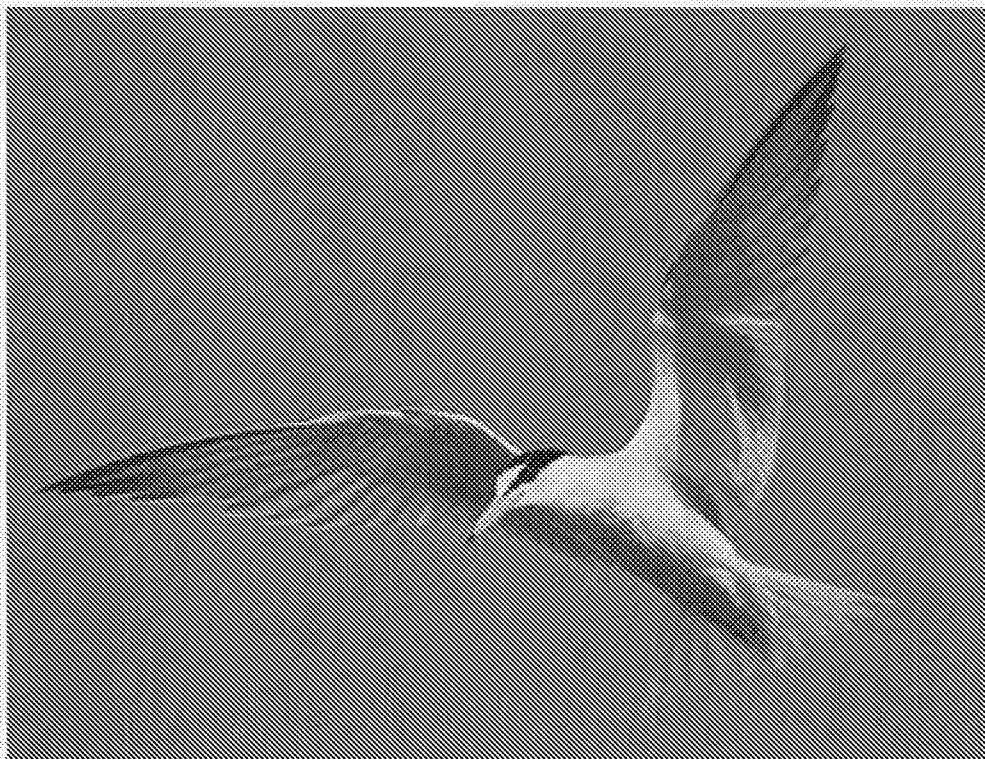


Pagham Harbour little tern nesting islands and shingle spits as compensatory nesting habitat

Application No: 19/02257/DOC Proposal: Discharge of Conditions 1 to 14 of planning permission
SY/15/03053/FULEIA.: Managed Breach Pagham Harbour West Sussex

Updated October 2019

version 2
Tim Callaway
(28/10/2019)



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Summary of revised proposal for compensatory breeding little tern habitat

It is accepted that all parties involved in considering the various planning permissions and applications, in regard to planning permission SY/15/03053/FULEIA (Managed Breach Pagham Harbour West Sussex), seek to achieve a successful outcome for people and for the designated features of Pagham Harbour LNR and SPA and SSSI (part of the Solent Maritime SPA and SAC)

Application 19/02257/DOC seeks to deliver the breach work and the compensatory little tern nesting habitat (included in planning permission SY/15/03053/FULEIA) in two phases and in two different time periods.

The decision to submit this application has been done with the support of the Pagham Coastal Issues Advisory Group (PCIAG) and the involvement of and support of RSPB and has been informed by:-

- The recent changes in growth of the spit
- An improved understanding of the processes occurring at Pagham Beach and around the distal spit and breach area
- A review of the successful techniques to create new little tern nesting habitat and the protection of little tern breeding colonies at both Pagham Harbour and other sites along the South Coast

The method statements originally drawn up in the planning permission SY/15/03053/FULEIA, detailed core engineering works occurring outside of the breeding season (1st April until mid-August, dependant on all little tern chicks having fledged) and avoiding the main period for wintering waterfowl (1st November until 31st March).

The revised proposals included in App No: 19/02257/DOC, in RSPB's opinion have the potential to deliver improved little tern compensatory habitat, both in the design and construction and in the future management of fences and vegetation.

The programme of works are designed to occur in two phases, with the little tern compensatory nesting habitat delivered first:-

- Phase 1 — Removal of shingle from the existing breach area to complete the new compensatory little tern nesting habitat at the concrete revetment spit. The time period for this works was suggested at 1st March – 31st March but this work would best be delayed until 15th March to 15th April 2020.
- Phase 2 –Removal of material to complete cut and infill the longshore channel, to completion of the project. 1st September to 31st October 2020.

The following report seeks to refine the delivery of the required compensatory little tern nesting habitat and address the concerns raised by both Natural England and Chichester District Council's Environmental Officer, specifically in relation to the creation of compensatory little tern nesting habitat and other mitigation projects.

The key concerns addressed relate to :-

1. Changes to the timing for construction (Condition 11)
2. Changes to the access routes, construction phasing and construction footprint. (Conditions 9 and 11)
3. Changes to the proposed compensation habitat. (Conditions 5 and 8)
4. Perceived removal and reduction to mitigation measures for the existing little tern habitat (signage, fencing, wardening, exclusion areas) and the management of these areas in the future (Conditions 7)
5. Construction management plan and watching brief (Condition 13)
6. Details of the future management plan for little terns within Pagham Harbour, including the compensatory habitat.
7. Proposals for future management and monitoring and how volunteers will be used to monitor and control

Summary of actions

Condition 11 – The suggested timings of works were chosen to complete the compensatory nesting habitat before the start of the 2020 gull and tern breeding season and to avoid the key part of the overwintering wildfowl and wader period.

Based on the successful project in 2018 on 'Tern Island' and the surrounding Church Norton Spit area to benefit breeding terns and a review of the tide tables for 2020, it is the RSPB's view that the proposed timing of the works should now start in the second half of March and complete in the first half of April 2019, which would also avoid the main spring tides.

NE will be aware of consent given in 2018 for the Pagham Harbour Tern Island project to 'mechanically' manage shingle and install approved anti-predator fencing. This work was consented to be active from mid-March to mid-April, with the resulting benefit that the newly created shingle nesting habitat was available at the optimum time for arriving breeding terns. The protocols agreed as part of the consent, can easily be adapted and the subsequent bumper breeding season in 2018 for all tern species at Pagham Harbour, is testament to the success of this approach. Similar experiences have been observed at Langstone Harbour.

Condition 9 and 11– The Construction Management Plan and access along Church Norton Spit is based on the methodology used for the project in 2018 to improve Tern Island for breeding terns. The revised plans seek to reduce the direct damage to vegetated shingle and mitigate impacts both on the shingle features and any potential disturbance to wintering and breeding SPA features by agreeing specific haul routes (on site with RSPB and NE), use of specific vehicles to reduce the number of vehicle movements from the breach to the mitigation concrete revetment and minimise vehicle movements to and from Church Norton car park. There will also be less impact on the vegetated shingle due to removal of the requirement to dig a channel across the concrete spit and therefore no impact on any underlying geology or archaeology.

Conditions 5 and 8 – Revised design of the compensatory habitat

The report below and revised details, provide the reasoning and justification for the modifications of the proposed compensatory little tern nesting habitat. This is based on specific experience at Pagham Harbour and from wider examples from the EU LIFE little Tern project. Specific RAMS (Risk Assessments and Method Statements) will be produced with the chosen contractor and to the satisfaction of RSPB and NE.

Condition 7 – mitigation measures for addressing little tern nesting activity should suitable nesting habitat develop at the distal end of Church Norton Spit.

The little tern management plan (included in the revised Pagham Harbour LNR management plan) will continue to include measures (carried out with the support of the Pagham local community

team) to protect nesting little terns should they nest on any suitable shingle 'spits or islands' that begin to develop above MSHW at the distal end.

Condition 13 – methodology and information to deliver the required watching brief to oversee the works during the breeding season and the start of the wintering bird season is provided in Appendix 1 - Pagham Harbour Managed Breach - Discharge of Conditions 1 to 14 (Condition 13) of planning permission SY/15/03053/FULEIA -Pagham Harbour LNR Construction Works Watching brief and management/mitigation October 2019

Volunteers and future management and monitoring. - RSPB Pagham Harbour currently has 105 volunteers, led by a Volunteer Coordinator and giving approximately 6,800 hours per annum. There is a strong practical management and survey/monitoring team and reserve staff and the volunteer coordinator will work with PFDCIC to develop any of additional volunteers to support work for little terns.

Management Plan - All management and monitoring works for little terns as part of the compensatory works are included in the RSPB Pagham Harbour LNR Management Plan (2019 – 2024) currently being updated and out for public consultation

1. Background to little terns in Pagham Harbour and the design of compensatory habitat

Pagham Harbour currently supports a re-establishing population of little tern and represents just over 20% of the Little tern breeding population for the Solent (Hurst Spit to Pagham Harbour). During the 1970s to the mid 1980s the site supported up to 75 pairs, but by 1990 they had ceased to breed in the harbour.

Little terns began to re-colonise from 2007 when 8 pairs raised 5 chicks. This recolonization appeared to be in response to the presence of new suitable shingle nesting habitat with the growth eastwards of the Church Norton Spit.

The area of the Church Norton Spit used by the colony during 2012 - 2015 was approximately 175m by 60m, with most of the nests found in an area of 155m by 25m (c 0.38ha).

However, this nesting habitat on the shingle ridge is extremely exposed and vulnerable to severe weather or tides and disturbance.

The existing 'Tern Island' in Pagham Harbour is c 0.4ha and much more secure from disturbance or to severe tides or weather event. However, for much of the preceding decade, most of the island was unsuitable for nesting little terns. Less than half of the island was cleared of vegetation (to create bare shingle attractive to nesting little terns) and the nesting habitat on Tern Island was more suitable for nesting black-headed gull and common tern. The lack of an effective anti-predator fence also limited the success of any breeding terns.

From 2014 - 2018, a programme of works, to better understand the needs of nesting little terns and improve their productivity, has been carried out in Pagham Harbour as part of the national EU LIFE Little tern project coordinated by RSPB.

The EU LIFE project at Pagham Harbour focused on restoring 'Tern Island' to optimum tern nesting habitat, to help secure the little tern colony by attracting nesting little terns away from the vulnerable main shingle spit. The little tern colony has increased to just over 20 pairs and is now averaging 0.7 chicks per pair required for the colony to be (see Fig. 1). This has been achieved by the creation of suitable areas of nesting shingle, the use of decoys/little tern call lures and the installation of new anti-predator fencing for Tern Island along with the use of temporary anti-predator fencing at other sites within the harbour.

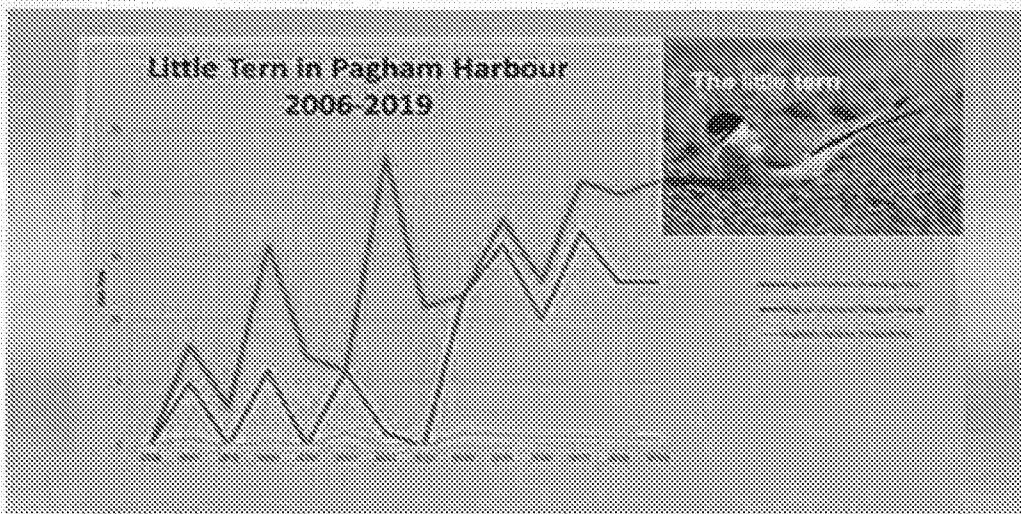


Fig 1. Population re-establishment of little terns at Pagham Harbour 2006 - 2019

The proposal to create a new tern nesting area within the harbour and off Church Norton Spit, further compliments and adds to the understanding and legacy of the EU LIFE Little tern project. The EU LIFE Little tern project in Pagham Harbour has also benefited other important breeding birds of shorelines, especially Sandwich tern (see Fig. 2).

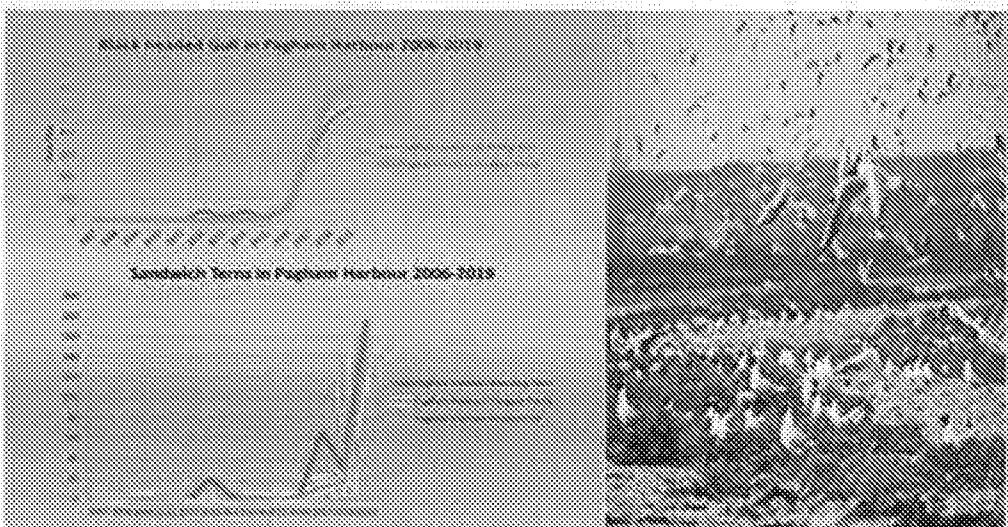


Fig. 2 – Colonisation of Tern Island Pagham Harbour by breeding gulls and terns after nesting habitat creation and effective ground predator fencing 2015 - 2019

2. Compensatory little tern nesting habitat - 'The Concrete spit'

The successful establishment of Tern Island as a mixed colony of terns and gulls has helped further inform and develop the revised design of the necessary compensatory little tern nesting habitat.

Any compensatory nesting habitat created on the 'concrete revetment spit' will include the main little tern nest site selection criteria:-

- New shingle
- More sheltered from tidal flooding and storms and winds.
- Surrounded by tidal waters for most of the perimeter
- More secure from opportunistic ground predators
- Reduced accidental/intentional human disturbance.

1. Location and aspect

The nature of the 'concrete spit' in Pagham Harbour (refer to Fig 3 and Fig 4) has some similarities with the 'Oysterbeds', West Hayling LNR which proved very attractive to little terns in the early 2000s, before erosion of the outer banks and colonisation of the Oysterbeds by an increasing colony of black-headed gulls.

- The concrete spit is sheltered within the harbour, but is in close proximity to open sea
- Adequate flows of water around the current concrete spit which reduce the risk of siltation
- The major extent of the spit is surrounded by water (Broad Rife) even at MLW neap tides
- Reduced exposure to the extent and fetch of most tidal water to minimise erosion.
- Potential for the public to see the breeding and roosting birds without causing disturbance.



Fig 3: Location of proposed site to create a new little tern nesting spit/islet on the Church Norton side of the harbour. This is the site of the 1910 breach and includes old concrete revetments from the previously installed training wall overlying a bed of shingle.



Fig 4. View of the concrete revetment (spit) at Pagham Harbour looking north west towards Norton Church

2. Size, shape and profile (see Fig 5)

- Minimum of 0.3ha in size (15m - 25m x 160m)
- Minimum width of 10 - 20m with a flat top ridge.
- Natural shape (elliptical or kidney shaped)
 - Shallow profile (1 in 3 slope) on exposed side
 - 'Flat topped' with simple shingle ridge to leeward side
 - Steeper profile on sheltered sides or along new channels (1 in 1 slope)

3. Height above sea level (see Fig 5)

- Mean height of the 'flat top' of the spit c. 3.75m ODN (c1m above MHW)
- Max height of ridge at 4.00m ODN

4. Open water around the island

The concrete spit is currently surrounded by tidal waters on at least 90% of its perimeter.

Small ridges and spits linked to the shoreline, with a suitable shingle nesting substrate have proved very attractive to little terns, both locally, eg. The Oysterbeds – West Hayling LNR) and on many of the East Coast beach colonies from Great Yarmouth to Scolt head.

In fact, recent evidence and assessments as part of the EU LIFE Little Tern project (in publication), clearly indicates that shingle ridges and spits, away from the main beach and protected from disturbance and predation, can hold the most successful and sustainable colonies.

It is therefore preferable (if shingle can be won from the breach works) not to separate the concrete spit from the main shingle bank by cutting a new channel (c 10m wide at the base and 1:1 slope) and creating a small spit 'island' (see Fig 5)

5. Surface finishing (topography and shingle capping)

Shingle capping - cover and infill around the concrete sheets and re-profile the edges of the new nesting habitat to reduce erosion and discourage rapid plant colonisation.

The preferred nesting surface for little terns should include a mixture of shingle, graded through 4 mm to 100 mm, but with a high proportion of finer materials on the top preferred nesting areas.

(See Fig 6)

Average depth of the shingle covering is estimated at 0.3m.

The amount of shingle needed (depending on the extent of infill around the concrete sheets), is estimated at between 1,900 and 2,000 cubic metres.

This amount of shingle can easily be won as part of the revised works to cut the main Church Norton Spit.

Cutting the concrete revetment spit off from the main shingle bank by creating a new channel would therefore not be necessary.

As previously outlined, separating the compensatory little tern nesting habitat from the main Church Norton Spit, could actually be counter-productive as regards creating sustainable little tern nesting habitat.

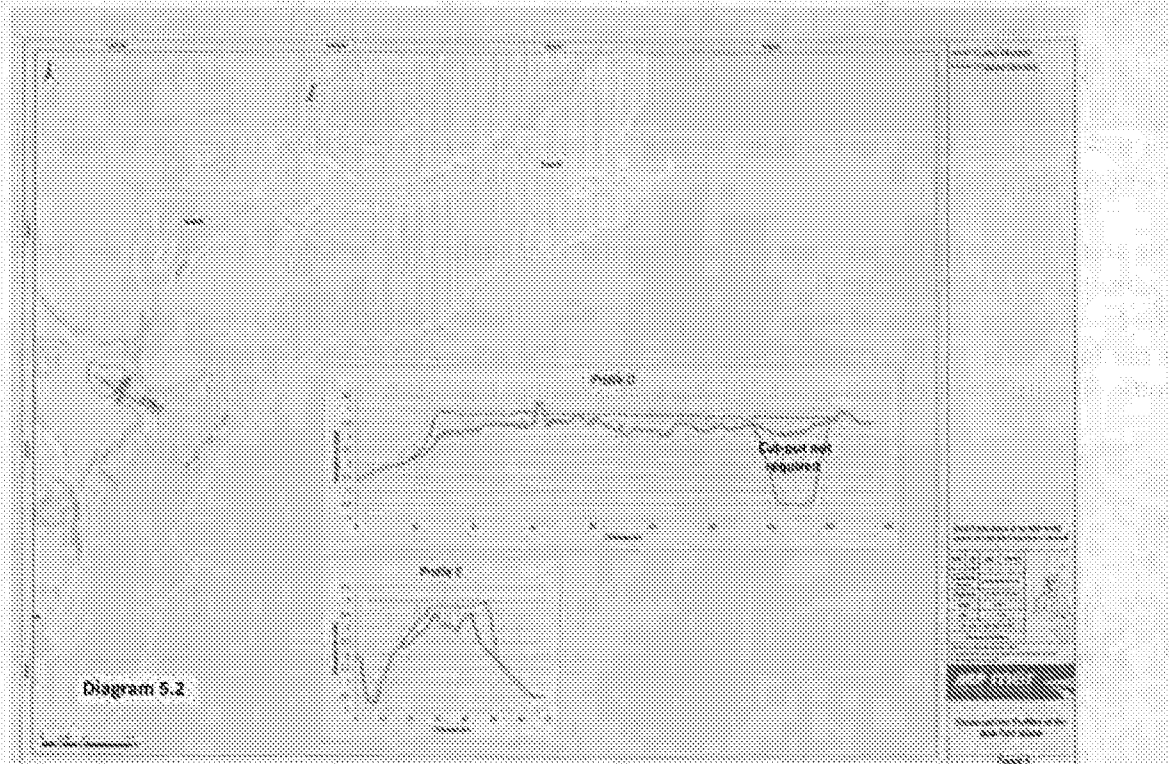


Fig 5 – Profile and elevation of finished little tern compensatory nesting habitat (metres ODN) on the 'concrete revetment' spit, Pagham Harbour

Fencing

A predator proof fence will be erected around the new nesting habitat. This will be a similar 'combination stock netting and electric wire' fence to that installed in 2018 around the perimeter of Tern Island (see Fig 6). The fence line will follow the MHW tide mark of the newly profiled spit.



Fig 6. – Predator fence and shingle nesting habitat just after installation (Tern Island Pagham Harbour - April 2018)

The area enclosed by the predator fence will be approximately 3.4ha and the perimeter of the fence approximately 410m (see Fig 7).

The fence design consists of stock type netting (50mm x 50mm) which will be hinged at the base so it can form an outward extension (max 600mm) on the ground to prevent predators from digging under. The stock netting part of the fence will be 1600mm high. (See Fig 8).



Fig 7 – Approximate position of new predator fence to be erected once the works to the concrete revetment have been completed

There will be four electric strands with the first at 650mm from the ground in order to prevent shorting out on vegetation or exceptional high tides. The final top strand will extend outwards on brackets to create an overhang in order to prevent a fox from jumping over the fence or a predator climbing the fence. The entrance to the fenced area of the new nesting habitat will have small fox proof gate for access purposes during the breeding season and a 10 metre section which can be removed to 'open' the spit outside of the breeding season. A suitable membrane will be placed at the base of the fence to reduce the risk of vegetation growth under the electric strands.

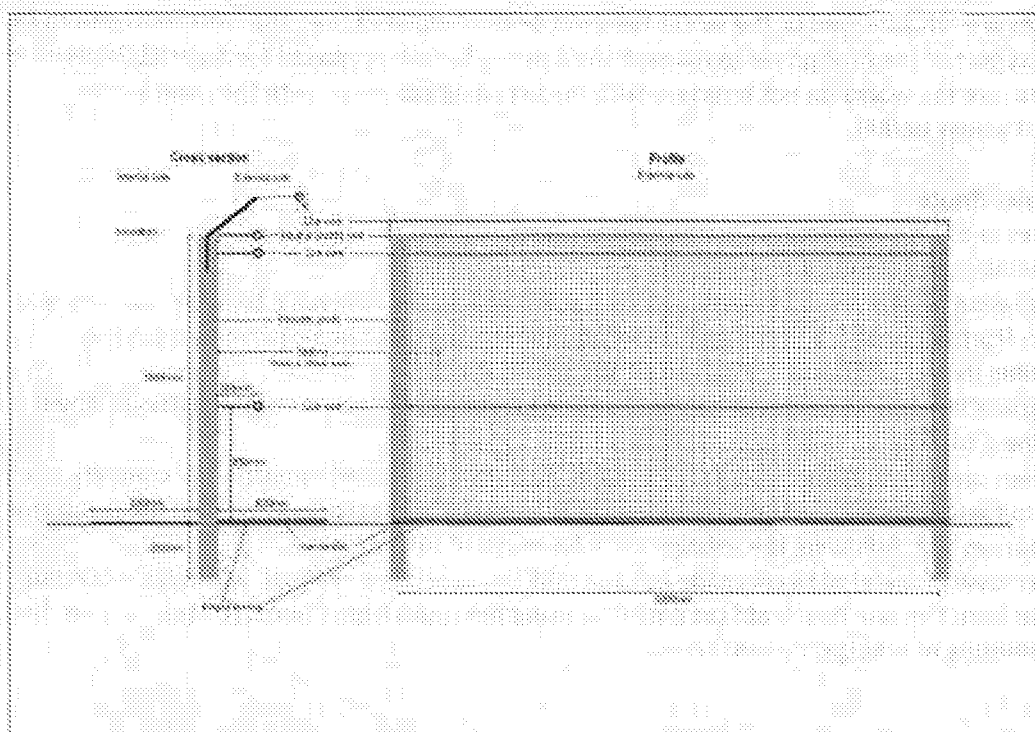


Fig 8. – Design of predator fence perfected at Pagham Harbour

6. Timing of works

The best time to carry out the work to create new nesting habitat and install the predator fence, based on previous works of a similar nature in both Pagham Harbour and Langstone Harbour would appear to be late March to early April.

Choosing this time period avoids the main winter wildfowl and wader season and will also allow the works to be completed before the arrival of prospecting terns in the second half of April.

It is proposed that works start with site set up in the week commencing 9th March 2019 and are completed by the end of the week commencing 30th March 2019.

Week commencing	Activity/project	Comment
09/03/2019	Mobilisation to site and set up site compound	Church Norton car park
16/03/2019	Remove shingle from around core areas of existing breach, cart to 'concrete revetment' to create new tern nesting habitat	Precise access and haul routes (sensitive to site features) marked out with contractors
23/03/2019	Install predator fence and complete shingle profiling	Fence installed after shoreline profile of spit completed
30/03/2019	Site tidy up/de-mobilise site and compound	Contingency plus routine preparation works for breeding season

This time period avoids the highest spring tides (9th March to 13th March 2019) and includes a contingency for overrun of minor works into the first half of April 2019. This will allow completion of the project and also the final elements of the routine habitat management to prepare both Tern Island and the new compensatory nesting habitat for the arrival of breeding terns.

This period also accommodates the start of the main nesting period for black-headed gulls and Sandwich terns at the end of April.

If these dates are not achieved or the works have not been completed then the work will need to be completed as part of the final phase to manage the existing breach proposed for Augusts/September in 2020 to ensure the works do not interfere with the breeding season or with the main winter wildfowl and wader period.

7. Access Route

Access routes and the works footprint are shown in Fig 9.

Two main initial access points are proposed.

Phase 1 – creation of compensatory tern nesting habitat will primarily involve bringing machinery in from Church Norton car park and the end of Rectory Lane. It may also be possible to cross the breach channel over to or from the Pagham village side at low tide

The route from Church Norton car park follows existing tracks down the site of the harbour, down the spit to the end.

Once the main construction machinery is located on site, it will be based opposite the concrete revetment spit and will only use the designated route from the concrete revetment to the distal end of Church Norton Spit, following the existing track for much of this route.

Phase 2 – Removal of material to complete cut and infill the longshore channel, will involve bringing machinery in from Pagham Beach old car park only using the route from Church Norton car park for routing monitoring or emergency exit/access.

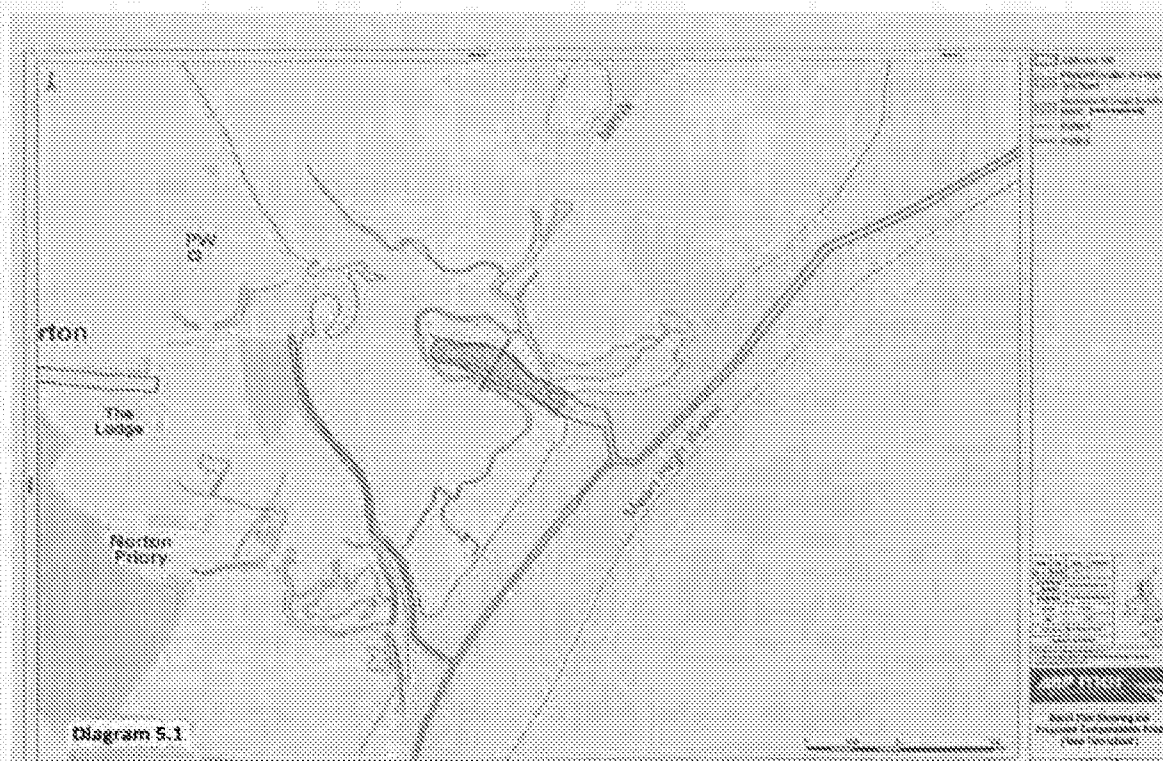


Fig 9 – Location of little tern compensatory habitat works footprint and main access routes – Pagham Harbour

8. Use of tape lures and little tern decoys

Little tern decoys and tape lures will be deployed in the spring on the newly created shingle habitat on the concrete revetment to help attract little terns to the nesting areas.

3. On going management

1. Vegetation

Annual management of vegetation will be required to maintain ideal nesting habitat for little tern, as it is on the existing 'Tern Island' in Pagham Harbour and at the Oysterbeds and main islands in Langstone Harbour. Some 'broad-leaved' annual shingle vegetation (e.g. Sea Blite) can be beneficial as it is often used for shelter by little tern chicks. (see Fig. 10)

Grassy vegetation (e.g. Sea Couch) and perennial shingle vegetation (Sea Beet, Sea Purslane, etc.) will be controlled annually to reduce the attraction of the new island to nesting gulls and to prevent grassy vegetation which holds moisture after rainfall and can make sheltering downy chicks more susceptible to hypothermia.



Fig. 10 – Nesting tern and gull colony after nesting habitat creation works and installation of new combination predator fence - Pagham Harbour 2018

Vegetation management of Tern Island and the new Concrete revetment Spit should be focused on creating optimum tern nesting habitat and discouraging large numbers of nesting gulls.

The new anti-predator fence will also be 'opened' after the end of the breeding season and only 'closed' in mid-April, just in time for the arrival of prospecting little terns, which will benefit little terns. RSPB will also continue to actively encourage gulls to nest, away from the main little tern sites in Pagham Harbour by ongoing management of the new islands in Medmerry.

Both black-headed gulls and Mediterranean gulls (whilst they will nest on bare shingle islands) prefer to nest on vegetated shingle selecting locations with denser vegetation than little terns prefer or at higher elevations in the upper saltmarsh or even coastal grassland.

The artificial islands at Medmerry total approximately 4 hectares and are designed to attract both species.

2. Mitigation measures for the remaining distal spit

Conservation efforts for little terns in Pagham Harbour will continue to be highly managed. If suitable ephemeral habitat that little terns would naturally utilise becomes available under coastal process, appropriate habitat management will be implemented to hopefully provide additional opportunities for breeding little terns.

The geomorphological changes that have occurred around the distal end of the spit since the spit breached on high tides in 2017 have seen the evolution of a number of ephemeral shingle banks and islands. However, these shingle features have, to date, not evolved to replace the previous little tern nesting habitat at this end of Church Norton Spit and there has been further losses of shingle features that are above 2.75m ODN that could potentially be used by nesting little terns.

The request was not to remove the condition around managing the remaining shingle habitat after the breach has occurred, but rather to modify this mitigation to recognise that it is not intended to encourage little terns to nest in this area. This is due to the low-lying nature of the ephemeral shingle habitat around the breach (less than 2.75m ODN) and, particularly on the Pagham Beach side, the difficulties in managing the high public recreational pressure and the easy access for foxes and other ground predators.

RSPB staff have monitored this area for potential prospecting little terns since 2007.

As part of the mitigation for the 'Managed Breach' (SY/15/03053/FULEIA), the RSPB, working with volunteers and PFDCIC, will continue monitoring of this area during the breeding season. If little terns attempt to nest anywhere around the breach, RSPB with the support of the existing volunteer team and PFDCIC, will erect suitable signage and install sections of temporary anti-predator fencing to help protect any little tern nests. (see Fig 11)



Fig 11. – Indicative temporary anti-predator fencing and signage to be erected around little tern nesting sites should little terns attempt to nest on suitable ephemeral shingle habitat occurring away from the compensatory nesting habitat

3. Breeding Seabird Biosecurity Plan

The RSPB has a breeding Seabird Biosecurity plan agreed for all its reserves that support important breeding seabird populations. The current Pagham Harbour LNR management plan is being updated to include the proposed new concrete spit nesting site.

Known predator risks at Pagham Harbour currently being monitored by observation and use of nest and 'fence' cameras are:-

Fox –

- Anti-predator fence was up graded to meet suggested specification in 2015
- Nest and 'fence' cameras widely deployed to identify and monitor fox activity (cameras in 2015 showed foxes test the fence after storms and exploit any weak points)
- 'Concrete' spit island will have seasonal anti-predator fencing installed.

Rats/mice-

Rats are present in the area, but have not been recorded recently out on the bare shingle of the spit or on Tern Island, but have been recorded along the strand line

- Use of monitoring points (mammal tunnels and chew sticks)
- Active control of identified with recognised pest control agency (currently working with ADC)

Surveillance

A number of different methods are used to detect both rodents and foxes:

- a. UV monitoring chew blocks – both on the island and spit
- b. Cameras – primarily on island due to the risk of theft
- c. Tracking Tunnels – both on the island and spit
- d. Live traps – use on island to establish small mammals on island
- e. Check the mudflats for visible signs
- f. Thermal imaging cameras

Other potential known predators

Corvids – carrion crow and magpie forage on the shingle banks and islands but, have not been observed attempting to predate nesting little terns.

Large gulls – a range of gulls, either breed (black-headed gull, Mediterranean gull) or are present in the harbour, but do not appear to predate nesting little terns to date.

Kestrels breed locally and routinely hunt nearby grassy banks, upper saltmarsh and areas of vegetated shingle.

In 2015 a male Kestrel provisioning a female and chicks near Pagham was seen occasionally hunting the area around Pagham spit and was observed predated an adult little tern. This seemed to be entirely opportunistic and neither the male or female were observed regularly in the area of the colony, despite hunting the grassy sea wall nearby.

- Kestrel activity is routinely monitored by observation around the colony and nearby possible nest sites located in the spring
- Diversionary feeding will be attempted if the colony is located by kestrels feeding nearby young.

4. Volunteers

RSPB Pagham Harbour currently has 105 volunteers, led by a Volunteer coordinator.

The volunteer team contribute approximately 6,800 hours per annum.

Volunteers support the reserve in various ways.

Existing volunteer teams include:-

- Practical reserve management - Monday and Wednesday (plus a new group at the weekends to tend to the newly refurbished Discovery Area)
- Monitoring and surveying
- leading guided walks
- Family and Children Events
- Schools on reserves and education delivery
- General odd-jobs and maintenance

There are a strong practical management and survey/monitoring teams that work with rotas and work programmes to assist with all areas of reserve work.

The Volunteer Coordinator (a volunteer himself), organises the recruitment and induction of the new volunteers, including coordinating any student work experience placements. The volunteer coordinator and reserve staff will work with PFDCIC on the development of additional volunteers to support further work for little terns.

The volunteers receive quarterly newsletters, with articles predominantly written by staff, updating them on all aspects of the reserve.

5 Management Plan

All management and monitoring works for little terns as part of the compensatory works are included in the RSPB Pagham Harbour LNR Management Plan (2019 – 2024) currently being updated and out for public consultation

Tim Callaway

28/10/2019

Annex 1

**Pagham Harbour Managed Breach:
Discharge of Conditions 1 to 14 (Condition 13)
of planning permission SY/15/03053/FULEIA
Pagham Harbour LNR
Construction Works Watching brief and management/mitigation
October 2019**

Introduction and Background

Pagham Flood Defence Community Interest Company PFDCIC) has recently submitted an application (App No: 19/02257/DOC) to deliver the breach work and the compensatory little tern nesting habitat (included in planning permission SY/15/03053/FULEIA) in two phases in two different time periods.

The decision to submit this application has been done with the support of the Pagham Coastal Issues Advisory Group (PCIAG) and the involvement of and support of RSPB and has been informed by:-

- The recent changes in growth of the spit
- An improved understanding of the processes occurring at Pagham Beach and around the distal spit and breach area
- A review of the successful techniques to create new little tern nesting habitat and the protection of little tern breeding colonies at both Pagham Harbour and other sites along the South Coast
- Planning permission start before the end of June 2020

The method statements originally drawn up for operational management (included in planning permission SY/15/03053/FULEIA), detailed core engineering works occurring outside of the breeding season (1st April until mid-August, dependant on all little tern chicks having fledged) and avoiding the main period for wintering waterfowl (1st November until 31st March). The main period of works, outlined in the original planning permission, was timed to occur from mid-August until the end of October and to occur in one stage.

The revised proposals included in App No: 19/02257/DOC in RSPB's opinion have the potential to deliver improved little tern compensatory habitat, both in the design and construction and the future management of fences and vegetation (see **Pagham Harbour design of little tern nesting islands and shingle spits as compensatory nesting habitat – October 2019**).

The programme of works are designed to occur in two phases, with the little tern compensatory nesting habitat delivered first:-

- Phase 1 — Removal of shingle from the existing breach area to complete the new compensatory little tern nesting habitat at the concrete revetment spit. The time period for this works was suggested at 1st March – 31st March but this work would best be delayed until 15th March to 15th April 2020.

Methods of working

Construction works have the potential to impact (primarily through physical disturbance) both wintering waterfowl and breeding birds using the intertidal shingle and saltmarsh of Pagham Harbour LNR SSSI/SPA.

Engineering works will be programmed and carried out to ensure:-

- Main construction works are completed outside of the main breeding season (15th April – 15th August) and by 31st October, before the main influx of wintering waterfowl.
- The majority of the immediate saltmarsh and mudflats will be undisturbed by construction activities to provide secure feeding and roosting areas for wintering birds and provide ample shingle nesting habitat for any early ground nesting birds. Care will also be taken to avoid incidental disturbance to these areas during construction works.
- Haul routes are designed and positioned to reduce disturbance to wintering birds. The routes are strictly adhered to and any essential lighting areas are restricted to the compounds.

Management of works

- All works shall be carried out in accordance with the NE consents/licences.
- Access to the construction areas will be via the haul routes agreed on site to minimise disturbance to the designated features.
- Any deviation from the access routes, except in an emergency evacuation, will need to be agreed by RSPB.
- Potential disturbance to wintering waterfowl and any breeding shorebirds will be managed by:-
 - a. Programme of works ensures at least one 'refuge area' of greater than 50ha within 500m of works footprint.
 - b. Routine breeding season management for the existing tern nesting areas (Tern Island and New Island) will be carried out to avoid disturbance to these areas during construction works
 - c. Works to be restricted to daylight hours only - to prevent disturbance to roosting wintering waterbirds particularly Brent geese.
 - d. Artificial lighting to be restricted to entrance and site compound areas or for use only in the event of an emergency or Health and Safety incident (use of low level task lighting for machinery maintenance or localised, small scale construction works will be acceptable) – to reduce incidental lighting of the SPA and resultant disturbance to wintering waterbirds particularly roosting Brent geese.
 - e. Keeping to agreed access routes away from the edge of the harbour and reducing 'skylining' - to reduce incidental disturbance to wintering waterbirds particularly roosting and feeding Brent geese.
 - f. Working around high tides to be adapted in response to high tide roosts of wintering and passage waterbirds - to reduce any possible impacts on high tide roosts of wading birds.

Monitoring during construction works March 2019 – April 2019

- RSPB to conduct daily watching brief of construction operations in relation to potential for early nesting by breeding birds.
- RSPB to conduct Monthly Wetland Bird Survey in Pagham Harbour

Monitoring during construction works September 2020 – November 2020

- RSPB to conduct twice weekly watching brief of construction operations in relation to distribution of both feeding and roosting waterbirds.
- RSPB to conduct Monthly Wetland Bird Survey in Pagham Harbour

The following steps are required for the programme of works and to finalise agreement of working methodology from RSPB and NE

- Site visit with RSPB, PFDCIC and contractor.
- Draft methodology, based on RSPB advice to NE for review.
- Methodologies signed off by PFDCIC and RSPB (includes RAMS).
- NE approval
- MMO approval.

Tim Callaway 27-10-2019

Annex 2

1. Summary of RSPB report on 'island and spit design for breeding terns'
2. Natural England preliminary comments on RSPB's draft information regarding the proposed compensation provision of a little tern island
25th April 2016

1. RSPB Summary report on design of islands and spits for breeding terns

'Artificial' shingle islands and 'spits' have been used locally by little terns, eg the Oysterbeds in West Hayling LNR, and the M27 'gravel stockpiles' and more recently the re-worked areas of 'Tern Island' in Pagham Harbour.

There is an apparent lack of published information on the design and subsequent success in attracting breeding terns and gulls of constructed islands or spits in coastal waters and Managed Realignment sites. However, as part of the Medmerry Managed Realignment design process, a review of the available information was undertaken and some basic design principles for constructed islands were developed in consultation with various RSPB staff (Malcolm Ausden, Chris Cockburn, Jim Glover, Tim Callaway) and Mark Dixon. The design concept used was based on natural islands and spits along the South Coast (primarily Langstone and Pagham Harbours and Keyhaven to Lymington Marshes) supporting breeding terns. These simple principles of design have been further investigated and trialled as part of both the EU LIFE Little Tern project and the EU LIFE Roseate Tern project. (RSPB in publication).

In summary:-

- The islands varied greatly in size, aspect and profile.
- Higher areas of shingle ridges (c0.6 m above HAT) were important for nesting terns
- The smallest tern nesting islands were approximately 0.1 ha and 0.4 ha at HAT in total, but the larger islands could support between 300 – 400 breeding terns and gulls.
- Larger more established islands were often dominated by larger mixed tern and gull colonies which ultimately lead to abandonment by little terns
- 'New' areas of shingle on islands or spits were most attractive to little terns.
- Little terns will nest at high densities (< 1 nest per 10m²) but a suggested ideal density might be closer to c. 1 nest per 50m²

2. Natural England preliminary comments on RSPB's draft information regarding the proposed compensation provision of a little tern island - 25th April 2016

- 1.1 The purpose of this document is to help secure sufficient certainty that little terns will use the proposed island. The RSPB agreed to look at the proposal for the little tern island and their comments are provided in Annex 1. Our initial comments below are based on that information. The RSPB has extensive experience of managing this little tern colony on site and are critical in specifying what is required.
- 1.2 The proposal is to use the old concrete revetment on the Church Norton side of the harbour to create a new little tern island. See Annex 2 for a map of the location and a photo of the current situation.
- 1.3 The design note from the RSPB usefully includes much of the information on: island shape, size, profile, height and surface finishing, etc. It also includes information on potential means of attracting little terns to the new island and management measures that may be required. We consider the report is thorough in its approach to creating tern-nesting habitat. It is also really useful to have had the input from Mark Dixon and Malcolm Ausden of the RSPB review the available information and development of the basic design principles for constructed islands undertaken as part of the Medmerry Managed Realignment design process, as well as the experience of Tim Callaway and his knowledge of the site and other adjacent colonies.
- 1.4 The RSPB could helpfully clarify what evidence has been used to inform the decisions on the various dimensions of the island.
 - There is a study that looked at the effect of island size etc. on nest selection of little tern:
https://www.jstor.org/stable/23355828?seq=1#page_scan_tab_contents
 - There are a number of reviews in Conservation Evidence on the effect of artificial islands, including at least one on substrate and vegetation, and how to encourage nesting through decoys etc.:
<http://www.conservationevidence.com/actions/480>

1.5 The note helps outline prescriptions for creating little tern nesting habitat and might help identify the level of risk associated with creating and managing this type of habitat (akin to off-setting guidance for habitats).

1.6 One of Natural England's colony managers (on the offshore island of Black Law) has reported that little terns were attracted using tape lures and tern decoys and there was success in moving birds, albeit over a short distance <300m. We are in the process of seeking further advice from Natural England's colony managers at sites with nesting little terns and this may add further evidence which can be used.

1.7 Area of new island - size and functional capacity

The RSPB note helpfully calculates that the area of the Church Norton Spit used by the colony in 2015 was c. 175m by 60m (which is approx. 1.05ha), with the majority of the nests in an area c. 155m by 25m (c 0.38ha).

The proposed design suggests that the island should be a minimum of 0.3ha in size.

- There is EC guidance on compensation, including the ratio for area of compensation – see link to guidance on Article 6.4 of the Habitats Directive:

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf This states (top of page 18) that *"compensation ratios of 1:1 or below should only be considered when it is demonstrated that with such an extent, the measures will be 100% effective in reinstating structure and functionality within a short period of time (e.g. without compromising the preservation of the habitats or the populations of key species likely to be affected by the plan or project)".*

In terms of allowing colony expansion, if we assume an ideal density of 1 little tern nest per 50m² (as suggested in the note) and the new island is 0.3ha, then it could potentially accommodate 60 nests/pairs (=120 little tern adults). So it could achieve approx. 3% of current GB breeding population (1,900 pairs), but that would depend on getting the habitat on the new island correct. We note that there is evidence that relatively small areas of habitat are capable of accommodating much larger numbers of birds than the current Pagham colony size – e.g. as happened at the Hayling Oysterbeds (RSPB pers. comm.), which supported over 100 little terns before predation by rats, etc. overtook events.

We advise however that making the island a little larger during construction will reduce risk and increase certainty.

1.8 Location of the little tern island: some additional questions to consider

Seeking further advice of the RSPB whether there any residual concerns that the proposed location of the island is located in too sheltered an area, close to Church Norton and the tree-line, and whether there are any concerns that its location does not have the same open coast aspect that the spit provides. Is there evidence from elsewhere of little terns nesting in such a sheltered area that could support this?

1.9 Attracting little terns to the new island

Attracting the birds to the site is likely to be one of the biggest risks/uncertainties with the proposal. We agree with the RSPB's approach to reducing this risk through design principles, as set out in their advice below.

Given that the proposal is to use shingles excavated from the breach in the new island, we assume construction of the island will happen at the time of the breach works. In this case, the severed part of the spit will remain for a period of time (exact timescales are unknown), meaning that for at least the first breeding season following the works there will be spit habitat remaining as well as the new island. It would be unlikely, therefore, that there would be a scenario where the birds return and the spit habitat has all gone. Therefore, if no little terns use the island in the first year, further modifications to the island could be undertaken if required. Given that there are likely to be difficulties in attracting birds to the new island from the spit even if the island were in place before the works start, this would represent the most time efficient way of proceeding.

Remedial action/an adaptive management plan could be conditioned as part of the planning process to put things right, if the little terns are not attracted to the island. We would welcome the RSPB's thoughts on how this might be achieved.

