Save Minster Marshes response to Deadline 4

Interested Party Reference [redacted]

Executive Summary

We have significant concerns regarding the Sea Link project's proposed converter station and substation at Minster Marshes. These concerns arise from evidence presented at the CAH and ISH2, observations from site visits, and analysis of recently issued documentation. The central conclusions are that (1) the Minster Marshes site is fundamentally unsuitable for development, (2) the Applicant's assessments do not reflect real-world environmental conditions, and (3) late or incomplete information has prevented meaningful scrutiny.

Flood Risk, Hydrology and Site Suitability

Evidence shows the proposed site experiences extensive, predictable winter flooding, confirmed through video and photographs submitted to the ExA. Despite this, the Applicant has scoped out flood-related impacts on the basis that Sustainable Drainage Systems (SuDS) would mitigate all risks. The Applicant's own Indicative Plans show very large attenuation ponds that would convert significant areas of marsh into permanent water bodies, altering habitat and increasing pollution risk via a proposed outfall into Minster Stream.

Nearby planning history shows SuDS were previously ruled out for the adjacent BESS site due to shallow groundwater, forcing discharge into the River Stour instead. This strongly indicates that SuDS are equally unfeasible at the Sea Link site.

Environmental and Biodiversity Impacts

The site lies within and adjacent to nationally and internationally important habitats with extensive protections under the UK and international law and which support seals, migratory birds, reptiles, raptors, European Eels, beavers and threatened species of bird such as Turtle Doves and Skylarks. Many of the Applicant's ecological statements conflict with established evidence or local data. For example, their assertion that seals are habituated to noise disregards the years of diligent conservation measures that have deliberately reduced disturbance.

Key species of bird such as Curlew, Little Tern, Golden Plover, and Turnstone have been insufficiently assessed despite being in unfavourable conservation status, with significant sensitivity to human disturbance. Skylark numbers reported by the Applicant contradict field counts and bird ringing data which show extensive use of Minster Marshes and cause doubt on their other species counts.

The arrangement of pylons is likely to create a bird-strike funnel effect, contradicted by Applicant statements but supported by their own visualisations.

Incomplete and Late Documentation

Key documents referenced by the Applicant, including the Preliminary Ground Investigation report, were not supplied as part of the submission, hindering scrutiny and transparency. Reptile surveys at the Hoverport have not been done and have not been committed to. Major technical information is being released too late for Interested Parties to assess before deadlines.

Contamination, Traffic, and Construction Concerns

The very real risk of colliery spoil leaching heavy metals from the hoverport as a result of regular vehicular access have not been assessed. Contamination risks from historic orimulsion pollution at Richborough Power Station and colliery spoil at the Hoverport have been downplayed despite evidence of its presence in local ground material. Traffic assessments have not been updated since the dDCO process opened, despite major changes on the A299 and known structural issues with Ramsgate Tunnel, which cannot support AILs in its current condition. We also find the Applicant's traffic surveys and impact on tourism and the economy severely lacking.

Conclusion

The cumulative evidence demonstrates that the Minster Marshes site is hydrologically unsuitable, ecologically sensitive, and insufficiently assessed. Significant documentation gaps, late submissions, and reliance on desk-based assumptions prevent a fair and informed examination process. The ExA is therefore requested to require full modelling evidence, allow additional time for Interested Parties to review, and seriously consider whether the Kent onshore scheme should proceed given its flawed premise and significant environmental and technical constraints.

Dear Ex A Panel,

Following our participation in the Compulsory Acquisition Hearing (CAH) and Issue Specific Hearing 2 (ISH2), we wish to raise several observations for your consideration for Deadline 4, 10 February 2026.

Despite your statement in the letter of 5 December 2025—*Implications of CR1 for the Examination Timetable*—that *"all of the materials pertaining to the change application (CR1) have been published on the Sea Link project page of the National Infrastructure Planning website and added to the Examination Library*", a further 42 documents relevant to Kent have been uploaded since that date. The most recent of these, submitted on 13 January, was again a late submission by the Applicant for Deadline 3 (9 January 2026).

In light of this, we contacted the Examining Authority (ExA) on 5 February 2026 to request a two-week extension for our next submission for Deadline 4, 10 February 2026, to give us and our legal counsel adequate time to respond.

We therefore respectfully ask that you consider not only the following submission, but also the supplementary material addressing this issue that we will provide following Deadline 4.

Comments Arising from CAH

We provided the ExA with a video following the CAH to show the waterlogged fields on which the Minster Converter and sub-station is proposed to be constructed. As this could not be publicly shown to the Applicant, we would be grateful if you would review the following concerns in light of our video evidence about flooding and SuDS provision.

> At **APP-064 6.2.3.4. part 3 Kent, Water Environment, Chapter 4,** para 4.4.2. shows ExA comment "[Flood risk] is proposed to be scoped out on the basis of no impact pathway given attenuation of runoff through SuDS provision. The Inspectorate agrees that, provided the operational control measures in the form of SuDS are clearly described in the ES and secured through the DCO, this would ensure no pathway of effect to result in increased flood risk from operational discharges and runoff from AGI or loss of floodplain storage. "

and also ..

> At **APP-064 6.2.3.4**. **part 3**, para 4.4.5. shows ExA comment [Runoff] This matter is scoped out on the basis of no impact pathway given attenuation of runoff through SuDS provision. The Inspectorate agrees that SuDS provision would remove/reduce the likelihood of surface water runoff from the converter site during operation and thus ensure any such effects would be fully mitigated. The Inspectorate therefore agrees this matter can be scoped out of the assessment."

Both paragraphs indicate that SuDS will be provided to attenuate increased flood risk and run off and will presumably need no further consideration by the ExA.

This document continues:-

At APP-064 6.2.3.4. part 3, para 4.8.3 Embedded Measures

- "Minster Converter Station and Substation would be served with drainage systems that embed SuDS for attenuation of runoff to green field runoff rates in line with the requirements of the receiving watercourse authorities (Internal Drainage Board, Environment Agency or Lead Local Flood Authority and provide treatment of runoff.

And

- Balancing ponds will be provided around the Minster Converter Station and Substation and close to the proposed access road to create a new riparian perimeter of 1.38 km (W25). The final habitat creation proposals will be developed through the final Landscape and Ecological Management Plan so may deviate from areas/ habitats presented here.

We referred to the documents submitted by the Applicant to see how and where attenuation ponds can be delivered in this site, since it is mostly underwater during the winter. We examined **CR1-025 2.14.2 Indicative General Arrangements Plans - Kent (Version 2, change request)** to find this at page 5. The water catchment areas are far bigger than those proposed routinely for a development of this nature in order to make this work in a waterlogged site.
So that now, on top of the footprint of the converter and substation itself, we see further acres of the fields that will be covered – not this time in concrete – but in permanent deep water bodies. These are not scrapes. For overwintering birds that require access to flooded fields as a food source, this extensive habitat will now be further damaged by the attenuation ponds, which appear to cover the same area as the sub-station when taken together.

We note also that a permanent outfall to the Minster Stream has been added from the most northerly attenuation pond and we are concerned about the effects of pollution from runoff into this pond from the Converter and SubStation that will run directly into this stream – which is important for European Eels, water voles and other riparian mammals, including beaver. We comment further on the viability of the Applicant's proposal to use SuDS later in this document.

And at **APP-064 6.2.3.4. Part 3 para 4.4.9**

- Data from the Environment Agency has been used to define the current condition and standards of protection provided by existing flood defences, no baseline condition surveys have been undertaken.

- Due to the *limited interactions of the operational above ground elements of the Kent Onshore Scheme with fluvial floodplains*, Application Document 6.8 Flood Risk Assessment has been informed by data collected from the Environment Agency, LLFAs and Kent Stour IDB, no new flood risk models have been developed.

As you are aware, we have provided video detail of flooding on the proposed converter site and have provided further evidence below that this is a yearly occurrence, together with additional video footage taken over the last few days while National Grid are on site. This flooding is not new and not

aberrant. We are mystified how there will be ‘limited operational above ground elements’. We suggest this is clearly incorrect.

For further clarification, we also provide the following photograph that shows the Applicant's bore-hole investigations on the same site (photograph taken 28 Jan 2026). This shows not only the state of the fields – but the additional damage that the bore-holing investigation is doing to the areas that do not have matting, but where vehicles have previously been driven.

We are also aware that the ExA Panel visited this location on 12 November (EV1-018) and thank you for your consideration in this, but you may be surprised to see the extent of the flooded fields on 28 January 2026. This site is clearly unsuitable for building and breaches the Applicant’s own guidance about avoiding areas for building that are prone to flooding.

The Applicant’s compound on 6 February 2026 when they were forced to down tools.

There is further damage to the bank next to the track way, where the netting to prevent access by reptiles to the work area is clearly not adequate for the job and has already been extensively damaged by the Applicant.

And further evidence that more mud will be discharged straight into the Minster Stream because of this Pre-Consent work. And this is *Pre-Consent*. How can we have any confidence in anything the Applicant says about mitigation of damage to the environment? This is how they behave in practice.

Looking towards the converter site from near the Railway line shows the extent of the flooding near the pylon route (photos taken 4th February 2026).

Below are 4 images from 2023. This is not a new occurrence. These fields flood every year. It is why it's called a marsh. The ability of this land to act as a sponge to prevent widespread flooding is vital. Removing that from the area needs to be properly modelled, not scoped out.


We have also provided modelled data mapping from Climate Central and would therefore urge you to challenge the data on which the Kent onshore location is pushing ahead in this location despite the clearly unsuitable conditions and the risks of further flooding.

Roll back on SuDS provision for adjacent site

This matter relates not only to Cumulative Impact, but also to SuDS plans that were made for the adjacent site and then reneged upon because of the geology/hydrology.

Please refer to Thanet District Council applications for the adjacent BESS plant site as follows:-

> *Application **F/TH/20/1467** Application for approval of Condition 6 (Verification Report) attached to Planning Permission F/TH/20/1467 for the development of an electrical battery storage facility with 49.9MW capacity including the installation of 23 batteries, electrical plant and equipment, alterations to land levels, landscaping and associated works:*
>
> ***Flood Risk Assessment Document in F/TH/20/1467** 4.4 SUDs were ruled out due to shallow ground water 4.5 Therefore propose to discharge surface water into the River Stour to the SW of the site 4.9 Run off from road collected in channel drains and conveyed to existing outflow. An attenuation tank will provide sufficient storage to prevent flooding 4.10 Construct inspection chambers as catchpits to trap and retain suspended solids.*

The upshot of this is that SuDS were promised and cannot be delivered in this location. This site is already proposing to discharge straight into the River Stour!

In addition, the fire risk from the BESS plant is particularly high and fire risk management is on record as a concern for Kent Fire and Rescue. Fire retardant pollution will be washed straight into the River Stour in the event of a fire. This will be true also for the Converter and SubStation site.

Horlock Rules and Design Guidelines implemented for North Falls & Five Estuaries NSIP[1]

[1] EN010119-000430-3.3.1.1_ES Appendix 4.1 Site Selection Golden Rules.pdf

We note the site selection guidance for this NSIP which is currently proceeding through Examination. The Design Guidance for the project clearly states on page 4:-

> "The identification of potential onshore substation options will also adhere to the principles identified below where possible: • [ ] • Avoid direct significant impacts to internationally, nationally and locally designated areas (e.g. SACs, SPAs, Ramsar sites, NNRs SSSIs, Local Nature Reserves and Local Wildlife Sites); • Minimise significant impacts to the special qualities of Areas of Outstanding Natural Beauty, National Parks or other designated landscapes; • [ ] • [ ]• Avoid historic or active landfill sites; • Avoid areas that fall within Flood Zone 3; • Avoid siting infrastructure within inner (SPZ1) and outer (SPZ2) source protection zones (SPZ), where possible; • Areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as reasonably practicable (specific wording from Horlock Rules);"

This is impressive. If this was being fairly applied to Sea Link, the Applicant would be getting a "full house" for how many of these are being totally ignored at the Kent landfall.

Horlock Rules are designed for Substations we know. The Converter station design and choice of site should logically follow the same guidelines. Anything else is simply semantics and disingenuous.

We still have no details about the method of construction on the site for the converter station itself. We understand that this will be supplied as a Technical Note at Deadline 4 and would request that we are given a 4 week extension to review this document as it is the first time we will have seen any detail whatsoever about how they plan to drain and build on the marsh.

Comments Arising from ISH2

We were surprised at some of the comments that were made on behalf of the Applicant during ISH2 28th January 2026 as follows and would draw your attention to these.

Surveys at the Hoverport

- It still appears that no reptile surveys are planned to be undertaken at the Hoverport until shortly before work commences. From our experience, developers pay their surveyors not to find problematic species. Bearing in mind the timeline of this DCO Examination, we cannot see how surveys for reptiles can be accommodated before it ends. We would urge the ExA therefore to insist on legally binding requirements for independent surveys for reptiles and other listed species at the Hoverport that will contain clear legal conditions for avoiding what is found on site. In addition, the Applicant has said that they will avoid areas of vegetation to avoid disturbing species and habitats. Given the lack of respect being shown to the reptile netting on Minster Marshes in the current pre-consent operations, we have no faith whatsoever that this will be adhered to.

Contamination

- We refer to **REP3-061, 9.17.2 Kent Drainage Strategy** (submitted by the Applicant on 13 January 2026 *giving us just 20 working days to review*). We note at para 5.3.1 to 5.3.3 that

there is mention of contamination risks from Richborough Power Station land; land we know to be contaminated with orimulsion (see BBC Programme First Sight and Deal & Walmer newspaper article attached at Appendix 1). Orimulsion combustion caused a toxic dust to settle over the surrounding area causing crop blight and damage to paint on the Volkswagen compound at Richborough Port, in addition to health problems for people living nearby breathing it in. Compensation was eventually paid to affected people. We believe that Powergen have used the rubble from the demolition of the cooling towers (contaminated with Orimulsion dust) in the platform for the NEMO converter and possibly for the base of the nearby BESS plant.
Orimulsion pollution risk should be considered in the strategy.

- Para 5.3.2 states “Risks to controlled waters (groundwater and surface water) were assessed as moderate/low to moderate due to their proximity to the site and shallow groundwater likely to be in hydraulic continuity with the surrounding water bodies; copper, nickel and zinc were identified in one of the groundwater samples. It is recommended that groundwater will be monitored during works of the proposed scheme.” We would suggest that the clearly high water table makes any disturbance of contaminated ground a serious health risk which is not low to moderate.

- Historic landfill is referred to but there is no mention of the colliery spoil that was used to make up the Hoverport base. David Stevens clearly made this point at ISH2. The Applicant originally stated that this was ‘anecdotal’ and had prepared no answers even though they have been working on this project for 4 years! This is just not acceptable at this late stage. The Applicant is not ready to start work.

Drainage and SuDS plans

- At para 5.4.2.of **REP3-061, 9.17.2 Kent Drainage Strategy**, the Applicant refers to **“Factual Report on Preliminary Ground Investigation (Structural Soils Ltd, 2024 Report No.: 563835-01 (03))”**. This document is not supplied as part of the submission. Are we supposed to hunt for this on the Internet?

- At para 5.4.3. Ibid, the Applicant states “The development design will need to account for fully saturated ground, and the need to dewater groundwater from the installation of any infrastructure required to be built in dry conditions”. Even now, we are still waiting for evidence of how the Applicant will proceed to drain the marsh in readiness for building. We are supposed to reply to the ExA by 10 February, but the Applicant does not intend to provide detailed construction information until the same date. This is not fair and transparent and does not give Interested Parties (let alone the ExA) an opportunity to examine the plans and comment.

- Throughout the document, the Applicant refers to the **Kent Drainage and Planning Policy Statement 2019**, but this document has to be found via an online search to request a copy from KCC’s website. Why has the Applicant not provided a link? This is contrary to principles of transparency. If the Applicant is using this as evidence they should make it easy to find the documents they are relying on.

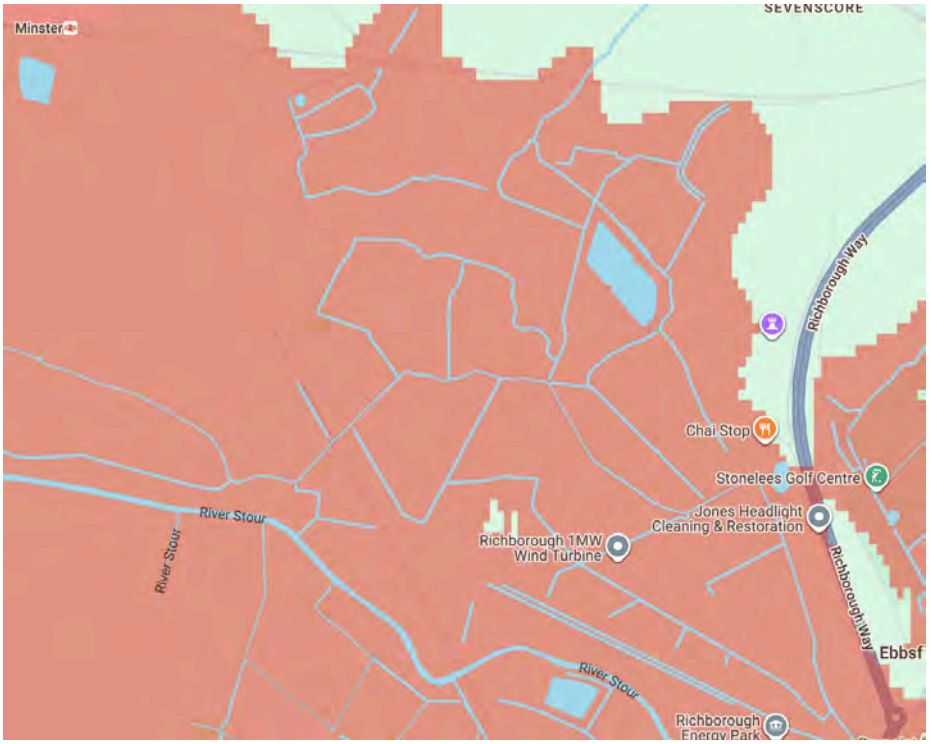
- We are amused to read para 6.2.7 referring to 1 in 30 and 1 in 100 year rainfall events and their design guidelines, when their current investigation compound is under water (see photographic evidence).

- We read at para 6.2.14 that the Stour IDB does not require the Applicant to use a Climate Change Allowance but that they have incorporated a 20% Climate Change Allowance. We refer you to page 8 of Appendix A and the data for the Converter Station plot, which shows that water seepage occurred at PC-09-ATPN and PC-09-ATPN at a depth of 0.85m. This is a high water table even in a dry period and the photos, once again, show the common state of the site.

- We would expect to have seen the Applicant use the measures recommended by Government[2] viz. the advice to:
    - use H++ climate change allowances for sea level rise **[this is 1.9m]**
    - use the upper end allowance for peak river flow
    - Employ the sensitivity test allowances for offshore wind speed and extreme wave height
    - add an additional 2mm for each year on top of sea level rise allowances from 2017 for storm surge
    - treat this as a 'sensitivity test'. It will help you assess how sensitive your proposal is to changes in the climate for different future scenarios. This will help to ensure your development can be adapted to large-scale climate change over its lifetime.

- We refer you again to the Climate Change data provided by climatecentral.org modelling a 1.9m rise in sea level. The fishing lakes can clearly be identified and the rest of the marsh is under water except for Weatherlees Hill.

[2] https://coastal.climatecentral.org/map/14/1.3436/51.3179/?theme=water_level&map_type=water_level_above_mhhw&basemap=roadmap&contiguous=true&elevation_model=best_available&refresh=true&water_level=1.9&water_unit=m accessed 07/02/2026



- We would suggest that the Applicant is clearly ignoring what is obvious on the ground and using desk data that provides the answers they are looking for.

Noise Disturbance on Seals

- Turning to questions and answers at ISH2, Jackie Hill for the Applicant appeared to not know about the Thanet Coast SAC and we found this quite shocking.

- We were also concerned when Jackie Hill for the Applicant dismissed the impact of disturbance on the seal colony, by stating that they are “Habituated to noise”. This is true to some extent in the river channel itself, but the seal colony has grown to the levels that the ExA saw for themselves on the site visit (80 seals on 12th November 2025). This growth in the colony is a result of a concerted effort by TDC and Kent Wildlife Trust working together to impose tighter restrictions on the use of Pegwell Bay. Kite surfers, jet skiers, windsurfers and swimmers are now completely banned from Pegwell Bay and there are much lower speed restrictions imposed on entering and leaving the river mouth. These measures, combined with engaging with commercial boat operators, have had a substantial impact on the seal colony by effectively reducing noise and vibration disturbance, meaning this is now the largest seal colony in Kent. The seals have not habituated to noise, the noise and vibration disturbance has been considerably reduced. The Applicant’s operations in Pegwell Bay will undo years of diligent conservation efforts.

Prey impact for Marine Mammals and Seabirds

- Jackie Hill for the Applicant stated during ISH2 that there would be no impact for seals as they would forage elsewhere. However **REP3-029, 6.6 (E) Habitats Regulations Assessment Report (Tracked)**, submitted 13 January 2026, states:

  > para 4.3.33 "Disturbance of the seabed during construction of the Proposed Project has the potential to affect prey availability. This may lead to indirect effects on species that forage within their range, including seabirds and marine mammals."

- Furthermore 4.3.7 states

  > "... the potential for indirect effects through impacts to prey species for features of the Southern North Sea SAC, the Wash and North Norfolk Coast SAC, the Humber Estuary SAC, and the Berwickshire and North Northumberland Coast SAC have not been taken forward to appropriate assessment."

  We want to know why the Thanet Coast SAC was not taken forward for appropriate assessment as this site is also RAMSAR and is host to Little Terns (breeding), Golden Plover and Ruddy Turnstone (see Natural England's qualifying features for the SPA[3]).

- The NE guidance for Little Tern, states

  > "100% Unfavourable Declining" and "Little terns arrive at Sandwich Bay, amongst other areas in Europe, to breed during the summer after spending the winter in the coastal areas of west Africa.[ ] Successful breeding is largely **dependent on relatively little disturbance** and limited predation (Forrest, 2000).
  > Little terns feed in the shallow coastal waters in and around the Sandwich and Pegwell Bay areas and in the lower reaches of the river Stour, foraging on small fish (including sandeel, pipefish and gobies) and crustacea (shrimps, prawns, crabs).
  > It has been observed that numbers of little terns have decreased in recent years and **this is thought to be largely as a result of increased human disturbance** (Rendell-Read, 2017)."

- The NE guidance for Golden Plover, states[4]

  > "100% Unfavourable/Declining" and "Within the SPA, golden plover favour the areas around Pegwell Bay and Long Rock. Areas outside of the SPA boundary are heavily used. High numbers have been recorded on low lying farmland north west of Sandwich including the eastern part of Ash Levels [this is Minster Marshes] and the Goshall Valley (Griffiths, 2003) (Henderson and Sutherland, 2017).
  > Grassland is the most important feeding habitat, with earthworm-rich permanent pastures preferred over leys and arable. The intertidal zone is also an important feeding habitat. Birds roost on arable land, damp grassland and intertidal areas (Stroud et al., 2001). Golden plover use the mud and sandflats at Pegwell and Sandwich Bays to roost, moving inland to arable fields and grazing marsh at high tide to roost and feed."

[3] European Site Conservation Objectives for Thanet Coast & Sandwich Bay SPA - UK9012071 accessed 07/02/26
[4] Ibid

We are somewhat at a loss to understand how the Golden Plover are given extra consideration by the Applicant, whilst Turnstone and Little Tern are equally important for the world, declining and apparently not worthy of special consideration..

Impact on Eels

- We did not comment or ask questions during the brief section on Fisheries about the impact on critically endangered European Eels which make their way through Pegwell Bay to the River Stour. It is unfortunate that we do not have access to funding for expertise to represent the eels, but we did note that the impact on them did not figure in the discussion in noise and vibration or disturbed sedimentation in Pegwell Bay. We would urge you to address this please, as these are creatures of international importance.

Fragmentation of Habitat especially for Dormice

- When discussing possible fragmentation of habitat, we were surprised that Dr James Riley appeared to have records of Dormice crossing motorways. We would request that he please share this with us, and yourselves, to inform our own knowledge of this species and its behaviour as we were not aware of this.

Habitat for Turtle Doves

- Dr James Riley also said that mitigation planting around the proposed converter station site would be beneficial for Turtle Doves. We were surprised that he was not aware of the habitat required for Turtle Doves. They require low plants and patches of open ground where they can find seeds. Farming practices in Minster Marsh and supplementary feeding on the Converter site provide this. Where they nest and breed is in tall, dense scrub or hedgerow (over 3 m tall and 4m wide). Thorn hedges are generally preferred, especially if there are native climbing plants present. This is a perfect description of the two 3 metre high 312m long hedgerows that have been planted across the converter station site to connect the SSSI to the Minster Stream. We would therefore draw your attention again to page 5 of **CR1-025 2.14.2 Indicative General Arrangements Plans - Kent (Version 2, change request)** that shows the suitable hedgerows (growing for over 20 years) cutting across the site that will be utterly destroyed, and the complete destruction of these suitable habitat fields abutting the SSSI. We also note that the plan shown on page 5 does not indicate the location of mitigation planting. Please also bear in mind that a 3m tall hedgerow takes time to grow and by this time we will see turtle doves go extinct from Thanet.

Skylarks and other important birds on the marsh

- Dr James Riley also stated that the converter site location was only used by one Skylark pair. This contradicts our own finding of a peak count of 76 birds in 2025 and ringing data from 2024 included ALL the Skylark ringed in Kent that year. The ringing data continues to show the value of the habitat including a total of 21 Jack Snipe in 2025 (refer to Appendix 2). Please, please do not allow NG to rip out the hedgerow through this important site and cover

it in concrete. This area is so important for birds. A few walkover surveys cannot capture the data.

- Dr Riley also commented that there are no industry standard metrics relating to the quantity of land required to mitigate for impacts on Skylark. There are, however, a number of studies that the Applicant could reference in relation to ground nesting birds like Skylark. For example, Barnsley Council commissioned a Skylark Mitigation Plan for a planned development in August 2025 in which the ecologist states "Buffer zones for these species should be about 15-20m minimum, as ground nesting birds have a greater disturbance range due to exposure. If the birds show signs of distress and risks nest abandonment, this should be increased." In addition, in a study reported in Bird Study Volume 66, 2019 on 'Occurrence of Eurasian Skylark (Alauda arvensis) territories in relation to urban area and heterogeneous farmland' found that "Skylarks clearly avoided the proximity of structures related to urbanization: paved roads, built-up areas and even unpaved tracks showed a negative effect on Skylark presence." We found this information through a brief internet search. If we can find it, there is no reason why the Applicant, with their vastly greater resources, cannot also do the research.

- Our expert bird ringer has provided a separate report which we have attached. While we are aware that the ExA does not usually accept data that challenges the Environmental data provided by the Applicant, this is continuous expertise providing you with valuable missing information. We urge you to please pay attention to this. See Appendix 2.

IUCN East Atlantic Flyway

- We would welcome an opportunity to hear your questions and the Applicant's responses about the IUCN East Atlantic Flyway that were not covered through lack of time.

Bird Strikes

- We were further concerned by the response from Neil Gates for the Applicant who appeared to be unaware of the arrangement of the pylons from the proposed converter station. He stated that there was no funnel effect and no pylons would cross the River Stour - although it is clear that pylons do and will cross straight across the River Stour to connect with the Richborough Canterbury pylons south of the river. The Applicant has provided their own visualisation of how the pylons would appear see page 7 of **AS-155** and we have zoomed in to show you the full effect more clearly.

The images clearly show that this is a significant funnel effect made much worse by pylons of varying heights.

- In the Infrastructure & Ecology Network Europe's (IENE) 'Biodiversity & Infrastructure Handbook', para 5.10.2 states "... birds are the most vulnerable group to electrocution and collision with powerlines. Bird mortality caused by powerlines and other electric utility structures has been reported for over 380 species including endangered and threatened species. Bats can be also negatively affected by the presence of powerlines, especially due to the lack of vegetation around poles supporting the powerline. Different studies highlight the importance of hedgerows and trees to bats for foraging and navigation during their flight. In many cases, because trees and hedgerows are cleared along the route of powerlines, a decline in bat populations is created by negative effects on bat habitat, feeding and navigation."[5]
- Turning to Neil Gates' response for the Applicant on 28 Nov in ISH2, we remain unconvinced that the 1000s of birds that use these fields will be able to "see the wires and go over the top" of this maze of wires and especially at night. Safe paths will only be found following strikes and will take years for birds to learn as a related flock (if ever).
- We were also unconvinced by his explanation that fluorescent deflectors would be sufficient to keep birds away from the wires at night. We request the ExA ask the Applicant for much more detail about the design and deployment of fluorescent markers and how they can mitigate strikes at night. We would also expect them to retrospectively fit these to the pylons installed as part of the Applicant's Nemo Link.

[5] 5.10.2. Measures to reduce risks caused by powerlines - Biodiversity & infrastructure handbook)

Noise and vibration from HDD and coffer dam construction

- We were unconvinced by the comment from the Applicant that working on HDD drilling will have no significant noise and vibration impact on cetaceans, pinnipeds and avian receptors.
- We note that **APP-189 6.3.3.9. Appendix B Kent Construction Noise and Vibration Data** does not include any analysis of the cofferdam construction, although we understand from the Applicant's Construction Method Technical Note this that there are likely to be four cofferdams in Pegwell Bay contributing to noise and vibration disturbance, not only to residential and business receptors in Pegwell Bay and Cliffsend, but also having significant effects on avian, pinniped and cetacean ecology.
- We have reviewed **REP2-008 6.4.4.5 (C) Environmental Statement Figures Marine Ornithology (Tracked)** page 9 and can see that the noise impact profile of the cofferdam construction has been skewed so that impacts on the lagoon to the west of the HDD working area, which is regularly used by birds at both high and low tide, is artificially reduced. We would argue that the dB of 60 and above would, in fact, reach the lagoon.
- We draw your attention to evidence that Curlews (Numenius Arquata) will take flight at 160m (Flight Initiation Distance) in response to provocation (visual or noise)[6].
- Additionally please review the list of seabirds in Nature Scot's analysis for developers at nature.scot/doc/disturbance-distances-selected-scottish-bird-species-naturescot-guidance in which Curlew are classified as High Sensitivity to disturbance and where flight initiation in non breeding season is between 200 and 650m. There is no reason to believe that Curlew in Scotland would behave any differently to Curlew in Kent. We draw your attention to the many Curlew who use the intertidal mudflats for foraging *at low tide* and would suggest that it would be impossible to work on the Cofferdams in this area without significant disturbance.
- Terns and Plovers and many other birds found in Pegwell Bay also have their disturbance distances usefully listed for your consideration.

EMF

We note at **REP3-0286.6 (E) Habitats Regulations Assessment Report (Clean)** submitted 13 Jan 2026,

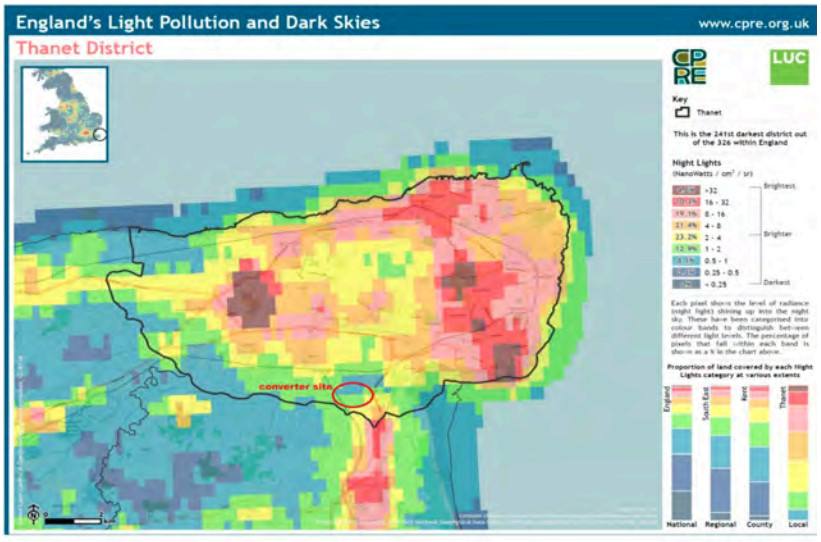
- Para 4.3.54 "EMF emissions from the cables have the potential to disturb foraging grounds for cetaceans. Species such as harbour porpoise forage on gadoids, and flatfish, and other sandy demersal species (Stone & Tasker, 2006), thus the effects of EMF may indirectly impact on these cetaceans. As the Offshore Scheme passes through the Southern North Sea SAC, there is potential for an indirect likely significant effect on the harbour porpoise feature as a result of EMF; therefore, the Southern North Sea has been taken forward to appropriate assessment."
- We would respectfully draw your attention to what this does <u>not</u> say, which is the effect on pinnipeds (which are of great significance to Pegwell Bay). Absence of evidence is not evidence of absence and excluding pinnipeds from assessment is a significant oversight in our opinion.
- We would also draw your attention to the effect of EMF on other receptors. The DCO for Manston International Airport has been granted. When fully operational, the Airport guidance

[6] Variable flight initiation distance in incubating Eurasian curlew, Adriaan de Jong & Carin Magnhagen & Carl-Gustaf Thulin, 2013

systems will be sensitive to EMF. We understand that this has not been considered and would request that the Applicant does consider this even if only to rule it out.

Light Pollution

- We were pleased to see that the ExA Panel had visited a site at night to view light pollution **EV1-01A** and requested a more detailed night time assessment in ISH2.
- **Mitigation site:** The most recent visualisations provided by the Applicant - **REP2-013 9.28 Winter Bird Use of Golden Plover Enhancement Area** (submitted 11 December) photo at 4.6.2. - appears deliberately misleading as it is angled away from the main sources of light pollution for the mitigation area.
- **Converter Site:** Thanet District Council's local plan describes the converter site as "intrinsically dark" (*ref Map below showing converter site in blue/green light pollution band - the lowest in Thanet*). It states "Thanet's open landscapes and vast skies, outdoor lighting can have a substantial adverse effect on the character of the area well beyond the site on which the lighting is located." "Lighting is only permitted when there is no adverse impact on sites of nature conservation interest and/or protected and other vulnerable species and heritage assets".
- We reference *EIA Regulations 2017 and NPPF para 185(c) (protecting dark landscapes from light pollution)*, which states that a comprehensive assessment requires worst case night time scenarios.
- We refer you also to CPRE's Light Blight map below.



- CPRE Night Blight Map for Thanet 2016

Traffic and Transport

- We are aware that time constraints prevented the ExA from discussing this matter at the ISH. We note that the Applicant has not updated **APP-338 7.5.1.2 Outline Construction Traffic Management and Travel Plan - Kent** since they first issued it in March 2025. In para 2.2.2, the Applicant states 'Within the study area, the A299 is a dual carriageway with two lanes in each direction and is subject to the national speed limit.' As the ExA and the Applicant are

aware, this is no longer the case and there has been a 50mph speed restriction over 9 miles of this road's length since September 2025 due the deteriorating condition of the road.

- In para 6.3.3, the Applicant states they intend to use Ramsgate Tunnel and that "Further review with the asset owners, including KCC, will be required at the next stage of the design to determine whether these structures are suitable for the required Proposed Project AIL loading, and whether further assessment or strengthening is required." As they have since been made aware by Save Minster Marshes and multiple other respondents, Ramsgate Tunnel requires at least £6million to make it structurally sound even for HGV traffic, regardless of AILs.
- In para 7.3.3, the Applicant states that 'The King Charles III England Coast Path, NCN Route 15/Cantii Way, the Contra Trail and Viking Coastal Trail will all be managed during trenchless works.' Access to the Hoverport for construction traffic access onto Pegwell Bay will not be trenchless.
- Why has the Applicant not updated their documentation to address these points? We are keen to understand how the Applicant proposes to remedy the inevitable damage to the A299 caused by thousands of HGVs and how they are proposing to address the issue of their inability to use Ramsgate Tunnel given its current constraints. There is no need to 'determine whether these structures are suitable' when there is ample evidence that they are not. It is simply negligent of the Applicant not to have addressed these issues and updated their documentation to reflect the impact on their plans.

National Security Risk

We would like to draw the ExA's attention to this Government's recently published report **Global biodiversity loss, ecosystem collapse and national security A national security assessment (Government report published 20th January 2026)**[7] which is highly relevant to this application. It clearly states that *'If current rates of biodiversity loss continue, every critical ecosystem is on a pathway to collapse.'* Not only will this proposal lead to extreme biodiversity loss in this area, it will also mean a further loss of arable land and extreme risks of pollution to a water system that is already under huge strain.

The report states that *'Critical ecosystems that support major global food production areas and impact global climate, water and weather cycles are the most important for UK national security.'*

- We feel that our national security should be an area for consideration by the ExA.
- This report was not available to us before now so we respectfully request the ExA consider it in relation to this proposal.

[7] National_security_assessment_-_global_biodiversity_loss__ecosystem_collapse_and_national_security.pdf accessed 09/02/2026

Socio-Economics

We still do not feel the Applicant has given adequate consideration of the socio-economic impacts of Sea Link in Kent. In particular, their inadequate traffic analysis means there has been limited assessment of the impact of vehicle movements on tourism.

- In **REP3-066 Document: 9.41 Visitor and Tourism Assessment Technical Note - Kent para 3.2.1** issued 13th January 2026, the Applicant refers back to their **APP-067 6.2.3.7 Part 3 Kent Chapter 7 Traffic and Transport** document which has not been updated since the dDCO process opened. In this document, the Applicant has '*concluded there are no significant effects in terms of severance on the roads to be used as construction routes during construction'* on the basis that *'there are no tourist and visitor attractions that would be affected by land take required for the Kent Onshore Scheme or to which access would be required'.* We contest this assertion.
- Firstly, while we appreciate that the 500m radius is a standard metric, it does not take into account that, as a peninsula, there is only one major artery, the A299, into Thanet. The cumulative impact on traffic will have a direct impact on tourism. Without an assessment of the impact of 108 HGVs a day on peak tourism traffic during the summer months (rather than the January analysis the Applicant carried out), their data is meaningless.
- Secondly, the Viking Ship Hugin at Pegwell Bay is a tourist destination, as is St Augustine's Cross (a significant historic and religious monument on an important pilgrimage route). These are directly adjacent to the Hoverport and the site of the converter station respectively, both of which are'affected by land take'.
- The only access to the Viking Ship Hugin is via PRoWs or Sandwich Road, both of which will be hugely impacted by the construction. A sinkhole opened up on Sandwich Road directly opposite the Viking Ship in 2025. There has been no assessment of how extensive use of a road which currently has a 7.5T limit will be impacted.
- Finally, we contest that using a range of infrastructure projects (some of which have not yet been built) as evidence to demonstrate that Thanet's tourism and economy will not be devastated by the Sea Link project. The Applicant refers to a number of different coast projects where the geography is simply not comparable - all coastal areas are not the same.
- Further, the Applicant largely quotes their own studies as evidence of lack of impact. This is quite simply marking their own homework. As we have seen throughout this dDCO process, (and during our community's experience of the Nemo Link project), the Applicant consistently downplays the impact of any of their projects on ecology, biodiversity, economy, wellbeing and local communities.

Conclusion

The cumulative evidence demonstrates that the Applicant still has failed to show that their chosen site for Sea Link to be environmentally, technically, or procedurally viable. Key assessments are incomplete, inconsistent with observed conditions, or based on assumptions that do not withstand scrutiny. The environmental and hydrological constraints of the site are profound and long-established, and the likely impacts on protected species, habitat integrity, drainage systems, and local communities are severe.

We understand that it is difficult for a Project Manager to halt a project when it is not going according to plan – but would respectfully suggest that now is the time to call a halt on the Kent end of the scheme and explore viable alternatives more fully.

Given the scale of outstanding concerns, the late submission of crucial information, and the fundamental unsuitability of the Minster Marshes location, SMM respectfully requests that the ExA:

- Requires the Applicant to provide the missing documentation and full modelling evidence
- Grants additional time for Interested Parties to review documentation submitted at Deadline 4
- Reassesses the hydrological, biodiversity, and transport risks using site-specific data
- Consider whether the Kent landfall and converter station location should be recommended for consent, given the serious deficiencies in the project.

Appendix 1

Deal, Walmer & Sandwich Mercury - Thursday 12 November 1992

Only 55 to go.
You want to live to 105.

EDWARDS — On November 5, 1992, peacefully at Nunnery Fields Hospital, Reg, aged 77 years, of Sandwich. Beloved Husband of Joan. Will be sadly missed by all family and friends. Cremation has taken place. Donations, if desired, to Cancer Research, c/o J Dilnot Smith and Son, Funeral Directors.

PILGRIMS HOSPICES CANTERBURY AND IN THANET
Care for those who are suffering terminal illness
They also care for their families.
Please show that you care too by sending a Donation, In Memoriam Gift, Covenant or Legacy

CLEVERLEY & SPENCER
Monumental Masons — Est 1869
Member of N.A.M.M.
Headstones from £139.50 plus vat
- All inscriptions hand-carved by our own craftsmen
- Cleaning and Restoration Service available
- Choose from our extensive stock
- Apply for free brochure
- Our representatives will be pleased to call

5 Frith Road, Dover — 0304 206379

c/o E B Cavell. I will miss you so very much Wyn. God bless, Olive.

A smile for all, a heart of gold,
The very best the world could hold,
Never selfish, always kind,
These beautiful memories you have left behind.

BEWETSON — Marianne, aged 61 years, peacefully at home with her family in London on October 31, 1992. Formerly proprietor of The Cave Restaurant, Hannah Street, Sandwich, with her husband Bill. At the time of her death she was a Director and Principal of St James's Secretarial College, London. She was an exceptional person who will be sadly missed by many. Requiem mass at 10am, Saturday, November 14 at St Thomas's Church, Burgate, Canterbury, followed by cremation at Barham. Close family only, no flowers, but donations to the Royal Marsden Hospital Cancer Fund. A thanksgiving service will be held in London in the Spring, date to be announced.

HOLLIS — Alexandra. Sadly taken away on

family. God bless.

DALLISON — Cyril, November 11, 1982.

Time goes by, but still you stay,
As dearly loved as yesterday.

Rose, Sheila and family.

DOUGLASS — Angus (Pat). November 11, 1989. Always in our thoughts, sadly missed by all. Daisy, Patricia, Barrie, Mary, Andy, Matthew, Helen and Lindsay.

HAMMOND — Emily Anne. November 8, 1982. In loving memory of a dear wife and mother, sadly missed by all Wally and family.

KEMP — Florence. November 13, 1961. Treasured memories of a dear Mother, remembered always by her family.

KNIGHT — Violet May, November 13, 1991

We're thinking of you today mum,
but that isn't new,
We thought of you yesterday,
And the day before that too,
We'll think of you tomorrow,
And the days that follow through,
Because we'll always

Orimulsion probe

THE controversial fuel Orimulsion burned at Richborough power station, is the subject of a programme on BBC2 tonight (Thu).

First Sight, at 7.30pm, will look at the question of the fuel's safety and whether the emphasis on profit is at the expense of the health of local people.

In the programme independent power expert David White expresses concern about the dust generated from the burning of Orimulsion, which contains the toxic metals nickel and vanadium.

When Orimulsion is burned, he says, it leaves a very fine dust, "the perfect size to lodge in the lungs of humans and animals and never come out again."

But Dr David Parry, Powergen's director of generation, says there should not be any health problems because when small quantities of ash reach the ground it is in concentrations several hundred times below the toughest health standards in the world.

There will be also be a live phone-in debate on Radio Kent between 8 and 9pm.

Hunt for attackers

TWO men are being sought by police after a man was attacked in Deal High Street on Friday. Roger Lee, 43, of Southwall Road, Deal, accidentally bumped into one of the men as he walked along the road.

The man, described as 20 to 25 years old, 5ft 10in, medium build with black wavy hair, punched and scratched Mr Lee causing injuries to his face.

The man with him was also said to be 20 to 25, 5ft 11in, medium build, with black gelled hair in a pony tail.

SAY IT IN FAMILY

Appendix 2

The attached bird ringing report is an overview provided by BTO C qualified bird ringer Graham Barker who has been ringing birds for 27 years. As you will see from the report he has been recording birds at Abbey Farm, Minster Marshes as a special project to track the increase in birds arising from changed use of the land and farming practices in harmony with nature.

He can provide individual ring numbers, information about each bird and when and where recorded if you require - please ask if you need this data. We appreciate you may not wish to see all of it for the purposes of the DCO - so Graham has provided a summary of the 2025 data for this purpose.

The document can be found on this link and is also copied on the following pages.

Abbey Farm Bird Ringing Report 2025.docx Abbey Farm Bird Ringing Report 2025.docx

Minster Marshes Bird Ringing Report

by Graham Barker

Abbey Farm – Weatherlees

with George Cooper

2025

Sparrowhawk, *Accipiter nisus*

In nature, nothing is perfect,
yet everything……is perfect.

Alice Walker

Abbey Farm

Abbey Farm is approximately 785 acres of arable farmland. Many acres are dedicated to baby leaf lettuce and herb production with some organic. Most of the land is drained marshland.

Firecrest, *Regulus ignicapilla*

About 84 acres remains as grazing marsh with Shetland sheep on. One boundary to the farm is provided by the River Stour and there are a number of man made splashes for over wintering birds. There are two reservoirs.

The farm is in the Higher-Level Stewardship Scheme with good acreage of wild bird and bumble bee cover. Woodland is scarce with perhaps around 0.5 acre in total.

Hedges have been planted over the past few years totalling around 800m. There are two rail crossings on the land.

There are few wooded or scrub areas but public access, via legal footpaths, is plentiful and it is also known that people stray from these paths either due to losing their way or possibly many years of use and believing there is a 'right' to be there.

Nightingale, *Luscinia megarhynchos*

Robin, *Erithacus rubecula*

Minster Marsh / Weatherlees

Minster Marshes, which encompasses a vast area including Weatherlees and much of Abbey Farm, remains under threat from the construction by National Grid of a 60,000sqm converter station as part of the SeaLink project.

Pegwell Bay, Sandwich Bay NNR and Minster Marshes will all be affected by the ongoing work and beyond completion of the project. If you have an interest see:

[redacted]

Blackbird, *Turdus merula*

Why Bird Ringing?

Ringing tells us about bird behaviour, migration and movement routes, age structure, reproduction rates and survival rates. It tells us an immense amount about the environment we share with them. If they are affected in any way, population shifts, then further investigation is warranted.

The process of ringing is undertaken by trained volunteers. The training process is rigorous and takes some time until a person can show they are confident enough to identify species they are likely to come in to contact with. They are then allowed a permit by the British Trust for Ornithology that organizes and runs the ringing scheme.

Sedge Warbler, *Acrocephalus schoenobaenus*

Goldfinch, *Cardeulis cardeulis*

All information is gathered from across the network of ringers in the UK to help inform policy on conservation issues.

Reed Warbler, *Acrocephalus scirpaceu*

There is then a network of ringing organisations across many countries that share information when migrating birds are re-trapped or found there. This also applies to the UK as there is a resident population of birds that do not migrate long distance but may undertake a partial migration though remaining in the UK.

Lesser whitethroat, *Sylvia Curruca*

Ringing Activity

During 2025 we have continued to ring as much as possible at various areas on the marshes targeting various species. Autumn migration was affected by poor weather thereby not allowing as many site visits as hoped.

Barn Swallow, *Hirundo rustica*

Cettis Warbler, *Cettia cett*

Spring, Summer, Autumn 2025 Totals

Our total for 2025, not including Winter ringing, see below, was 973 birds of 32 species.

Species	**Total**
Blackbird	5
Blackcap	233
Blue Tit	40
Bullfinch	2
Cettis Warbler	36
Chaffinch	2
Chiffchaff	136
Dunnock	21
Firecrest	5
Garden Warbler	9
Goldcrest	12
Goldfinch	2
Grasshopper Warbler	8
Great-spotted Woodpecker	2
Great Tit	13
Lesser Whitethroat	21
Linnet	14
Long-tailed Tit	41
Meadow Pipit	4
Nightingale	1
Reed Bunting	6
Reed Warbler	136
Robin	43

Sedge Warbler	33
Song Thrush	16
Sparrowhawk	1
Barn Swallow	1
Whinchat	1
Whitethroat	90
Willow Warbler	12
Wren	20
Yellowhammer	7
Total	**973**

Winter ringing 2025 (Jan, Feb, Oct, Nov, Dec)

Most of our winter ringing takes place during the night-time on Abbey Farm. Yet again our three main target species were Woodcock, Jack Snipe and Skylark.

Winter 2025 Totals

The winter total, including both some daytime mist netting and night time netting was 141 of 10 species.

Woodcock	15
Tree Sparrow	9
Stock dove	2
Redshank	1
Redwing	2
Jack Snipe	21
Grey Partridge	5
Fieldfare	1
Skylark	76
Common Snipe	9
Total	**141**

Both Woodcock and Jack Snipe migrate in and out of the country in good numbers. They arrive mostly during October from the far northern reaches of Europe and the Arctic circle where they breed.

Local numbers will vary from year to year depending on the severity of the winter across mainland and northern Europe.

Jack Snipe have proven to be here in good numbers, shown by our total catch for the winter, quite exceptional compared to previous years. Woodcock numbers were up and Skylark numbers are incredible.

Woodcock, *Scolopax rusticola*

Jack Snipe, *Lymnocryptes minimus*

Comparisons

Comparison for three species trapped and ringed. The number of target birds ringed in Kent in total each year and the number ringed on Minster Marsh. 2025 totals across the UK are unknown at this point.

	2023 Kent	2023 Minster Marsh	2024 Kent	2024 Minster Marsh	2025 Kent	2025 Minster Marsh
Woodcock	14	14	10	6	Unknown at this time	15
Jack Snipe	1	1	14	14	Unknown at this time	21
Skylark	30	30	29	29	Unknown at this time	76

The table clearly shows that the effort being made here on Minster Marsh is proving invaluable in starting to understand numbers of birds present on the marsh during the winter months making use of the important cover it offers for both safety and feeding.

Other birds we encountered during the winter period of 2025.

Grey Partridge 5

Perdix perdix

Common Snipe 9

Common Snipe, *Gallinago gallinago*

Redwing, *Turdus iliacus*

Skylark, *Alauda arvensis*

Birds of Interest

We have managed to ring some interesting birds during 2025.

We caught a leucistic Skylark. It is a genetic condition inherited from its parents, having a loss of pigmentation, melanin. It is not a progressive loss. Birds can survive without issue.

Not all waders are easy to catch using a torch and hand net. This is our first Redshank and was a pleasing sight in the hand.

Redshank, *Tringa totanus*

Whitethroat, *Sylvia communis*, eye colour variation:

Juvenile

adult

adult


Juvenile Reed Warbler, *Acrocephalus scirpaceus,* above left, showing 'growth bar' in its tail. This was likely caused by a lack of food for a short time due to bad weather perhaps. All species can show growth bar problems, it creates a weakness in the feather and is likely to break. The tail feathers would then be replaced. The same growth bars can appear in primary wing feathers as well, the wing on the right above belongs to a juvenile Blackcap, *Sylvia atricapilla*.



Blackcap, *Sylvia atricapilla*, 'cap' development. All juveniles have brown caps, males start developing their black cap before they migrate out of the country. The bird on the right is an adult female.

Thanks and Support

I would like to thank James and Pippa Southorn for their continued support in allowing us to meander around their farm.

George Cooper has continued to be help beyond measure and gives his time generously under all sorts of conditions and demands.

Aaron Cooke for allowing access to Weatherlees.

Nature does not hurry. Yet everything is accomplished.

Lao Tzo

Last….but not least….George, on the left, and myself, at the Natural History Museum, London for the premiere of Connor Carruthers documentary 'Minster Marshes – the planet we call home' (available on YouTube).

APPENDIX 3
DUNGENESS BIRD STRIKE REPORT

Volume 65 Number 7 July 1972

British Birds

Bird deaths from power lines at Dungeness

R. E. Scott, L. J. Roberts and C. J. Cadbury

It has long been recognised that birds are killed or injured by flying into overhead wires, but the problem has received little in the way of detailed investigation. Although birds strike telephone wires, this paper is largely concerned with electrical transmission cables. In Britain, the Central Electricity Generating Board has some 17,000 km of major (400, 275 and 132 kv) transmission lines, 5,800 km of which have been erected within the last ten years. Lines sited near estuaries, in river valleys or between bodies of water provide a particular hazard when they lie across the flight paths used by wildfowl, waders, gulls and other water birds between feeding and roosting areas. A high incidence of casualties among such birds was reported from the Teesmouth area in 1963 and 1964 (Teesmouth Bird Club *per* Mrs Angela Cooper *in litt.*) and near Carlisle in 1968 (J. Jackson *in litt.*).

The vulnerability of the Mute Swan *Cygnus olor* to collisions with overhead wires has been discussed by Ogilvie (1967) and Perrins and Reynolds (1967). Indeed, analysis of the ringing recoveries for this species and the Grey Heron *Ardea cinerea* indicates that overhead wires are the cause of a considerably higher proportion of deaths in these large, low-flying species than in the Black-headed Gull *Larus ridibundus* and raptors (table 1). The figures stated are limited to recoveries in which the cause of death is known. Since, however, it is fairly easy to determine whether a bird has flown into wires, the true proportion which die in this way may be somewhat lower. The significant increase since 1946 in the proportion of Black-headed Gulls killed as a result of striking overhead wires is noteworthy.

The aim of the survey at Dungeness was to record systematically the effect of overhead wires on birds in one area over a relatively long period. In particular, it provided an opportunity to assess the hazard of overhead wires to migrant passerines, and to test methods of protection.

Table 1. Casualties of six species among British Trust for Ornithology ringing recoveries, showing proportions found dead beneath overhead wires

The proportions of Black-headed Gulls killed as a result of striking overhead wires are significantly greater in both the later periods than in 1909-24 ($P < 0.01$ and $P < 0.001$ respectively)

	Period in years	Total corpses	FOUND DEAD BENEATH WIRES Number	Per cent	Source of data
Grey Heron *Ardea cinerea*	1959-70	67	28	41.7%	B.T.O. records
Mute Swan	1959-66	1,051	464	44.1%	Ogilvie (1967)
Cygnus olor	1967-70	734	387	52.7%	B.T.O. records
Hen Harrier *Circus cyaneus*	1944-71	45	10	22.2%	B.T.O. records
Kestrel *Falco tinnunculus*	1910-69	344	25	7.3%	Glue (1971)
Black-headed Gull	1909-24	302	9	3.0%	J. J. M. Flegg
Larus ridibundus	1946-52	139	15	10.8%	and C. J. Cox
	1953-68	509	71	13.9%	(*in preparation*)
Barn Owl *Tyto alba*	1910-69	171	11	6.4%	Glue (1971)

THE STUDY AREA AT DUNGENESS

The shingle headland of Dungeness on the Kent coast has long been known as a focal point for bird migration. Since 1952, when a bird observatory was established in the area, records have been kept of migrants, both diurnal species which tend to follow the coast and nocturnal ones which are sometimes grounded near the coast. Data on the migration through the area are to be found in Scott (1961-70) and Parslow (1969).

In 1960 the Central Electricity Generating Board began constructing the first of two nuclear power stations to be built at Dungeness and in 1963 two 400 kv transmission lines were erected parallel to one another. These lines run from the power station in an ESE-WNW direction across gently undulating shingle. The area has remained sparsely vegetated with small clumps of broom *Sarothamnus scoparius* and gorse *Ulex europaeus*, in addition to lichens and grasses. The Channel coast lies only 400 metres to the south of the lines, while to the north there are several flooded pits (see fig. 1).

METHODS

The survey, organised jointly by the Central Electricity Generating Board and the Royal Society for the Protection of Birds, extended over a six-year period from November 1964 to November 1970, and was based on a series of regular searches. The search area lay beneath two parallel sets of transmission lines, each consisting of three spans (5-6,

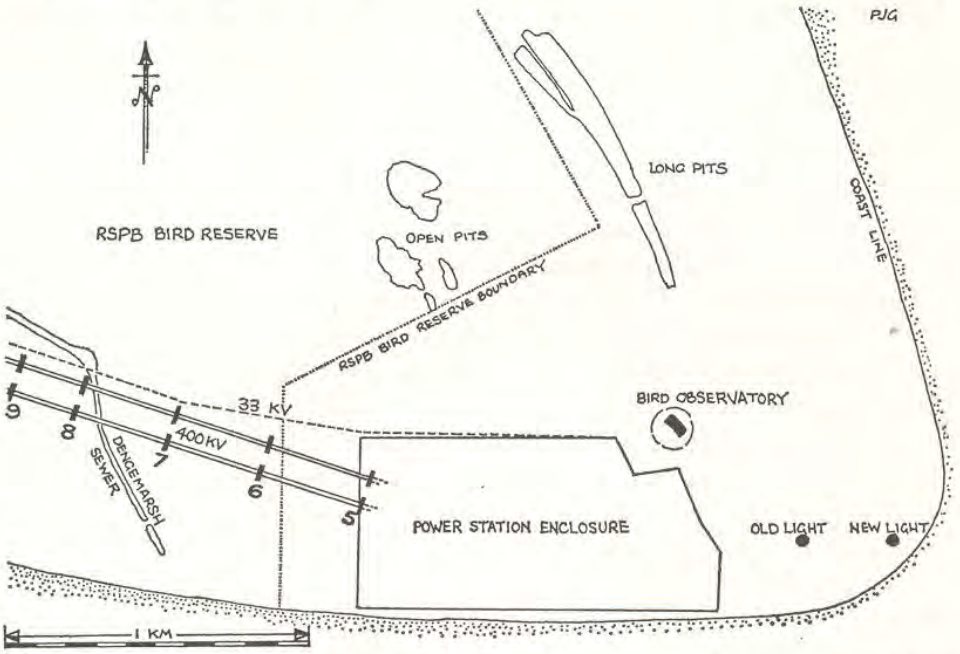


Fig. 1. Sketch map of Dungeness, Kent, indicating positions of 400 kv transmission lines and numbered pylons in relation to local features. The six-year survey of bird corpses beneath the power lines was carried out between pylons 5 and 8. The scale of 1 km shown is approximate

6-7 and 7-8) between pylons (fig. 1). The total length of spans under observation was 2,160 metres. All searches were carried out by L.J.R. and R.E.S. with occasional assistance from other workers. The ground beneath each line was covered by walking slowly in a zig-zag pattern. When the location of each corpse had been mapped, the body was either removed from the area or buried.

During the six years a total of 188 searches was carried out. Some of those in the earlier years involved additional spans which were lost as a result of extensions to the power station buildings. Data available for the extra spans and also for the period January-November 1964, before the survey was established, are incorporated in the appendix, but are not otherwise included in the material analysed and interpreted by C.J.C.

RESULTS OF SURVEY

A complete list of the 1,285 corpses of 74 species located during the period January 1964 to November 1970 is given with specific names in the appendix. The reasons why certain species are killed more frequently than others are considered below.

(a) *Nocturnal or diurnal migration*

Nocturnal migrants, such as rails, thrushes and warblers, form a

considerably higher proportion of the total casualties than the largely diurnal ones, notably Swifts *Apus apus,* hirundines, Skylarks *Alauda arvensis*, pipits, wagtails and finches (table 2). There seems to be little risk of day fliers colliding with overhead lines, except when weather conditions reduce visibility and the birds are forced to fly low. At such times there is, in any case, a tendency for migration to be inhibited. As seen from table 2, Starlings *Sturnus vulgaris*, Turtle Doves *Streptopelia turtur* and Woodpigeons *Columba palumbus* were among the most frequent casualties. Though the peak period for Starlings to set off across the Channel and North Sea is usually soon after daybreak, many appear to migrate at night (Snow 1953, Lack 1963). There is uncertainty in the literature over whether the Turtle Dove is a diurnal or nocturnal migrant, but it appears that the majority start at dusk. The large autumn movements of Woodpigeons at Dungeness have been during the day, but Murton (1965) provided evidence that at least some fly at night during the migration period.

The species of birds that strike lighthouses, and therefore those which move at night, are compared in table 3 with those killed by the Dungeness power lines. Since few casualties have been recorded at the Dungeness lighthouse in recent years, the figures quoted are for Bardsey, Caernarvonshire (Evans 1966-69). Starlings, thrushes and warblers predominate among the casualties in both situations. The

Table 2. Breakdown of 1,046 corpses of 32 species of nocturnal and diurnal migrants found beneath power lines at Dungeness, Kent, between January 1964 and November 1970

NOCTURNAL MIGRANTS	
Water Rail *Rallus aquaticus*	20
Corncrake *Crex crex*	6
Moorhen *Gallinula chloropus*	38
Coot *Fulica atra*	30
Turtle Dove *Streptopelia turtur*	57
Mistle Thrush *Turdus viscivorus*	2
Fieldfare *Turdus pilaris*	38
Song Thrush *Turdus philomelos*	61
Redwing *Turdus iliacus*	55
Ring Ouzel *Turdus torquatus*	5
Blackbird *Turdus merula*	52
Reed Warbler *Acrocephalus scirpaceus*	14
Sedge Warbler *Acrocephalus schoenobaenus*	14
Blackcap *Sylvia atricapilla*	16
Garden Warbler *Sylvia borin*	12
Whitethroat *Sylvia communis*	15
Lesser Whitethroat *Sylvia curruca*	5
Willow Warbler *Phylloscopus trochilus*	25
Chiffchaff *Phylloscopus collybita*	4
Wood Warbler *Phylloscopus sibilatrix*	1

DIURNAL/NOCTURNAL MIGRANTS	
Starling *Sturnus vulgaris*	489

DIURNAL MIGRANTS	
Woodpigeon *Columba palumbus*	45
Stock Dove *Columba oenas*	2
Collared Dove *Streptopelia decaocto*	1
Swift *Apus apus*	5
Skylark *Alauda arvensis*	16
Swallow *Hirundo rustica*	3
Meadow Pipit *Anthus pratensis*	2
Greenfinch *Carduelis chloris*	2
Goldfinch *Carduelis carduelis*	2
Chaffinch *Fringilla coelebs*	6
Brambling *Fringilla montifringilla*	3

Table 3. Comparison of bird mortality at a lighthouse (Bardsey, Caernarvonshire) and from power lines (Dungeness, Kent)

The data for Bardsey are from Evans (1966-69): in March 1966 a particularly bright light was installed at the lighthouse there

	BARDSEY LIGHTHOUSE (Mar-Nov 1966-69)		DUNGENESS POWER LINES (Jan 1964-Nov 1970)	
	Number	Per cent	Number	Per cent
Manx Shearwater *Puffinus puffinus*	63	1.5%	–	–
Woodpigeon *Columba palumbus*	–	–	45	3.5%
Turtle Dove *Streptopelia turtur*	2	–	57	4.4%
Skylark *Alauda arvensis*	36	0.9%	16	1.2%
Fieldfare *Turdus pilaris*	92	2.3%	38	3.0%
Song Thrush *Turdus philomelos*	164	4.0%	61	4.7%
Redwing *Turdus iliacus*	722	17.7%	55	4.3%
Blackbird *Turdus merula*	191	4.7%	52	4.0%
Grasshopper Warbler *Locustella naevia*	425	10.4%	–	–
Sedge Warbler *Acrocephalus schoenobaenus*	578	14.1%	14	1.1%
Whitethroat *Sylvia communis*	332	8.1%	15	1.2%
Willow Warbler *Phylloscopus trochilus*	433	10.6%	25	1.9%
Chiffchaff *Phylloscopus collybita*	93	2.3%	4	0.3%
Starling *Sturnus vulgaris*	749	18.3%	489	38.1%
Other species	206	5.0%	414	32.2%
TOTAL RECORDED CASUALTIES	4,086		1,285	

fact that Skylarks were not infrequently killed both at Bardsey and at Dungeness is indicative that on occasion they fly after dark. Larks and other species which are normally diurnal migrants may be forced to keep flying at such times, especially if they find themselves over the sea. Only small numbers of Woodpigeons and Turtle Doves are observed at Bardsey, but there are a few records of Woodpigeons at other lighthouses after dark (Murton 1965).

(b) *Seasonal variation*

The numbers and species occurring as casualties varied during the course of a year (table 4). Few birds were killed in June and July when little migration takes place. Two groups of regular migrants, the warblers and the thrushes, clearly indicate the seasonal differences in the period of passage. The main movements of thrushes at Dungeness are earlier in the spring and later in the autumn than those of the warblers, which are mainly concentrated into two periods, April to May and August to September (Harris and Scott 1964). This pattern is reflected in the incidence of these two groups as casualties from power lines (table 4). The largest numbers of Woodpigeons occur at Dungeness in November, at a time when both British and Continental birds are moving southwards out of the country (Murton 1965). The majority

Table 4. Casualties beneath power lines at Dungeness, Kent, between November 1964 and November 1970

	CASUALTIES RECORDED IN TWO-MONTH PERIODS						
	Feb-Mar	Apr-May	Jun-Jul	Aug-Sept	Oct-Nov	Dec-Jan	TOTALS
Wildfowl (Anatidae)	6	3	–	3	1	2	15
Rails (Rallidae)	15	12	3	5	27	16	78
Waders (Charadriiformes)	6	2	–	–	3	1	12
Gulls (Laridae)	23	7	8	13	19	20	90
Woodpigeon *Columba palumbus*	5	23	5	1	3	5	42
Turtle Dove *Streptopelia turtur*	–	26	12	6	13	–	57
Swift *Apus apus* and Swallow *Hirundo rustica*	–	1	3	1	2	–	7
Thrushes (Turdidae)	52	22	–	3	95	42	214
Warblers (Sylviidae)	–	28	10	42	15	3	98
Skylark *Alauda arvensis* and finches (Fringillidae)	7	8	1	1	10	6	33
Starling *Sturnus vulgaris*	47	32	8	15	223	46	371
TOTAL RECORDED CASUALTIES	161	164	50	90	411	141	1,017
NUMBER OF SEARCHES	31	28	27	32	44	26	188

of casualties from power lines have, however, been in April and May. Dr R. K. Murton has suggested to us that at this time of year there is probably a return movement, though this is less conspicuous than the autumn passage.

(c) *Height at which birds fly*

Rails, including Coots *Fulica atra* and Moorhens *Gallinula chloropus*, were frequently found dead beneath the overhead wires at Dungeness. The fact that they are largely nocturnal migrants may be a main reason for the high incidence of casualties: little is known about the heights at which they migrate, but at least in daylight Coots are low altitude fliers with poor manoeuvrability (Stainton 1970). Mute Swans and Partridges *Perdix perdix*, both considered to be low-flying species, have been killed on the Dungeness lines on three and four occasions respectively. When confronted by a head wind, migrating flocks of Starlings tend to fly low: this increases their vulnerability to collisions with the power lines, the earthing wires of which are approximately 49 metres from the ground.

(d) *Flock formation*

There are several reasons, other than those already mentioned, why more Starlings than other species are killed on the Dungeness power lines. Not only are they the most numerous passage migrants, but the flocks which pass over Dungeness in late autumn are also dense and may comprise several thousand individuals. When flying closely

grouped together, the birds may have their vision of the cables obscured.

(e) *Roosts and flight lines*

The only large-scale roosting movements which occur over Dungeness are those of gulls. At the end of the breeding season and throughout the winter months the flooded pits and various other freshwater areas provide roosting sites for five species of gulls. In addition to this regular dusk and dawn flighting between the roosts and the sea, the gulls fly inland to Romney Marsh on a rising tide and return to the shore as it ebbs. Since these movements may take place after dark or in the twilight it is not surprising that gulls were frequently killed on the power lines (table 5). A lack of flight lines of waders and wildfowl across this section of Dungeness is reflected in the relatively low numbers of casualties in these two groups (table 5 and appendix).

Table 5. Corpses of waders, gulls and terns beneath power lines at Dungeness, Kent, between January 1964 and November 1970

Lapwing *Vanellus vanellus*	3	Great Black-backed Gull *Larus marinus*	47
Golden Plover *Pluvialis apricaria*	4	Lesser Black-backed Gull *Larus fuscus*	23
Snipe *Gallinago gallinago*	2	Herring Gull *Larus argentatus*	18
Curlew *Numenius arquata*	1	Common Gull *Larus canus*	35
Whimbrel *Numenius phaeopus*	1	Black-headed Gull *Larus ridibundus*	13
Bar-tailed Godwit *Limosa lapponica*	1	Kittiwake *Rissa tridactyla*	1
Knot *Calidris canutus*	1		
Dunlin *Calidris alpina*	1	Common Tern *Sterna hirundo*	8
Stone Curlew *Burhinus oedicnemus*	1	Little Tern *Sterna albifrons*	1

LIMITATIONS OF SEARCH

Two factors affected what proportion of those birds killed were found as corpses. First, there was the ability of the searchers to locate the casualties: large corpses, such as those of gulls, are fairly obvious, but the small bodies of warblers are easily overlooked. Second, there was evidence that the corpses were being eaten: indeed, in the later years of the survey, unmutilated bodies were rarely found and passerines were frequently reduced to no more than wings or a few feathers and bones. Predatory or scavenging species, such as Kestrels *Falco tinnunculus*, Little Owls *Athene noctua*, Carrion Crows *Corvus corone corone*, Foxes *Vulpes vulpes*, Stoats *Mustela erminea* and Weasels *M. nivalis*, were present in the area and on occasion were observed feeding on dead birds which had struck the wires. It soon became apparent that scavengers were associating the area spanned by wires with a readily available source of food. The presence of large numbers of faeces and footprints when the ground was snow-covered indicated that Foxes were largely responsible.

To obtain some assessment of the actual casualty figure as opposed to the number of corpses observed, it was necessary to discover the rate at which they disappeared. Daily searches over the survey area, which were carried out for two periods in the autumn of 1968, indicated that a number of corpses were removed between the regular weekly searches.

CORPSE REMOVAL EXPERIMENTS

In an attempt to gauge scavenger activity in the vicinity of the power lines, dead House Sparrows *Passer domesticus* were laid out on the shingle at intervals of 18 metres on three occasions (table 6). For one of the experiments, in addition to putting these corpses on the ground beneath the power lines, other bodies were also placed in a similar sparsely vegetated area 2.4 km to the north of the lines. Beneath the wires, about 50% of the bodies were removed on the first night, 75% after the second night and nearly all by the end of the fourth. Moreover, many of the corpses left after the first night were partially eaten. C. A. Norris found that the bodies of sparrows similarly disappeared overnight when placed on rough grassland (Dobinson and Richards 1964). Away from the lines, the sparrow corpses were removed at a slower rate. It appeared, therefore, that the scavengers were concentrating their searching activities to specific areas where they were most frequently rewarded by food, a type of behaviour observed by Croze (1970) in the Carrion Crow.

Even though the scale on which these experiments were carried out was small, the results provide enough evidence to conclude that the figures for casualties obtained from weekly surveys represented a considerable underestimate of the number of birds killed by the power lines. The removal rate of corpses under experimental conditions was such that it may not be misleading to suggest that less than 20% of the bodies of small passerines were found by the surveys. The discre-

Table 6. Experiments to ascertain rate of removal of corpses of House Sparrows *Passer domesticus* by predators at Dungeness, Kent

The details of the experiments are given in the text. From these figures, it can be calculated that only 15% of the small passerines killed by power lines in a week would be observed

	Under lines 17.11.64	Under lines 13.11.68	Under lines 27.10.70	Per cent left (under)	Away from lines	Per cent left (away)
Put out at dusk	20	30	20	–	30	–
After 12 hours	11	10	18	56%	28	93%
After 36 hours	7	5	7	27%	26	87%
After 60 hours	4	3	4	16%	20	67%
After 84 hours	–	2	–	3%	14	47%

pancy between the number of larger birds killed and those found as corpses is almost certainly less, since their bodies are more visible and less easily removed by scavengers. Corpses of birds killed shortly before dawn may have a higher chance of remaining uneaten than those of birds striking power lines soon after nightfall. Nevertheless, if a total of 1,285 corpses (872 of which were passerines) were recorded beneath two sets of lines, the true total of casualties may have exceeded 6,000.

CAUSES OF DEATH

Birds may be killed on power lines either by electrocution or by striking the cables. In the type of construction used at present on major supply lines, there is a space of 3.7 metres between adjoining conductors. Therefore, only birds with a particularly large wing span have much chance of causing a short circuit. Indeed, in certain areas, swans are

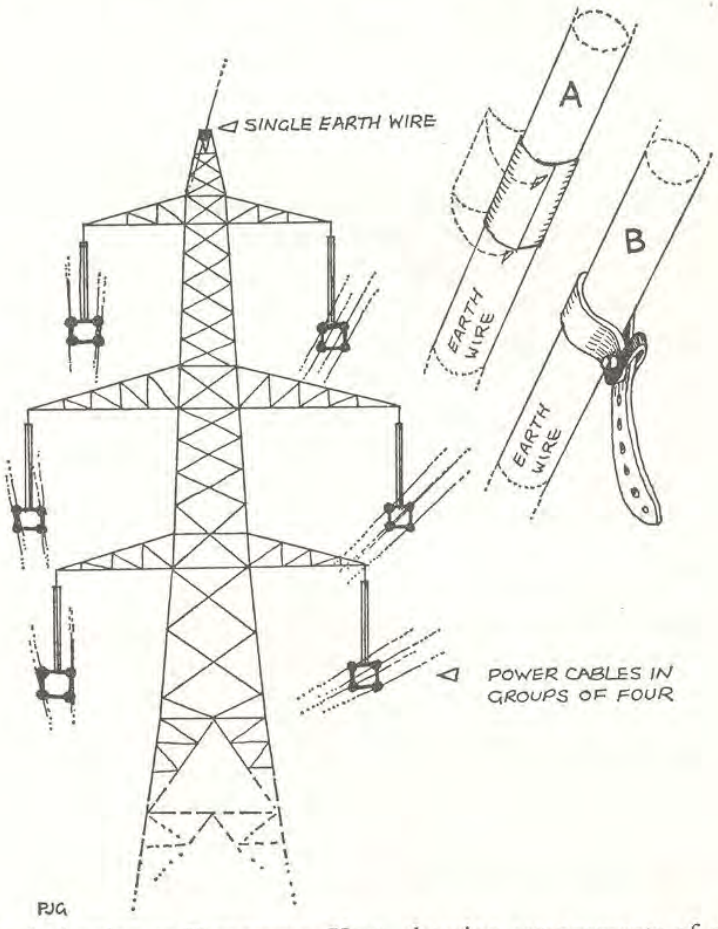


Fig. 2. Typical pylon at Dungeness, Kent, showing arrangements of cables, with conductors in groups of four and single earthing wire attached to top of tower. **A** shows a luminous orange band wrapped round the earthing cable, and **B** a luminous orange strip clipped to the cable

one of the most frequent causes of power failures. On occasion, a flock of large birds, such as Cormorants *Phalacrocorax carbo*, has caused a 'flash-over' when it has attempted to fly through the conductors (Central Electricity Generating Board *in litt.*). At Dungeness, none of the corpses located during the survey had the scorched plumage which is usually a feature of electrocuted birds.

The arrangement and distribution of cables from each pylon is shown in fig. 2. Each of the arms projecting from the tower support four conductors, while the top of each pylon carries a single earthing wire. Though this is the same thickness as the other cables, it appears, at least to an observer on the ground, to be much less visible than the groups of conductors. Since the majority of birds are killed by power lines at night, few collisions have been witnessed. At Teesmouth, however, nine birds were recorded striking the earthing wire in three-quarters of an hour in October 1963 (Teesmouth Bird Club *per* Mrs Angela Cooper *in litt.*). In the Dungeness area, flocks of Starlings have been observed rising above the conductors and then having to split above and below the earthing wire. At dusk one evening in September 1969 a Shelduck *Tadorna tadorna* was seen to avoid the conductors successfully only to strike the earthing wire fatally. There is some evidence that birds react to the electrical field surrounding a conductor (H. Dickinson *in litt.*). Large species may distort the field sufficiently to cause an electrical discharge. Birds responding to this phenomenon could fly over the main cables and collide with the earthing wire. During the period of the survey no birds were seen perching on 'live' 400 kv conductors at Dungeness.

From the limited amount of information available, it appears that birds are killed largely by striking the earthing wire at times of poor visibility, particularly at night. Some of the heaviest kills at Dungeness occurred in fog and in rain, while gale-force winds often resulted in an increase in gull casualties.

PROTECTIVE MEASURES

Elsewhere, corks and coloured balls have been fitted to lines to increase their visibility to birds. In the Teesmouth area black tapes 15 cm long were tied at intervals of 1.9 metres (six feet) to the earthing wire of a 275 kv line (Mrs Angela Cooper *in litt.*). Before the tapes were in position about a dozen birds were found dead each weekend, but after the tapes had been fitted in 1964 the casualties were negligible. Casualties on two other sets of power lines in the region were likewise reduced when similar protective measures were applied to them in 1966.

At Dungeness, the wind resistance of the cables in such an exposed area precluded the fitting of corks or balls, but two other methods were attempted. Two parallel sets of lines lead westwards away from

the power station (fig. 1). On one span (6-7) of the south line, 5 cm bands of luminous orange tape were wrapped around the earthing wire at intervals of 1.2 metres (i.e. four feet) (fig. 2). On an adjoining span (7-8), similarly coloured strips were clipped to this top wire, again at intervals of 1.2 metres: these strips had a tail 5 cm long, which hung free from the wire. The two corresponding spans of the north line were left unmarked as a control. On each line span 5-6, nearest the power station, was also left unmarked. The protective measures were not applied until November 1967, by which time regular searches for corpses had already been carried out under the lines in question for three years. The survey continued for another three, enabling comparative data to be obtained (table 7). The clipped strips turned white within 18 months of fitting, but the bands remained luminous throughout.

Table 7. Bird casualties beneath three spans of the north power line and three of the south at Dungeness, Kent, in each of the six years 1965-70, including those following marking experiments

For 1968-70 the earthing wire on the south line was fitted with bands of luminous orange tape on span 6-7 (subsequent casualty figures marked *) and with similar hanging strips on span 7-8 (marked †). All the others were unmarked and in the two periods there was no clear difference in the numbers of casualties beneath these unmarked spans (5-8 on the north line and 5-6 on the south line), the totals being 303 in 1965-67 and 306 in 1968-70

	NORTH LINE			SOUTH LINE				
Spans:	5-6	6-7	7-8	Spans:	5-6	6-7	7-8	TOTAL CORPSES	TOTAL SEARCHES
1965	18	53	28	1965	23	29	15	166	32
1966	27	20	17	1966	35	22	7	128	31
1967	20	13	30	1967	19	8	11	101	26
1965-67	65	86	75	1965-67	77	59	33	395	89
1968	26	33	46	1968	59	16*	22†	202	41
1969	17	13	25	1969	18	8*	12†	93	30
1970	13	8	22	1970	26	9*	10†	88	28
1968-70	56	54	93	1968-70	103	33*	44†	383	99

From the results given in table 7, there is no evidence that marking the south line influenced the number of birds killed by it. Moreover, the experiment provided no conclusive evidence on the relative effectiveness of clipped strips and tapes in reducing bird casualties. The influence of the protective measures was largely overridden by positional effects related to the siting of the lines. Over spans 6-8 there was a significantly higher number of casualties on the north line than on the south one in both the 1965-67 and 1968-70 periods ($P < 0.01$). Over span 5-6, nearest the power station, however, it was

the south line which killed more in the years 1968-70 ($P < 0.01$). On this same line, casualties on span 5-6 were significantly higher than on span 7-8, farthest from the power station, in both periods ($P < 0.01$ and $P < 0.001$ respectively).

CONCLUSIONS

It is clear that locally power lines can present a hazard to birds, but this cause of mortality is unlikely to have much effect on populations, except those of a few species such as the Mute Swan. Birds resident for any length of time in an area may learn to avoid obstructions on their flight lines. The casualty rate may, however, be fairly high for a temporary period immediately following the erection of new power lines. Within two months, 21 Mute Swans out of a flock of about 70 were electrocuted along a 400 metre stretch of recently erected low voltage line on Romney Marsh not far from Dungeness, causing several power failures (Harrison 1963).

The casualties among migrants at Dungeness, and among swans in the Thames Valley near Oxford (Perrins and Reynolds 1967) and elsewhere, certainly provide a warning about the siting of power lines. The hazard may be minimised by suspending the cables parallel to, rather than across, regularly used flight paths of birds. Radar observations have shown that the main movements of night migrants in the Dungeness area lie along a SSE-NNW axis (Parslow 1969). It is possible, therefore, that had the lines been erected so that they ran northwards rather than westwards from the power station the number of casualties would have been fewer. Where flight paths are likely to be obstructed, and if expense precludes burying the line, the earthing wire over the critical section should be well marked to make it easily visible during both day and night.

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SUMMARY

A survey (from January 1964 to November 1970) was conducted jointly by the Royal Society for the Protection of Birds and the Central Electricity Generating Board to study the effect of power lines on birds at Dungeness, Kent, which is a

focal point for migration. Weekly searches were carried out over the shingle beneath three spans of two parallel sets of 400 kv lines close to the power station. In all, 1,285 corpses of 74 species were located. The majority of casualties were either gulls, which fly between the sea and roosts on gravel pits, or nocturnal migrants (mainly Starlings *Sturnus vulgaris*, thrushes, warblers, rails and Turtle Doves *Streptopelia turtur*, in descending order of abundance). There were relatively few corpses of species usually recognised as diurnal migrants.

The number of corpses found was probably a considerable underestimate of the casualties. Not only are the bodies of passerines easily overlooked, but they were rapidly removed overnight by scavengers, particularly Foxes *Vulpes vulpes*, which appeared to concentrate their searching activities beneath the lines. The results of corpse removal experiments indicate that less than 20% of the small birds were located. It is possible, therefore, that in the six-year period over 6,000 birds were killed by colliding with the particular lines under observation.

Though large birds such as Mute Swans *Cygnus olor* are sometimes electrocuted on conductors, at Dungeness it appears that the casualties resulted chiefly from striking the single earthing wire which is suspended above the conductors on a 400 kv line. An attempt was made to increase the visibility of this wire with luminous orange markings, either tapes wrapped round the cable or strips clipped to it. The results of the experiment were inconclusive, however, since the effects of the protective measures were overridden by positional factors, such as the siting of the lines with respect to the power station.

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Appendix. List of all 1,285 corpses of 74 identified species found beneath power lines at Dungeness, Kent, between January 1964 and November 1970

Great Crested Grebe *Podiceps cristatus*	1
Little Grebe *Tachybaptus ruficollis*	7
Gannet *Sula bassana*	1
Mallard *Anas platyrhynchos*	5
Common Scoter *Melanitta nigra*	7
Red-breasted Merganser *Mergus serrator*	1
Shelduck *Tadorna tadorna*	4
Mute Swan *Cygnus olor*	3
Merlin *Falco columbarius*	1
Partridge *Perdix perdix*	4
Quail *Coturnix coturnix*	2
Water Rail *Rallus aquaticus*	20
Corncrake *Crex crex*	6
Moorhen *Gallinula chloropus*	38
Coot *Fulica atra*	30
Lapwing *Vanellus vanellus*	3
Golden Plover *Pluvialis apricaria*	4
Snipe *Gallinago gallinago*	2
Curlew *Numenius arquata*	1
Whimbrel *Numenius phaeopus*	1
Bar-tailed Godwit *Limosa lapponica*	1
Knot *Calidris canutus*	1
Dunlin *Calidris alpina*	1
Stone Curlew *Burhinus oedicnemus*	1
Unidentified waders (Scolopacidae)	2
Great Black-backed Gull *Larus marinus*	47
Lesser Black-backed Gull *Larus fuscus*	23
Herring Gull *Larus argentatus*	18
Common Gull *Larus canus*	35
Black-headed Gull *Larus ridibundus*	13
Unidentified gulls *Larus spp*	2
Kittiwake *Rissa tridactyla*	1
Common Tern *Sterna hirundo*	8
Little Tern *Sterna albifrons*	1
Unidentified tern *Sterna sp*	1
Stock Dove *Columba oenas*	2
Feral/Racing Pigeon *Columba livia*	5
Woodpigeon *Columba palumbus*	45
Turtle Dove *Streptopelia turtur*	57
Collared Dove *Streptopelia decaocto*	1
Cuckoo *Cuculus canorus*	1
Little Owl *Athene noctua*	1
Swift *Apus apus*	5
Skylark *Alauda arvensis*	16
Swallow *Hirunda rustica*	3
Magpie *Pica pica*	1
Wren *Troglodytes troglodytes*	1
Mistle Thrush *Turdus viscivorus*	2
Fieldfare *Turdus pilaris*	38
Song Thrush *Turdus philomelos*	61
Redwing *Turdus iliacus*	55
Ring Ouzel *Turdus torquatus*	5
Blackbird *Turdus merula*	52
Unidentified thrushes *Turdus spp*	4
Wheatear *Oenanthe oenanthe*	7
Reed Warbler *Acrocephalus scirpaceus*	14
Sedge Warbler *Acrocephalus schoenobaenus*	14
Blackcap *Sylvia atricapilla*	16
Garden Warbler *Sylvia borin*	12
Whitethroat *Sylvia communis*	15
Lesser Whitethroat *Sylvia curruca*	5
Willow Warbler *Phylloscopus trochilus*	25
Chiffchaff *Phylloscopus collybita*	4
Wood Warbler *Phylloscopus sibilatrix*	1
Goldcrest *Regulus regulus*	2
Spotted Flycatcher *Muscicapa striata*	2
Meadow Pipit *Anthus pratensis*	2
Rock Pipit *Anthus spinoletta*	1
Pied Wagtail *Motacilla alba*	1
Starling *Sturnus vulgaris*	489
Hawfinch *Coccothraustes coccothraustes*	1
Greenfinch *Carduelis chloris*	2
Goldfinch *Carduelis carduelis*	2
Chaffinch *Fringilla coelebs*	6
Brambling *Fringilla montifringilla*	3
Corn Bunting *Emberiza calandra*	2
Reed Bunting *Emberiza schoeniclus*	1
House Sparrow *Passer domesticus*	2
Unidentified small passerines	5