



Forth Road Bridge Five-Year Marine Licence Tern Species Management Plan – Habitats Regulations Appraisal Appendix D

V2

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BEAR Scotland

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Forth Road Bridge Five-Year Marine Licence

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1. Introduction

1.1 Background

Jacobs UK Limited (hereafter 'Jacobs') have been commissioned by BEAR Scotland to undertake a Habitats Regulations Appraisal (HRA), in support of a five-year Marine Licence application for the planned ongoing maintenance works ('the Proposed Works') on the Forth Road Bridge (FRB). This Licence would be required to commence from 1 October 2021. BEAR Scotland is the Operating Company for the FRB on behalf of Transport Scotland.

The HRA including Appropriate Assessment (AA) produced by Jacobs in relation to the Proposed Works identified the requirement for mitigation to be implemented to safeguard three European/Ramsar sites and ensure that no adverse effect on site integrity arises as a result of the works, specifically in respect of disturbance to tern species. The sites are the Firth of Forth Special Protection Area (SPA) and the Firth of Forth Ramsar site (which cover the same area with only very slight differences), and the Forth Islands SPA.

Of relevance to this Species Management Plan (SMP), the Forth Islands SPA is designated for four breeding tern species, whilst the Firth of Forth SPA and Ramsar site is designated for one of those four, Sandwich tern, as a passage species.

This SMP collates the mitigation identified as required by the HRA process, and provides additional information on its implementation and monitoring. It forms Appendix D of the main HRA text, and will be replicated and developed as required as part of the Construction Environmental Management Plan (CEMP), which BEAR Scotland will produce on a project by project basis.

1.2 Purpose of the Document

This document is a live document that consolidates the avoidance and mitigation measures identified as required in the HRA for the Proposed Works and in turn avoid adverse effects on site integrity of the Forth Islands SPA and the Firth of Forth SPA/Ramsar. This is an essential requirement of the HRA process and as such the implementation of this SMP will be a specification in the contract for the Proposed Works.

The SMP provides a framework to prevent or minimise the implications of the Proposed Works for terns and their supporting habitat. The measures identified are required specifically in relation to terns which breed on Long Craig Island, which is one of the constituent islands of the Forth Islands SPA and located directly beneath the FRB, as well as to Sandwich tern, which use Long Craig Island and Port Edgar marina particularly during the passage period (peaking in July and August, with most birds leaving by the end of September (Scottish Natural Heritage¹ (SNH), 2016)). The measures will also help to remove or reduce effects on other bird species, including other qualifying interests of European and Ramsar sites.

The document details the mechanisms and deliverability of the environmental commitments in relation to terns throughout the five-year duration of the Marine Licence. Information contained in this report is drawn from relevant sections of the HRA for the Proposed Works but does not replicate the data or assessments in full. Whilst it is intended to operate as a standalone document, for additional context and justification, the full HRA text should be referred to.

At the time of writing, works are underway on the FRB to replace the expansion joints under a six month extension to the existing Marine Licence. As agreed with NatureScot, and taking a precautionary approach, an ECoW has been appointed to be present on site daily for the duration of works between a minimum of 1 May and 15 August 2021. The ECoW undertakes regular counts of the adult terns present on Long Craig Island, and monitors their response to potential disturbance events. It is anticipated that this will provide a valuable dataset

¹ Now NatureScot.

to inform this SMP, and as such, it is expected that this SMP will be revised in the coming months, in consultation with NatureScot.

1.3 Structure of the document

The following sections provide a brief overview of the ecology of the tern species relevant to this SMP and their use of the Firth of Forth estuary, and in particular Long Craig Island.

Thereafter follows the roles and responsibilities for implementing the SMP, followed in turn by a summary of the effects that may result from the works activities, and the associated mitigation and monitoring required to ensure no adverse effects on the integrity of the European/Ramsar sites arise.

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2. European/Ramsar sites

2.1 Legislation

The Habitats Regulations (Conservation (Natural Habitats, &c.) Regulations 1994) translated the European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive²) into UK legislation to protect sites that are internationally important for threatened habitats and species (European Sites), and to create a legal framework for species requiring strict protection.

The Habitats Regulations have been amended in Scotland, most recently in 2019 as a result of the UK leaving the EU (Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019). This latest amendment ensures that the requirements of the Habitats Directive and the Birds Directive (European Union Council Directive 2009/147/EC) continue to be relevant to the management of European sites, so that the sites are both protected and that they continue to operate as originally intended.

European Sites are Special Protection Areas (SPAs) (classified under the Birds Directive) and Special Areas of Conservation (SACs) (classified under the Habitats Directive) and form part of an international network of protected sites. Prior to leaving the EU Scotland's sites contributed to the Natura network and now form part of the Emerald Network³, spanning Europe and into Africa.

The Habitats Regulations continue to require that an Appropriate Assessment (AA) be undertaken by a Competent Authority where any plan or project not directly connected with or necessary to the management of the European/Ramsar site, is likely to have a significant effect either individually or in combination with other plans or projects.

Whilst not a European site designation, wetland sites designated under the Convention on Wetlands of International Importance, known as Ramsar sites, are also relevant since they are afforded the same level of protection as European sites under domestic policy and treated in the same way as the UK site network. Most Ramsar sites in Scotland are either designated SPAs or SACs although not always sharing the same qualifying interests (NatureScot, 2020).

2.2 Forth Islands SPA

Forth Islands SPA (NatureScot Site Code 8500, EU Site Code UK9004171) (NatureScot, 2021a) covers a series of islands in the Forth Estuary, one of which is Long Craig Island (Photographs 1 and 2; Figure 1), which supports a breeding tern colony. The FRB passes directly over Long Craig Island. Amongst the qualifying interests of the site, and relevant to this document, are:

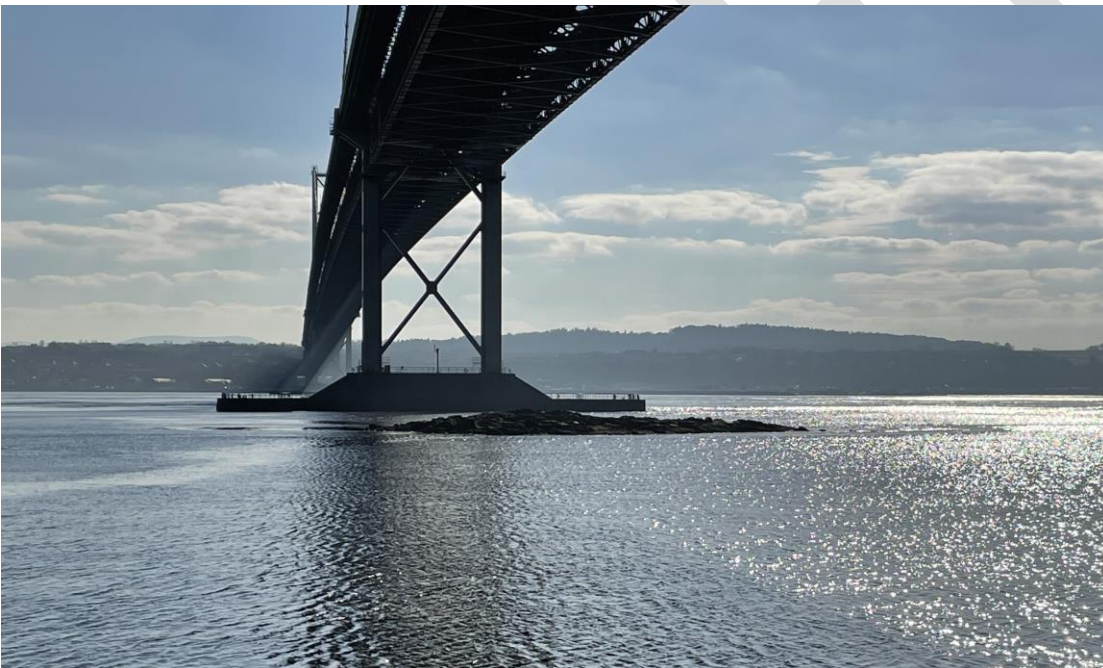
- Arctic tern (*Sterna paradisaea*), breeding;
- common tern (*Sterna hirundo*), breeding;
- roseate tern (*Sterna dougallii*), breeding; and
- Sandwich tern (*Thalasseus sandvicensis* (formerly *Sterna sandvicensis*)), breeding.

² The Habitats Directive was adopted in 1992 by the European Community (as was) as the Community's response to the Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention).

³ The Emerald Network was launched by the Council of Europe as part of its work under the Bern Convention.



Photograph 1: Long Craig Island at low tide



Photograph 2: Long Craig Island at high tide. A small part of the island is located out of sight to the left (east)

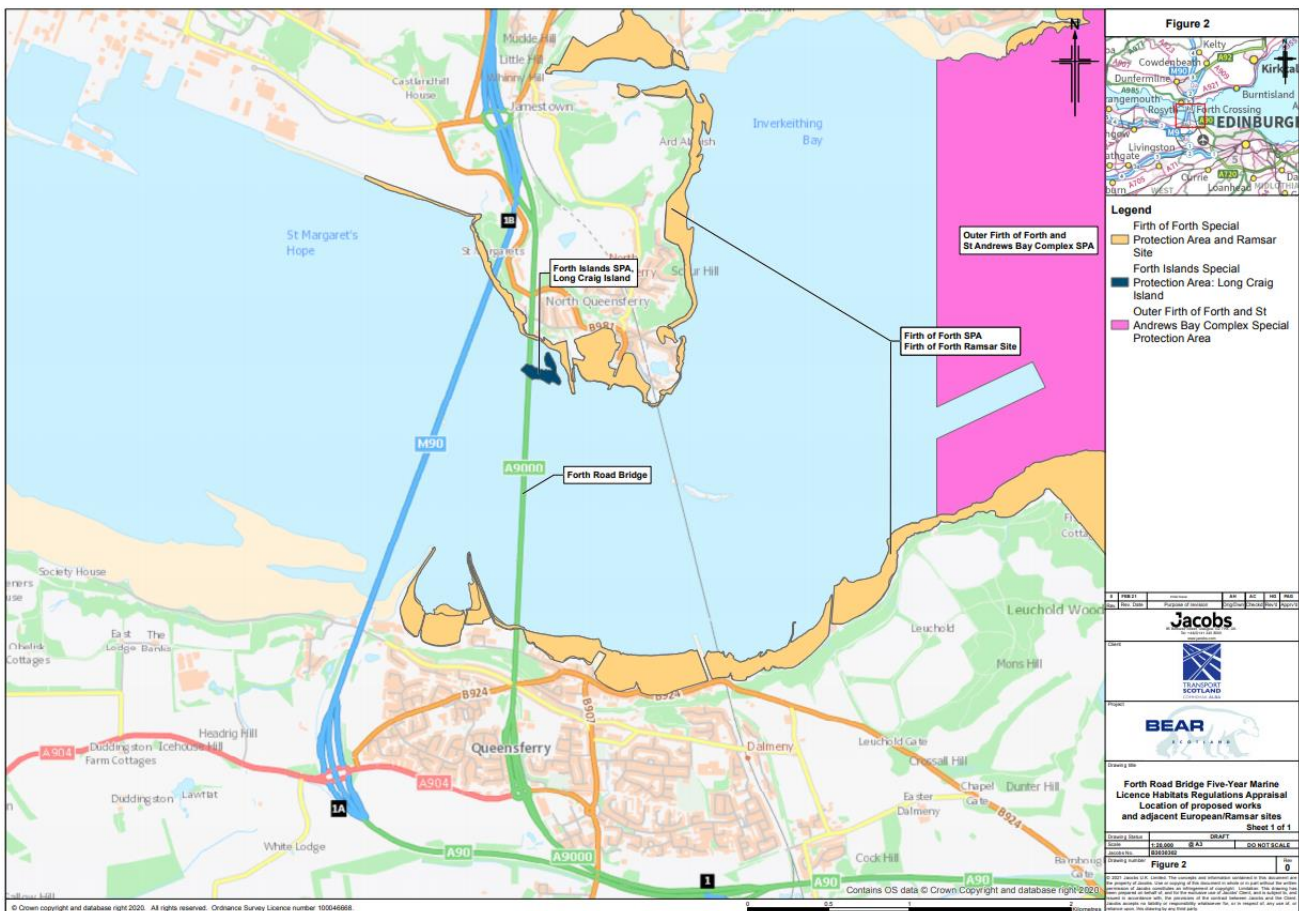


Figure 1⁴: Location of Proposed Works and adjacent European/Ramsar sites

2.3 Firth of Forth SPA/Firth of Forth Ramsar

Firth of Forth SPA (NatureScot Site Code 8499, EU Site Code UK9004411) (NatureScot, 2021b) and Ramsar (NatureScot Site Code 8424, EU Site Code UK13017) (NatureScot, 2021c) covers approximately 6,300ha of the estuary. The area comprises a mosaic of estuarine and coastal habitats spanning the length of the Forth Estuary. The intertidal mudflats, saltmarsh, rocky shores and bays that provide important food sources and shelter for the qualifying, wintering, birds and passage migrants are included within the extensive designated site boundary. The qualifying interest of both sites relevant to this document is Sandwich tern (passage). The FRB passes over the Firth of Forth SPA/Ramsar, as shown in Figure 1.

⁴ Referred to as Figure 2 within the HRA for the Proposed Works.

3. Tern Species

The following section provides an introduction to tern ecology as relevant to this SMP and the distribution of tern species within the Firth of Forth.

3.1 Common tern

Common tern is a summer visitor to the UK, and is primarily a marine species in Scotland. After breeding, some birds remain in the Firth of Forth until as late as October, before wintering off the coast of West Africa.

It forages over inshore and offshore waters, diving from height into water to feed on small fish, principally sandeels, small herrings and sprats. The species roosts on islands, exposed rocks and estuary shores at low tide.

Common tern is the primary species known to nest on Long Craig Island, with a peak of 128 Apparently Occupied Nests (AONs) and 163 successfully fledged chicks in 2019 (Knowles, 2019). This makes this location one of the most important, in terms of absolute numbers, in the Forth Islands SPA for this species. Common terns have arrived to breed in relatively similar numbers for at least the last 20 years, with the exception of 2012 when no pairs arrived. However, productivity has varied, with a sharp drop off between 2016-2018, most significantly in 2018 with only five chicks fledging when the colony was recorded as failing (Knowles, 2018). In 2019, however, the colony had the highest number of chicks and highest productivity since 2003, indicating the terns' fidelity to the site between years. Wetland Bird Survey (WeBS) data provided by the British Trust for Ornithology (BTO) recorded common terns throughout the breeding season each survey period (July to June) between 2014/2015 and 2018/2019, with a peak count of 354 in June 2019, in the Hound Point to South Queensferry sector, on the south side of the estuary.

For the purposes of this SMP the tern breeding season is taken to be 1 April to 15 August inclusive, in line with NatureScot consultation advice (NatureScot, 2021d). It should be noted that some birds will remain in the Firth of Forth beyond this date, but are no longer breeding. Clutch size is typically 2-3 eggs, with incubation lasting 21-22 days (Holden and Houseden, 2016). Young leave the nest after 3-4 days and hide nearby while waiting to be fed. They fly at 22-28 days and are not fully independent until 2-3 months (Holden and Houseden, 2016).

3.2 Roseate tern

Roseate terns visiting the Firth of Forth area are likely to be from colonies in Northumberland (SNH, 2016). The species winters off West Africa and arrives in Scottish waters between late April and early June. Like the common tern, it feeds on small fish caught by plunge diving. Some adult roseate terns exhibit kleptoparasitic behaviour whereby they steal fish from other terns (Shealer and Spendelow, 2002).

Roseate tern is the rarest breeding seabird in the UK, and Long Craig Island was previously the site of the largest colony in the UK. In addition to its European designation, Long Craig Island is designated as a Site of Special Scientific Interest (SSSI) for roseate tern, and the species is additionally 'red-listed' in the Birds of Conservation Concern (Eaton *et al.*, 2015). However, a successful pair has not bred on the island since 2009 (Knowles, 2019) and there have only been occasional hybrid pairs recorded in the Forth since that time. WeBS data from 2014/2015 to 2018/2019 did not record the species. Data collected in relation to the Forth Replacement Crossing (FRC) between 2007 and 2009 recorded roseate terns rarely flying and foraging from Port Edgar, over Inch Garvie Island and between the rail bridge and FRB. They were also observed loafing on Long Craig Island. In 2007 at least two pairs were recorded displaying at Long Craig Island early in the breeding season, and in 2008 one to two pairs were regularly observed there. The Forth Islands Tern Warden Season Report from 2018 noted that a single adult roseate tern was observed on several occasions in July 2018 loafing in the location that the last pair mated in 2008/9, however no courtship behaviour or attempts at mating with common terns was observed (Knowles, 2018).

Roseate tern relies on the protection of the more aggressive and numerous common (and where present Arctic) tern at nesting sites. Sandwich tern are known to outcompete roseate tern for nesting habitat, making colonies of only common tern ideal for roseate terns. As a result, the welfare of the other terns in the Forth is vital if roseate

terns are successfully to reclaim their original nesting areas, and indeed NatureScot have identified Long Craig Island as being essential to the recolonisation of the Firth of Forth by roseate tern.

3.3 Arctic tern

Arctic tern typically arrives in the UK from mid-April onwards. Historically the species nested on several of the Forth Islands but since 1998 have only been recorded nesting on the Isle of May (SNH, 2016) and Great Carr (Knowles, 2018). The available WeBS data and the Forth Islands Tern Warden Season Reports (Knowles, 2017; Knowles, 2018; Knowles, 2019) did not indicate presence of Arctic tern in the vicinity of the FRB. FRC data recorded small numbers of Arctic tern in the autumn/winter of 2007 and 2008. In 2008, most records were from Port Edgar. They were described as rarely observed in the wider survey area for estuarine birds and as making very little use of the inner Forth estuary in the vicinity of the FRC.

The species feeds primarily in the outer Forth (SNH, 2016). Low numbers of Arctic tern are known to frequent the inner Forth, but due to the fact there is regular and ongoing monitoring of the terns on and around Long Craig Island yet they have not been regularly recorded, it is considered unlikely that the area surrounding the bridges is important for this species.

3.4 Sandwich tern

Sandwich terns build in large numbers in the Forth in July and August, after breeding, with most birds leaving by the end of September before spending the winter off west Africa. **For the purposes of this SMP the Sandwich tern passage period is taken to be 1 July to 30 September, or whenever the last Sandwich terns leave the area if earlier.**

Like the other tern species, it feeds on small fish by aerial diving. Sandwich tern nests in multi-species colonies with other terns and gulls. They have not bred on Long Craig Island in recent years, with their breeding site within the SPA being restricted to small numbers on the Isle of May (Knowles, 2017; Knowles, 2018; Knowles, 2019). Other birds in the Forth have been identified as originating from breeding sites elsewhere in Scotland, England, Belgium and The Netherlands (SNH, 2016).

Sandwich tern was recorded in both WeBS sectors, with a peak count of 12 birds recorded in July 2017 and July 2018 (Hound Point to South Queensferry sector, southern side of the estuary) and in September 2018 (Forth Cult Ness sector, northern side of the estuary). This peak corresponds with the main passage season (July to September). Sandwich tern will roost across a range of habitats including offshore islands, rocks, estuaries and coastal lagoons, and can be displaced from roost sites due to disturbance, predation and gull colony presence.

Although reported as uncommon in the inner Forth (SNH, 2016), FRC data found Sandwich tern frequently foraged throughout the wider area around the bridges, and that flocks loafed and roosted around Port Edgar marina, especially the floating breakwater at the entrance of the harbour and purpose-built tern raft, and Long Craig Island where they were reported to roost with other tern species. Peak numbers identified across the two locations combined in 2007 and 2008 respectively were 596 and 429 birds, which is over a quarter of the population cited Firth of Forth SPA population of Sandwich tern⁵.

⁵ The cited Firth of Forth SPA population is a winter peak mean during the five year period 1993/94 to 1997/98 of 1,617 individuals (6% of the GB population).

4. Roles and Responsibilities for Implementing the SMP

This SMP is a live document which will be updated as further relevant information becomes available. It will be a contractual responsibility of the appointed Contractor to ensure all mitigation is implemented for the duration of the five-year licence as required (for example some measures apply at certain times of the year only). Whilst the mitigation proposed is expected to safeguard the conservation objectives of the Firth of Forth SPA/Ramsar and Forth Islands SPA, if during the course of operations should it become apparent that additional mitigation is required, this document will be updated to include those measures.

A programme of works was provided by BEAR Scotland to inform the HRA (Appendix A of the HRA), setting out the routine and non-routine works expected to be undertaken during the five-year period. It details the expected activities, timing, duration/frequency, and equipment required. If the programme of works is changed by the Contractor or BEAR Scotland, the changes will have to be assessed to demonstrate there are no additional implications for the European/Ramsar sites. They will need to undergo an HRA process to demonstrate there are no additional likely significant effects which could lead to adverse effects on site integrity of European/Ramsar sites from the changes to ensure that the conclusion of the HRA produced for five-year programme is still valid. This assessment may consequently identify changes to the avoidance and mitigation measures required and the SMP would need to be updated to include these additional protective measures and agreed with NatureScot and Marine Scotland.

4.1 Responsibilities of the Ecological Clerk of Works (ECoW)

To ensure that this SMP is implemented effectively, an Ecological Clerk of Works (ECoW) will be appointed by BEAR Scotland prior to works commencing in certain areas and certain times of the year.

For the first year of the licence, the ECoW is required to be present during the sensitive part of the tern breeding season (1 May to 15 August) whenever noisy works are being undertaken within 400m of Long Craig Island (Section 6.2.2). In addition, the ECoW is required to be present during the passage period for Sandwich tern (1 July to 30 September, or whenever the last Sandwich terns leave the area if earlier) whenever potentially noisy works are being undertaken at both ends of the bridge simultaneously, that is within 400m of (i) the floating breakwater at the entrance of Port Edgar Marina harbour and/or the purpose-built tern raft and (ii) Long Craig Island.

Arrangements relating to the ECoW appointment are as follows:

- the ECoW will be a member of the Chartered Institute of Ecology and Environmental Management (CIEEM) and will have previous experience in similar ECoW roles.
- the ECoW will be a suitably experienced ornithologist.
- the ECoW will be primarily a site-based role, but the ECoW will be consulted when necessary if not required on site.
- the ECoW will be appointed in advance of the relevant packages of works or maintenance activities commencing to ensure any advance mitigation measures required are implemented.

During the tern breeding period, and when present during the Sandwich tern passage period (as noted above), the ECoW will be responsible for the following key activities:

- supervision of the works in the context of the ecological mitigation and protective measures agreed through the consenting process;
- providing ecological advice to BEAR Scotland and the Contractor as required;
- ensuring mitigation measures are implemented as committed within the HRA, including this SMP, with a view to preventing significant adverse effects on qualifying tern species;

- issuing a stop works instruction if the works are identified as having potential adverse effects for the terns, or if mitigation is failing to deliver protection, until such time as a solution can be found and/or NatureScot agrees to the works continuing. Further details are provided in Section 7;
- monitoring and assessing the delivery of the contractual obligations with regard to ecological safeguarding and ecological mitigation requirements by the Contractor; and
- discussing and agreeing with BEAR Scotland and the Contractor appropriate approaches to implementing additional ecological mitigation where more than one option is available.

Should the ECoW identify significant disturbance to terns, works will be stopped as soon as this is identified and further mitigation will be designed and implemented based on professional experience and the scientific literature. Further mitigation could include, but not be limited to: extending the soft-start process; amendments to working practices; and restricting certain activities during sensitive periods. Should any compliance issues or significant changes in the distribution and numbers of terns be observed, works will cease as soon as it is safe to do so, and will only commence once suitable mitigation is in place. Marine Scotland and NatureScot will be notified of any disturbance incidents that warrant works to be stopped (as detailed in Section 7), and provided with details of actions taken.

For emergency repairs, the implementation of certain additional mitigation measures as identified above may not be possible due to length of time required to put these measures in place. In such cases agreement will be sought with NatureScot and Marine Scotland prior to the commencement of works. In addition, works will be discussed with and monitored by the ECoW. A written record will be kept of why emergency repairs were required, what alternatives and mitigation was discussed and, where proposed mitigation was agreed as being feasible, and what that mitigation was.

As detailed in Section 7, the ECoW will implement mitigation as required, and monitor the terns in order to demonstrate the efficacy of the mitigation and build up a better understanding of the birds' response to disturbance. This monitoring will therefore necessitate some data collection when works are not being undertaken to act as a control baseline. It is anticipated that the noise disturbance response monitoring and colony counts being undertaken between May and September 2021 under the existing licence (Section 1.2) will form part of this, and will be used to update this SMP as required.

The ongoing requirement for the ECoW and/or the timing and responsibilities of the ECoW, will be reviewed and agreed with NatureScot after the first year of the licence, or earlier if relevant data becomes available from the 2021 season. Changes agreed with NatureScot will be reflected in updates to this SMP.

4.2 Communications strategy

The following communications strategies will be implemented to ensure the timely resolution of any incidents and that relevant parties are informed as required.

4.2.1 Incident reporting

1. Incident or perceived incident occurs. Refer to Section 7.1 for examples of behaviour that may be considered an incident.
2. Incident is observed by ECoW or other site personnel. Observer (if not ECoW) reports incident to ECoW immediately.
3. If, based on professional judgement, ECoW considers it appropriate, instruction to stop work as soon as it is safe to do so is issued. Instruction to Contractor to stop work will be issued by BEAR Engineer, not the ECoW. Marine Scotland and NatureScot will be notified as soon as possible (within the day) if a stop works event occurs. The Transport Scotland Environment Adviser and Project Manager will also be notified by BEAR Environmental Manager (via BEAR Engineer) of any significant incidents that require notification to statutory bodies.

4. When ECoW, BEAR Engineer, and where appropriate NatureScot, are in agreement that it is appropriate, instruction that works may recommence is issued via the BEAR Engineer. The time for which works cease may vary from a short period required for the birds to re-settle, to a much longer period should it be identified that additional mitigation and/or discussion with NatureScot is required. The Transport Scotland Environment Adviser and Project Manager will also be notified by BEAR Environmental Manager (via BEAR Engineer) once works have re-commenced.
5. Lessons learned will be collated by ECoW with input from site personnel and site supervisors/managers as appropriate, and reviewed by all parties on a monthly basis, with resulting recommendations implemented as appropriate.

4.2.2 Monitoring data

As detailed in Section 7, regular monitoring data will be issued to NatureScot monthly during the tern breeding and passage periods.

4.3 Useful contacts

Contact information for those parties identified in the communications strategy are provisionally provided as follows. This section will be updated as required.

Organisation	Name/Team	Role	Email address
NatureScot	Malcolm Fraser	Forth Regional team contact	malcolm.fraser@nature.scot
Marine Scotland	Ellie Noble	Marine Licensing Case Manager	ellie.noble@gov.scot
BEAR Scotland	Ged Mitchell	Environment team contact	gmitchell@bearsotland.co.uk
BEAR Scotland	Murray McGrouther	Project manager	mmcgrouther@bearsotland.co.uk
BEAR Scotland	Robert McCulloch	Principal Engineer	rmcculloch@bearsotland.co.uk
TBC	TBC	Ecological Clerk of Works	TBC
Scottish Wildlife Trust (SWT)	Rory Sandison	Reserves Manager - East Central Scotland SWT manages Long Craig Island	rsandison@scottishwildlifetrust.org.uk
Transport Scotland	Myra Conn	Client Environmental Advisor	Myra.Conn@transport.gov.scot
Transport Scotland	Jason Cheetham	Client Project Manager	Jason.cheetham@transport.gov.scot

5. Potential Impacts

5.1 Firth of Forth SPA/Ramsar: Sandwich tern

The HRA identified that protection measures were required to address the potential for noise, vibration, movement and visual disturbance related to the works to deter Sandwich tern from using the area adjacent to the bridge.

As noted in Section 3.1.4, although reported as uncommon in the inner Forth (SNH, 2016), Sandwich tern was recorded in both WeBS sectors⁶, with the peak count corresponding to the main passage season. FRC data found Sandwich tern frequently foraged throughout the wider area around the bridges, and identified flocks loafing and roosting around Port Edgar marina, especially the floating breakwater at the entrance of the harbour and purpose-built tern raft, and roosting with other tern species at Long Craig Island. Long Craig Island is within the 300m Zone of Influence (ZOI) around the bridge defined in the HRA. As such, noise, vibration and visual activity could result in disturbance to the birds.

In respect of vessel movements, such as those required for the New Suspended Span Underdeck Access Gantry and Repair of Cathodic Protection Systems works packages, any aggregation of Sandwich tern at Port Edgar would likely already be habituated to boat movements due to the regular traffic in the area. Boat traffic is less frequent near to Long Craig Island, since it is situated approximately 500m from the northern shipping channel in the Forth Estuary. Nevertheless, given the size of the barge required for the New Suspended Span Underdeck Access Gantry work and the likelihood of its sustained presence, rather than simply passing by, there is potential for disturbance to birds at both locations, and in particular at Long Craig Island, which is located closer to the likely location of the boat during operations.

Whilst it is considered relatively unlikely that both roost locations would be impacted simultaneously, if disturbing works were being undertaken at both ends of the bridge, or along the length of it, birds may be forced to relocate elsewhere in the Forth Estuary, as there are apparently no other key roosting locations for this species nearby. This would constitute an impact on the distribution of the species within the site. Mitigation set out in Section 6.2.1 is therefore required to allow no adverse effect on site integrity to be concluded.

5.2 Forth Islands SPA: breeding terns

The HRA identified that protection measures were required to address the potential for disturbance to qualifying interests of the SPA, namely common tern and roseate tern. Noise and visual disturbance related to the Proposed Works could deter tern species from feeding in the open water adjacent to the FRB and successfully breeding on Long Craig Island. The potential for items being dropped from the bridge and resulting in direct mortality of adults or nests was also identified as requiring protection measures to be implemented.

Long Craig Island is the only area of the Forth Islands SPA that falls within the 300m ZOI defined in the HRA, and the only suitable habitat for breeding terns within the ZOI. Long Craig Island is currently considered key supporting habitat for common tern and roseate tern only. Arctic tern and Sandwich tern do not breed on Long Craig Island, however the measures proposed would help to maintain or restore conditions that would be potentially suitable for breeding of these species.

Common tern

As noted in Section 3.1.1, common tern is the primary species known to nest on Long Craig Island and Long Craig Island is one of the most important, in terms of absolute numbers, in the Forth Islands SPA for this species.

Common terns are considered to be reasonably resilient to human disturbance. Research done on the nearby common tern population at the Imperial Dock Lock, Leith SPA found the terns to be habituated to the constant

⁶ Note that gulls and terns are only optionally recorded within WeBS data and as such may be under-represented.

low-level disturbance, with only high-level disturbance events having a significant effect (Jennings, 2012). Furthermore, the presence of gulls and other predatory bird species was shown to be far more likely to cause a disturbance event than anthropogenic noise. However, a number of disturbance events, in addition to high tides and poor weather, have been linked to the abandonment of the colony at Long Craig Island in 2018, and significant disturbance was noted again in 2020. Whilst there is no proven causation, there is clearly potential for the works to result in significant disturbance. During the nesting period such disturbance events could have a significant impact on productivity due to increased chick/egg predation and associated energetic costs. This would constitute an impact on the population of the species as a viable component of the site. It should be noted that, since terns do not breed until three or four years old, the limited breeding success of the Long Craig Island tern colony in 2018 and 2020 can reasonably be expected to be reflected in a reduction in colony size emerging over the next few years, even if no further disturbance were to take place. As such, assurances around the population of the species being maintained as a viable component of the site and no significant disturbance of the species are particularly critical over the coming five years during which the Marine Licence will be in place.

In addition, due to tern species' tendency to roost and nest in multi-species colonies, protection of the common tern population is essential to the ongoing conservation objective of restoring a roseate tern population to Long Craig Island, as roseate tern is reliant on the protection of common terns at nesting sites (SNH, 2011).

Disturbance during the Proposed Works has the potential to negatively impact the conservation objectives for common tern in the Forth Islands SPA. Mitigation is proposed (Section 6.2.2) to allow no adverse effect on site integrity to be concluded.

Roseate tern

As noted in Section 3.1.2, roseate tern is the rarest breeding seabird in the UK, and Long Craig Island was previously the site of the largest colony in the UK. Limited observations have been recorded in recent years, with no successful breeding since 2009 (Knowles, 2019).

Due to the species' tendency to nest in multi-species colonies with the more aggressive and numerous common tern (and where present Arctic tern), the welfare of the other terns in the Forth is vital if roseate terns are successfully to reclaim their original nesting areas.

Disturbance during the Proposed Works has the potential to negatively impact the conservation objectives for roseate tern in the Forth Islands SPA. Mitigation is proposed (Section 6.2.2) to allow no adverse effect on site integrity to be concluded.

6. Mitigation Measures

6.1 General mitigation measures

Prior to the works commencing, BEAR Scotland will develop a CEMP specific to each package of works. It will include a Construction Noise Management Plan (CNMP) and this SMP. The CEMP will detail the mitigation to be implemented and how this will be monitored. It will be developed in consultation with relevant stakeholders including NatureScot.

Plant and personnel will be constrained to the bridge structure itself, with only two exceptions, for which barge/boats are required, namely the New Suspended Span Underdeck Access Gantry activity and the Repair of Cathodic Protection Systems activity. Further mitigation relating to these works packages are detailed in Section 6.2.2. In addition, a safety boat is required to be available whenever activities requiring work outside of the carriageway and walkways are programmed. During such periods, the safety boat anchors in the water with a view of the works area and remains there for the standby period unless an emergency call is made. The boat does not patrol, and is moored at Port Edgar Marina when not in use.

Standard working hours will be 08:00-17:00 (Monday to Friday), with occasional weekend working. Due to limited daylight length, some working during the hours of darkness will likely be unavoidable during winter, and there is a requirement for night working associated with some overnight closures of the carriageway for surfacing works, and potentially for emergency works.

Where working during the hours of darkness is required, a lighting plan and method statement will be developed by the Contractor. The plan will detail specific mitigation requirements, including but not limited to measures to avoid light spill/reflections and avoidance of white-blue spectrum and high UV emitting lighting during the hours of darkness, to protect qualifying interests of the SPA and Ramsar sites. The lighting plan will take into account published guidance on lighting (e.g. Institution of Lighting Professionals (2011), The Royal Commission on Environmental Pollution (2009) and Bat Conservation Trust and Institution of Lighting Professionals (2018)). The lighting design will be developed specifically to prevent illuminating sensitive bird habitats below and adjacent to the works areas.

Wherever feasible and relevant to do so (due to potential pollution, dropping of tools, or other disturbance), appropriate mitigation measures will be employed to: provide a degree of visual screening; to contain the works and prevent any materials or tools dropped from falling onto areas below the bridge; and to contain waste arisings such as dust and paint flakes. Appropriate mitigation will be developed on a scheme-by-scheme basis following environmental screening, and may include (but not be limited to) measures such as: full encapsulation of the works area, use of tool tethers, installation of boarding, netting, and sheeting, etc

6.2 Site-specific mitigation

6.2.1 Mitigation specific to effects from Proposed Works during the Sandwich tern passage period - 1 July to 30 September, or whenever the last Sandwich terns leave the area if earlier

During the Sandwich tern passage period, noisy or otherwise disturbing works will not be undertaken at both ends of the bridge simultaneously, that is, within 400m of both Long Craig Island and Port Edgar Marina (floating breakwater and/or purpose-built tern raft). Noisy activities are typically defined as any construction activity that would result in an increase of $\geq 3\text{dB(A)}$ in the ambient noise level (dBLAeq) at sensitive receptors (i.e. Port Edgar Marina and/or Long Craig Island). It is acknowledged that due to the complexity of works planning and the requirement for emergency works, this may not always be possible. In the rare instances when this is required, an ECoW is required to be present to monitor Sandwich tern response and provide advice on further mitigation or issue a stop works instruction if required.

Any requirement for noise and vibration limits for Sandwich tern during the passage period will be agreed with NatureScot and these limits will be incorporated into the CEMP.

During the Sandwich tern passage period, the Contractor will employ a 'soft-start' to all noisy activities undertaken within 400m of habitats used by Sandwich tern, to avoid sudden and unexpected disturbance during construction. Each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to habituate to the disturbance.

6.2.2 Mitigation specific to effects from Proposed Works during the tern breeding season - 1 April to 15 August inclusive

The primary means of avoidance of adverse effects has been to restrict the timing of the noisiest and otherwise most disturbing works to take place outwith the tern breeding season and/or to take place during the breeding season only at locations beyond an exclusion zone around Long Craig Island (i.e. at the southern section of the bridge only).

During early consultation with NatureScot (Jacobs, 2020), NatureScot indicated that this exclusion zone should be 400m from Long Craig Island during the breeding season (Section 3.1.1). The ZOI for breeding terns is identified in the HRA as 300m, and as such a 400m exclusion zone is considered precautionary. BEAR Scotland have reflected the 400m buffer in the works programme where possible. Based on the works programme provided by BEAR Scotland (Appendix A of the main HRA) this has been implemented for the following works packages:

- Suspended Span Painting Contract;
- Suspended Span Strengthening Contract;
- Viaduct Span Painting Contract;
- Suspended Span Under Deck Access (SSUDA);
- Footpath Elastomeric Pads Replacement;
- Side Tower Lateral Thrust Bearing Strengthening;
- Main Tower Lateral Thrust Bearing Replacement;
- Side Tower Elastomeric Bearings Replacement;
- Pedestrian Balustrade Strengthening; and
- New Suspended Span Underdeck Access Gantry.

Packages for which it is not anticipated to be possible to time works near the island outside this period are:

- Viaduct and North Approach Resurfacing;
- Suspended Span Resurfacing;
- Footpath Resurfacing; and
- Main Cable Intrusive Investigation (no noisy or visually disturbing works required).

Some of these packages require a sustained period of carriageway closure, including overnight works, in order to complete the works efficiently. Others are more difficult to undertake during winter from an engineering perspective due to the requirement for waterproofing or exposure of cables to the elements. In addition, it is desirable by BEAR Scotland and Transport Scotland for the FRB to remain available as an alternate crossing point in the event that the Queensferry Crossing is forced to shut during bad weather.

In addition, some routine maintenance works, including emergency works may be required to be undertaken during the tern breeding season within 400m of Long Craig Island. The ECoW will be consulted in the first instance where this is the case.

The main bridge expansion joint replacement task is being undertaken at the time of writing, between April and September 2021, and as such it is not expected to fall into the works programme for the five-year licence. Whilst it is anticipated by BEAR Scotland that these works will be completed before the end of September 2021, the

northbound joints may still be ongoing in October 2021 in the event of delays to the works. In order to avoid impacts on terns, these works are required to be completed prior to the start of the breeding season in spring 2022.

Plant and personnel will be constrained to the bridge structure itself, with only two exceptions, for which barge/boats are required, namely the New Suspended Span Underdeck Access Gantry activity and the Repair of Cathodic Protection Systems activity. For the New Suspended Span Underdeck Access Gantry the use of a barge is essential to install the main span gantry. For the two side spans, access is feasible from either the estuary side or via a barge. In order to minimise disturbance to birds at Long Craig Island, access should be taken via whichever entails more distant activity from Long Craig Island.

Boat movements may also be required as part of the Repair of Cathodic Protection Systems activity but are not expected to require close access to Long Craig Island and are not time-sensitive, therefore for this activity, boat access within 400m of Long Craig Island should be undertaken outwith the tern breeding season. In addition, a safety boat is required to be available whenever activities requiring work outside of the carriageway and walkways are programmed. When the safety boat is required, it is anchored in a suitable location as to be able to provide a safe and effective rescue service. During the tern breeding and passage period, the safety boat will not anchor within 200m of Long Craig Island and will take relevant and appropriate measures to minimise any potential disturbance to Long Craig Island (e.g. will not leave the engine idling).

For any works taking place during the tern breeding season and within 400m of Long Craig Island, the following additional mitigation measures are required to be implemented.

- Due to the complexity of the works programme and potential requirement for emergency works, the requirement for multiple maintenance packages to be undertaken concurrently cannot be precluded. Where this is the case, noisy or otherwise disturbing works will be timed so as not to coincide.
- No access beyond mean low water springs (MLWS) of Long Craig Island will be permitted under any circumstance during the tern breeding season without written agreement of the ECoW and NatureScot. The sole exception to this would be access by the safety boat or rescue operatives during an emergency rescue.
- 'Soft-start' techniques will be used for all noisy activities to avoid sudden and unexpected disturbance during construction. Noisy activities are typically defined as any construction activity that would result in an increase of $\geq 3\text{dB(A)}$ in the ambient noise level (dBLAeq) at sensitive receptors (i.e. Long Craig Island). For any such activity, each time the activity is started up after a period of inactivity, the noise levels will be gradually increased over a period of 30 minutes to allow birds to habituate to the disturbance.
- Noise and vibration limits for terns during the breeding season will be agreed with NatureScot and these limits will be incorporated into the CEMP. Measures contained within the CNMP will reduce construction noise and limit it to agreed noise thresholds.

Should additional mitigation be identified as required to achieve the noise limits noted in the CEMP, as experienced at Long Craig Island, additional measures may be required, such as noise barriers or noise damping materials being installed within the encapsulation. The locations of screening or barriers should be agreed with an acoustics specialist prior to works in discussion with the ECoW, and checked periodically throughout works.

Monitoring of bird responses to works activities will be undertaken, and observations of bird responses will be combined with ongoing noise monitoring, as detailed in Section 7. Should monitoring data identify significant changes in the distribution or number of birds as a result of works, then works will be stopped until further mitigation is agreed with NatureScot. Further mitigation could include extension or expansion of the measures noted in this section, including: restrictions to the types or timing of noisy works; extending the 'soft-start' process; amendments to lighting plans; and changes to visual and noise screening.

7. Monitoring

7.1 Disturbance incidents

As an agile and largely airborne species, terns generally take flight quite readily compared with other species, and exhibit little by way of pre-flight activity or restlessness. They exhibit various behaviours that may appear to be reactions to disturbance; sometimes the source is obvious and sometimes there is no apparent trigger. A ‘fly-up’ is when the birds lift off the nests and hover above it or otherwise remain nearby. The birds would usually settle quite quickly, within a minute or so. A ‘dread’ can also occur, whereby part or the whole colony fly silently away from the nest area, and may exhibit calling upon resettling. Note that other behaviours can be observed where there is an obvious disturbance from predators such as gulls, herons or crows.

The judgement as to whether an incident requires a stop work instruction to be issued will be made by the ECoW based on experience and professional judgement. Examples of when a stop works instruction should be issued include the following:

- a fly up or dread of a significant proportion of the tern colony (50% or more) without resettling within a short period and where there is a clear link to bridge works or there is no other clear external influence to cause that behaviour;
- fly ups or dreading occurring with a frequency that is higher than baseline behaviour, when no potential disturbance is occurring;
- any other disturbance of concern or disturbance response potentially related to the works occurs, for example something is observed falling onto the island from the works, or personnel or a boat is observed within MLWS of Long Craig Island.

Examples of when a stop works instruction would not usually be required include the following:

- dreading occurs but is clearly in response to the presence of a natural predator (e.g. gull, crow, heron); or
- dreading occurs but is clearly caused by weather (e.g. thunder) or sea state conditions.

7.2 Noise monitoring

Noise monitoring equipment is installed in two locations on the bridge – on the North Main Tower at pierhead level, and on the North Side Tower at ground level. This equipment will be operational throughout the tern breeding and passage season i.e. 1 May to 30 September. As set out in the CNMP, when there are works ongoing within 400m of Long Craig Island during the breeding and passage seasons, the data will be sent to Marine Scotland and NatureScot on a monthly basis, together with tern counts, as set out in Section 7.3. This will enable trends in tern activity in response to specific construction activities and noise levels to be identified.

7.3 Tern colony monitoring

During the tern breeding season of the first year of the licence (1 May 2022 to 15 August 2022), the ECoW will undertake counts of the number of adult terns on Long Craig Island. Where possible, counts will be taken three times daily, spaced throughout the day. This may not be possible where no works are scheduled within 400m of Long Craig Island and therefore an ECoW is not required. With terns being active throughout all but the short period of darkness during summer, the true peak number of birds would likely be captured at night, however undertaking regular counts throughout the day will enable a daytime peak number of birds to be recorded. The highest count of the day will be recorded as the daily peak count.

Counts will be undertaken from an appropriate vantage point identified by the ECoW using a scope and binoculars. Data will be recorded using standard BTO species codes.

During the Sandwich tern passage period, where possible, the ECoW will undertake counts of terns on Long Craig Island and at Port Edgar Marina, as deemed appropriate based on professional judgement.

Additional information relevant to tern behaviour will also be recorded, for example the arrival and departure dates of terns at the start and end of season, the presence of other bird species on the island, the presence of predators (birds, mammals or human) in the vicinity, and anything else the ECoW deems noteworthy that may provide further insight into tern behaviour.

As noted in Section 4.3.3, regular monitoring data will be issued to NatureScot monthly during the tern breeding and passage periods. In addition, if a stop works instruction is issued or if the ECoW identifies other changes of concern, NatureScot will additionally be notified as soon as possible, within the day.

Undertaking intensive monitoring of the colony during the first year of the licence duration will enable a good understanding of the terns' general behaviour and response to potential disturbance to be compiled. This information will be used to review and update the requirement for ongoing monitoring and ECoW presence in subsequent years, in agreement with NatureScot.

7.4 Data sharing

Given the current and historic importance of Long Craig Island for the UK's tern populations, and the rarity of roseate tern in particular, it is considered that the dataset compiled by the monitoring set out above will be of substantial value in nature conservation and informing mitigation requirements and construction methods for other similar developments. As such, the daily counts and noise records will be shared with the BTO and SWT at the end of each year for the five-year duration of the Marine Licence.

8. Summary

This SMP sets out the mitigation and monitoring that will be implemented during the Proposed Works to safeguard the conservation objectives of the Forth Islands SPA and Firth of Forth SPA/Ramsar and ensure no adverse effects on site integrity, as required by the HRA process. This is required specifically in relation to passage Sandwich tern of the Firth of Forth SPA/Ramsar, and breeding terns of the Forth Islands SPA.

The conservation objectives for the sites centre around avoiding deterioration of the habitats of the qualifying interests, including their distribution, structure, function and supporting processes; avoiding significant disturbance to the qualifying interests; maintaining in the long term the distribution of the species and thus the population of the species as a viable component of the site, all of which in turn contribute towards the maintenance of site integrity.

The primary means of avoiding significant effects during the breeding season is the implementation of an exclusion zone around Long Craig Island. In addition, a suite of measures to reduce the likelihood and severity of impacts is proposed, including a soft-start process, encapsulation of works, and prohibiting access to the island.

A programme of intensive noise monitoring and tern counts is proposed for at least the first year of works when works are taking place that could potentially disturb breeding or passage terns. In addition, an ECoW is present daily during the 2021 tern breeding season at Long Craig Island. The information collated as part of initial monitoring will be used to inform and, where possible, target the requirement for ongoing monitoring and ECoW presence, and this SMP updated accordingly, in consultation with NatureScot. Sharing of the data collated is identified as an important contribution to ongoing conservation efforts in relation to roseate tern, and to better scientific understanding of disturbance responses of terns to construction activities on the Firth of Forth.

This SMP will form part of the contract documents for the Proposed Works in order to ensure the environmental commitments relating to protection of European and Ramsar sites are delivered effectively.

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