 terns observed in a pivot irrigated dairy farm in January 2026 (Andrew Crossland, ornithologist, pers. comm.)

directly to be at risk of injury or death from collision – this is clearly demonstrated by overseas data showing significant mortality of migratory songbirds.

144. Dr Bramley refers to the lack of evidence of the severity of the risk of collision, particularly at the population level. There is certainly no example that I am aware of where a solar farm has been located within an area that supports a species as threatened as kakī. He also notes, “Given the highly threatened status of several of the species of interest at The Point, any additional mortality could have population level effects”, but then considers Dr O’Donnell to have overstated the risk. In my opinion, the risk is obvious. Kakī are present year round, breeding and foraging in the habitats that surround the proposed solar farm, and possibly within it, and moving throughout the landscape. Even if just from the risk of colliding with infrastructure, in the absence of any specific effect caused by the panels themselves, the presence of hundreds of thousands of panels standing up to 4.5 m high in the landscape must be considered to present a collision risk.
145. Like Drs Bramley and Craig, I also consider that species will become accustomed to the presence of the solar farm, some more than others, and some individuals more than other individuals. We can see this where we live and work – those bird species and individuals that are more tolerant of our urban areas. These same birds occasionally misjudge the environment where they live, for example, flying into windows that they would usually avoid, sometimes causing mortality. As Dr Craig observes, many of these mistakes are made by juveniles.
146. All around the site of The Point, juveniles and adults of Threatened and At Risk bird species are flying at day, and many at night, presumably in poor weather as well as fine. Given our lack of understanding of the drivers of collisions with solar panels, I consider that the risk of population level effects, particularly for kakī, is very real.

Cumulative effects

147. The Point Solar farm is the second Fast Track solar farm proposal being assessed for this area, next to Lake Benmore, the Takapō, Pūkaki, Ōhau and Twizel rivers, and associated wetlands. The Haldon Solar Farm is smaller and proposed for less modified habitats.
148. Both sites are likely to support a similar suite of Threatened and At Risk species. However, the extent that the sites are used for breeding and foraging by these species was not determined through fieldwork at either location.
149. In my opinion, the greatest threat that these farms pose to the Threatened and At Risk bird community is collision with infrastructure, and specifically, solar panels. The

Haldon solar farm is 320 ha, and The Point solar farm is 670 ha. In essence, the greater coverage of the area with solar panels simply compounds the risk.

150. There is little evidence to suggest that one location presents less risk than the other. The only data available are black-fronted tern GPS tracking movements obtained by the Department of Conservation which show regular flight paths directly over The Point site, but not Haldon. However, as I have previously mentioned, those data are from a sample of birds of one species from a particular set of colonies over a certain period. It is insufficient evidence for me to be able to say if one site presents less risk than the other.

Management of effects and conditions

151. As I have previously set out, the ecological assessment highlights bird strike with solar array panels as one of five potential effects on birds. It considered that “more information and further investigations is required to determine direct affects at the site regarding the risk of bird strike”. It also stated that “The level of effect has been determined at a conservative level and may change based on final plans. Without mitigation, this effect is likely to be **more than minor.**”
152. The assessment provides a single mitigation action: “Providing clear areas between solar panel arrays will allow birds to navigate the access corridors and avoid bird strikes when landing or departing from the site” (p43). This does not demonstrate an understanding of the risk of bird collision with solar panels.
153. Though the assessment does not mention it, providing clear areas between lines of panels is, in fact, a suggested mitigation to reduce the lake-like appearance of the banks of arrays to birds flying overhead (that is, the Lake Effect hypothesis). However, to my knowledge, this mitigation method remains untested. It is also not necessarily resident birds that are most at risk; overseas data indicate that most mortality is often of bird species that are migratory and have not been detected in pre-construction surveys.
154. No other mitigation measures addressing collision risk are specified in the ecological assessment, substantive application, or the conditions. However, the Substantive Application notes that the panels are coated in a low-reflectivity material to reduce the glare and glint perceived by people. However, specific research into the efficacy of anti-reflective coatings at reducing fatalities does not yet exist; this is also noted by the ecoLogical Solutions peer review. The peer review also lists patterned coatings as a possible approach for solar farms. White, non-polarising lines are already being used to reduce the ‘ecological trap’ caused by solar panels whereby aquatic

invertebrates are attracted to the panel surfaces to lay eggs. Condition 71 states that all panels must have “gridlines” but it is not clear what lines are being referred to. The white lines have been shown to significantly reduce egg laying by aquatic insects but not resolve the issue.

155. The fact remains that birds are still found dead at more modern photovoltaic facilities. The extent of mortality is highly variable between facilities, almost certainly due to site-specific factors.
156. It is possible that the closer solar panels are to the lake, and possibly the Takapō River, the greater the risk that birds intending to feed or land on the lake (e.g. Australasian crested grebe and black-fronted tern) will mistake panels for water. However, there is no information to suggest what kind of setback might be appropriate, or if indeed any setback is sufficient to avoid risk.
157. Other mitigation options have been suggested. As part of the Glorit Solar Farm hearing, experts for the Applicant and Department of Conservation experts discussed mitigation measures during caucusing for the Joint Witness Statement. I have compiled their suggestions below⁴⁶:

- Site layout and landscaping to break up continuous profile
- Panel arrangement, height and spacing
- Minimising the time panels spend in the horizontal position
- Stowing at 60 degrees overnight
- Stowing at 90 degrees overnight
- Anti-reflective coating
- No bare wiring, and the use of appropriate insulators
- Minimising light at night
- Dynamic bird flappers on transmission lines.

However, it was pointed out that none of the suggestions regarding the panels themselves have been tested for their ability to reduce collisions at solar farms specifically.

158. I note that the ecoLogical Solutions peer review states that the proposed arrays can be stowed in a vertical position overnight, thereby reducing the reflection of polarised light. However, the Substantive Application states that “The highest tilt is expected to be around 65 degrees (this depends on the exact panels selected,

⁴⁶ Joint Statement of Experts: Ecology (Avifauna), 21 May 2025. For the applications for resource consents by Glorit Solar P LP for activities associated with the Glorit Power Scheme.

the tracker hardware and the spacing between the rows) (Section 4.2). It is not clear that this potential mitigation option is available.

159. The ecological assessment's recommendation for "more information and further investigations is required to determine direct affects at the site regarding the risk of bird strike" [sic] appears to have been addressed in the Conditions. Condition 58 specifies that at least six months before the commencement of construction, a Literature Review must be completed that summarises the current state of knowledge on bird collision with ground-mounted, photovoltaic solar arrays. The review is intended to "Provide an up-to-date evaluation of bird collision risk with equivalent technology projects both internationally and within New Zealand".
160. I do not see the point of undertaking this review after consent is obtained, and six months before the panels are being placed on site. It is simply too late. My sense is that overseas research in this area is now moving relatively quickly, but still with a frustrating lag time from fieldwork to publication. Nevertheless, if a new panel coating, for example, with proven efficacy at reducing collisions went on the market this year, is six months a sufficient window to obtain panels from overseas? Or alter the layout of the solar facility?
161. This is a commonality that runs through this application for consent. Baseline data collection has been left too late (see my paragraph 175), the Literature Review on solar panel collisions is yet to be undertaken, and methods for monitoring collisions and mitigating collisions have yet to be designed.
162. I have several comments on conditions regarding the Avifauna Management Plan and the collision monitoring design.
163. The duration of the monitoring programme is to be "a minimum of 36 months from commencement of installation of solar panels and ancillary infrastructure within the Site". This contrasts with the ecological assessment's recommendation of "the lifetime of the solar farm". I consider lifetime monitoring to be ideal, but would support, for example, scaling down monitoring if no collisions of Nationally Threatened species are detected by the monitoring programme for two years.
164. The indigenous bird mortality thresholds are appropriate. I presume that Nationally Endangered species also have the same one carcass threshold as Nationally Critical species; it is not clear from the layout of the table.
165. Given the solar farm will be situated in kakī habitat, it is imperative that if a kakī is killed through collision with any infrastructure, it is located. Usually, a collision

monitoring programme involves searches of a sample of the site on any single occasion. This is inadequate in this situation. It is important that the whole site is searched within a timeframe that minimises the potential loss of a dead kakī through scavenging, predation, or decomposition. Wrybills and pipits are the smallest birds of interest and will become undetectable the quickest; carcass detection and persistence trials should include similarly small birds.

166. Carcass detection dogs should be used for carcass searches given the importance of detecting, for example, a single kakī or wrybill. The proposed literature review will show that trained dogs have a much higher rate of carcass detection than human searchers. The use of dogs was recommended by Bull *et al.* (2013)⁴⁷ for searches at wind farms in New Zealand, but dogs have still not been utilised here despite the obvious expertise in training conservation dogs in this country. A dependence on people only for searching will lead to higher numbers of carcasses being missed, and the possibility that a death of an individual of a rare species will not be detected.
167. The method of determining the cause of death of birds found as carcasses is not mentioned. This is a major issue in solar panel collisions, with a large percentage of carcasses not being identified to species and not being assigned a cause of death. Human searchers and dog handlers are unlikely to have the expertise to determine the cause of death. Birds that have collided with solar panels have been found to have broken bones, particularly legs, and internal trauma. It is most appropriate for all carcasses to be collected and sent for independent autopsy. This would allow for certainty of species identification.
168. In the event of collision thresholds being exceeded, a Bird Collision Management Plan will be developed. It is at this point that mitigation options will be tested to attempt to reduce mortality. What if mitigation actions are not effective? What if existing panels need to be replaced with others with proven efficacy at reducing collisions – for example, panels that can be stowed vertically during poor weather or at night? My understanding is that panel coatings must be applied during the manufacturing process, so new coatings would also require new panels. Is that going to be feasible?
169. As far as I am aware, none of the proposed mitigation actions listed in Condition 66(b) have been tested at solar farms. It is not evident that the Applicant will be able to rectify the situation in the event of excessive levels of mortality.

⁴⁷ Bull L.S., Fuller S. and Sim D. 2013: Post-construction avian mortality monitoring at Project West Wind. *New Zealand Journal of Zoology* 40: 28-46.

170. One option that might reduce the risk is for the solar farm to be constructed with a staged approach. Only once the first stage of solar panels has been shown to cause minimal mortality of birds can the next stage be constructed.
171. My last comment is that the results of the monitoring programme should be accessible to the public, and quickly. Construction of solar facilities in New Zealand is proceeding rapidly, and we need to understand the extent of risk to New Zealand bird species as soon as possible.
172. Conditions relating to birds regarding construction activities are appropriate.
173. The Applicant has proposed an Ecological Enhancement Plan, the purpose of which is to “describe how indigenous vegetation on the site will be managed during the term of the resource consent” (Condition 69). This presumably refers to the Wildlands (2025) document. Birds are not a focus of this plan. However, I consider mammalian pest control is likely to benefit birds that may continue to nest at the site such as banded dotterel and pipit and may also increase foraging activity by species such as black-fronted tern which hunt for lizards in Mackenzie Basin grasslands. While benefiting bird species, this may also increase the potential for interactions with infrastructure.
174. It is also understood that compensation measures have been discussed with the Department of Conservation. It is not clear what these measures are compensating for given the Substantive Application considers all adverse effects are minor. The Applicant proposes to contribute one million dollars over the life of the consent to support predator control programmes that benefit braided-river birds, including kakī. It is not clear if there is a specific project intended, but my preference would be to compliment the proposed pest control programme at The Point with an extension of pest control around this site that covers the Takapō River and the delta.

Further ecological surveys

175. In response to questions from the Panel, it is understood that the Applicant’s ecologists carried out further surveys over the week commencing 9 February 2026 (Wildlands Memo dated February 2026). This will not assist in a greater understanding of the use of the site by Threatened and At Risk bird species as it is outside of the breeding season, and most braided river birds will have dispersed from the Mackenzie Basin.

Conclusions

176. The Point Solar Farm will be located on the edge of nationally and internationally important bird habitats. Lake Benmore, the Takapō River and delta, and associated wetlands support approximately 33 indigenous bird species, of which six are Nationally Threatened and eight are At Risk. All 33 species will undertake movements over and around the proposed solar farm; for some species, these movements will be frequent, and for many, flights will occur at night as well as during the day.
177. The use of the proposed site by Threatened and At Risk bird species is poorly understood, but braided river species are expected to nest and/or forage at the site, including kaki. Kakī is one of the rarest bird species in the world and restricted to this region for breeding.
178. The Point Solar Farm has the potential to create a novel and significant adverse effect on a suite of bird species already threatened by predation, hydroelectric development, habitat degradation and loss, and disturbance. No one knows the extent of the risk posed by the proposed facility to each of the Threatened and At Risk species present at this locality. But we do know that utility-scale photovoltaic solar installations result in the mortality of many bird species overseas, a proportion of which are waterbirds.
179. The proximity of The Point Solar Farm to Lake Benmore and the Takapō River, and within an area supporting many Threatened and At Risk species, may have unintended consequences for these populations of birds. Two solar farms in the same general location compounds the potential risk.
180. I have a strong preference on ecological grounds for solar farms and wind farms over other forms of energy production. However, I do not think that the location of The Point Solar Farm is the appropriate place to test the impacts of solar panels on so many of New Zealand's Threatened and At Risk bird species.

Rachel McClellan
19 February 2026

Appendix 1

Common, te reo Māori, and species names of birds mentioned in the text.

Common name	Te reo Māori	Species Name	Threat Classification
Australasian bittern	Matuku-hūrepo	<i>Botaurus poiciloptilus</i>	Nationally Critical
White heron	Kōtuku	<i>Ardea modesta</i>	Nationally Critical
Black stilt	Kakī	<i>Himantopus novaeseelandiae</i>	Nationally Critical
Black-fronted tern	Tarāpirohe	<i>Chlidonias albostratus</i>	Nationally Endangered
Australasian crested grebe	Kamana / pūteketeke	<i>Podiceps cristatus cristatus</i>	Nationally Vulnerable
Grey duck	Pāpera	<i>Anas superciliosa</i>	Nationally Vulnerable
Caspian tern	Taranui	<i>Hydroprogne caspia</i>	Nationally Vulnerable
Wrybill	Ngutu pare	<i>Haematopus finschi</i>	Nationally Increasing
Marsh crane	Kotoreke	<i>Porzana pusilla affinis</i>	Declining
South Island pied oystercatcher	Tōrea	<i>Haematopus finschi</i>	Declining
Banded dotterel	Pohowera	<i>Charadrius bicinctus bicinctus</i>	Declining
Black-billed gull	Tarāpuka	<i>Larus bulleri</i>	Declining
New Zealand falcon	Karearea	<i>Falco novaeseelandiae</i>	Declining
New Zealand pipit	Pīhoihoi	<i>Anthus n. novaeseelandiae</i>	Declining
Pied shag	Kāruhiruhi	<i>Phalacrocorax varius varius</i>	Recovering
Royal spoonbill	Kōtuku ngutupapa	<i>Platalea regia</i>	Naturally Uncommon
Black shag	Māpunga	<i>Phalacrocorax carbo novaehollandiae</i>	Relict
Little shag	Kawaupaka	<i>Phalacrocorax melanoleucos brevirostris</i>	Relict
Black swan	Kakīānau	<i>Cygnus atratus</i>	Not Threatened
Mallard/grey duck hybrid		<i>Anas superciliosa x platyrhynchos</i>	Not Threatened
Grey teal	Tētē moroiti	<i>Anas gracilis</i>	Not Threatened
Australasian shoveler	Kuruwhengi	<i>Anas rhynchotis</i>	Not Threatened
Paradise shelduck	Pūtangitangi	<i>Tadorna variegata</i>	Not Threatened
New Zealand scaup	Pāpango	<i>Aythya novaeseelandiae</i>	Not Threatened
White-faced heron	Matuku moana	<i>Egretta novaehollandiae</i>	Not Threatened
Australian coot		<i>Fulica atra australis</i>	Not Threatened
Pūkeko		<i>Porphyrio melanotus melanotus</i>	Not Threatened
Pied stilt	Poaka	<i>Himantopus himantopus leucocephalus</i>	Not Threatened
Spur-winged plover		<i>Vanellus miles novaehollandiae</i>	Not Threatened
Black-backed gull	Karoro	<i>Larus dominicanus dominicanus</i>	Not Threatened
Australasian harrier	Kāhu	<i>Circus approximans</i>	Not Threatened
Grey warbler	Riroriro	<i>Gerygone igata</i>	Not Threatened
Shining cuckoo	Pipīwharaua	<i>Chrysococcyx lucidus lucidus</i>	Not Threatened
New Zealand kingfisher	Kōtare	<i>Halcyon sancta</i>	Not Threatened
Silvereye	Tauhōu	<i>Zosterops lateralis lateralis</i>	Not Threatened
South Island fantail	Piwakawaka	<i>Rhipidura fuliginosa fuliginosa</i>	Not Threatened
Welcome swallow	Warou	<i>Hirundo neoxena neoxena</i>	Not Threatened
Kererū		<i>Hemiphaga novaeseelandiae</i>	Not Threatened
Australasian little grebe	Tokitokipio	<i>Tachybaptus n. novaehollandiae</i>	Coloniser