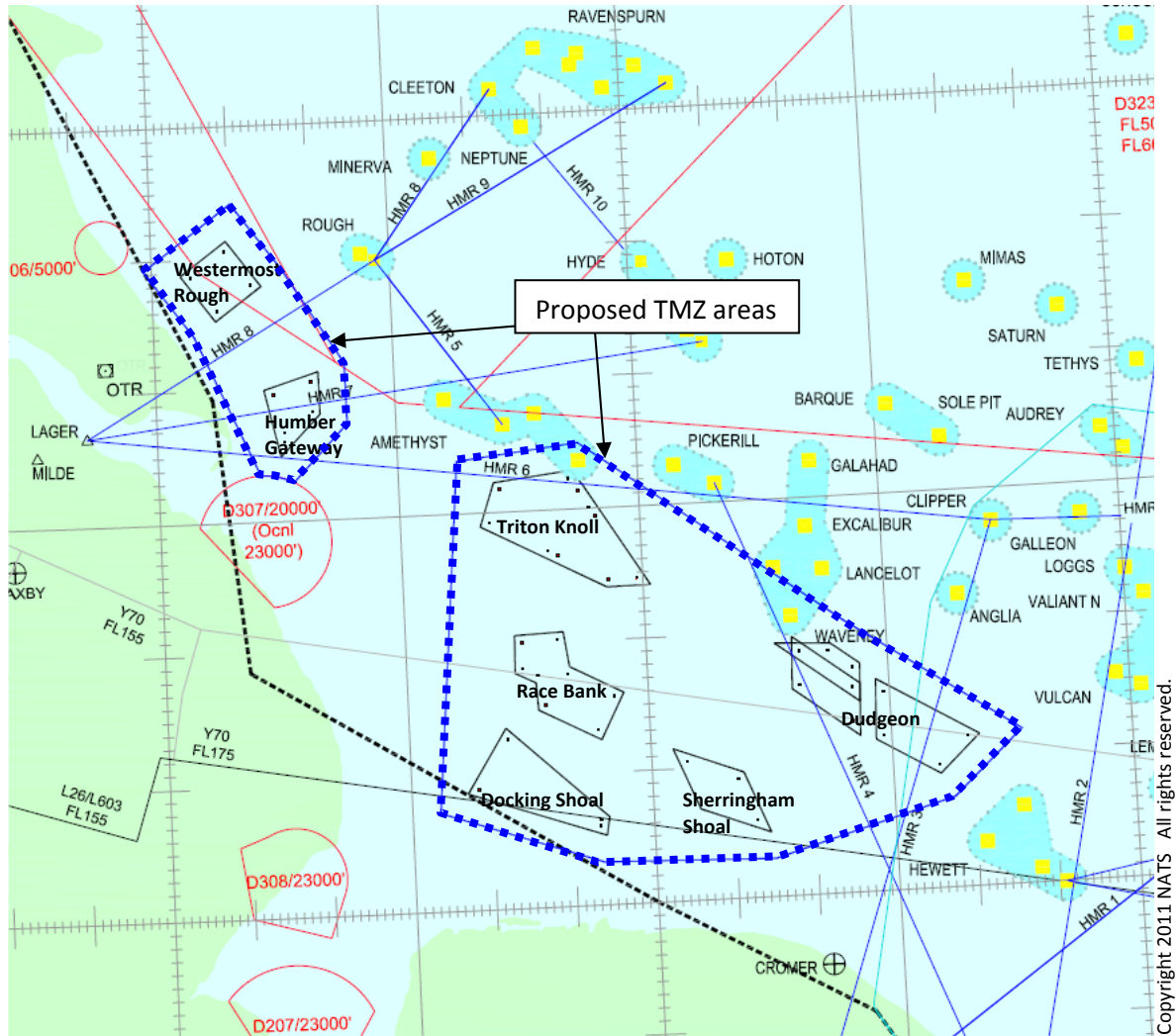


STAKEHOLDER CONSULTATION DOCUMENT



Greater Wash TMZ Stakeholder Consultation

Consultation on the proposal to establish transponder mandatory zones (TMZs) over wind farms in the southern North Sea

DOCUMENT INFORMATION AND VERSION CONTROL RECORD

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1. Executive Summary

Planning consent has been granted for seven large wind farm developments in the Greater Wash area of the southern North Sea. Together these developments will result in the construction of over one thousand wind turbines with a total maximum generation capacity of over 3.7GW. Construction is due to start in Q4 2012 (Humber Gateway) with the first turbines planned to be operational in Q2 2013.

The Humber Gateway Wind Farm was granted Planning Consent by the Secretary of State dependent on a "Grampian Condition", i.e. Consent was granted conditional to an acceptable (to NATS) mitigation being put in place before construction commences¹. This planning condition puts an obligation on NATS and the windfarm developers to work together to produce a primary radar mitigation scheme to discharge the condition and allow both parties to co-exist long term. The Humber Gateway development was the first of seven developments in the southern North Sea to be granted planning consent dependent on this condition (see Table 1). The combined mitigation solution (described herein) is known as the Greater Wash Regional Solution (GWRS).

What is the Issue?

The proposed wind farms will produce primary radar clutter on Air Traffic Control (ATC) radar screens. This clutter can obscure primary returns from aircraft and can interfere with radar tracking resulting in erroneous radar returns. This in turn reduces ATC's ability to observe primary-only aircraft and increases the risk of ATC not detecting a conflict between aircraft and hence is detrimental to safety assurance.

Large numbers of turbines would also lead to saturation of the radar processing systems unless blanked.

Proposed solution

Blanking of Cromer and Claxby primary surveillance radar (PSR) over the defined wind farm areas will be necessary. Blanking the wind farm areas will eradicate clutter on PSR but will also prevent detection and display of primary returns from aircraft in the areas.

In order to mitigate this loss of surveillance capability it is proposed that Transponder Mandatory Zones are introduced over the areas which are blanked to ensure visibility to ATC (via secondary radar) of all aircraft operating over the wind farms.

The airspace change process requires that consultation is undertaken with the relevant stakeholders. This document provides all consultation information required for stakeholders to make an informed decision on the impact of the proposed changes.

The consultation will begin on 15 July 2011 and end on the 21st October 2011, a period of 14 weeks.

¹ Decision Letter para 8.1.19,

<https://www.og.decc.gov.uk/EIP/pages/projects/Humber%20Gateway%20Decision%20Letter%20Final.pdf>

2. What is the consultation about, and how does the consultation process work

What is this consultation about?

This consultation is about establishing Transponder Mandatory Zones (TMZs) over off-shore wind farms in the southern North Sea (see Figure 1 on the front cover). Where a TMZ is proposed, a consultation is required to be undertaken with stakeholders and any interested parties likely to be affected by the change. Full details of the proposed change are given in section 3.

The proposed TMZs would require aircraft to carry and operate a working transponder in the airspace above the wind farms.

All of the airspace in question is Class G (uncontrolled) airspace. The majority of aircraft operating in this airspace are equipped with Mode C (altitude reporting) transponders. For these aircraft there would be no change. The introduction of TMZs within this region would not result in changes to the procedures or to the general distribution of air traffic in the vicinity.

Aircraft not operating a transponder (Mode A minimum) would be required to avoid the proposed TMZ areas. The TMZ areas would be easily identified by the visual reference of the wind turbines (each of similar size to the London Eye).

This consultation will allow NATS to obtain feedback, views and opinions about the impact of the proposed airspace change.

We encourage you all to participate so that the full spectrum of stakeholder views and opinions can be gathered with respect to the proposal of the TMZs. Your feedback could influence the size, shape and vertical extent of the proposed TMZs.

What is the Issue?

Wind turbines can cause a number of effects on air traffic control systems such as radar, navigation and communications systems. Large developments of multiple wind turbines often need mitigation to be put in place such that the safety of flight is not compromised. These effects are described in detail in the NATS document "Mitigating the Effects of Wind Turbines"². There are seven large off-shore wind farms proposed in the Greater Wash area. The concern for NATS is the amount of primary radar clutter that these would produce on Air Traffic Control (ATC) radar screens. This clutter will obscure primary radar returns from aircraft, and reduce ATC's ability to observe primary-only aircraft. This increases the risk of not detecting a conflict between aircraft and hence is detrimental to safety assurance.

Primary radar works using simple echo returns. Wind turbines can cause problems with this since the turbines can generate returns which can be indistinguishable from real aircraft. Large numbers of wind turbines can produce returns which can obscure large areas of radar. Secondary radar however communicates with a transponder, which is a device onboard many aircraft; secondary radar is not affected by wind turbines. Not all aircraft are equipped with transponders (though it is mandatory for commercial aircraft to be equipped). A Transponder Mandatory Zone dictates that only aircraft which are operating a transponder can fly within the stipulated zone.

Primary-only aircraft do operate in this area. A three month trial from April 2008³ produced evidence which satisfied DAP that "frequent and regular non-squawking (non-transponding) military flights did occur over the southern North Sea".

Furthermore large numbers of turbines would also lead to saturation of the radar processing systems unless blanked.

Why is a condition Needed?

On 9th February 2011, E.on Climate & Renewables UK Limited ("E.on") obtained consent under Section 36A of the Electricity Act 1989 ("**S36 Consent**") to construct the Humber Gateway wind farm at the mouth of the Humber

² <http://www.nats.co.uk/enviro/windfarms/> NATS & wind farms

<http://www.nats.co.uk/wp-content/uploads/2011/05/Mitigating-the-effects-of-wind-turbinesV3.3.pdf>

³ Non-squawking Military Aircraft Operating over the Southern North Sea. NATS Aberdeen 2008.

Estuary subject to discharging certain conditions including condition 8.1.19 which relates specifically to the impact of the Wind Farm upon NATS (En Route) PLC's ("NERL") Claxby & Cromer primary surveillance radar ("PSR").

What does Condition 8.1.19 state?

Condition 8.1.19 Impacts on Aviation

"Impacts on aviation: The Secretary of State is aware that a well-recognised feature of wind farm developments is the potential adverse impact on air traffic control radar from moving wind turbine blades. The Secretary of State recognises that, in the absence of appropriate mitigation, the proposed Development would potentially have an adverse impact on NERL's ability to provide safe and efficient air traffic services in the surrounding area. The Secretary of State notes that NERL has given careful consideration to a range of possible mitigation measures, including changes to existing airspace rules, and in seeking to find an appropriate solution has consulted the CAA and other wind farm developers in the Greater Wash. The Secretary of State is aware that any solution to the potential radar problems will take time to implement, including (to the extent that it includes an airspace change) the carrying out of a formal consultation by the CAA. However, the Secretary of State having considered all the issues carefully is satisfied that there is a reasonable prospect of a solution to the potential radar problems being found and implemented within the lifetime of any section 36 consent, if granted. The Secretary of State notes that NERL has formally withdrawn its objections to the proposed Development on condition that in any section 36 consent that may be granted, **the commencement of construction is made conditional upon the Secretary of State, having consulted with NERL, being satisfied that appropriate mitigation arrangements are in place and will be implemented** (a so called "Grampian condition"). This approach has been endorsed by the CAA."

Planning Condition

The planning condition pertaining to the Greater Wash developments states:

- (1) No turbine forming part of the Development shall begin to be constructed until the Secretary of State, having consulted with the Operator, is satisfied that appropriate mitigation will be implemented and maintained for the life of the Development and that arrangements have been put in place with the Operator to ensure that such appropriate mitigation is implemented before the Development gives rise to any adverse impact on air traffic services.
- (2) In this condition:
"appropriate mitigation" means measures to prevent or remove any adverse impacts which the operation of the Development will have on the Operator's ability to provide safe and efficient air traffic services during the lifetime of the Development, in respect of which all necessary stakeholder consultation has been completed by the Operator and all necessary approvals and regulatory consents have been obtained;

"Operator" means NATS (En Route) plc, incorporated under the Companies Act (4129273) whose registered office is 5th Floor, Brettenham House South, Lancaster Place, London WC2E 7EN or such other organisation as is licensed from time to time under sections 5 and 6 of the Transport Act 2000 to provide air traffic services in an area which includes the Development.

Who imposed the condition?

The Secretary of State for Energy & Climate Change (Chris Huhne)¹.

Approval deadline and implementation date

If the use of TMZs is approved, the target date for implementation of the TMZ would be May 2013 which is the target date for the first turbines being operational.

Condition 8.1.19 states

"the **commencement of construction** is made conditional upon the Secretary of State, having consulted with NERL, being satisfied that **appropriate mitigation arrangements are in place** and will be implemented"

Hence the proposed mitigation must be approved before construction can commence, but does not need to be implemented. Approval of TMZs by Q1 2012 (for May 2013 TMZ implementation) would not impact construction timelines.

Why does NATS need TMZs

Anglia Radar is the NATS ATC sector which provides air traffic services in the southern North Sea. Anglia Radar is operated from the NATS Aberdeen ATC unit. The Greater Wash windfarm development will result in over 1000 turbines spread across seven areas, all of which are within the Anglia Radar ATC sector. The largest of the turbines planned will be 220m high with blade diameter of 180m (the London Eye is 135m in diameter). It is agreed in the windfarm and aviation industries that areas of significant clutter need to be mitigated. The airspace over Greater Wash is all Class G and can be busy (especially with low-level helicopter traffic).

The clutter expected to be generated by the Greater Wash windfarm will be significant and would severely limit the ability of Anglia Radar to offer safe air traffic services. The wind farm developers and NATS have worked

together to develop the solution proposed herein, as acceptable mitigation to allow the full development of the wind farms in the Greater Wash region.

	Development	Developer	No of Turbines	Max Capacity (MW)	Target O-date
1	Westermost Rough	Dong Energy	80	240	Q1 2015
2	Humber Gateway	E.ON	83	300	Q2 2013
3	Race Bank	Centrica	140	620	Q1 2014
4	Docking Shoal	Centrica	130	540	Q2 2015
5	Triton Knoll	NPower Renewables	333	1200	Q1 2016
6	Dudgeon East/West	Warwick Energy	130	560	Q2 2014
7	Sherringham Shoal	StatoilHydro/Statkraft	108	315	
	Totals		1004	3775MW	

Table 1 Wind farm developments covered by the Greater Wash Regional Solution

Why is this consultation required?

It is a regulatory requirement of the CAA to consult when changes to the use of airspace (such as TMZs) are proposed. The consultation procedure required to be followed is outlined in Civil Aviation Publications (CAP) 724 and 725. This consultation follows the procedures outlined in these documents and the Cabinet Office Code of Practice on Consultation⁴.

Who are the stakeholders in the consultation?

This airspace change proposal only affects aviation stakeholders. As such this document assumes a knowledge of basic aviation issues and terminology. Four key consultation stakeholder groups have been identified covering those with an interest in the specialist nature of the proposal, this list is not exhaustive but is thought to be the most appropriate to the nature of the proposed change:

- (i) The Ministry of Defence
- (ii) Helicopter Operators servicing the North Sea Oil & Gas industry
- (iii) Members of the National Air Traffic Management Advisory Committee (NATMAC)
- (iv) General Aviation (GA) users of the airspace

It is envisaged that the proposal for TMZs in the Greater Wash area will have the most impact on military fast jets which use the area to transit to the North Sea Danger Areas for training sorties. These aircraft are equipped with transponders. GA aircraft such as private light aircraft, gliders, hang-gliders, paragliders, balloons etc which may not be equipped with transponders, do not usually operate in this offshore area. Therefore the proposed TMZ will be of most interest to groups (i) and (ii) above.

A full list of identified consultees has been developed in conjunction with industry bodies and can be found in Appendix 2. Feedback is requested from all, this list is not exhaustive, anyone is welcome to provide feedback if they so wish.

How will the consultation work?

The CAA has determined that consultations be conducted in line with the principles set out in the Cabinet Office Code of Practice on Consultation. Please read the details of the proposed change given in Section 3, and respond using the template as described in Section 4.

How long will the Consultation Period Last?

The consultation will begin on 15 July 2011 and finish on the 21st October 2011, a period of 14 weeks.

It would be appreciated if consultees could provide comments as early in the process as possible. This will allow NATS to answer any additional questions, provide further information or engage in dialogue as appropriate in good time.

⁴ www.berr.gov.uk/files/file47158.pdf

Effect of wind turbines on Air Traffic Control (ATC) radars and radar displays for Air Traffic Controllers

The motion of rotating wind turbines leads ATC radars to detect them. Because the radar frequently observes a different part of the rotating blades each time it surveys the area it detects movement. That movement is similar to the pattern observed when an aircraft is flying through the airspace, so the radar displays a target to Air Traffic Controllers on their radar screens. A large number of turbines in an area cause a large number of apparently moving radar returns to be displayed on ATC radars. The effect of these returns is to clutter a particular area on an Air Traffic Controller's radar screen.

The actual position of real aircraft is displayed by a symbol which moves across the Controller's screen accurately indicating where the aircraft is at any time. Information such as identity and height is transmitted by the aircraft working altitude reporting transponder. That information is displayed and a label attached to the aircraft position symbol on the Air Traffic Controller's radar display.

When real aircraft are being observed by ATC radars and transiting these areas of clutter there are three main effects to ATC.

- (i) The aircraft position symbol is obscured by the clutter and the controller cannot accurately observe the actual position of aircraft under their control.
- (ii) The information displayed in the label attached to the position symbol may be obscured or misread by ATC.
- (iii) Aircraft which are not in contact with ATC, will not be observed in this area of clutter.
- (iv) Returns from wind turbines cannot be differentiated from primary-only air traffic.

These form the key considerations in seeking solutions to best manage aircraft safety using radar control in and around wind farm developments. For further detail regarding the effects of wind turbines on Radar and other ATC systems please refer to the [NATS website](#) and in particular the paper "[Mitigating the effect of Wind Turbines](#)".

An overview of civil aircraft Operations over Greater Wash Wind Farms

The airspace above the wind farms, is busy with frequent helicopter flights. It is controlled by the Anglia Radar sector of the NATS Aberdeen ATC unit.

Over the wind farms, Anglia Radar provides the following air traffic services:

- Deconfliction Service/Offshore Deconfliction Service
- Traffic Service/Offshore Traffic Service
- Basic Service/Offshore Basic Service (not a radar service)

The "Offshore" variant of each service can only be given to helicopters of the companies that are signatory to the MOU with NATS Aberdeen (Bristow, Bond, CHC-Scotia, NHV and British International).

The area is covered by two radars, Cromer & Claxby. There is no Multi-Radar Tracking (MRT) system and hence Anglia sector air traffic controllers workstations have different radar screens displaying each of these radar pictures separately.

The options explored regarding the mitigation measure are outlined below.

3. Design Options

The options below have been considered as possible design options.

Option 1: Do Nothing

CAP 724 and 725 require that in all proposals requiring a change to airspace, that the effect of 'doing nothing' must be considered.

If no action was taken to adapt the airspace arrangements large portions of the Anglia Radar ATC sector would become obscured by the radar returns from the 1000+ wind turbines, and the radar would suffer from saturation. This would prevent aircraft from being detected amidst the clutter and would severely restrict the ability of ATC to provide safe and effective air traffic services over the whole Anglia sector (not just over the Wind Farm arrays).

The condition 8.1.19 attached to the approval given for the development of Humber Gateway wind farm took account that something other than 'Do Nothing' would be required before the development could proceed.

Condition 8.1.19 must be discharged before construction can start. Construction of Humber Gateway is targeted to start in the fourth quarter of 2012.

Therefore to preserve NATS' radar coverage over Greater Wash area and as is required by the planning requirements, 'Do Nothing' is not an option.

Option 2: Blanking of radar and Introducing two Transponder Mandatory Zones (TMZs) covering the seven wind farm developments in the Greater Wash Area

It is possible to blank out the PSR returns in the area where wind turbines cause extensive clutter. However if an area is blanked out then there is no height limit to that blanked area. All primary radar returns in that area will be blanked including the aircraft that the ATC radar is designed to detect.

Because of the off-shore nature of the wind farms (no terrain shielding effects exist) and the distance from the radar heads, in-fill is not technically feasible. If the size of the area is significant then coverage must be assured over the blanked area using another surveillance source for ATC operations to continue. If TMZs are introduced over the blanked areas, then secondary surveillance radar (SSR) can be used to provide the assurance of coverage.

The lateral extent of the proposed Greater Wash TMZs are shown in Figure 2 – 4 below. There are three sub-options proposed each with different sized TMZs, having a 1nm, 2nm and 5nm buffers around the blanking areas.

Option 2a (1nm buffer)

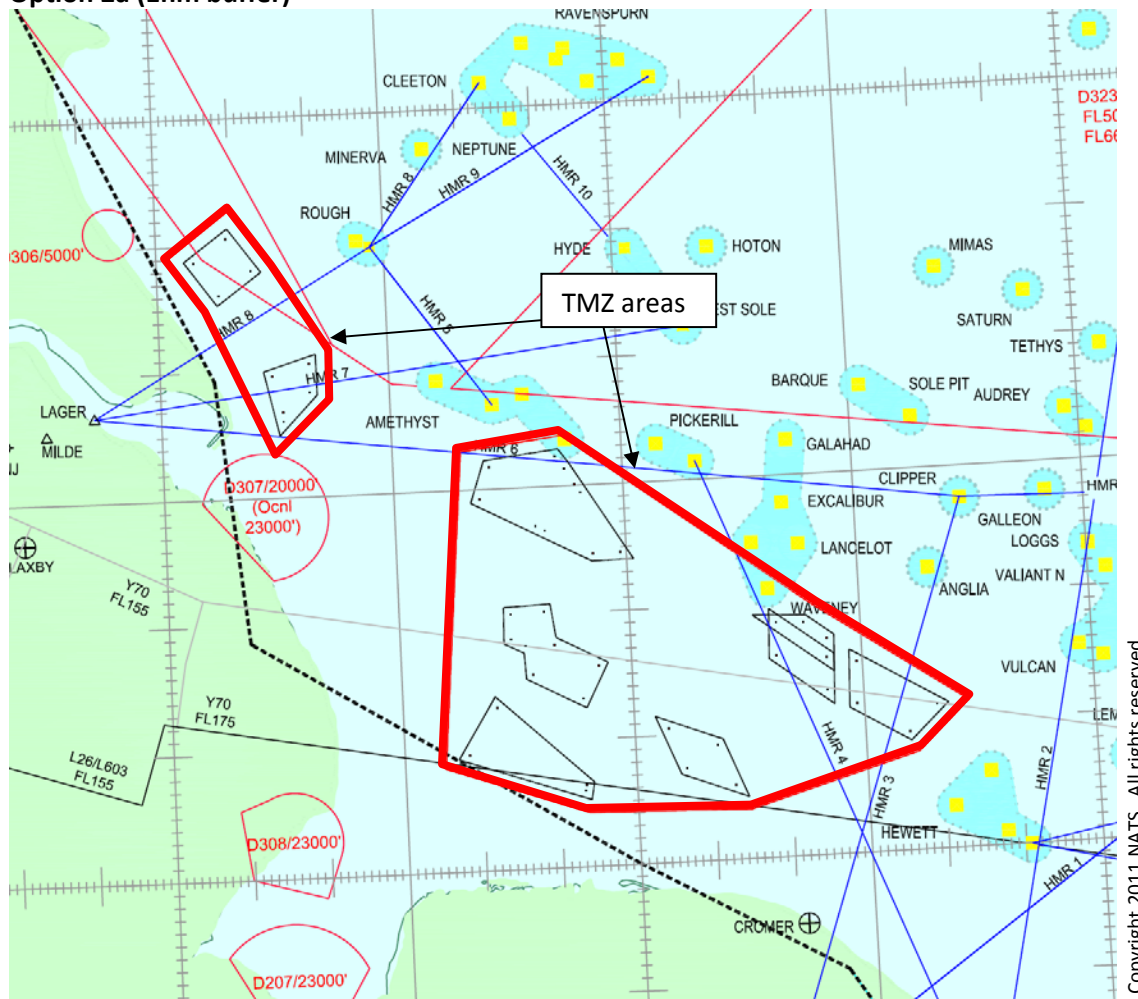
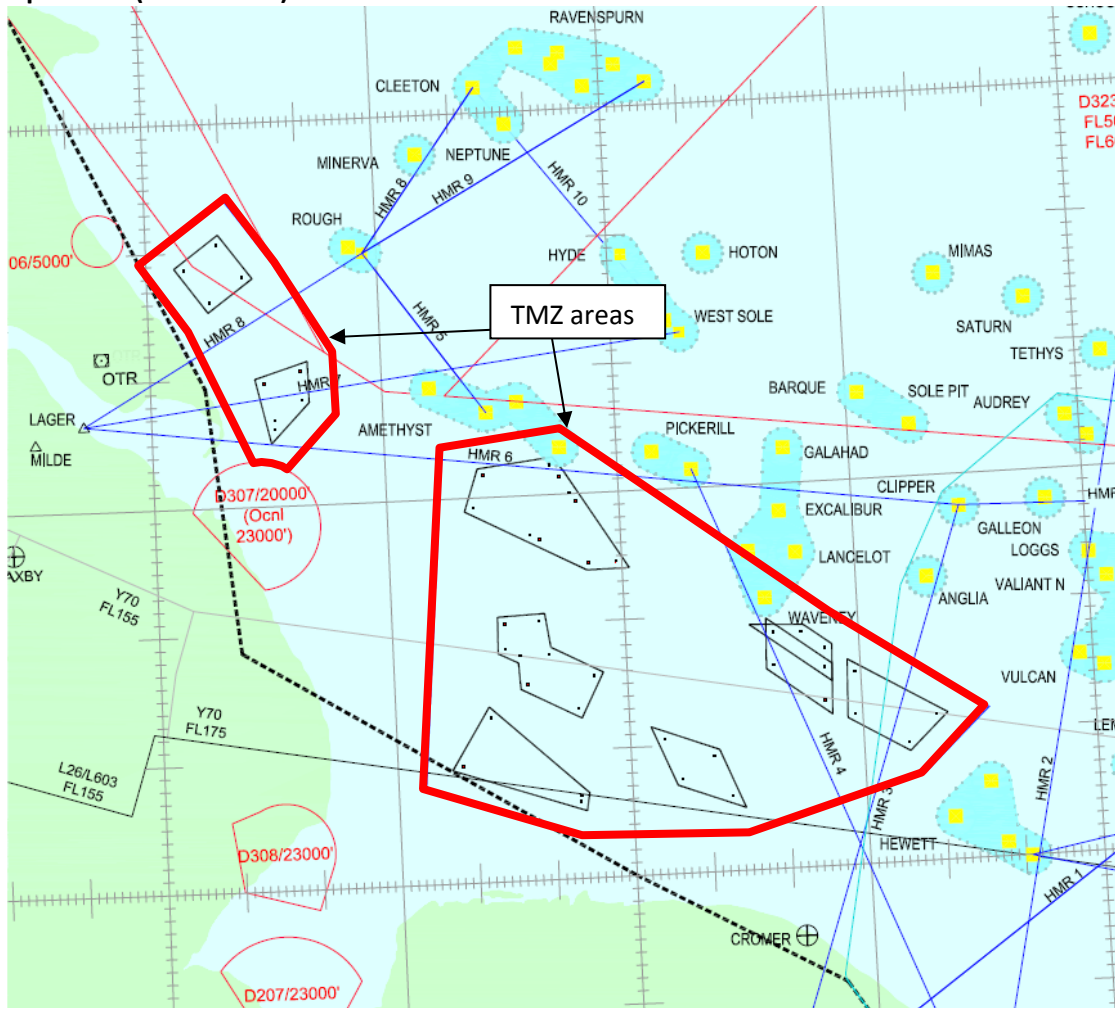


Figure 2 TMZ with 1nm buffer around blanked areas

Option 2b (2nm buffer)



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Figure 3 TMZ with 2nm buffer around blanked areas

Dimensions of the proposed Greater Wash TMZs

The options under consideration (Option 2a, 2b & 2c) are shown in Figure 2 - 4. The blanking areas are the same for each of these options. The choice between the size of the buffer zone around the blanking area is a trade off between competing factors. On the one hand a larger buffer gives ATC given more chance to spot any non-transpondering aircraft entering the TMZ heading for a blanking zone. On the other reducing the size of the buffer minimises the area of restriction (TMZ) and hence presents the minimum inconvenience to those aircraft who are not equipped with transponders.

For Option 2a (Figure 2) the TMZ extends 1nm around the blanking areas. This gives a very small buffer within which ATC could identify a non-squawking aircraft entering the TMZ before it becomes undetectable within the blanking area. The 1nm buffer represent the minimum practicable to meet safety and operational requirements. For instance at 400knots (typical speed of a military jet) the 1nm buffer is passed in 9 seconds. At 120knots (e.g. speed of GA aircraft) the 1nm buffer would be passed in 30 seconds.

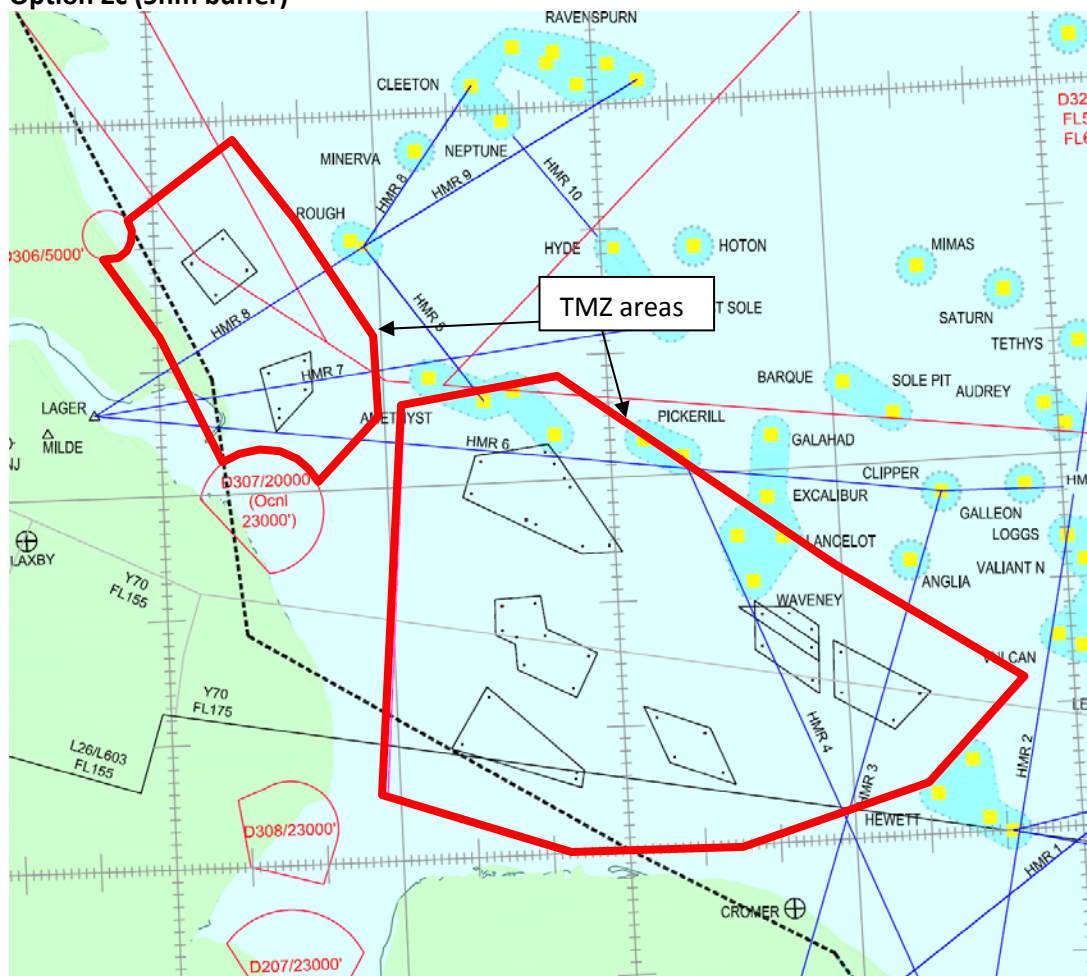
For Option 2b (Figure 3) the TMZ extends 2nm around the blanking areas. This gives a larger buffer which would give ATC more time to identify a non-squawking aircraft entering the TMZ before it becomes undetectable within the blanking area. The 2nm buffer dimension represents a more conservative buffer zone, and would be preferred over Option 2a by NATS.

For Option 2c (Figure 4) the TMZ extends 5nm around the blanking areas. This gives a much larger buffer, however this results in this version of the TMZ extending beyond the coastline, inland in the vicinity of the Westernmost Rough wind farm. It is recognised that GA pilots regularly fly along the coastline and these aircraft are the most likely to be non-transponder equipped. Hence this option is more likely to result in GA aircraft modifying their route of flight.

Aircraft intending to enter the TMZ airspace would be required to carry and operate a serviceable Mode A, Mode C or Mode S transponder. This would enable ATC to observe transponding aircraft operating over the wind farms. The proposed vertical extent of the TMZ would be between surface and FL65.

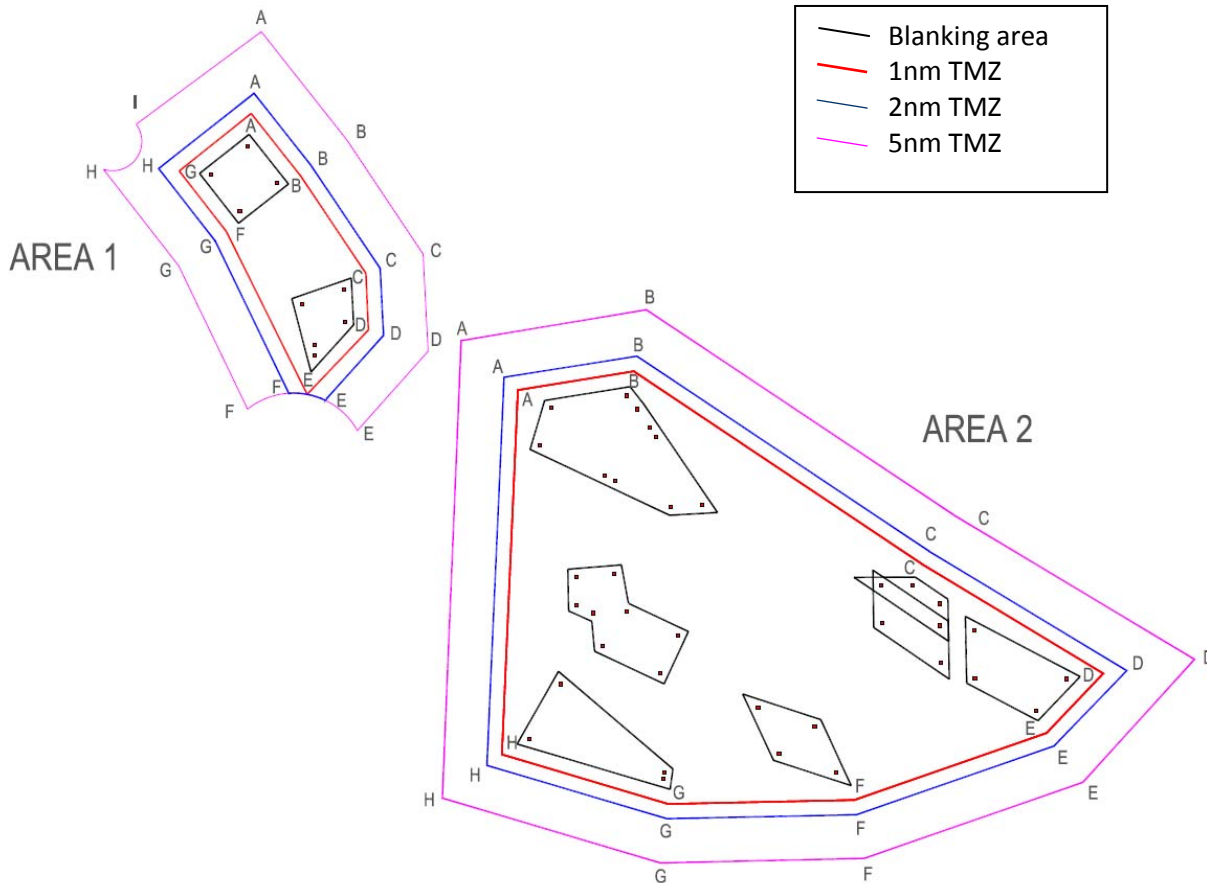
In accordance with CAA policy, conditional access to a TMZ can be granted with prior approval from ATC. If an aircraft without a working transponder needs to transit a TMZ, the aircraft must be equipped with appropriate 2-way radio, and must contact Anglia Radar at least 10 minutes prior to the planned time of entry into the TMZ. Anglia Radar will make best endeavours to give authorisation for transit of the TMZ by the non-transponding aircraft. This authorisation will be dependent on the quantity of other air traffic in the vicinity at the time. Aircraft which do not have a working transponder and do not have a working radio will be required to fly clear of the TMZs. (From a safety perspective, it would be foolhardy to fly offshore without either radio or transponder. For commercial operations **both** are mandatory).

Option 2c (5nm buffer)



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Figure 4 TMZ with 5nm buffer around blanked areas



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Figure 5 Coordinates of the three proposed options for TMZ areas

Option 2a 1nm Buffer	
Area 1	Area 2
A. 53-52-48N 000-10-11E	A. 53-33-03N 000-39-17E
B. 53-48-19N 000-15-37E	B. 53-33-54N 000-52-40E
C. 53-41-31N 000-22-31E	C. 53-19-37N 001-24-15E
D. 53-37-39N 000-22-30E	D. 53-11-22N 001-44-00E
E. 53-33-26N 000-15-08E	E. 53-07-34N 001-37-08E
F. 53-44-48N 000-06-44E	F. 53-03-49N 001-14-54E
G. 53-49-05N 000-01-36E	G. 53-04-16N 000-53-51E
	H. 53-08-14N 000-35-21E
Option 2b 2nm Buffer	
Area 1	Area 2
A. 53-54-10N 000-10-37E	A. 53-33-58N 000-37-47E
B. 53-49-02N 000-16-50E	B. 53-34-55N 000-53-07E
C. 53-41-48N 000-24-12E	C. 53-20-26N 001-25-11E
D. 53-37-14N 000-24-12E	D. 53-11-27N 001-46-41E
E. 53-32-59N 000-17-10E thence in an anti-clockwise direction by an arc of a circle radius 5nm centred on 53-28-35N 000-13-12E to	E. 53-06-39N 001-37-52E
F. 53-33-35N 000-13-02E	F. 53-02-48N 001-15-03E
G. 53-44-10N 000-05-25E	G. 53-03-16N 000-53-38E
H. 53-49-19N 000-00-46W	H. 53-07-32N 000-33-35E

Option 2c 5nm Buffer	
Area 1	Area 2
A. 53-58-21N 000-11-46E	A. 53-36-37N 000-33-05E
B. 53-50-39N 000-21-07E	B. 53-38-03N 000-54-29E
C. 53-42-39N 000-29-12E	C. 53-22-49N 001-28-14E
D. 53-36-00N 000-29-14E	D. 53-11-55N 001-54-27E
E. 53-30-49N 000-20-42E thence in an anti-clockwise direction by an arc of a circle radius 5nm centred on 53-28-35N 000-13-12E to 53-32-37N 000-08-15E	E. 53-04-02N 001-40-52E
F. 53-42-36N 000-01-05E	F. 52-59-47N 001-15-39E
G. 53-49-25N 000-07-07W thence in an anti-clockwise direction by an arc of a circle radius 2nm centred on 53-51-17N 000-05-57W to	G. 53-00-16N 000-52-38E
H. 53-52-24N 000-03-09W	H. 53-05-28N 000-28-22E

Table 2: Co-ordinates which delineate the proposed Greater Wash TMZs

Option 3: Blanking of Radar and In-fill of the Blanked Areas Using Existing or New Radar

As per Option 2 the radar would be blanked to remove clutter. PSR blanking results in a blind spot or region. It is sometimes possible to fill the blind spot with another radar source (in-fill). This presumes that a source can be found that provides coverage over the development. Typically this would be a radar that is within range but is sited in a position where terrain shielding prevents line of sight to the turbines. Whilst in-fill radar is often theoretically possible, the crucial factor is whether the level of coverage at low level in the in-fill area is acceptable to the operating unit in order for this solution to be feasible in a practical sense.

Because the Greater Wash turbines are all off-shore, there is no terrain shielding, and any radar that can achieve coverage of the area would also “see” the turbines. Tilting the radar beam upwards so that the turbines are not detected would lose coverage at the lower levels at which the helicopters operate⁵. For these reasons in-fill of PSR down to the low levels required (i.e. 900ft amsl) was not technically feasible. Infill to 2500ft could be achieved but this would still require a mitigation solution below 2500ft. Since this option cannot provide mitigation at all levels required **this option was rejected.**

Option 4: Blanking of radar and Establishing a ‘Known Traffic Environment’ Controlled Airspace

As per Option 2 the radar would be blanked to remove clutter. The airspace over the Greater Wash area wind farms would be promulgated as controlled airspace, thereby establishing a ‘Known Traffic Environment’. This would ensure that all traffic in proximity to the wind farm would be known to ATC, and subject to ATC Clearance.

Controlled Airspace (e.g. Class D) would not however address the issue of non-transponding traffic not being detected within the blanking areas. Therefore it would not guarantee that aircraft would be able to be tracked effectively.

It was considered that this option would be unnecessarily restrictive on all airspace users including the GA community. **Therefore this option was rejected.**

Option 5: TMZ plus Infill at higher levels

As per Option 2, the radar would be blanked to remove clutter. Infill would be provided from one or more new radar sources, optimised with the beam tilted upwards so that the turbines are not detected. This could provide coverage down to 2500ft.

As described in Option 3, a radar tilted in this way would not provide coverage at the lower levels of the helicopter operation. Helicopters are routinely required to operate at levels below 2500ft, for both ATC and operational reasons (e.g. to remain clear of icing conditions).

However, the lack of coverage at these lower levels could still be mitigated by TMZs, with the same lateral dimensions as described in Option 2, and either with a lower vertical extent – i.e. 2500ft, or the same upper limit as described in Option 2 – FL65.

⁵ Helicopters in the Anglia Radar Area of Responsibility normally operate between 500ft and 4000ft. Helicopters cruise at 1000ft routinely, hence radar coverage is required down to at least 900ft amsl.

This combination of the infill and TMZ options will add complexity to both ATC procedures and operational information to aircrew. New ATC procedures will be required to limit service provision within a TMZ and also in proximity to areas where infill is being employed. Aircrew will also need to be made aware, separately, of areas where infill is being employed, in situations such as the infill radar being out of service (e.g. for maintenance).

Option 5a If the upper limit of the TMZs is 2500ft controllers will be obliged to apply different procedures to aircraft as they climb or descend through 2500ft, and between different aircraft depending on whether they are cruising above or below that level. This will not only increase the complexity of the ATC task, it will also add to the amount of R/T exchanges required as service levels are changed. The R/T loading in the Anglia Radar sector is already recognised as high, and any further increase will be detrimental to overall safety.

Option 5b If the TMZs extend to FL65, the employment of infill will not have provided any benefit to airspace users in terms of reducing the impact of a TMZ. With regard to the benefits gained for aircraft receiving a service from Anglia Radar from the return of PSR coverage in the infilled areas, these benefits are outweighed by the added complexity of ATC procedures required.

It was considered that option 5a would be detrimental to safety and 5b would provide no benefits while adding to ATC complexity. **Therefore Option 5 was rejected.**

Miscellaneous Options

Other options considered included,

- Use of Lockheed-Martin TPS-77 radar
- Stealth turbine blades
- Raytheon R&D programme
- Cambridge Consultants Holographic radar
- Short range in-fill using Kelvin Hughes/C Speed/ Sensis Corp radar
- Radar Head tilting
- Beam Switching

Conclusion

Options 1, 3, 4 and 5 were considered as possible mitigation solutions, however these options were not considered satisfactory and hence have been ruled out.

Options 2a/2b/2c are deemed to be the only feasible options from those listed above. The establishment of TMZs will provide the most effective mitigation measure with the least impact on the operations of airspace users. This will safeguard the safety of airspace users most effectively. Hence your feedback is sought on Option 2a, 2b & 2c. NATS preference is for a 2nm buffer – option 2b, since it is believed that this presents the best trade-off between the safety requirements and the need to minimize the area affected by the proposed TMZs (in particular keeping the TMZs entirely over the sea).

4. Consultation Details

Proposed solution

The proposed solution is to implement blanking of Cromer and Claxby PSR systems over the defined wind farm areas as proposed in option 2 above. Blanking the wind farm areas would eradicate clutter on PSR but will also prevent detection of primary returns from aircraft in the areas.

In order to mitigate this loss of primary surveillance capability, Transponder Mandatory Zones would need to be introduced over the areas which are blanked. This would ensure visibility to ATC via secondary radar, of all aircraft operating over the wind farms.

The airspace change process requires a consultation to be undertaken with the relevant stakeholders. This document provides all consultation information required for stakeholders to make an informed decision on the impact of the proposed changes.

What airspace users will be impacted?

Jan	3431	Jul	4016
Feb	3012	Aug	4428
Mar	4229	Sept	4352
Apr	3814	Oct	3615
May	4344	Nov	3418
Jun	3934	Dec	2883
		Average	3790

Table 1: Number of flights handled by the Anglia Radar Sector Jan – Dec 2009⁶

The traffic figures in Table 1 above represent Commercial Air Traffic which already operates with working altitude reporting transponders as a mandatory requirement.

The main users of the airspace are helicopters related to the off-shore oil & gas industry as described in Section 3. These aircraft are all transponder equipped. In addition to this there is significant military flying⁷ which can take place at low level. A number of Danger Areas (e.g. D323B, D323C) are used regularly for training sorties. Flights frequently transit between these Danger Areas and bases such as Conningsby, Waddington, Cranwell, Marham and Lakenheath.

The proposed TMZs over the Greater Wash Wind Farms will only impact on individuals who use the airspace below FL65 and whose aircraft are not fitted with a working transponder. These users would either need to use a working transponder within the zone (to ensure that they could be detected by secondary radar), contact ATC by radio and request permission to transit the TMZ (without a transponder) or navigate around or above the TMZ.

Military and commercial aircraft are not expected to be impacted by this proposed change as they are equipped with, and routinely use transponders.

⁶ Due to changes in systems at Aberdeen, consistent statistics have not been available across the whole year 2010, hence 2009 data is presented here.

⁷ All military aircraft are equipped with Altitude reporting transponders.

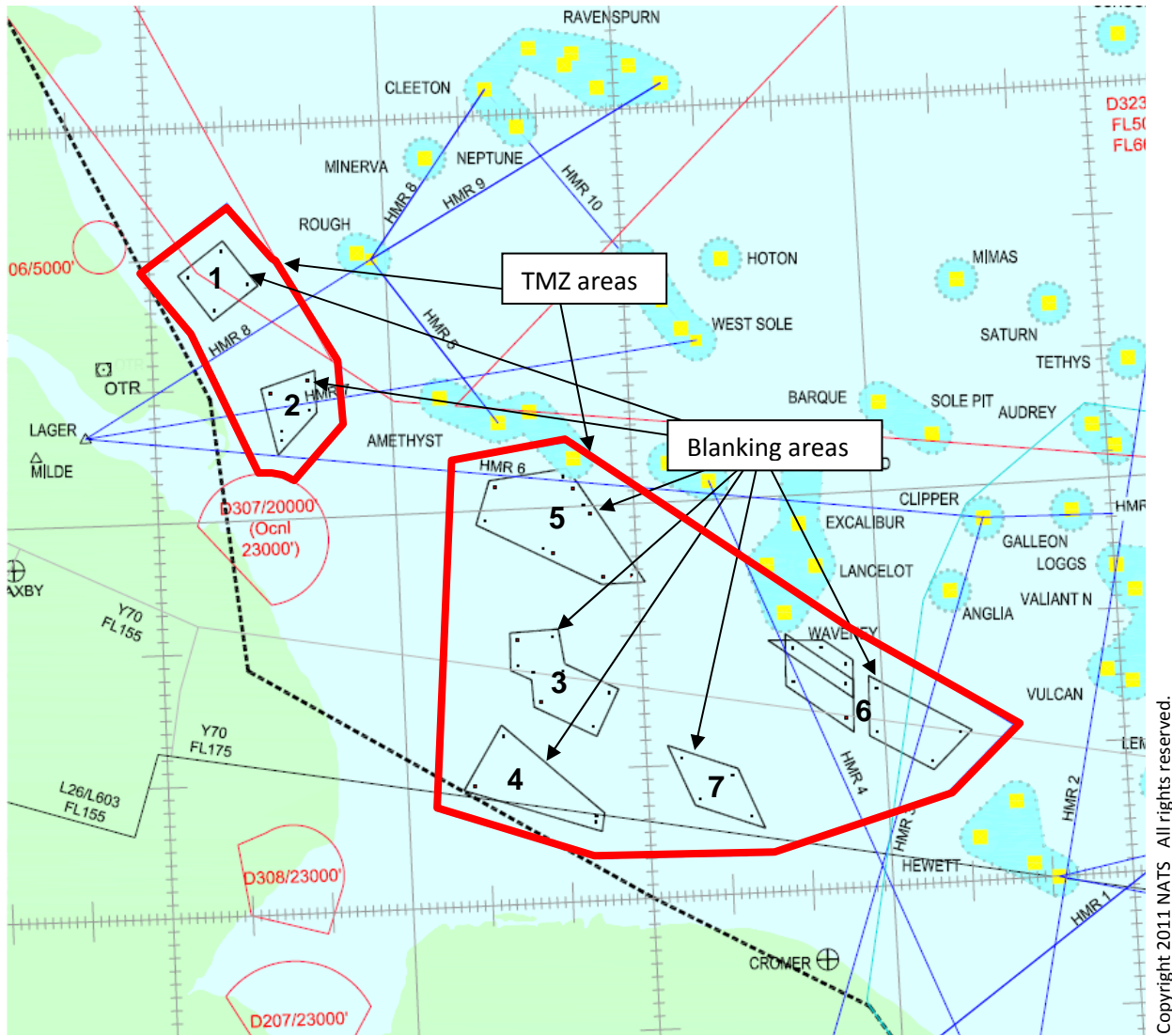
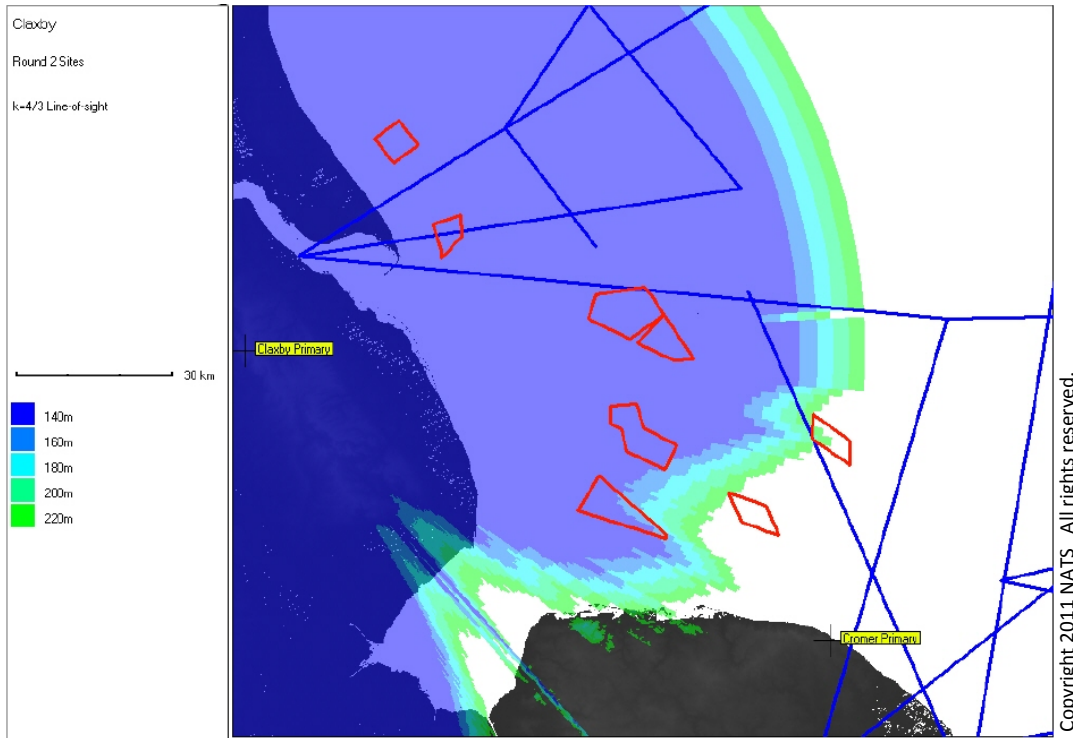


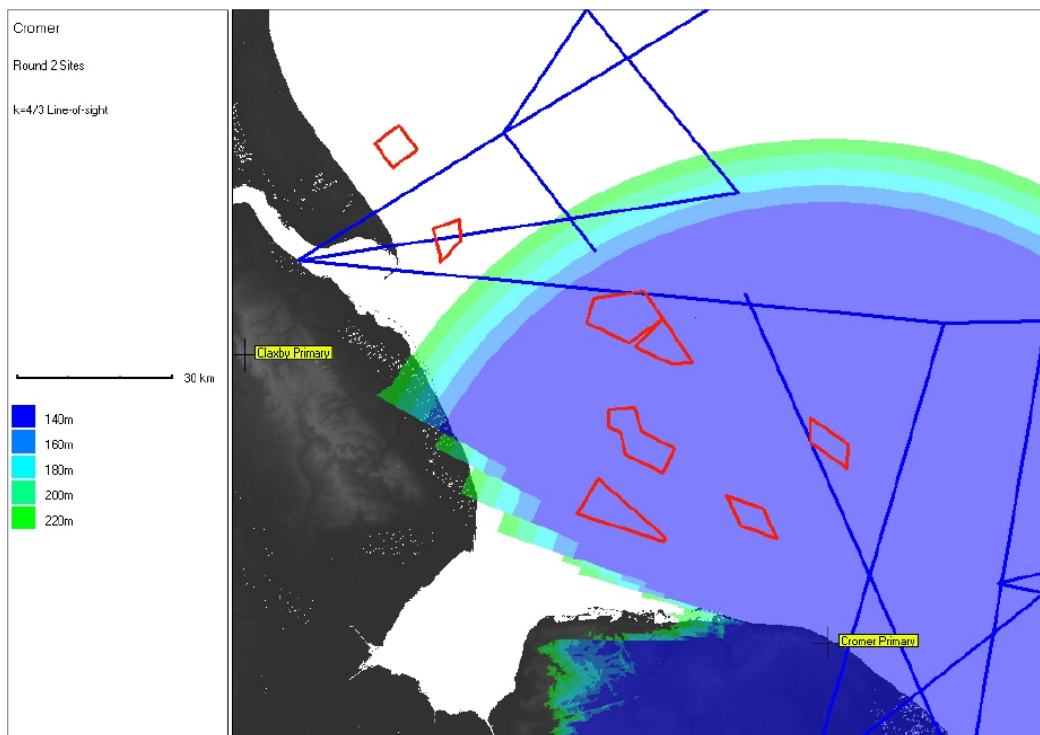
Figure 6 Proposed Blanking and TMZ areas. (Option 2b)

NATS Cromer and Claxby primary radars both detect the Greater Wash turbines. Radar coverage diagrams are provided at Figure 7 and Figure 8. These illustrate the extent of radar coverage over the wind farms and the areas where clutter would be produced. The darkest blue areas show where radar coverage is able to detect objects (i.e. wind turbines) below 140m down to the surface. The base of radar coverage over the wind farms has also been assessed through flight trials, and it was determined that the detection of aircraft by PSR at 900ft AMSL was not reliable over the whole region. The mitigation which best satisfies the ATC requirement for Anglia Radar is to blank both of these radars to the areas of the wind farms as shown in Figure 6. In-fill by existing or new radar is not technically feasible to the low level required (900ft amsl). Hence the mitigation proposed is to blank the areas over the wind farms and introduce Transponder Mandatory Zones so that surveillance is assured by secondary radar.



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Figure 7 Claxby radar coverage.



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Figure 8 Cromer radar coverage.

The presence of the wind turbines themselves will give pilots conspicuous visual reference of the locations of the TMZ areas. GA aircraft do not tend to venture offshore in this region but usually fly along the coastline.

The base of controlled airspace is FL195 above the Greater Wash area. The carriage and use of a working altitude reporting transponder is mandatory above FL100. The Anglia Radar area of responsibility extends from the surface to FL65. The usual operating altitudes for helicopters within the area is from the surface to 4000ft.

TMZ Duration and Frequency

The TMZs would be established permanently.

It is recognised that there is research & development work currently ongoing⁸, which might, if successful, render the TMZs obsolete. The CAP725 process dictates that a post implementation review is undertaken after any change has been implemented (usually after 12 months). This review should include an examination of any proven technologies which have emerged since the introduction of the TMZs, and consider whether the use of TMZs is still appropriate. It may also be appropriate to review the need for TMZs 5 years after implementation.

5. Environmental Considerations

The proposed Greater Wash TMZs lie wholly in Class G airspace. This proposal will not result in any changes to current Instrument Flight Procedures or any other flight procedures in the vicinity of Greater Wash Wind Farms, the intention is to maintain the existing routings and ATM operation within the Anglia Radar sector. The Helicopter Mandatory Routes (HMRs) which indicate areas of intense helicopter activity will not be changed as a result of the introduction of TMZs.

Exhaust emissions and fuel burn

This proposal is not an airspace redesign, but proposes the designation of the airspace as a TMZ, with access procedures even for aircraft which are not transponder equipped. The presence of TMZs will not change the usual trajectories of flights using the airspace. Almost every flight that requires access to the airspace will be able to achieve that in one way or another. Only aircraft without a working transponder and with no radio will be required to route around or above the TMZ. Hence there will be no measurable impact on exhaust emissions and fuel burn.

Noise, Tranquillity, Visual Intrusion, Local Air Quality

As stated above this proposal will not change the trajectories of flights. The areas affected are all over the sea and hence analysis of exhaust emissions, fuel burn, noise impact, tranquillity, visual intrusion, and local air quality have not been undertaken⁹.

6. Political Environment and Economic Benefit

The Greater Wash Wind Farms will together produce 3775 megawatts of generation capacity by the use of 1004 wind turbine generators. This will make an important contribution towards the UK Government's aim to provide 34% of the UK electricity demand from renewable sources by 2020. The UK Government has indicated its intention to support a tougher European target during current debate on emissions reduction targets and has passed the UK Climate Act 2008 with a legally binding commitment to reduce UK carbon emissions by 80% by 2050.

The UK Government's Low Carbon Transition Plan has initiated a system of [departmental carbon budgets](#) covering every central government department. These budgets represent a commitment from all parts of Government to take their carbon impacts seriously, and to managing total emissions from the UK. Between 2008 and 2012 the UK must reduce its emissions by 22%, and between 2013 and 2017 by 28%.

In March 2010 every department published a Carbon Reduction Delivery Plan which sets out how they will meet their departmental carbon budget.

The delivery and deployment of the Greater Wash Wind Farm is an important investment with associated economic benefits spread across many UK supply chain companies. Any significant delay or threat to the commissioning of the project, could damage confidence across the renewable energy sector and jeopardise the wider economic benefits from the low carbon economy which has been so extensively articulated by the UK Government.

"The implication of the latest trends in emissions and concentrations is that radical reduction is needed..... to achieve climate targets." (p.11 - [Building a low-carbon economy - the UK's contribution to tackling climate change](#)).

⁸ Work which would remove wind turbine returns from primary radar displays without blanking.

⁹ As was agreed by the CAA at the 15 September 2010 framework briefing.

"Climate change resulting from CO₂ and other greenhouse gas emissions poses a huge threat to human welfare. To contain that threat, the world needs to cut emissions by about 50% by 2050, and to start cutting emissions now. A global agreement to take action is vital. But a global agreement will not be possible unless the countries of the rich, developed world provide leadership." (p.1. [Executive Summary - Building a low-carbon economy - the UK's contribution to tackling climate change](#)).

The Greater Wash Regional Solution as described herein mitigates the impact of wind turbines on ATC systems, and demonstrates NATS willingness to work with wind farm developers in order to find solutions to the problems.

7. Summary

This document has presented the various options proposed by NATS to maintain a safe ATS over the Greater Wash Wind Farm developments.

Upon consideration of the various options it has been determined that blanking of the radars and establishing Transponder Mandatory Zones is necessary in order to mitigate against the loss of surveillance capability.

NATS is consulting widely on this proposal so that the range of views from all airspace users can be ascertained, and any unforeseen environmental and economic impact of the proposal understood. Aircraft not equipped with a working altitude reporting transponder can fly around or above the proposed TMZs or can access the TMZs through the provision of conditional access in accordance with CAA policy using the procedure described in section 4.

NATS believes that there are no measurable adverse environmental or economic impacts arising from the proposal.

NATS understands that the airspace arrangements outlined in this proposal will eradicate radar screen clutter and facilitate the continued safe provision of ATC service in the airspace above the Greater Wash wind farms.

8. How do I respond? Should I respond?

NATS requests that you consider this proposal and provide a written response. In accordance with the CAA airspace change process (Ref 1), a period of 14 weeks has been allowed for this stakeholder consultation¹⁰. Where possible an early response would be appreciated so that any issues arising may be addressed as soon as possible. The closing date for replies associated with consultation issues is **21st October 2011**.

Please respond to this consultation even if you have no objection to the proposal.

Before you respond to this consultation you may wish to consider the following questions:

- a) Do you operate within the area in question?
- b) If yes, would the proposals benefit your operation?
- c) Would you prefer Option 2a (two smaller TMZs with 1nm buffer) or Option 2b (two TMZs with 2nm buffers) or Option 2c (two larger TMZs with 5nm buffer, part of one of which is over the coast)?
- d) Are there any unintended consequences of the proposed changes, of which you feel NATS should be made aware?

This consultation will be primarily managed by email as our preferred medium, however postal responses will be accorded identical status and processed in the same way.

¹⁰ The statutory 12 week period has been extended by 2 weeks to account for holidays.

Via email - Please compose your response in the following format:

To: AirspaceConsultation@nats.co.uk

Subject: Greater Wash Consultation Response

First line of text:

"I am responding on behalf of [name of organisation]"

Or *"I am responding as a member of the public"*

Second line of text – agreement to pass on personal details to the CAA, for Data Protection Act compliance:

"I/We agree/do not agree that personal details contained within this response may be sent to the CAA as part of the Airspace Change Proposal"

Third line of text: Your formal response, one of the following:

"I/We support the Greater Wash TMZ proposal"

or *"I/We object to the Greater Wash TMZ proposal"*

or *"I/We have no objection to the Greater Wash TMZ proposal"*

Subsequent text:

Please state the grounds behind your formal response, i.e. the reasons why you support or object to the proposal, and which Option (2a/2b/2c) you prefer.

Via postal system - Please compose your response in the above format, and send it to:

Greater Wash TMZ Consultation Co-ordinator
Mailbox 10A
NATS
4,000 Parkway
Whiteley, Fareham
Hampshire PO15 7FL

If you wish to submit a formal response to the consultation please use the contact information above marking clearly on your correspondence **'Response'** i.e. placing it in the subject line of the e-mail or letter reference and the name of any organisation or group you may be representing. Please include your contact details in case we need to contact you on any aspects of your response as appropriate.

The list of stakeholders in appendix 1 is considered to be the most appropriate list, but anyone can comment and feedback is requested from all.

If I have no comment to make on the proposal do I need to do anything?

If you have no comment to make on the proposal, either as an individual or as a representative of an organisation **we would still like to know**. Please send your email with **'No Comment'** in the email subject line or letter reference, again stating your name and/or organisation you represent.

What happens to the responses to the Consultation?

Responses to the Consultation are used to prepare a formal submission to the CAA Directorate of Airspace Policy (DAP) regarding change required to be made to the airspace.

Responses to the consultation will be analysed to identify the key concerns of respondents and how these may be addressed. Where concerns can be addressed by making changes to the overall proposal, whilst still protecting the integrity of the proposed TMZ solution, these will be made and incorporated into the formal submission to

the CAA Directorate of Airspace Policy (DAP); any significant changes to the proposal may extend or restart the consultation process.

When does the CAA DAP decide on the outcome of the Consultation?

Following consultation NATS will submit an Airspace Change Proposal (ACP) to the CAA. The CAA will make a decision within 16 weeks of the submission of the ACP.

Can I have copy of the Consultation Results?

A summary report including feedback of this Consultation will be added to the website www.consultation.NATS.co.uk. This will be published shortly after the consultation closes.

What is the consultation not about?

The scope of this consultation is to gather the views of stakeholders and any interested parties regarding the implementation of TMZs over the Greater Wash Wind Farms.

This consultation is not about: wind farms in general; the merits of the Greater Wash wind farm developments; any other or future development; any aspect of Government wind farm or airports policy; or the establishment of controlled airspace.

The presence of TMZs will not influence the position of HMRs. Hence this consultation is not related to any change to Helicopter Main Routes (HMRs). If the physical obstructions presented by wind turbines necessitates changes to the HMR network, this will be addressed independently. Please note that TMZs do not change the status of the airspace from uncontrolled airspace to controlled airspace.

Comments in responses not directly related to the Greater Wash TMZ will be discounted from the analysis.

Who monitors the consultation and where can I go if I have concerns regarding how the Consultation is being carried out?

The CAA DAP will oversee the implementation of this consultation that is being carried out by NATS to ensure adheres to the process laid down in CAP 725 document mentioned earlier. If you have any complaints about NATS's adherence to the consultation process these should be referred to:

Head of Business Management
Directorate of Airspace Policy
CAA House
45 -49 Kingsway
London
WC2B 6TE

E-mail: businessmanagement@dap.caa.co.uk

Please note that this address is for concerns and complaints regarding non-adherence to the defined consultation process. The DAP will not engage with consultees on details of this consultation. Response to the nature of this specific consultation should be addressed to NATS. The DAP will receive details of your response as part of the formal submission for the proposed implementation of an Airspace Change proposal, which a TMZ over the Greater Wash Wind Farms fall into (see 'Confidentially' below).

Will my Query/Response be treated as Confidential?

The CAA requires all consultation material, which includes copies of responses from all key stakeholders, to be included in any formal submission.

However, aside from providing details to the CAA, NATS undertakes that we will not disclose personal details or content of responses and submissions to any third parties without prior permission.

9. What Happens Next?

This consultation document has been circulated to a range of aviation and non-aviation stakeholders which have been identified and agreed with NATS and the CAA. The list of consultees can be found in Appendix 1.

Following the consultation guidelines provided by the CAA, consultees will be provided with 14 weeks for consultees to consider and respond to the proposal and, depending on initial feedback, an extension to this period maybe exercised.

Shortly after the consultation period closes a short report will be made available that will include summary details of the main issues that have presented by stakeholders during the consultation period. This will be posted on the NATS website (www.consultation.nats.co.uk).

Once the Stakeholder Consultation is completed and any issues arising have been dealt with accordingly, NATS will submit a formal proposal to the CAA which shall detail the case for the proposed TMZs. It is a requirement of the consultation process that NATS will provide the CAA with full details of the Consultation (including copies of responses and correspondence) together with all documentation necessary for the promulgation of the proposed TMZs.

The CAA will then review the proposal, which can take up 17 weeks, and reach a Regulatory Decision. If the case is accepted, then the implementation process could take a further eight weeks.

Appendix 1: Consultee List

National Air Traffic Management Advisory Committee (NATMAC) Members

	Abbrev.
NATS	NATS
Aircraft Owners and Pilots Association	AOPA
PPL/IR Europe	PPL/IR Europe
Royal Aeronautical Society	RAeS
The British Hang Gliding and Paragliding Association Ltd	BHPA
The Guild of Air Pilots & Air Navigators	GAPAN
British parachute Association	BPA
Helicopter Club of Great Britain	HCGB
British Helicopter Association	BHA
Royal Aero club	RAeC
British Business and General Aviation Association	BBGA
Unmanned Aerial Vehicle Systems Association	UAV Systems Association
British Balloon & Airship Club	BBAC
Light Aircraft Association	LAA
Society of British Aerospace Companies	SBAC
General Aviation Safety Council	GASCo
British Gliding Association	BGA
British Microlight Aircraft Association	BMAA
Royal Aero Club Records Rally & Racing Association	Three Rs
Royal institute of Navigation	RIN
Flying Farmers Association	FFA
Association of Licensed Aircraft Engineers	ALAE
National Association of Agricultural Contractors	NAAC
General Aviation Awareness Council	GAAC
General Aviation Alliance	GAA
Department For Transport	DFT
Historic Aircraft Association	HAA

Local Flying Organisations, airports, heliports or aerodromes

Bristow Helicopters Limited
CHC-Scotia Limited
Bond Offshore Helicopters Limited
NHV Helicopters
Fisheries Protection
Pollution patrol
Humberside International Airport
Norwich International Airport
North Denes heliport
North Repps / Cromer Airfields
De Havilland Support Ltd (Duxford)

Appendix 2: Glossary Of Key Terms

ATC	Air Traffic Control
ATS	Air traffic control service
Blanking	Term used to identify an area in affected PSR where clutter is removed by plot suppression.
CAA	Civil Aviation Authority
CAP 725	CAP 725, CAA Guidance On The Application Of The Airspace Change Process, March 2007, CAA Directorate of Airspace Policy http://www.caa.co.uk/docs/33/CAP725.PDF
DAP	Directorate of Airspace Policy (the department of the CAA responsible for airspace matters)
FIR	Flight Information Region
IFR	Instrument flight rules
In-fill	PSR radar used to provide cover for the blanked area of the affected PSR
PSR	Primary Surveillance Radar (detects echoes from any object)
Squawk	The signal from an aircraft's transponder, picked up by SSR. The Transponder code.
SSR	Secondary Surveillance Radar - radar which detects & communicates with transponders carried by aircraft. SSR gives ATC additional information such as altitude and an identifying code (Squawk)
TMZ	Transponder mandatory zone. A defined area of airspace where aircraft wishing to enter or fly within are required to have and operate a transponder.
Transponder	A device on the aircraft which transmits information (an identifying code, and usually altitude) which is displayed on the Air traffic Controller's radar screen.
VFR	Visual flight rules

Intentionally Blank