Interim Bird Survey
Cosmeston lakes
19/07/2025

It should be noted that there is scientific difficulty in attribution of cause and effect on the species at Cosmeston due to the high number of other external influences that are not associated with the Aqua Park and this is discussed below.

Causality of Disturbance and Limitations of Noise Surveys

Determining causality in ecological studies—particularly in relation to bird movement, nesting behaviour, or temporary absence—is inherently complex in publicly accessible multi-use environments such as Cosmeston Lakes Country Park. Bird presence and behaviour are influenced by a wide range of environmental, anthropogenic, and ecological factors. As such, attributing changes in bird activity specifically to the presence or operation of the Aqua Park could be scientifically unreliable and unsupported by meaningful data, even with formal noise monitoring.

In the context of Cosmeston, it is important to acknowledge the highly dynamic baseline environment in which Cetti's Warbler and other bird species exist. This includes:

- **Routine Maintenance Activities**: Use of petrol-powered strimmers, mowers and other equipment for maintaining the extensive footpath network and vegetation around the lakes introduces unpredictable and high-intensity acoustic and visual stimuli in immediate proximity to potential nesting areas.
- **Dog Walking and Off-Lead Access**: The park is a popular location for recreational dog walking. Dogs are frequently observed off-lead, entering the lake, and flushing birds from reedbeds and marginal vegetation, including areas near the identified nesting territories. Throwing sticks into the lake—particularly from the slipway, around the pontoons, and along the lake margins—is a common activity which introduces both auditory and visual disturbance.

- **General Public Use**: The public footpaths encircle the entire lake system and are used extensively throughout the day by walkers, runners, families, and cyclists. This results in a constant and fluctuating level of human presence and associated noise. The eastern lake is regularly accessed by visitors, and the nearby café, boardwalk, and car park increase foot traffic in areas near established bird territories.
- **Protest Activity**: Demonstrations and associated noisy gatherings related to the Aqua Park development have occurred on the lake shore, resulting in increased human presence, raised voices, and unpredictable movement in areas adjacent to sensitive bird habitat.
- The Protest held on the 14th of June encouraged the use of whistle and drum to make noise, and a loud hailer was used on the length of the southern shoreline, adjacent to the site of the nesting Cettis warbler. It was not observed again after this date..

These background levels of disturbance are persistent, highly variable, and largely unregulated. Consequently, any attempt to isolate the acoustic contribution of the Aqua Park and link it to a specific bird movement or behavioural change would be fundamentally flawed. Even with accurate decibel readings, it would be impossible to distinguish the influence of the Aqua Park from other simultaneous and potentially more impactful activities occurring across the site.

Furthermore, this is not a quiet nature reserve where human activity is restricted to defined observation hides or controlled access. It is a well-used country park with a high and diverse baseline of human activity that would confound any attempts at controlled comparative analysis.

Conclusion:

Given the above, it is not considered feasible or scientifically robust to implement noise surveys with the aim of attributing causation for bird movement or nesting disruption to the Aqua Park.

A more appropriate and meaningful approach is to continue monitoring the overall population and behaviour of key species—including Cetti's Warbler—across the site, allowing for a holistic understanding of species presence and resilience within this active, mixed-use setting.

Cosmeston Lakes,
Vale of Glamorgan

Proposed Aqua Park
Interim Ecological Technical Note on Nesting Birds Including Cetti's Warbler

July 2025

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Cosmeston Lakes, Vale of Glamorgan: Proposed Aqua Park Ecological Technical Note on Nesting Birds Including Cetti's Warbler				
Revision	Date	Prepared by	Checked by	Approved by
2.0	18 July 2025	Paul Hudson MCIEEM Principal Ecologist	Paul Hudson MCIEEM Principal Ecologist	Paul Hudson MCIEEM Principal Ecologist

1. Introduction

1.1. Brief

Acer Ecology were instructed by the Aqua Park Group to provide an ecological technical note in response to advice received from Natural Resources Wales (NRW) regarding the need for a nesting bird survey ahead of the proposed installation and operation of a seasonal Aqua Park at the eastern lake of Cosmeston Lakes Country Park.

Assent under Section 28H of the Wildlife and Countryside Act 1981 was granted on 23rd May 2025 for the temporary installation of an Aqua Park in the eastern lake of Cosmeston Lakes SSSI. The assent is subject to the following note:

NRW advise that prior to the installation of the Aqua Park a suitably qualified ecologist should undertake a nesting bird survey. Cetti's Warbler (Cettia cetti) are known to nest in close proximity to the proposal. Cetti's Warbler are listed Schedule 1 on the Wildlife and Countryside Act (as amended, 1981). It is an offence to disturb these species during the breeding season without a valid licence.

Details of appropriate mitigation (following the step-wise approach) for any likely significant effects identified should be provided along with appropriate enhancements. In some instances, mitigation may need to take the form of curtailment or redirection of activities during particular times of year. Where buffer distances are required or need to be considered then reference should be made to Goodship & Furness 2022 or alternative published references for species not listed within Goodship & Furness 2022.

1.2. Site Context

The seasonal Aqua Park is to be installed at Cosmeston Lakes County Park, Lavernock Rd, Penarth, CF64 5UY (Ordnance Survey Grid Reference: ST 17746 69287)[1] as shown on Plan 1.

The site includes two lakes, created from flooded limestone quarries, which are connected by a narrow channel. The lakes are bordered by woodland, lines of trees, and footpaths, with open grassland areas, particularly around the eastern lake.

The wider landscape consists of a mosaic of woodlands, agricultural land, and urban areas, with the Glamorganshire Golf Club directly north.

The site is designated as a Site of Special Scientific Interest (SSSI), Local Nature Reserve (LNR) and country park.

[1] Latitude and Longitude: 51.416612 , -3.1842155

1.3. Proposal

The proposal includes the installation of a floating inflatable Aqua Park in the eastern part of the east Cosmeston Lake for seasonal summer use. The Aqua Park will operate at weekends in June and then seven days a week in July, August and the first half of September. It is proposed to close on 14th September 2025, with all Aqua Park inflatables then removed.

1.4. Background and Legislative Context

All wild British birds (while nesting, building nests and sitting on eggs), their nests and eggs (with certain limited exceptions) are protected by law under Section 1 of the Wildlife and Countryside Act 1981 (as amended). Included in this protection are all nests (at whatever stage of construction or use) and all dependent young until the nest is abandoned and the young have fledged and become independent. Particularly rare species such as Cetti's Warbler are listed on Schedule 1 which gives them additional protection from disturbance whilst nest building, whilst near a nest with eggs or young, or from disturbing the dependent young.

For Schedule 1 bird like the Cetti's Warbler and Kingfisher (*Alcedo atthis*) it is an offence to intentionally or recklessly disturb this species while it is building a nest or is in, on or near a nest containing eggs or young, or to disturb dependent young.

"Disturbance" in this legal context includes:

- Causing a bird to abandon its nest;
- Interrupting feeding of chicks, leading to reduced survival;
- Provoking a bird to leave the nest, exposing eggs or young to the elements or predators;
- Prolonged disturbance or noise near the nest that results in stress or changes in behaviour (such as reduced singing or mating activity); or
- Sudden or repeated human activity that causes significant behavioural change during the breeding season.

NRW has indicated that Cetti's Warbler is known to nest in close proximity to the proposal, thereby necessitating a robust ecological survey and appropriate mitigation strategy to ensure compliance with wildlife legislation and to avoid disturbance to this species.

Cetti's Warbler nesting habitat includes reedbeds, marginal scrub, and dense wetland vegetation.

1.5. Cetti's Warbler Nesting Season

The breeding season for Cetti's Warbler extends from mid-March to early August, with the peak nesting period from April to June inclusive.

1.6. Reporting

This technical note outlines the proposed survey methodology, and results of the interim bird survey.

2. Methods

2.1. Survey Methodology

Cetti's Warbler Surveys

A nesting birds survey of the site focusing on Cetti's Warbler was undertaken by Matt Binding on 30th May 2025 and Paul Hudson on 31st May 2025 and 1st June 2025, 2nd June 2025, 4th June 2025, 5th June 2025, 7th June 2025, 9th June 2025, 10th June 2025, 12th June 2025, 13th June 2025, 14th June, 15th June 2025, 16th June 2025, 18th June 2025, 20th June 2025, 21st June 2025, 24th June 2035, 26th June 2025, 27th June 2025, 28th June 2025, 30th June 2025, 2nd July 2025, 3rd July 2025, 4th July 2025 and 5th July 2025, 6th July 2025, 7th July 2025, 9th July 2025, 11th July 2025, 14th July 2025, 15th July 2025 and 16th July 2025.

Both Matt and Paul are suitably qualified and experienced ornithologists.

General Bird Surveys

The survey method focussed on Territory Mapping and Song Detection. An early morning visit was undertaken to map territories through observing singing males. Cetti's Warblers are highly vocal and territorial, allowing for reliable identification of breeding territories. The surveys were all undertaken in good weather between 6.00am and 8.30am apart from the survey on the 4th July 2025.

In addition, nesting bird surveys were undertaking covering a full range of birds on 1st June (Paul Hudson), 6th June 2025 (Matt Binding), 23rd June (Matt Binding) 29th June 2025 (Matt Binding), 4th July 2025 (Paul Hudson) and 9th July (Matt Binding). The Aqua Park opened on the 4th July 2025.

All of the affected land area was walked on each occasion and all signs of bird activity were recorded on a suitable base plan using the notation developed for the BTO Common Bird Census (CBC) technique (see Bibby *et al* 1992). This method records the species and numbers of birds present in an area of habitat, and records features indicative of nesting behaviour such as territorial singing, alarm calling, distraction displays, the presence of adult birds with food and the observed presence of nests, eggs, chicks or families of birds.

The survey boundary of the surveys is indicated by the red line shown on Plans 2-8.

2.2. Limitations

The surveys started 30th May, missing early breeding activity (March–May). Cetti's Warbler males sing less during incubation, so the absence of detections later in June does not confirm absence of breeding pairs. NRW's critique (Appendix 2) reflects this concern.

The survey undertaken on the 4th July 2025 was undertaken in windy conditions (Beaufort level 4) which acted as a constraint to the survey.

3. Results

3.1. Existing Data on Cetti's Warbler at Cosmeston Lakes

Table 1 below provides monthly totals for bird species recorded at Cosmeston Lakes throughout 2022, based on data extracted from the Glamorgan Bird Club Annual Report. These records offer valuable insights into seasonal variations in species abundance and site usage and are particularly important in understanding the ecological baseline against which potential disturbance impacts can be assessed. The data highlight periods of peak presence for certain species, such as overwintering waterfowl and passage migrants, which are likely to be more vulnerable to human-induced disturbance during specific times of year.

Table 1: Monthly Bird Record Totals for Cosmeston Lakes Extracted from 2022 Glamorgan Bird Club Report

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cetti's Warbler	2	1	3	1	2	1	0	2	1	3	1	2
Notes: The Greyed area shows when Aqua Park is proposed to operate.												

3.2. Field Study

A Cetti's Warbler territory was recorded regularly during the survey. This was recorded daily from 30th May 2025 until the 14th June 2025 and then not recorded subsequently. A second singing male was recorded on a single occasion on the 6st June; its location is shown on Plan 2.

The apparent decline in the numbers of singing makes after 14th June is likely the result of males reducing or ceasing singing once incubation has begun, rather than a decline in presence on site.

Table 2: Summary of Cetti's Warbler Survey Results

30th May 2025	1 Cetti's Warbler territory (1 singing male)
31st May 2025	1 Cetti's Warbler territory (1 singing male)
1st June 2025	1 Cetti's Warbler territory (1 singing males)
2nd June 2025	1 Cetti's Warbler territory (1 singing male)
4th June 2025	1 Cetti's Warbler territory (1 singing male)
5th June 2025	1 Cetti's Warbler territory (1 singing male)
6th June 2025	2 Cetti's Warbler territory (2 singing males)
7th June 2025	1 Cetti's Warbler territory (1 singing male)
9th June 2025	1 Cetti's Warbler territory (1 singing male)
10th June 2025	1 Cetti's Warbler territory (1 singing male)
12th June 2025	1 Cetti's Warbler territory (1 singing male)
13th June 2025	1 Cetti's Warbler territory (1 singing male)
14th June 2025	1 Cetti's Warbler territory (1 singing male)
15th June 2025	0 Cetti's Warbler recorded
16th June 2025	0 Cetti's Warbler recorded
18th June 2025	0 Cetti's Warbler recorded

20th June 2025	0 Cetti's Warbler recorded
21st June 2025	0 Cetti's Warbler recorded
24th June 2035	0 Cetti's Warbler recorded
26th June 2025	0 Cetti's Warbler recorded
27th June 2025	0 Cetti's Warbler recorded
28th June 2025	0 Cetti's Warbler recorded
30th June 2025	0 Cetti's Warbler recorded
2nd July 2025	0 Cetti's Warbler recorded
3rd July 2025	0 Cetti's Warbler recorded
4th July 2025	0 Cetti's Warbler recorded
5th July 2025	0 Cetti's Warbler recorded
6th July 2025	0 Cetti's Warbler recorded
7th July 2025	0 Cetti's Warbler recorded
9th July 2025	0 Cetti's Warbler recorded
11th July 2025	0 Cetti's Warbler recorded
14th July 2025	0 Cetti's Warbler recorded
15th July 2025	0 Cetti's Warbler recorded
16th July 2025	0 Cetti's Warbler recorded

A summary of the birds recorded during the surveys of the eastern lake is detailed below and on Plans 3-8. Probable breeding species on or around the eastern lake include: Blackbird, Blackcap, Cetti's Warbler, Coot, Great Tit, Moorhen, Reed Warbler and Robin.

	1/6/2025	**6/6/2025**	**23/6/2025**	**29/6/2025**	**4/7/2025**	**9/7/2025**	**On-site Status**
Blackbird	Present	Present	Present				Probable breeding
Blackcap			Present	Present			Probable breeding
Blue Tit			Present				Probable Non-breeding
Cettis Warbler	Present			Present			Breeding. Two territories
Common Sandpiper			Present		Present		Non-breeding
Coot	Present	Present	Present	Present	Present	Present	Breeding. Two nests.
Great Crested Grebe			Present	Present	Present	Present	Non-breeding
Great Black Backed Gull					Present		Non-breeding
Great Tit	Present	Present					Breeding. Two territories

	1/6/2025	6/6/2025	23/6/2025	29/6/2025	4/7/2025	9/7/2025	On-site Status
Great Spotted Woodpecker			Present				Non-breeding
Grey Heron			Present		Present		Non-breeding
Herring Gull			Present			Present	Non-breeding
Kingfisher			Present			Present	Non-breeding
Lesser Black Backed Gull	Present		Present	Present	Present	Present	Non-breeding
Magpie	Present		Present		Present		Non-breeding
Mallard	Present	Present	Present	Present	Present	Present	Non-breeding
Moorhen	Present		Present	Present	Present	Present	Breeding (1 nest)
Mute Swan	Present		Present	Present			Non-breeding
Reed Warbler	Present	Present	Present	Present			Breeding (2 territories)
Robin				Present			Probable breeding
Swallow						Present	Non-breeding
Swift			Present				Non-breeding
Wood Pigeon	Present	Present	Present	Present	Present		Non-breeding
Wren	Present	Present	Present	Present			Non-breeding

4. Evaluation

4.1 Ongoing Bird Monitoring

Bird monitoring surveys are ongoing, and a final evaluation of the Aqua Park's potential impacts on birds will be provided once these surveys are complete.

5. Conclusions

Ongoing bird surveys are being undertaken. No conclusions will be made until these have been completed.

6. References

Bibby, C J, Burgess, N D & Hill, D A (1992) *Bird Census Techniques*. Academic Press, London.

Bright, J., Langston, R., Bullman, R., Evans, R., Gardner, S. and Pearce-Higgins, J., (2008) *Map of bird sensitivities to wind farms in Scotland: A tool to aid planning and conservation*. Biological Conservation, 141(9), pp.2342–2356. Retrieved from https://doi.org/10.1016/j.biocon.2008.06.029

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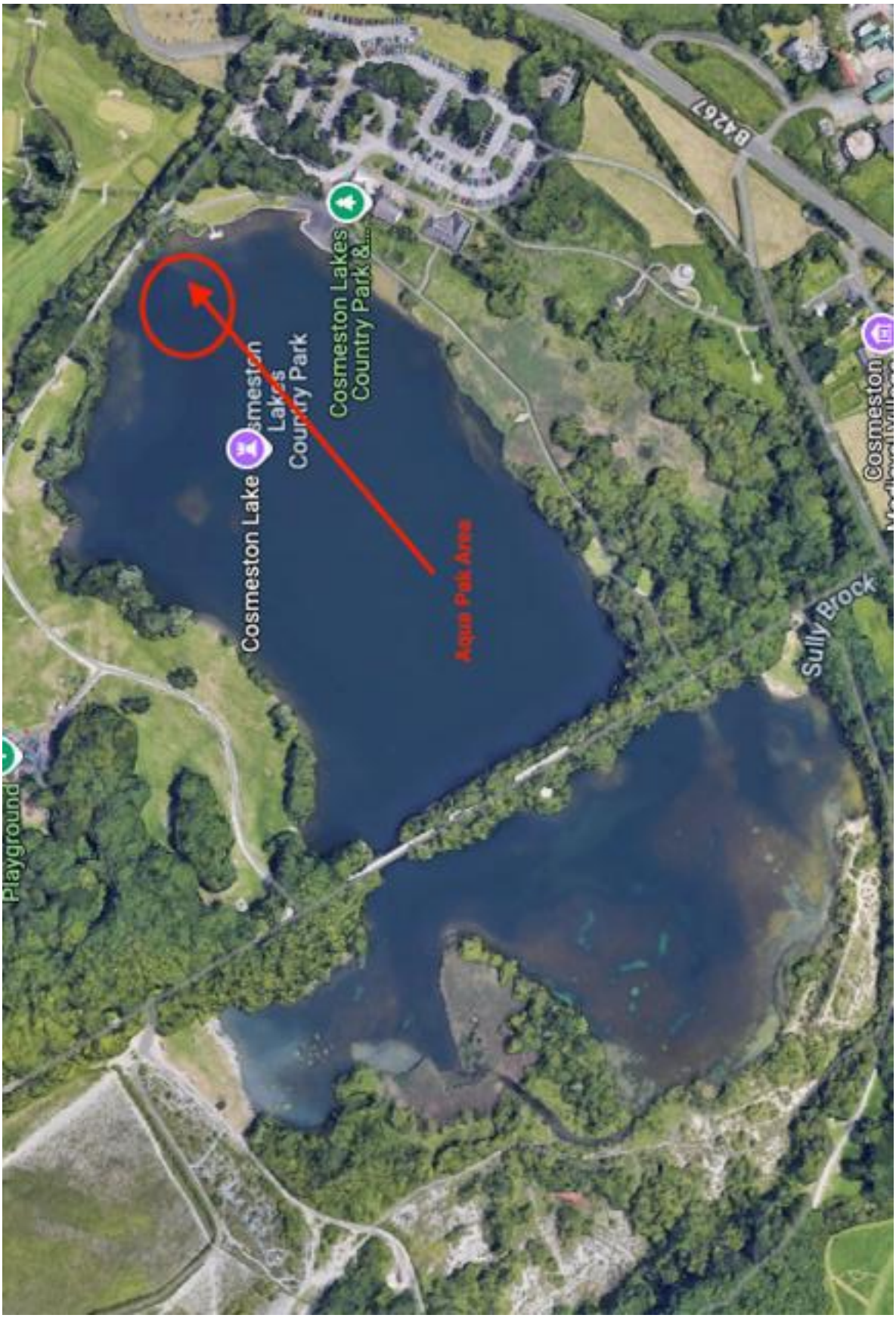
Goodship, N.M. & Furness, R.W. (2022) *Disturbance Distances Review: An updated literature review of disturbance distances of selected bird species*. NatureScot Research Report 1283. Available online at https://www.nature.scot/doc/naturescot-research-report-1283-disturbance-distances-review-updated-literature-review-disturbance

Reijnen, R, Foppen, R, Ter Brak, C & Thissen, J (1995) The effects of car traffic on breeding bird populations in woodland. 111. Reduction of density in relation to the proximity of main roads. *Journal of Applied Ecology* **32**: 187-202.

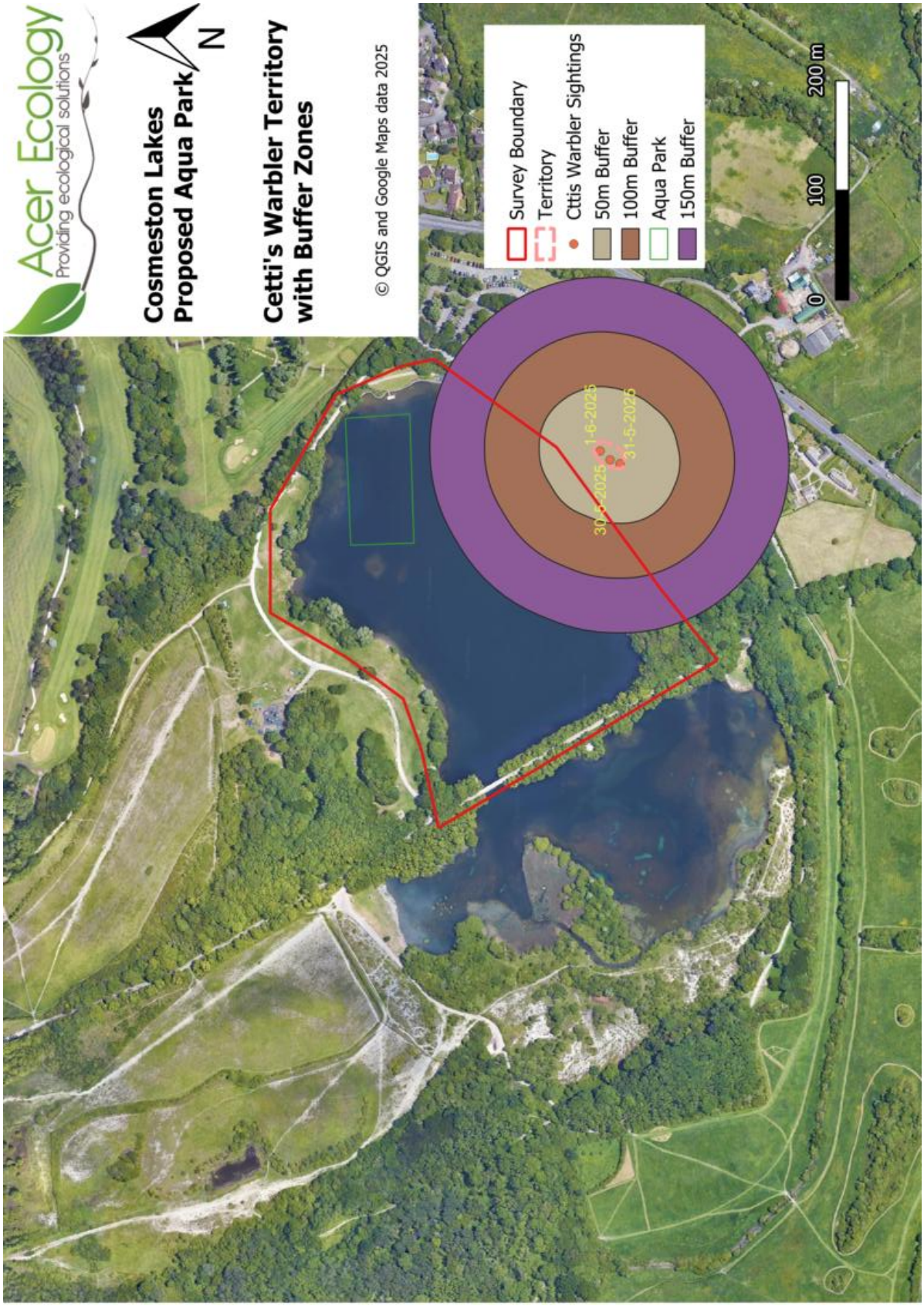
Robinson, R. A., Freeman, S. N., Balmer, D. E. & Grantham, M. J. (2007). *Cetti's Warbler Cettia cetti: analysis of an expanding population. Bird Study*, **54**(2), 230–235. Avaialble online at https://gat04-live-1517c8a4486c41609369c68f30c8-aa81074.divio-media.org/filer_public/c4/8a/c48ac907-40af-4fef-838d-aadb98ba0247/11356.pdf

Wintermans, G.J.M. (1991) Effects of shooting-range noise on feeding and roosting waders in the Dutch Wadden Sea and Delta region. *International Wader Studies*, 3, 12–13.

Plan 1: Proposed Seasonal Aqua Park Location



Plan 2: Cetti's Warbler Territory with Buffer Zones



Plan 3: Bird Survey 1th June 2025

Plan 4: Bird Survey 6th June 2025

Plan 5: Bird Survey 23th June 2025

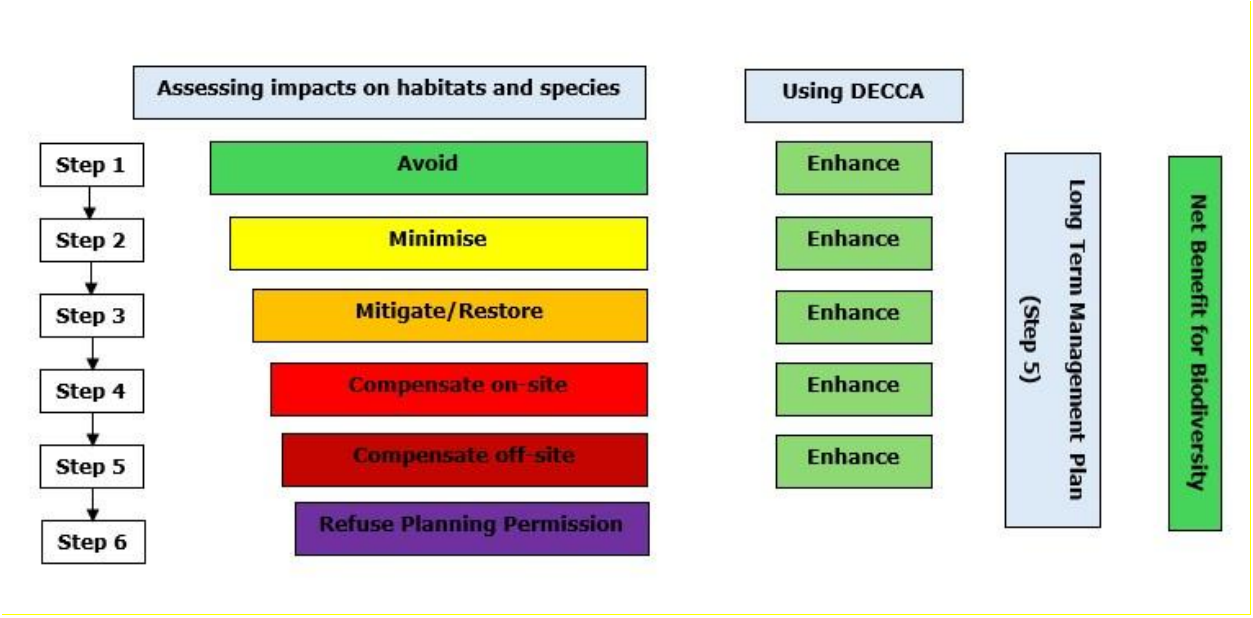
Plan 6: Bird Survey 29th June 2025

Plan 7: Bird Survey 4th July 2025

Plan 8: Bird Survey 9th July 2025

Appendix 1: Step-wise Approach:

Planning Policy Wales Version 12 provided further clarity on the need to secure a net benefit for biodiversity through the application of the step-wise approach, including the acknowledgement of off-site compensation measures as a last resort, and the need to consider enhancement and long-term management at each step.



Appendix 2: Extract from NRW Correspondence with Local Authority on the Bird Survey Requirements

From: "Goldsworthy, Marcus J" <MJGoldsworthy@valeofglamorgan.gov.uk>
Date: June 17, 2025 at 4:48:44 pm BST
To: Simon James <simon@aquaparkgroup.co.uk>, "Pickering, Steven P" <SPPickering@valeofglamorgan.gov.uk>
Cc: "Robinson, Ian" <IRobinson@valeofglamorgan.gov.uk>
Subject: Meeting to discuss outstanding issues

Further commentary from NRW:

"2.1. Survey Methodology

Plan 2 infers that the whole boundary of east lake was surveyed but this is not clear from the main body of the text – This needs to be clarified.

The surveys, while comprising three visits, were completed on consecutive days. While this is mentioned in the limitations section, there is very limited acknowledgement of the fact that such an approach will greatly limit the robustness and confidence in the survey; for example, by missing early breeding males. NRW therefore don't' agree that the survey, in its current form, is sufficiently robust or appropriate to achieve its aims. The very fact that the report states that this is a departure from best practice is somewhat concerning, especially as this limitation does not appear to have been considered fully in the evaluation of the results.

While the results appear to be corroborated by the data from the Glamorgan bird club data, there are several issues to raise. It indicates that the surveys were undertaken at a sub-optimal time of year for this species (there is more activity earlier in the breeding season March-April). The apparent decline in the numbers of singing makes is likely the result of males reducing or ceasing singing once incubation begins, rather than a decline in presence on site. This is not discussed within the report.

Comments on 4. Evaluation

The report states "Installation activity and increased recreational use of the site, involving higher levels of human presence and noise during the key nesting period, may disturb the behaviour and breeding success of nesting Cetti's Warblers." Then later in this section "Given the distance between the proposed Aqua Park over 100m away from the Cetti's Warbler, the noise impacts on nesting, territory occupancy and breeding success is likely to be negligible." The report also states that "There is no specific buffer distance recommended for Cetti's Warbler (Cettia cetti) in the literature, including the study by Goodship & Furness (2022). This is likely due to the species' preference for dense, low-lying vegetation in wetland habitats, which may naturally mitigate disturbance."

1) It is not clear then how the authors were able to determine how 100m is sufficient distance without reference to evidence; species specific or that concerning similar taxonomically or ecologically related species.
2) Goodship & Furness (2022) reviewed a select number of species that breed in Scotland and the absence of Cetti's Warbler from this review is because the species does not breed in Scotland. A number of species covered by Goodship & Furness (2022) could also be considered to nest in "dense, low-lying vegetation".
3) Linked to 1) while there is mention of current activity at the park near the identified Cetti's Warbler territory there is no quantification of by how much the aqua park will increase noise levels against the current baseline. Or attenuation of noise from the aqua park. Therefore, it is not clear how a conclusion of "negligible" has been derived.

We require clarification of all points raised in the above text. We will require that ecological monitoring of Cetti's Warbler activity during the operational phase, with an appropriate scheme of iterative mitigation approaches is submitted at the end of the trial. NRW have confirmed as follows regarding nesting birds generally:

Our particular focus was on the possible impact to Cettis Warbler as a schedule 1 species but given the situation we'd suggest that potential impacts to all nesting birds should be considered.

Please confirm measures/proposals to address the above regarding Cetti's Warbler and nesting birds generally, to include reporting at the end of the trial."

Appendix 3: Impacts of Noise and Visual Disturbance on Birds

The Waterbird Disturbance Mitigation Toolkit (Cutts et al., 2013) states that different bird species exhibit varying tolerance thresholds to noise and visual disturbance, meaning that operations affect each species differently. In addition, birds are capable of habituation; with prolonged exposure, they often become more tolerant of both auditory and visual disturbance stimuli. This is significant because different types of noise can have differing effects. At its simplest, continuous background or regular noise is generally more easily assimilated by waterfowl than sudden, irregular noise events at the same decibel level. Consequently, 'loud' works in an already noisy environment may cause minimal disturbance (as birds are likely to be tolerant or habituated), whereas quieter works in a generally quiet environment could, in some cases, have a greater disruptive effect (Cutts et al., 2013).

Different types of disturbance stimuli produce variable behavioural and physiological responses in birds, and these responses are often species-specific and context-dependent. Current generic guidelines for consenting requirements adopt a precautionary approach, typically recommending an exclusion distance of 300m and a conservative noise threshold of 55 dB. This threshold may be informed by research such as Wintermans (1991), which reported no discernible effect of shooting on roosting waders at noise levels below 55dB. Notably, this figure likely represents a *no-effect level* rather than a true threshold at which disturbance effects begin to manifest.

Noise Effects on Waterbirds

A 70dB noise threshold has however been developed over a period of years, based on published data as well as findings from primary observations (Cutts et al., 2013). It is considered that the threshold works as a general rule but is relatively simplistic as it does not take into account the type of stimuli or the species of bird involved.

Although larger visual stimuli often elicit stronger disturbance responses, this is not always the case. For example, a large machine engaged in vigorous activity may cause less disturbance than a single operative moving along the side of a lake. Sudden, irregular sounds typically provoke greater reactions than continuous or regular noise, irrespective of decibel level (e.g. a dropped scaffold at 65 dB may cause more disturbance than sustained piling at 80 dB). Habituation to both visual and auditory stimuli generally results in reduced responses over time. However, when multiple disturbance sources occur simultaneously (e.g. construction works and aircraft), a phenomenon known as *facilitation* may occur, resulting in a greater than expected disturbance effect.

Noise Level Effects have been classified within Cutts et al., 2013 into the following categories:

High Noise Level Effects	Noise disturbance is typified by regular responses to stimuli with birds moving away from the works to areas which are less disturbed (within noise tolerances). Most birds will show a degree of response to noise stimuli. Birds that remain in the affected area may not forage efficiently and if there are

	additional pressures on the birds (cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed. For auditory disturbance to qualify as a high level, it must constitute a sudden noise event of over 60dB (at the bird, not at source) or a more prolonged noise of over 72dB. Included at the bottom of this worksheet is a graphic, showing how noise at source relates to noise at the receptor (using standard decay formulae) and categorising this as high, moderate or low impact
Moderate Noise Level Effects	Moderate noise disturbance is typified as high -evel noise which has occurred over long periods so that birds become habituated to it or lower level noise which causes some disturbance to birds. This encompasses occasional noise events above 55dB, regular noise 60-72dB and long-term regular noise above 72dB, where birds have become habituated. There is cross-over in moderate and high level noise thresholds although the lower band can be assumed unless the species is particularly sensitive. Those species that are particularly sensitive are Brent Goose, Curlew & Redshank. Birds that may be more sensitive than average include Shelduck & Bar-tailed Godwit.
Low Noise Level Effects	Low level noise is classed as that which is unlikely to cause response in birds using a fronting intertidal area. As such noises of less than 55dB at the bird are included in this category. These effects are likely to be masked by background inputs in all but the least disturbed areas and thus would not disturb the birds close by. Noise between 55-72dB in some highly disturbed areas e.g. industrial or urban areas and adjacent to roads, may feature a low level of disturbance provided the noise level was regular as birds will to often habituate to a constant noise level.

Disturbance Effects on Waterbirds

Disturbance Level Effects have been classified within Cutts et al., 2013 into the following categories:

High Level Visual Disturbance	This is typified by regular reactions to visual stimuli with birds moving away from the works (source) to areas which are less disturbed. Most birds will show a degree of response to stimuli. Birds that remain in the affected area may not forage efficiently and if there are additional pressures on the birds (cold weather, extreme heat etc.) then this may impact upon the survival of individual birds or their ability to breed. Visual stimuli reaches high levels of disturbance extremely easily with workers operating outside of equipment, fast movement, large plant and close proximity to the birds (especially encroachment on mudflats) contributing to this level of disturbance.

Moderate Level Visual Disturbance	Typified as either high level disturbance which has occurred over long periods so that birds become habituated to it or less intrusive works which still cause a degree of disturbance. This describes visual stimuli such as works or third parties on the flood bank. Habituation occurs less with workers on the flood bank or foreshore working outside machinery. If a worker leaves plant it usually increases the disturbance level to high. There is a cross-over in the moderate and high-level thresholds, although unless a species is particularly sensitive or it is a new activity then the lower band can be assumed.
Low Level Visual Disturbance	This is stimuli that is unlikely to cause a response in birds using an adjacent wetland. Most works would not qualify as low-level impact unless they were out of sight of the birds and any disturbance then would be considered noise-related disturbance (there remain overflight issues for some species whereby flights to and from inland feeding and roost sites can mean that behind bank works have an effect). Long-term works including plant on a floodbank are also considered to be low impact. This type of work would initially qualify as moderate disturbance but with the absence of workers on the floodbank, birds would quickly become habituated. If workers were to appear alongside plant this would immediately increase the disturbance to moderate

Appendix 4: Photograph of Aqua Park After Installation