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vårgrønn

Green Volt Offshore Wind Farm

Outline Seabird Compensation Plan

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Document History

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1 Introduction

This document provides the Outline Seabird Compensation Plan for the Green Volt Offshore Wind Farm (the Project), as requested by the Scottish Government Marine Directorate – Licensing Operations Team (MD-LOT), in order to address in-combination Adverse Effect on Site Integrity (AEoSI) as calculated by the Appropriate Assessment for the Project.

The Outline Seabird Compensation Plan builds on information previously provided to MD-LOT in the Project’s Without Prejudice HRA Derogation Case and outlines three compensation proposals which are capable of providing the requisite level of compensation for each species where this has been determined to be required by the Appropriate Assessment.

The Project is committed to completion of all three outline proposals, or measures providing at least the same level of compensation, prior to construction of any wind turbines.

The Outline Seabird Compensation Scheme shall be augmented by a Detailed Seabird Compensation Scheme, to be submitted to and approved by MD-LOT as competent authority, prior to the implementation of any compensation measure.

This document describes the Project Outline Seabird Compensation Scheme as follows:

- Section 1 provides background information, including the level of AEoSI provided by MD-LOT
- Section 2 describes the schedule for implementation of the Compensation Plan, including key checkpoints for the competent authority (with consultation with NatureScot, as required).
- Section 3 and Section 4 outline two compensation proposals, which if implemented together can be expected to provide compensation at a level significantly greater than required by the Appropriate Assessment conclusion, for each of the target species.
- Section 5 provides compensation specific to Puffins at the Forth Islands SPA
- Section 6 reviews implementation of all three schemes, which are intended to operate in combination.
- Section 7 reviews how ongoing monitoring and adaptive management can be used to ensure compensation measures are effective and remain so for the life of the wind farm.
- Section 8 reviews the proposed compensation measures using guidance from the Scottish Government Framework to Evaluate Ornithological Compensatory Measures for Offshore Wind: Process Guidance Note for Developers, October 2023.

1.1 Background

Green Volt Offshore Windfarm Limited submitted an application on the 20th January 2023 for consent under Section 36 of the Electricity Act 1989 for the construction and operation of an offshore generating station; the Green Volt Offshore Wind Farm (the Project).

Background to the project, additional information and the without prejudice HRA derogation case can be found in the following documents, as submitted to MD-LOT previously (Table 1):

Table 1 – Reference documents already submitted to MD-LOT

Document title	Document Number	Rev	Submission
Offshore Environmental Impact Assessment Report	PC2483-RHD-ZZ-XX-RP-Z-0001	3	20 Jan 2023
Report to Inform Appropriate Assessment	PC2483-RHD-ZZ-XX-RP-Z-0024	3	20 Jan 2023
Supplementary Ornithological Assessment Report	FLO-GRE-REP-0020	2.2	20 Oct 2023
Without-Prejudice HRA Derogation Case	FLO-GRE-REP-0021	4	20 Oct 2023
Offshore Ornithology Compensation Report	FLO-GRE-REP-0025	4	20 Oct 2023

1.2 Conclusions of the Appropriate Assessment

MD-LOT have concluded an Appropriate Assessment, which has identified in-combination Adverse Effect on Site Integrity (AEoSI). The Project's assessed contribution is as set out in Table 2.

Table 2 - Competent authority Appropriate Assessment conclusions

	Guillemot*	Razorbill*	Gannet*	Kittiwake*	Puffin*
SPA	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)
East Caithness Cliffs	60 breeding adults (0.03% of colony**)	4.2 breeding adults (0.01% of colony**)		1.6 breeding adults (0.003% of colony**)	
Fowlsheugh	8.6 breeding adults** (0.008% of colony**)			0.9 breeding adults (0.003% of colony**)	
Forth Islands			7.6 breeding adults (0.005% of colony**)		0.8 breeding adults (0.001% of colony**)
Buchan Ness to Collieston Coast				1.4 breeding adults (0.006% of colony**)	
Troup, Pennan and Lion's Heads				1.1 breeding adults (0.005% of colony**)	

Table Notes: *MD-LOT Appropriate Assessment

**Colony size estimates from the Supplementary Ornithological Assessment (reviewed by NatureScot), updated for Fowlsheugh with SMP 2023 data,

0.01% = 1 bird in 10,000 & 0.001% = 1 bird in 100,000

1.3 The Outline Seabird Compensation Plan

The Outline Seabird Compensation Plan presented here has been developed by ornithology specialists APEM Ltd (hereinafter referred to as APEM) and is based on the predicted impacts identified for Green Volt in Table 2. It includes the following measures:

- **Proposal Compensation Measure 1: Drainage management** at cliff edge locations to increase available potential nesting habitat and quality of existing nesting habitat, with appropriate monitoring and adaptive management, as required. A specific proposed measure has been identified for implementation at Ashy Geo at East Caithness Cliffs SPA. See further details in Section 3.
- **Proposal Compensation Measure 2: Disturbance reduction** at priority locations for target species, with appropriate monitoring and adaptive management, as required. A specific proposed measure has been identified for implementation at Troup, Pennan and Lion's Head SPA, which consists of path realignment and disturbance management. See further details in Section 4.

- **Proposal Compensation Measure 3** is targeted specifically at Puffin and will ensure delivery of tree mallow removal, which has been highly successful at enhancing breeding habitat for this species in the Forth Islands SPA but for which there is currently no committed funding, leading to operational constraints. See further details in Section 5.

Green Volt has obtained expert opinion from APEM, who have confirmed that, when combined, the three proposed measures can be expected to provide a compensation benefit that significantly exceeds the potential Adverse Effect on Site Integrity (AEoSI), as concluded by MD-LOT for each relevant species per the Appropriate Assessment.

A comprehensive description of the compensation scheme implementation, including data collection and analysis methods, shall be included in the Detailed Seabird Compensation Plan, to be submitted to MD-LOT and agreed in consultation with NatureScot, prior to any works commencing.

The detailed proposal for each measure is to be accompanied by appropriate baseline data collection measures (both pre and post implementation), to be developed in consultation with the competent authority and NatureScot to confirm that the measures are delivering the required level of compensation.

Following implementation, appropriate monitoring and adaptive management will be employed to demonstrate that the compensation measures continue to effectively compensate for the identified adverse effects on guillemot, razorbill, kittiwake, gannet and puffin for the life of the wind farm.

The broad proposal follows these steps (see also Section 2):

1. Green Volt to develop Detailed Seabird Compensation Plan following appropriate site surveys, based on this Outline Seabird Compensation Plan.
2. Competent authority, in consultation with NatureScot, to agree Detailed Seabird Compensation Plan is likely to deliver the required level of compensation.
3. Baseline monitoring and review of data to be completed and approved by competent authority.
4. Wind Turbine installation can only occur after compensation measures have been completed and monitored for one full breeding season to confirm effectiveness.
5. Ongoing monitoring, with adaptive management if necessary.

2 Schedule for compensation plan implementation

A programme of site-specific baseline monitoring data collection will be implemented to provide a suitable baseline for the level of success achieved by the compensation measures. The proposed timeline for undertaking baseline monitoring data collection, submitting the Detailed Seabird Compensation Plan, implementing the compensation measures and for monitoring their success is provided in Figure 1.

The key stages include:

- One full breeding season of baseline monitoring data collection, with contingency of a second year of baseline monitoring (if required)
- Submission of Detailed Seabird Compensation Plan to MD-LOT and NatureScot
- Implementation of compensation measures
- Measures to be monitored after installation for one breeding season to confirm colony use/habitat improvement of area
- Measures to be monitored annually thereafter for five years
- Measures to be further monitored every five years for the remaining life of the wind farm

- Adaptive management to be applied, as required

At all stages, consultation with MD-LOT and NatureScot will be undertaken.

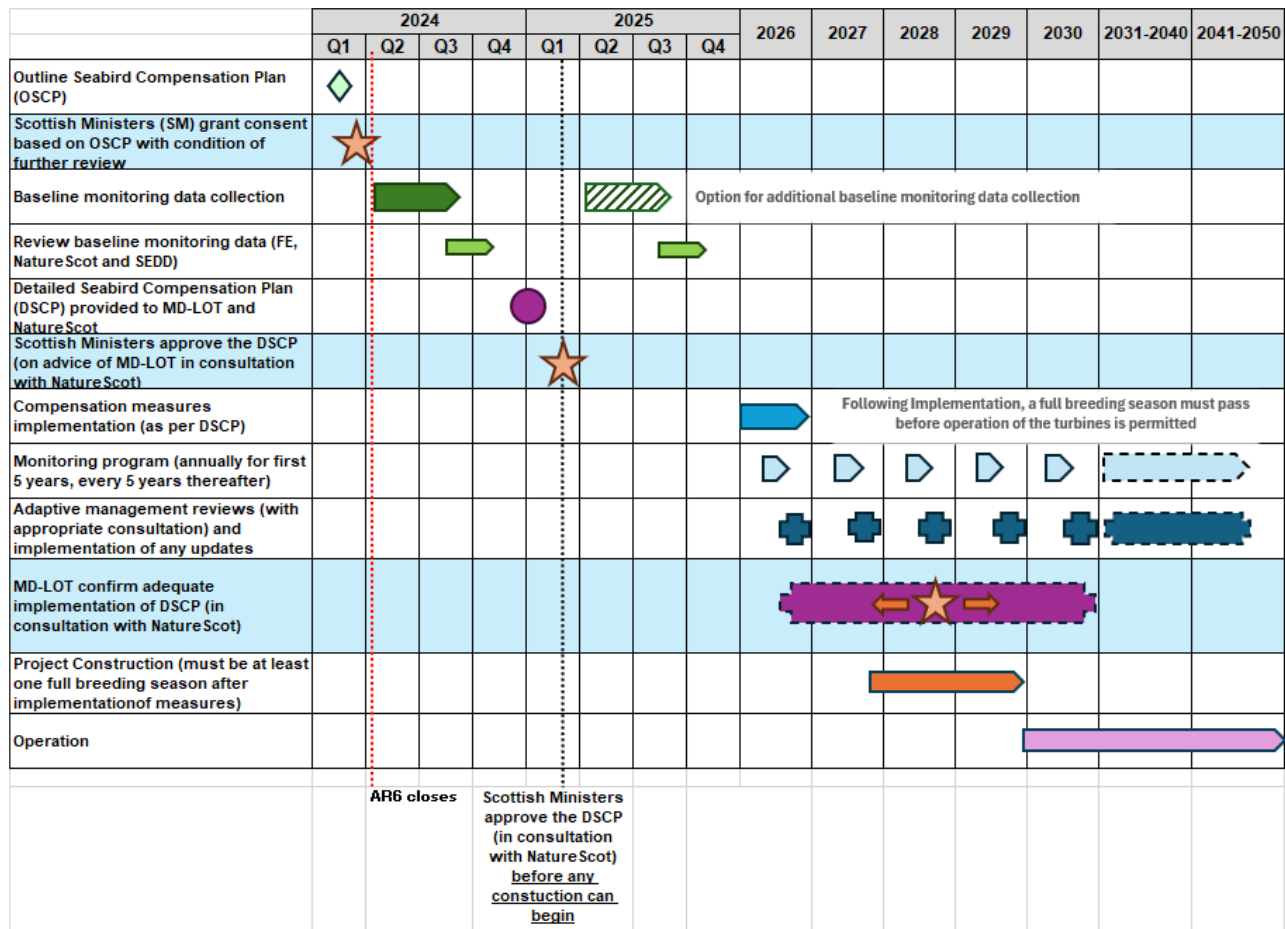


Figure 1 - Proposed schedule for implementation of compensation measures

3 Proposal Compensation Scheme 1 – Drainage Management at Tod’s Gote and Ashy Geo

3.1 Existing pressure at the site

Site investigations conducted in February 2024 have recorded water draining over the cliffs, with a significant impact on the availability of high-quality nesting sites and potentially compromising breeding success at existing nesting sites. Run-off from fields is occurring in a number of locations in the East Caithness Cliffs SPA, as shown in the site investigation photos.

Figure 2 provides examples from Ashy Geo and Tod’s Gote where potential drainage management measures could be implemented. A detailed view of the site around Ashy Geo is included at 1:2,500 scale in Figure 11, Appendix 1.

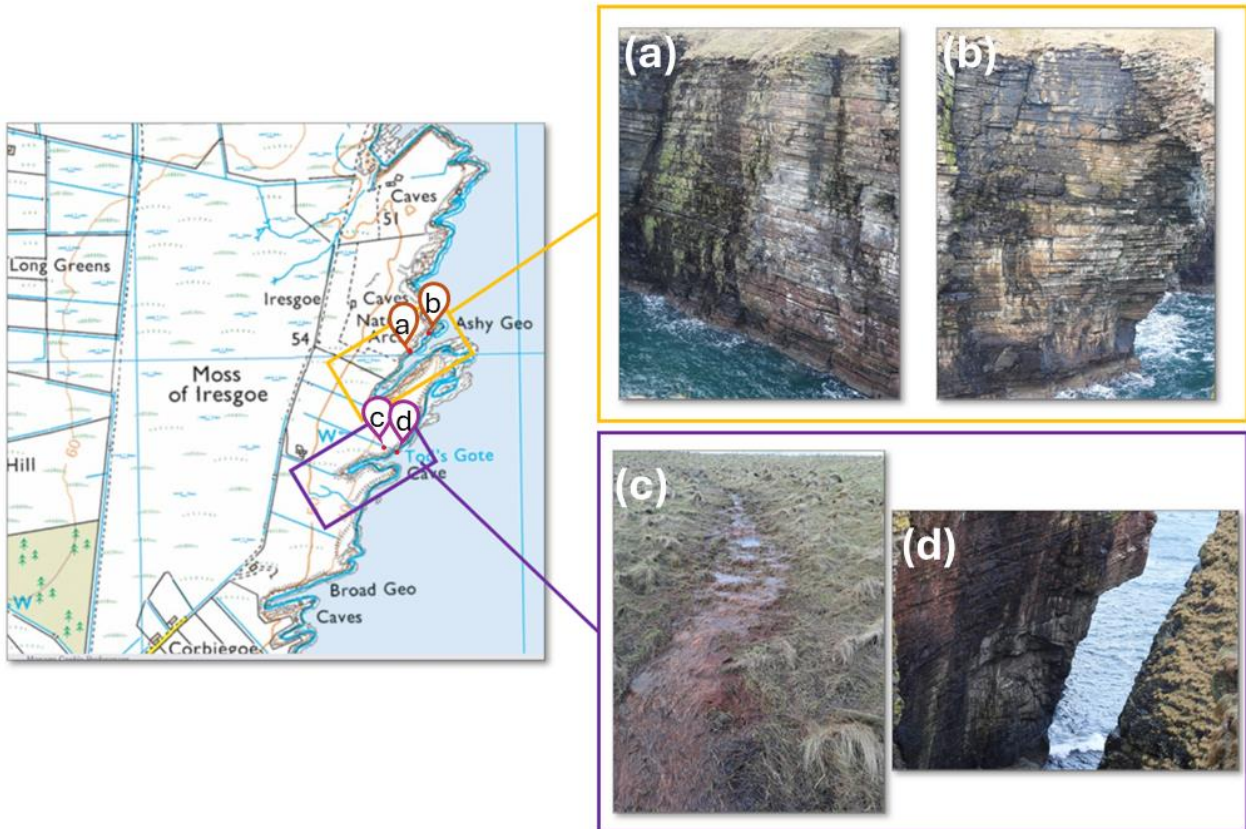


Figure 2 - Example locations where agricultural runoff occurs at East Caithness Cliffs SPA in the area of Ashy Geo (a,b) and Tod's Gote (c,d)

Figure 3 provides an aerial view of the site, illustrating how existing (man-made) field drainage is contributing to the flooding of nesting sites. The area of cliff highlighted in red in Figure 3(a) and Figure 3(d) corresponds to the cliff shown in Figure 2(a).

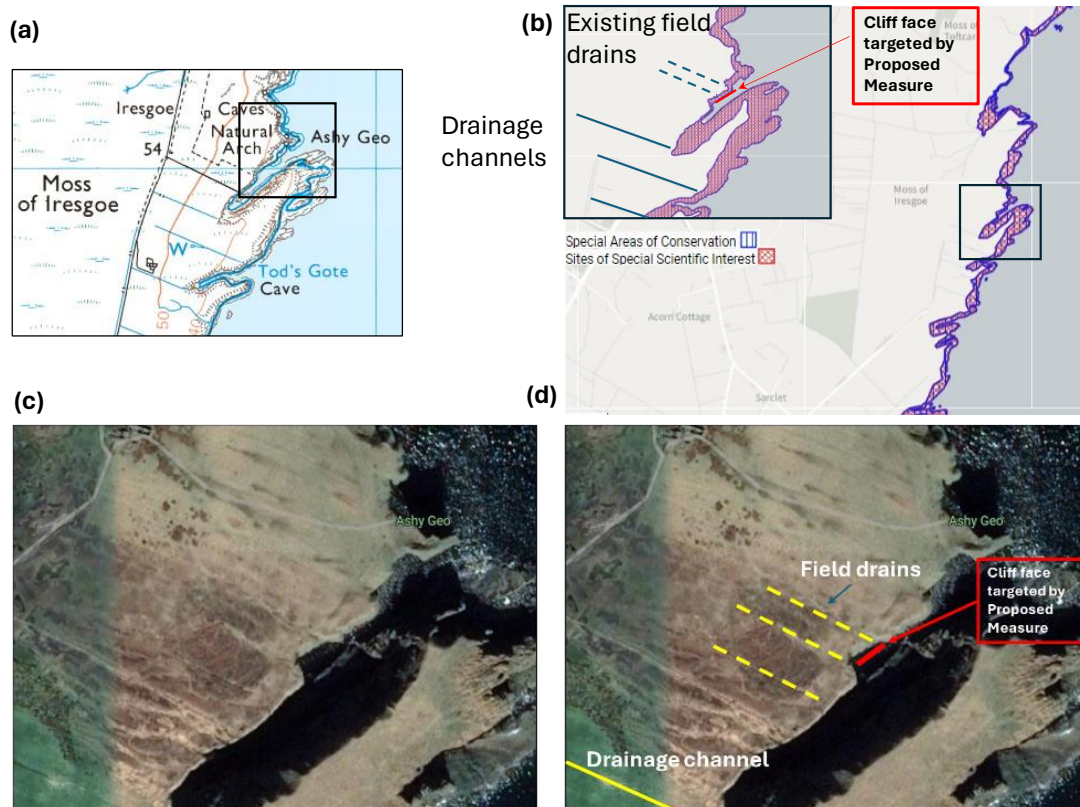


Figure 3 - (a) Ordnance Survey, (b) SAC and SSSI designated areas, (c) Aerial view (August 2023) without markup, (d) Aerial view with markup (August 2023) without markup

Seabird monitoring in this area was completed in 2013 (Swann, B. 2016a, report 622) and 2015 (Swann, B. 2016b, report 902). In 2013, approximately 400 guillemots, 85 kittiwakes and 100 razorbills were recorded to be breeding within a monitoring plot addressing the cliff around the Ashy Geo Arch area (Figure 8).

Counts undertaken in 2015 reported an increase in guillemots to over 600 individuals within this plot (Swann, B. 2016b, report 902).

Site investigations completed in 2024 (Figure 2(a,b) and Figure 8) show less than half of the cliff within the monitoring area with available ledges is currently suitable for nesting due to run-off (Figure 3). Current nesting areas also appear to be at risk from any increases in run-off extending over the current nesting areas or dripping from saturated ground above onto the nests.

Increased population pressure, particularly for guillemots at this SPA

Since designation, the guillemot population at East Caithness Cliffs SPA has increased by 39.8% from 1986 to 2015; with 2015 being the year of the last colony census undertaken at the SPA (SNH, 2016, report 902).

The Seabird Monitoring Programme (SMP) database (as of 2023) reports significant guillemot population growth since 2015 for northeast coast mainland colonies, which would also be expected to be representative of colony trends at East Caithness Cliffs SPA. For example:

- North Caithness Cliffs SPA: 32.5% increase (2015/16 to 2023).
- Troup, Pennan and Lion's Heads SPA: 49.3% increase (2015 to 2023).
- Buchan Ness to Collieston Coast SPA: 3.6% increase (2019 to 2023), no counts undertaken in 2015; estimated 21.6% population increase from 2015 to 2023.
- Fowlsheugh SPA: 46.0% increase (2015 to 2023).

These increases occurred despite the impacts of Highly Pathogenic Avian Influenza (HPAI) (Falchieri *et al.*, 2022; APHA, 2024)) or auk wrecks observed in previous years (Ashworth, 2021).

Current growth trends of these regional colonies suggest the population is reaching previous historical highs and may potentially exceed this within three to five years.

Propensity to flooding nesting sites at these locations is increasing with climate change

Available evidence of climate change impacts demonstrates a shift to higher rainfall during the breeding season (State of the UK Climate report 2022 (Kendon *et al.*, 2023) which means the run-off is a consistent and likely increasing issue at East Caithness Cliffs.

Referring to Figure 4:

- By comparing recent monthly rainfall (blue line) at Wick (SEPA, 2024) with the historic rainfall data, a climatic shift to wetter periods during the breeding season is evident. A representative historic peak value is shown by the green line (mean of the highest month's rainfall during the breeding season for Wick approximately 100 years ago), taken from Met Office data.
- This regional observation is in agreement with the State of the UK Climate report (2022), that reported annual precipitation has increased with five of the wettest years since 1836 occurring since 2000 (Kendon *et al.*, 2023).
- In 7 out of the last 10 years, rainfall in at least one month during the breeding season has equalled or exceeded the month when site investigation recorded excessive cliff face run-off (red line), as highlighted by a red asterisk when this has occurred in Figure 4.

Together, these data suggesting nesting sites and breeding birds at this location are regularly under threat from runoff conditions. This will continue (and may increase) in proceeding years.

There is a need for high quality nesting sites

This means the creation of high-quality nesting habitat on sea cliffs, which have been demonstrated to have high utilisation by seabirds already, can be expected to provide a direct benefit to the SPA and provide outsized compensation for any effect caused by the Project.

Cliff-face drainage management would therefore bring benefits on two levels:

- Allow sub-colonies to expand, as the population grows, into adjacent quality nesting habitat reducing density-dependent competition which can lead to conflict and reduced breeding success.
- Improve the habitat quality of existing nesting areas from the threats of run-off during the breeding season which rainfall data is predicting to occur more often and therefore increase current breeding success in these areas.

Overall, such improvement in habitat quality will lead to an increase in productivity (Koko *et al.*, 2004) and therefore an increase in the colony size, as set out in more detail in section 3.4, below.

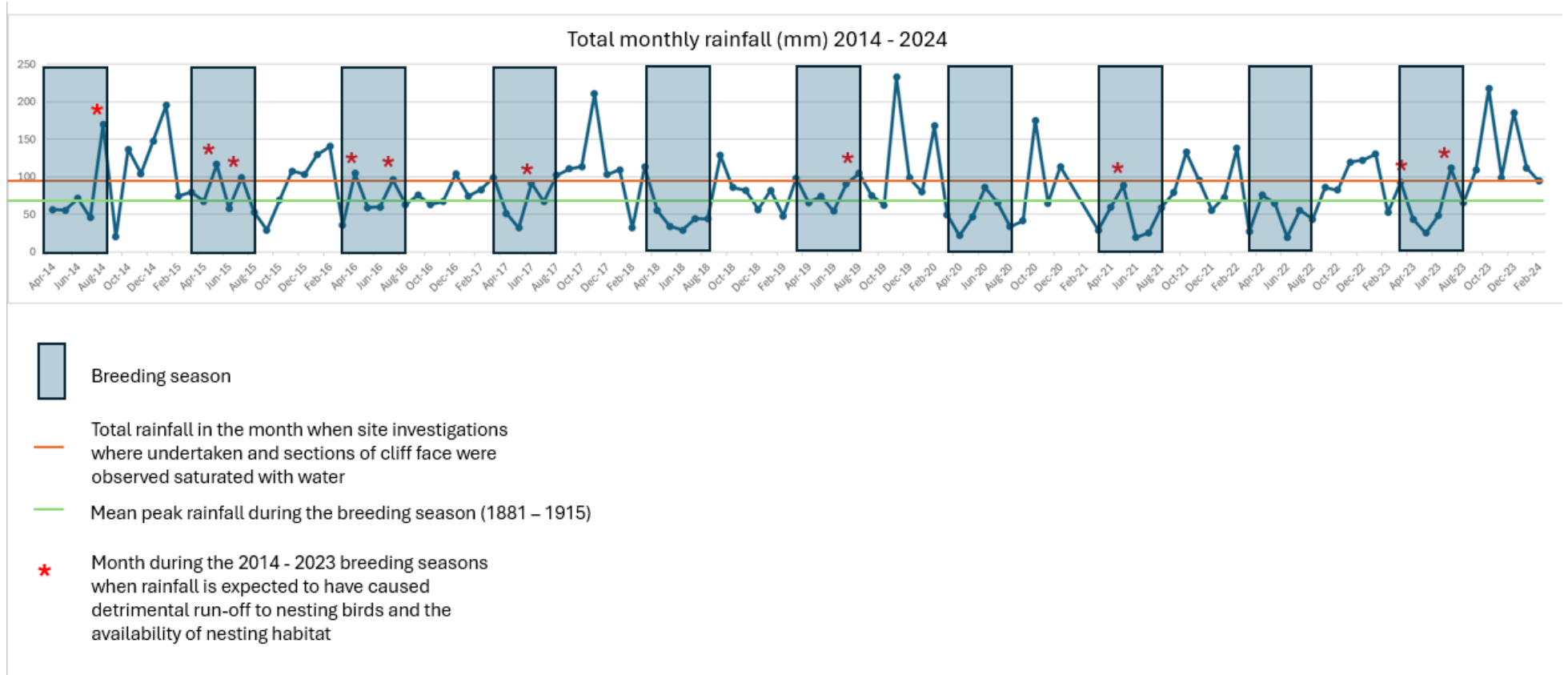


Figure 4 Graph presenting (i) total monthly rainfall (mm) 2014 – 2024 at Caithness (blue line), (ii) evidence of climatic shift to wetter breeding seasons (green line historic mean peak month rainfall during the breeding season), (iii) likely occurrence of runoff during the breeding season in the last ten years (red asterisk). The red line indicates rainfall when site investigations took place and run-off was observed.

3.2 Technical solution for implementation of proposed measure

Vegetated swale

The Project has contracted specialist engineers and hydro-ecologists to examine the run-off issue and propose solutions to control and mitigate the run-off over the cliff face.

It is understood that an elevated peat area to the west of the site is likely contributing to surface water flowing over the cliff edges. An existing, man-made drainage network to the west of Ashy Geo and Tod's Gote appears to be aggravating run-off.

One option to prevent run-off over the cliff face and allow the area to dry is the installation of low maintenance swales/ditches. These can be installed subject to topographical, hydrological and ecological assessments, consents from statutory bodies and with necessary agreement with landowners.

Figure 5, Figure 6 and Figure 7 show examples of a typical swale that could be installed. This includes a grass vegetated shallow swale drainage channel to intercept drainage flows and focus to a discharge location. Such a measure would be expected to allow a target area of cliff face to dry out, whilst maintaining or improving current nesting locations.

In order to control flow speed and volume, check dams made from earth or timber can be added. The design of the swale would be subject to technical assessment, to be included in the Detailed Seabird Compensation Plan.



Figure 5 - Swale example

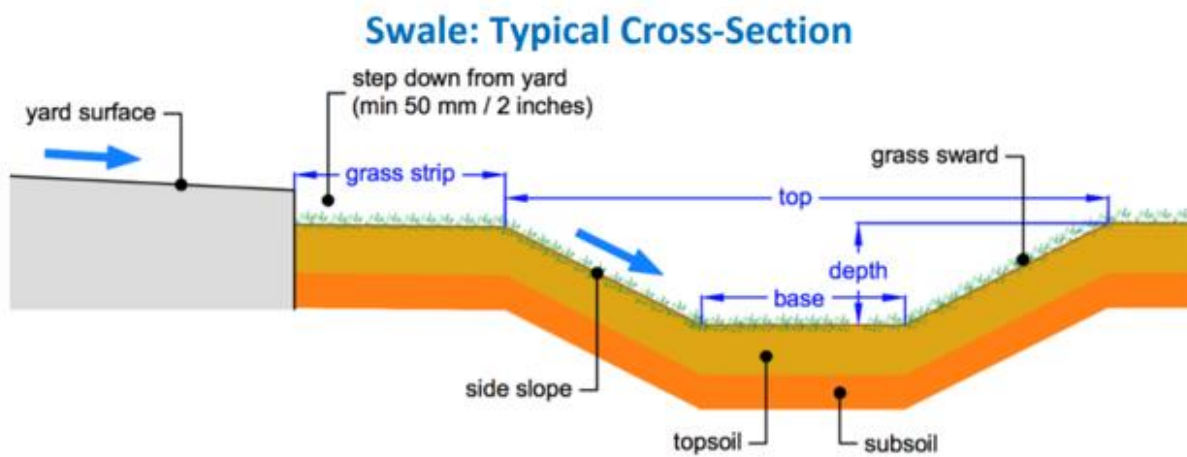


Figure 6 - Swale cross-section

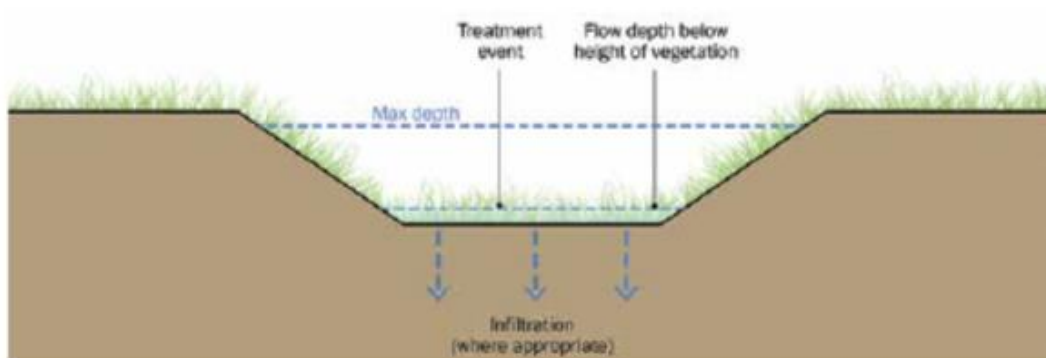


Figure 7 - Swale cross-section (Source: CIRIA SuDS Manual)

3.3 Feasibility

An outline assessment of the proposed measure indicates that it is readily feasible to develop. Key considerations are:

- A number of standard technical solutions are available for drainage management, including the example cited above.

- The Project has obtained written confirmation from landowner, who has confirmed they are agreeable to the completion of the relevant works.
- The area at the cliff edge is subject to a Special Area of Conservation (SAC) and also a Site of Special Scientific Interest (SSSI) for its vegetated sea cliffs of the Atlantic and Baltic Coasts (Figure 3 and Figure 11).
 - o An initial technical assessment demonstrates that it will be possible to construct the required drainage management system outside the SAC / SSSI boundaries and that excessive runoff may also be negatively impacting qualifying plant features for which the SSSI and SAC are designated. An outline plan of the proposed area of works is shown in Figure 11 (Appendix A).
- All necessary consents will be obtained as required, including planning permission, once the Detailed Seabird Compensation Plan is approved and prior to any works.
 - o This will require assessment of any potential for impacts of the proposed compensation measures on the SAC / SSSI, including a Habitats Regulations Appraisal carried out by the competent authority in consultation with NatureScot, as appropriate.
 - o Given the nature of the measures, and the anticipated location outside of the SAC / SSSI boundaries, there are no identified impediments to the grant of such consents.

It is noted that the run off issue appears at a number of locations within the SPA and that suitable alternative locations can be selected, if required, to ensure the measure can be adequately implemented.

Figure 11 shows the outline of the SSSI and SAC, which fully overlap in this area, at 1:2,500 scale. Note that proposed areas of work are outside both the SSSI and SAC.

SAC and SSSI – Additional Observations provided by APEM

APEM have reviewed the potential impact of the proposed measure on the designated plant features of the SAC and SSSI on behalf of Green Volt, in order to assess any potential impact of drainage management at the proposed location.

The designated plant features of the site have a habitat preference for drier soils or wet/damp conditions and none of the site's designated plant features require saturated soil, standing water or flush conditions. The drainage management as proposed in Figure 11 would prevent surface water flow during and after heavy rainfall and would benefit any of the plants with a preference for drier conditions. Plants with a preference for damp or wet conditions would not be adversely affected if surface water across the site was prevented as water would still move through the site but in a more natural and regulated manner. Designated plant features on the cliff ledges would clearly benefit from surface run-off management, having a preference for well drained conditions. Therefore it is considered that likely significant effects on the designated features are not expected to be identified.

3.4 Expected compensation level

APEM has independently evaluated the potential for drainage management on the proposed section of cliff highlighted in Figure 3(b) at Ashy Geo.

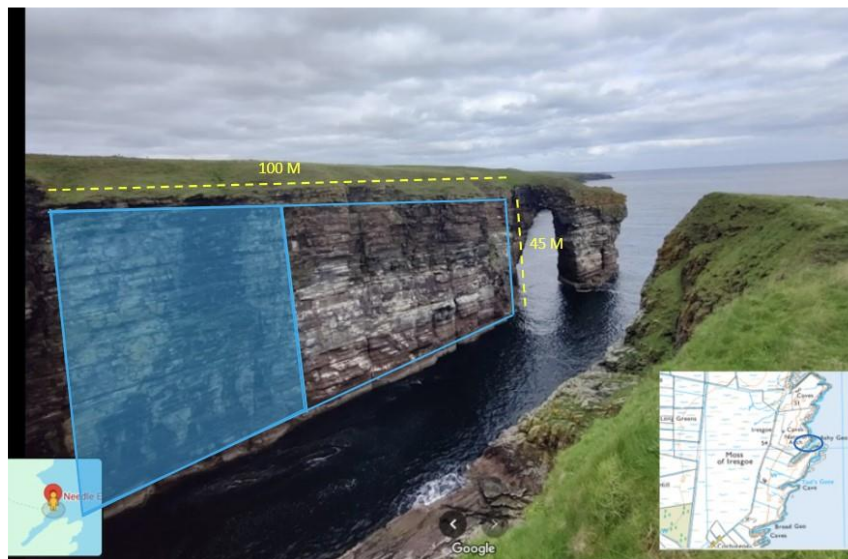


Figure 8 –Ashy Geo Arch plot – monitoring area (as highlighted red in Figure 3). The shaded area is unavailable for nesting due to flooding.

The summary below from APEM provides the expected level of compensation available for guillemots, razorbill and kittiwakes from the proposed measure. A comparison between compensation available and estimated compensation required from the MD-LOT appropriate assessment is provided in Table 3. APEM has advised the Project that the proposed measure is expected to exceed the required compensation level for both guillemot, razorbill and kittiwakes, as outlined in Table 2.



“Drying the proposed area of cliff (circa 2,250m²) would be expected to accommodate additional nesting sites of equivalent number and of a similar species composition to those already on the adjacent dry cliff. This 2,250m² area has the potential to accommodate additional sites for approximately 700 guillemot, 100 razorbill and 200 kittiwake breeding pairs.

Compensation is based using the following calculations:

- 700 guillemot pairs will produce 462 fledglings (700 x 0.66) of which 157 (462 x 0.34) survive to breeding age.
- 100 razorbill pairs will produce 57 fledglings (100 x 0.57) of which 17 (57 x 0.29) will survive to breeding age.
- 200 kittiwake pairs will produce 164 fledglings (200 x 0.82) of which 74 (164 x 0.45) will survive to breeding age.”

Parameters used in the calculations are provided in Table 4 below.

Dr Rob Catalano and Matthew Boa, APEM

Table 3 - Level of compensation expected from Compensation Scheme 1 vs required level (APEM)

	Guillemot*	Razorbill*	Gannet*	Kittiwakes*
SPA	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)
East Caithness Cliffs	60 birds (0.03% of colony**)	4.2 birds (0.01% of colony**)		1.6 breeding adults (0.003% of colony**)
Fowlsheugh	8.6 birds*** (0.008% of colony**)			0.9 breeding adults (0.003% of colony**)
Forth Islands			7.6 birds (0.005% of colony**)	
Buchan Ness to Collieston Coast				1.4 breeding adults (0.006% of colony**)
Troup, Pennan and Lion's Heads				1.1 breeding adults (0.005% of colony**)
Compensation Required per Table 2 (per annum)	68.6 breeding adults	4.2 breeding adults	n/a	5 breeding adults
APEM Estimate Compensation that can be delivered (per annum) (Ashy Geo only)	157 breeding adults	17 breeding adults	n/a	74 breeding adults

Table Notes: *MDLOT Appropriate Assessment – Table 2 **Colony size estimates from GV Additional Information (reviewed by NS) ***in combination with Berwick Bank only

Table 4 below shows the parameters APEM used in the compensation calculations above for each species at Ashy Geo.

Table 4 - Assumptions for species productivity, breeding age and survival to breeding age for this compensation proposal (APEM)

Demographic parameter	Guillemot	Razorbill	Kittiwake
Potential increase in nesting capacity (breeding pairs)	700	100	200
Productivity*	0.66	0.57	0.82
Average breeding age (years)*	6	5	4
Survival to breeding age*	0.34	0.29	0.45

Table Note: *derived from Horswill, C., & Robinson, R. A. (2015). Review of Seabird Demographic Rates and Density Dependence. JNCC Report no. 552.

4 Proposal Compensation Scheme 2 – Disturbance reduction at Troup Head / Collie Head

4.1 Existing pressure at the site

A new core path was installed in 2021, creating access to Collie Head and extended to the RSPB reserve at Troup Head. This path was installed after NatureScot’s assessment of site disturbance in 2017.

There is currently no control of access and no suitable viewing location created at Collie Head, resulting in visitors using informal paths along the cliff (Figure 9), which have potential to disturb cliff nesting colonies. Evidence for reduced productivity attributed to human disturbance of nesting birds has been reported at the SPA previously (Furness *et al.*, 2013).

Informal paths show access to cliff edges, with no restriction to access at present. This provides potential for disturbance of breeding seabirds to occur. Disturbance is a primary concern for seabirds and multiple studies have confirmed the potential for impact from anthropogenic activities leading to a reduction in seabird breeding success, as set out in the example studies evidencing the effects of disturbance on seabirds in Table 5.

The Project proposes to implement path realignment to avoid informal paths from being used, combined with installing of visitor screens and signage to minimise the anthropogenic impact of visitors on seabirds.



Figure 9 - Informal paths at Collie Head along cliff edges (highlighted by a dotted outline in the right hand image)

Table 5 Selected peer-reviewed literature demonstrating that disturbance is a primary concern for breeding seabirds at UK colonies.

Evidence	Title / Author / Date
<p>A period of lower than normal productivity at Troup Head (0.5 chicks per pair) was attributed to disturbance at that colony, from a review of potential management for gannet in the UK.</p>	<p>Evidence review to support the identification of potential conservation measures for selected species of seabirds. Furness, R.W., MacArthur, D., Trinder, M. and MacArthur K. (2013). http://dx.doi.org/10.13140/RG.2.1.4666.3200</p>
<p>Study on the proximity of visitors to a gannet colony showed distances of less than 8m reduced productivity by 36%.</p>	<p>The effectiveness of regulatory signs in controlling human behaviour and Northern gannet (<i>Morus bassanus</i>) disturbance during breeding: An experimental test. Allbrook, D. L., & Quinn, J. L. (2020). https://doi.org/10.1016/j.inc.2020.125915</p>
<p>“... a disturbance-induced decrease in overall nesting success of around 10% from the expected nesting success in the absence of visitors was estimated at St. Abb’s Head”</p>	<p>Modeling the Effects of Limiting the Number of Visitors on Failure Rates of Seabird Nests. Beale & Monaghan (2005) https://conbio.onlinelibrary.wiley.com/doi/abs/10.1111/j.1523-1739.2005.00256.x</p>
<p>“... the most important pressures negatively impacting on England’s breeding seabirds at a site, regional, and national level. These were (in order of importance): disturbance, habitat loss, predation, invasive species, reduction in food, and the impacts of climate change.”</p>	<p>England’s breeding seabirds: A review of the status of their breeding sites and suggested measures for their recovery. Lock, L., Donato, B., Jones, R. and MacLeod-Nolan, C. (2022) https://www.projectlote.life/uploads/1/3/5/6/135667366/seabird_colony_assessment_lote.pdf</p>
<p>“Human disturbance has been linked with declines in breeding success of cliff-nesting birds and cause abandoning of nest and chicks and/or increase the risk of eggs and chicks being predated while breeding adults are absent due to disturbance.”</p>	<p>Development of Marine Bird Sensitivity Assessments for FeAST. NatureScot Research Report 1273. Rogerson, K., Sinclair, R., Tyler, G., St John Glew, K., Seeney, A, Coppack, T. and Jervis, L. (2021) https://www.nature.scot/doc/naturescot-research-report-1273-development-marine-bird-sensitivity-assessments-feast#Annex+4+%E2%80%93+Indirect+pressures+scoped+by+NatureScot+and+JNCC</p>
<p>“Seabird colonies need to be protected from disturbance through guidance, codes of practice and even bylaws which guide public access and activities on sea and land. Fencing and signage can be effective”</p>	<p>The pathway to seabird recovery in England. Banks, A. and Williams, N. (2024) The pathway to seabird recovery in England - Natural England (blog.gov.uk)</p>
<p>“Safe, undisturbed and productive nest sites are crucial to enable seabirds to recover, as they tend to reproduce very slowly</p>	<p>The pathway to seabird recovery in England. Banks, A. and Williams, N. (2024) The pathway to seabird recovery in England - Natural England (blog.gov.uk)</p>

Evidence	Title / Author / Date
<p>– many species do not breed until they are several years old, typically then lay just a few eggs each year, and in some years may decide not to breed at all.”</p>	
<p>“Disturbance of seabirds at their colonies can lead to reduced breeding success or even to permanent abandonment of the site.”</p>	<p>Threats to seabirds: a global assessment. Dias, M. P., Martin, R., Pearmain, E. J., Burfield, I. J., Small, C., Phillips, R. A., ... & Croxall, J. P. (2019). https://seabirdinstitute.audubon.org/sites/default/files/2019-threatstoseabirds-aglobalassessment.pdf</p>
<p>“Hatching success did not differ between disturbance levels, but overall nestling mortality was significantly higher in areas exposed to high visitor pressure.”</p>	<p>Out of sight but not out of harm’s way: human disturbance reduces reproductive success of a cavity-nesting seabird. Watson, H., Bolton, M., & Monaghan, P. (2014)</p>
<p>“Overall colony [wide] productivity was reduced by ≤1.6% compared with that expected in the absence of visitors.”</p>	<p>Out of sight but not out of harm’s way: Human disturbance reduces reproductive success of a cavity-nesting seabird – ScienceDirect</p>

4.2 Technical solution for implementation of proposed measure

The proposal compensation measure set out here is to install a new path and viewpoint, enhanced with additional screening to reduce disturbance at this location and stop cliff top disturbance to the seabird colony below. Benefits in terms of reduced cliff top erosion are also expected.

Construction of the proposed footpath is a routine construction activity. Materials specified for use (per planning application [APP/2023/1010](#)) are benign to the local environment. The design shall accommodate individuals with disabilities, with features including adequate width, handrails, and non-slip surfaces. Materials can be easily obtained and delivered to site with little or no disturbance to the surrounding area.

4.3 Feasibility of proposed measure

An outline assessment of the Proposed measure indicates that it is readily feasible to develop. Key considerations are:

- The Project has engaged the landowner, who has provided written confirmation that they are supportive of the proposed works.
- Planning permission is already in place for the creation of a footpath at Crovie (Aberdeenshire Council Planning Application Reference Number (hyperlink: [APP/2023/1010](#)). These works have not been completed, which the Project has been advised is due to lack of funding.

4.4 Expected compensation level

APEM has independently evaluated the potential for disturbance management to improve nesting quality for seabirds. The summary below from APEM provides an example calculation for the expected level of compensation available for gannets with the proposed measure.



“Disturbance reduction is widely understood to be an effective colony management measure. Evidence suggests that the proposed works at Collie Head could feasibly increase mean productivity by 25% for the species indicated in Table 5 as demonstrated in previous studies (Beale & Monaghan, (2005); Allbrook & Quinn, (2020)). This measure is expected to provide a significant benefit to the colony as a whole, particularly as visitor numbers which are currently in their thousands at the RSPB reserve (pers comms), are expected to only further increase in future years – partly due to completion of new paths in 2021 in the adjacent area at Troup Head”.

Example calculation for gannet compensation that could be delivered:

25% increase in productivity; $0.70 > 0.875$

Number of yearly fledglings increasing from 872 ($1,245 \times 0.70$) to 1,089 ($1,245 \times 0.875$)

Additional fledglings surviving to breeding age per annum; $217 (1,089 - 872) \times 0.26 = 56$.

Parameters used in the calculations are provided in Table 7 below.

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APEM has also calculated expected compensation levels for other target species referenced in Table 2. Results are provided in Table 6 and illustrate that when compared to the required level of compensation provided in Table 2, the proposed measure can be expected to be effective in compensating for gannet, whilst being highly effective in compensating for razorbill, kittiwake and guillemot.

APEM have therefore confirmed that the proposed measure is expected to deliver the required benefit.

Table 6 - Level of compensation required and level of compensation that scheme 2 can deliver (APEM)

SPA	Guillemot*	Razorbill*	Gannet*	Kittiwakes*
	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)	Predicted mortality (per annum) and (percentage of colony)
East Caithness Cliffs	60 birds (0.03% of colony**)	4.2 birds (0.01% of colony**)		1.6 breeding adults (0.003% of colony**)
Fowlsheugh	8.6 birds*** (0.008% of colony**)			0.9 breeding adults (0.003% of colony**)
Forth Islands			7.6 birds (0.005% of colony**)	
Buchan Ness to Collieston Coast				1.4 breeding adults (0.006% of colony**)
Troup, Pennan and Lion's Heads				1.1 breeding adults (0.005% of colony**)
Compensation required per Table 2 (per annum)	68.6 breeding adults	4.2 breeding adults	7.6 breeding adults	5 breeding adults
APEM Estimate Compensation that could be delivered (per annum)	69 breeding adults	40 breeding adults	56 breeding adults****	131 breeding adults

Table Note: *MDLoT Appropriate Assessment **Colony size estimates from the Supplementary Ornithological Assessment (reviewed by NatureScot) ***in combination with Berwick Bank only. **** Based on the latest 2023 gannet colony count of 1,245 pairs confirmed by the RSPB at Collie Head (pers comms).

Table 7 provides the assumptions APEM used for each species.

Table 7 - Assumptions for species productivity, breeding age and survival to breeding age (APEM)

Demographic parameter	Guillemot	Razorbill	Gannet	Kittiwake
Productivity*	0.66	0.57	0.70	1.06
Average breeding age (years)**	6	5	5	4
Survival to breeding age**	0.34	0.29	0.26	0.45
Estimated population	1,239 pairs***	978 pairs***	1,245 pairs****	1,099 pairs***

Table Note: *10-year average productivity SMP database for gannet, and Horswill and Robinson (2015) for guillemot, kittiwake and razorbill. ** derived from Horswill and Robinson (2015) *** Population is based on the last count in 2017 + the % increase numbers seen within the SPA from the RSPB counts in 2023 (SMP database, 2023) **** Based on the latest 2023 gannet colony count of 1,245 pairs confirmed by the RSPB at Collie Head (pers comms).

5 Proposal Compensation Scheme 3 – tree mallow removal in Puffin nesting habitat

Proposal 3 has been developed to specifically compensate for any impact Green Volt may have on Puffin populations in the Firth of Forth. The required compensation level of 0.8 birds per year is shown in Table 2. This represents less than 0.001% of estimated colony population.

5.1 Existing pressure at the site

The rapid decline in puffin on the Islands of the Firth of Forth (Craiglieth, Fidra, Lamb and Inchcolm) began approximately 20 years ago and is due to the rapid spread of an alien plant, *Lavatera arborea* (commonly known as *tree mallow*) (Harris et al., 2003). Tree mallow grows over puffin burrows, disabling access to their nests, causing soil erosion and hence reducing the amount of suitable habitat for puffins to build new burrows (Van der Wal, 2006).

5.2 Technical solution for implementation of proposed measure:

It has been demonstrated that targeted control of the extent of tree mallow leads to restoration of puffin nesting habitat (van der Wal, 2006; Rieglova, 2007).

The SOS Puffin Project has provided control of tree mallow within the Forth Islands SPA. The SOS Puffin Project has been determined to be successful and it is widely accepted that within five to ten years the majority of the islands will be free of tree mallow and that low-level maintenance will suffice to keep the islands in an ecologically favourable state for puffin nesting (Rieglova, 2007). However, the overall objective can only be achieved if there is ongoing monitoring and continued yearly maintenance (van der Wal, 2006).

Proposal 3 is to contribute towards tree mallow removal, for example through contribution to the volunteer project led by the Scottish Seabird Centre (SSC) which started in 2007 and aims to bring under control the invasive plant tree mallow on the islands of Craigleith, Fidra and The Lamb.

A research and monitoring project has also been funded by the Scottish Marine Environmental Enhancement Fund (SMEEF) for two years (SMEEF, 2023). The latest report by the Scottish Seabird Centre indicates tree mallow is still present on Craiglieth, Fidra and The Lamb and although is currently under control continued maintenance and monitoring is required prior to the beginning of each breeding season (SSC, 2024b).

5.3 Feasibility of proposed measure

Funding contributions are currently being sought by the SOS Puffin project, operated by the Scottish Seabird Centre. This volunteer led project has been operating since 2007 and is dependent on funding donations to the Scottish Seabird Centre to organise visits to cut tree mallow (SSC, 2024a). There is currently no committed funding for this work and fundraising for this scheme continues.

There are also operational challenges in delivering elements of tree mallow removal due to limitations in resources (e.g. lack of available vessels)¹.

¹ <https://www.seabird.org/uploads/store/mediaupload/618/file/SOS%20Puffin%20VolReportJan20.pdf>

The Project compensation measure will provide committed funding for an annual programme to ensure the necessary resources are in place to deliver suitable nesting habitat improvement for Puffin on the Islands of the Firth of Forth for the lifetime of the wind farm.

5.4 Expected compensation level

APEM have provided an independent review of this measure on behalf of the Project as follows:



"In 2006, it was shown that successfully removing tree mallow could double the number of Puffins nesting in a given area.

SOS Puffin has proven the approach to actively restoring nesting habitat for Puffins in the Forth Islands SPA. As of 2021, 4,168 Puffin Apparently Occupied Burrows (AOB) were recorded at Craigleith Island (SMP, 2024). Historically, this number was much higher with 28,000 AOB in 1999 (SMP, 2024), prior to the onset of tree mallow.

This demonstrably successful scheme has been improving Puffin habitat for a number of years. Continuing tree mallow management will deliver substantially outsized compensation against the AEoSI identified.

Even if the proposed scheme were only 10% effective, this could be expected to lead to additional habitat for over 400 AOB, or circa 800 breeding adults.

Securing the continuation of tree mallow removal will deliver compensation above the level required by the Appropriate Assessment".

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6 Overall compensation

Green Volt proposes to complete Proposed measure 1, Proposed measure 2 and Proposed measure 3 in combination, so that the Outline Seabird Compensation Strategy can be expected to deliver the benefit at a ratio substantially greater than the AEoSI identified in Table 2.

7 Monitoring and adaptive management proposal

Monitoring shall be implemented at all stages of the compensation process, as outlined in Section 2.

The purpose of monitoring is to:

- map nesting habitat distribution and quality within a defined seabird colony site - including unoccupied sites, potential habitat that can be restored and any associated factors that may deter occupation in these areas;
- gather baseline sub colony populations and productivity data
- establish the current status and trends of seabird colonies which are targeted to benefit from the proposed compensation measure(s);

- to understand the extent and various types of disturbance which may be impacting breeding seabirds at sites; and
- monitor the effectiveness of the compensation measures post-implementation to enable adaptive management, if necessary, to ensure the required level of compensation is achieved for the Project.

As well as the locations of the proposed measures outlined in this document, nearby areas where it is expected that similar measures could provide the required level of compensation will also be included in the pre-construction monitoring work. Additional sites could be included for monitoring following further discussions with stakeholders.

Adaptive Management

Should there be a deficit of compensation accrued by the Project at the end of the first five years of monitoring requiring corrective action, the following approach would be followed:

- review if wider implementation or minor adjustments to the proposed compensation measure can be provided and could be expected to deliver the required level of compensation (in consultation with key stakeholders).
- If not sufficient, consider requesting to participate in any strategic or collaborative compensation funding mechanisms. If no such mechanism is available (as is currently the case), revisit other identified compensation measures (as presented in Section 4 of the Offshore Ornithology Compensation Report submitted alongside the Without-Prejudice HRA Derogation Case) and agree and implement accordingly.

Baseline monitoring and adaptive management roadmap

A draft roadmap outlining steps in baseline monitoring and adaptive management to be completed by the Project is provided in Figure 10. It is expected that this draft roadmap will be reviewed and adopted as part of the Detailed Seabird Compensation Scheme, to be authorised by the competent authority following the first year of baseline monitoring.

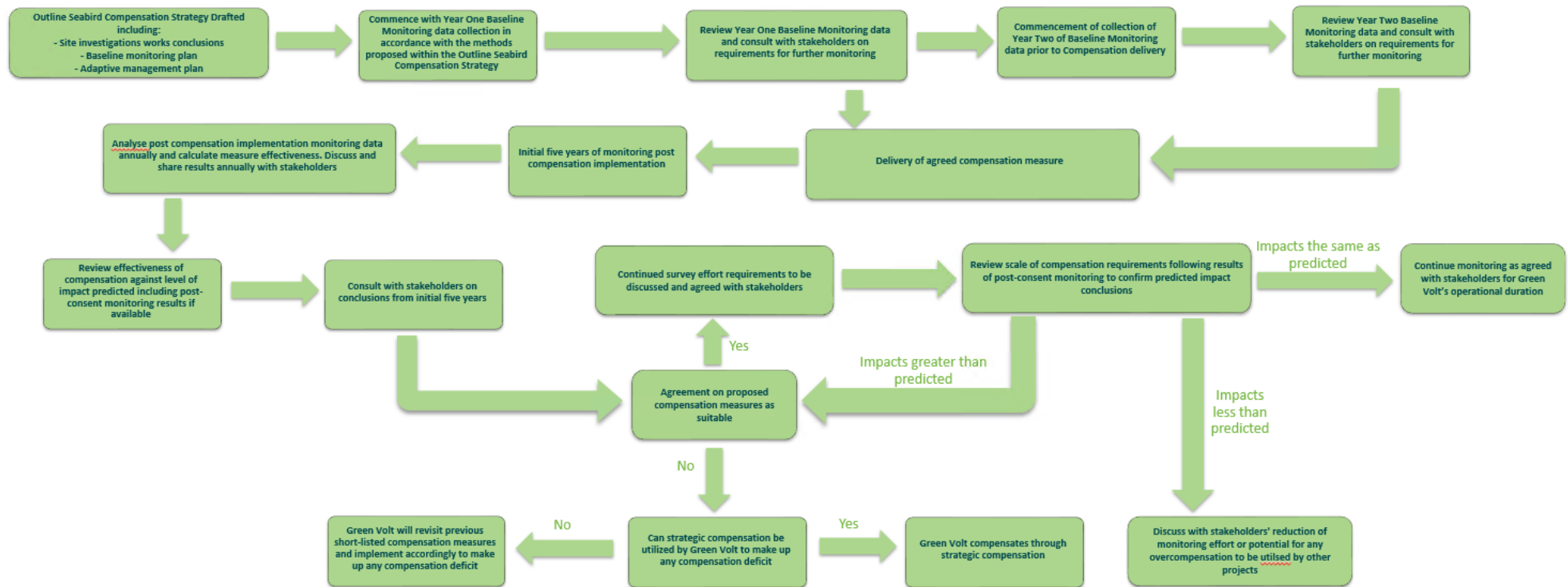


Figure 10 - Baseline monitoring and adaptive management draft roadmap

8 Compensatory measures checklist

This section reviews the proposed compensation measures using guidance from the Scottish Government Framework to Evaluate Ornithological Compensatory Measures for Offshore Wind: Process Guidance Note for Developers, October 2023.

Table 8 and Table 9 review Proposed Compensation Schemes 1 and 2, respectively.

8.1 Proposal Compensation Scheme 1 - Drainage management

Table 8 - Drainage management (Scheme 1) compensation checklist (see also section 0).

Compensatory measures checklist - Drainage Management at Ashy Geo, East Caithness Cliffs		
Checklist question	Y/N/?	Explanation
Is the measure technically feasible?	Y	Multiple technical options are available for drainage improvement, as offered by specialist engineering contractors. APEM advise that such options, if implemented, can be expected to address the impact of flooding of nesting sites at Ashy Geo (within East Caithness SPA). APEM advise that a similar level of benefit could be expected at other locations within the SPA, if required. Additional technical options include peatland restoration to allow for water retention.
Is the measure financially feasible?	Y	The Project has obtained outline quotations for the proposed works and fully commits to funding completion. The outline cost estimate for these works is equivalent to approximately 0.01% of wind farm cost and has been deemed financially feasible to the developer.
Is the measure legally feasible?	Y	Written confirmation received from landowner. No impediment identified to obtaining necessary planning permission / other consents – it is expected that the SSSI / SAC can be avoided, but full assessment of any impacts of the measure would be part of the consent process. APEM advise that a similar level of benefit could be expected at other locations within the SPA, if required. Additional options include peatland restoration to allow for water retention.
Is the measure deliverable?	Y	The measure can readily be technically deployed. No impediment identified to obtaining necessary planning permission / other consents – as outlined above. Adjacent SAC and SSSI features have been identified, but works within these areas can be avoided whilst maintaining the compensation benefit. There are no peatland features of concern in these areas and drainage is expected to either be neutral or improve the habitat for SAC / SSSI conservation species. Should any concern be raised during development of the Detailed Seabird Compensation Plan, APEM have identified a number of areas of cliff flooding within the SPA, including the specific proposed location, where a similar measure would be expected to be similarly effective in improving nesting sites.
Is the measure ecologically effective (i.e. sufficient)?	Y	Review by APEM: <i>Drying the proposed area of cliff (circa 2,250m²) would be expected to accommodate additional nesting sites of equivalent number of species composition to those already on the adjacent dry cliff, i.e. the 2,250m² area has the potential to accommodate additional sites for approximately 700 guillemot, 100 razorbill and 200 kittiwake breeding pairs.</i> <i>Compensation is based using the following calculations:</i> <ul style="list-style-type: none"> 700 guillemot pairs will produce 462 fledglings (700 x 0.66) of which 157 (462 x 0.34) will survive to breeding age annually.

		<ul style="list-style-type: none"> • 100 razorbill pairs will produce 57 fledglings (100 x 0.57) of which 17 (57 x 0.29) will survive to breeding age annually. • 200 kittiwake pairs will produce 164 fledglings (200 x 0.82) of which 74 (164 x 0.45) will survive to breeding age annually. <p><i>These figures compare with compensation requirements for 68.6 guillemots, 4.2 razorbills and 5 kittiwakes per MD-LOT Appropriate Assessment. Gannets are not typically present at this site.</i></p> <p><i>We note that there are a number of nearby sites within the SPA which would expect to achieve a similar level of compensation. Overall, improvement in habitat quality will lead to an increase in productivity and therefore an increase in the colony size as required to compensate for Green Volt's impacts.</i></p>
Will the measure be effective before adverse effects arise?	Y	The wind farm would not be operational until one full breeding season after implementation of the measures
Can the measure be secured?	Y	The above positive analysis of feasibility identifies that the measure is securable. The proposed suspensive condition can secure, deliver and ultimately places the risk of completion on the developer.
Can success of the measure be monitored?	Y	<p>A full programme of pre-implementation baseline monitoring and post-implementation monitoring is included in the Outline Compensation Plan, with review and acceptance of the Detailed Compensation Plan required by MD-LOT (in consultation with NatureScot) and evaluation of compensation measure effectiveness to be completed prior to wind farm construction.</p> <p>Baseline monitoring will include sub colony census, productivity monitoring and disturbance monitoring.</p>
How have uncertainties been addressed?		<p>Compensation to be applied at a ratio greater than 1:1 than that of potential impact.</p> <p>Monitoring to demonstrate effectiveness of measures.</p> <p>Adaptive management to address any shortfalls.</p>
Additional comments		
Were there any barriers preventing delivery of better ecological outcomes?	Y	There is a lack of baseline data for the site, this is fully addressed within the Outline Seabird Compensation Plan.

8.2 Proposal Compensation Scheme 2 - Disturbance reduction

Table 9 - Disturbance management (scheme 2) compensation checklist (see also section 4).

Compensatory measures checklist - Disturbance reduction at Collie Head, Troup, Pennan & Lion's Head SPA		
Checklist question	Y/N/?	Explanation
Is the measure technically feasible?	Y	The proposed measure is already developed to the point where planning permission has been obtained. Proposed delivery solutions include routine technical and engineering works.
Is the measure financially feasible?	Y	The Project has obtained outline quotations for the proposed works and fully commits to funding completion. The outline cost estimate for these works is equivalent to approximately 0.01% of wind farm cost and has been deemed financially feasible to the developer.
Is the measure legally feasible?	Y	Written confirmation received from landowner. Planning approval for the proposed project has already been obtained. Proposed solutions include routine technical and engineering works.
Is the measure deliverable?	Y	Planning approval for the proposed project has already been obtained. Proposed solutions include routine technical and engineering works.
Is the measure ecologically effective (i.e. sufficient)?	Y	<p>Review by APEM: Disturbance reduction is widely understood to be an effective colony management measure. Evidence suggests that the proposed works at Collie Head could feasibly increase mean productivity by 25% for the species indicated in Table 5 as demonstrated in previous studies (Beale & Monaghan, (2005); Allbrook & Quinn, (2020)).</p> <p>Compensation is based using the following calculations:</p> <ul style="list-style-type: none"> - 25% increase in productivity for gannets will allow yearly fledglings to increase from 872 to 1089, leading to 56 additional fledglings surviving to breeding age. - 25% increase in productivity for guillemots will allow yearly fledglings to increase from 817 to 1022, leading to 69 additional fledglings surviving to breeding age. - 25% increase in productivity for razorbills will allow yearly fledglings to increase from 557 to 696, leading to 40 additional fledglings surviving to breeding age. - 25% increase in productivity for kittiwakes will allow yearly fledglings to increase from 524 to 655, leading to 131 additional fledglings surviving to breeding age. <p>This measure is expected to provide a significant benefit to the colony as a whole, particularly as visitor numbers (which are currently in their thousands) are expected to further increase in future years. Overall, reduction in disturbance effects can be expected to lead to an increase in productivity and an associated increase in the colony size which more than compensates for Green Volt's impacts, as assessed by the Appropriate Assessment.</p>

Will the measure be effective before adverse effects arise?	Y	The wind farm would not be operational until one full breeding season after satisfactory implementation of the measures.
Can the measure be secured?	Y	The above positive analysis of feasibility identifies that the measure is securable. The proposed suspensive condition can secure delivery, and ultimately places the risk of completion on the developer.
Can success of the measure be monitored?	Y	A full programme of pre-implementation baseline monitoring and post-implementation monitoring is included in the Outline Seabird Compensation Plan, with review and acceptance required by MD-LOT (in consultation with NatureScot) prior to wind farm construction. Baseline monitoring would include sub colony census, productivity monitoring and disturbance monitoring.
How have uncertainties been addressed?		Compensation to be applied at a ratio greater than 1:1 than that of potential impact. Monitoring to demonstrate effectiveness of measures. Adaptive management to address any shortfalls.
Additional comments		
Were there any barriers preventing delivery of better ecological outcomes?	Y	There is a lack of baseline data for the site, this is fully addressed within the Outline Seabird Compensation Plan.

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A.1 Appendix – Map showing approximate location for implementation of Scheme 1 measures

Figure 11 provides a 1:2,500 scale view of the area around Ashy Geo, illustrating SAC and SSSI features. Note that the SAC and SSSI fully overlap in the area shown. The inset photo shows the area addressed by Figure 8. The area of proposed works is highlighted in red outline.

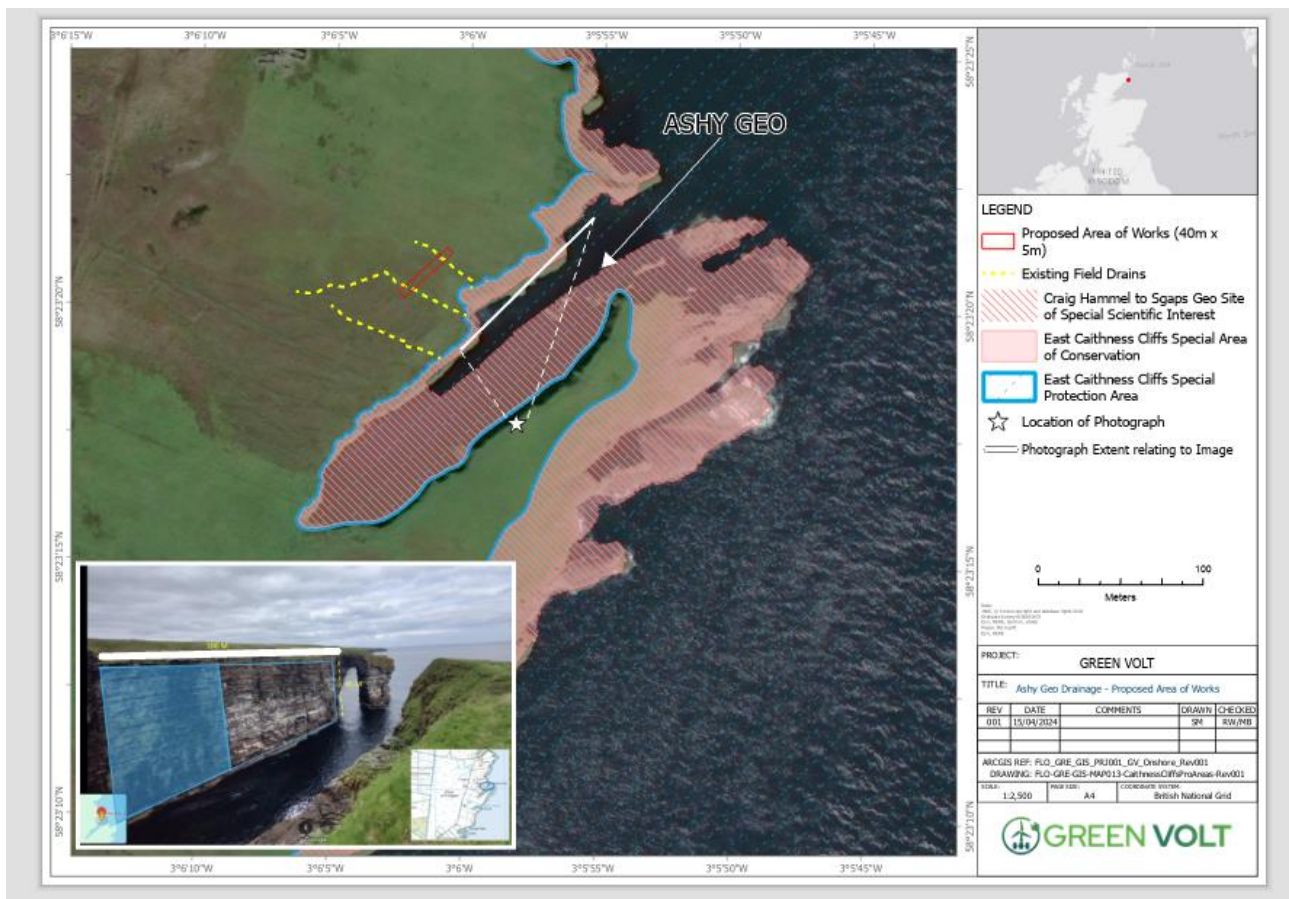


Figure 11 - Proposed Area of Works for Scheme 1 - Improved Drainage above cliffs at Ashy Geo.