



**ELECTRIC
AVIATION**

Section 3

Final Airspace Change Proposal

Section 3: Final Airspace Change Proposal

3.0 Final Design Proposal

Our Final Design Proposal for Airspace Change Proposal ACP-2021-022 is hereby detailed, post significant stakeholder activities and airspace analysis.



Heysham Power Station as viewed across the bay from Aldingham beach



The view from the top of the bay with Morecambe on the left and Barrow on the right hand side.

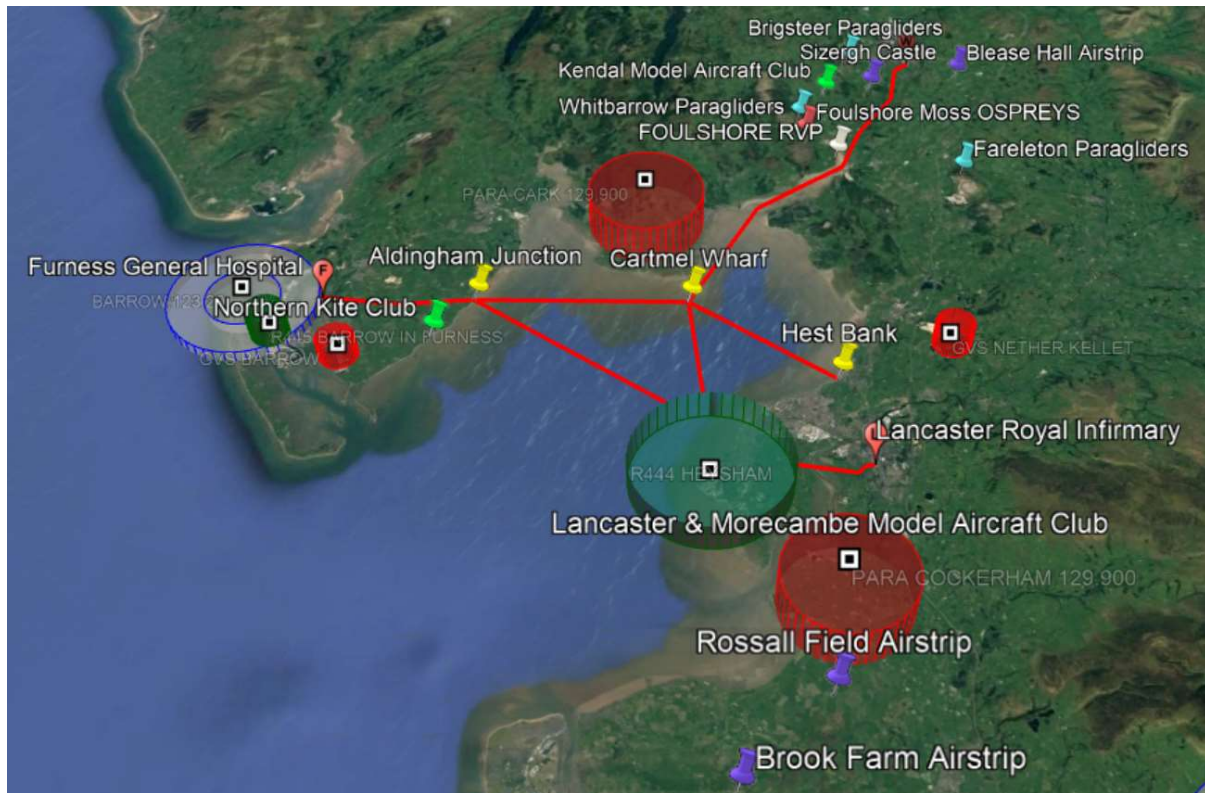
Please note

1: We have applied to the CAA for permission to recreate the 1:250,000 charts in this report

2: Images above are most certainly not indicative of Morecambe Bay in winter.

3.1 The Morecambe Bay Aviation Environment

We present a Google Earth image showing the location of aviation activity across the Morecambe Bay Area, with the proposed TDA tracks shown in red.



Please note Blease Hall Airstrip is no longer in service.

3.1.1 ACP 2021-022 support

This Airspace Change Proposal is submitted with the support of:

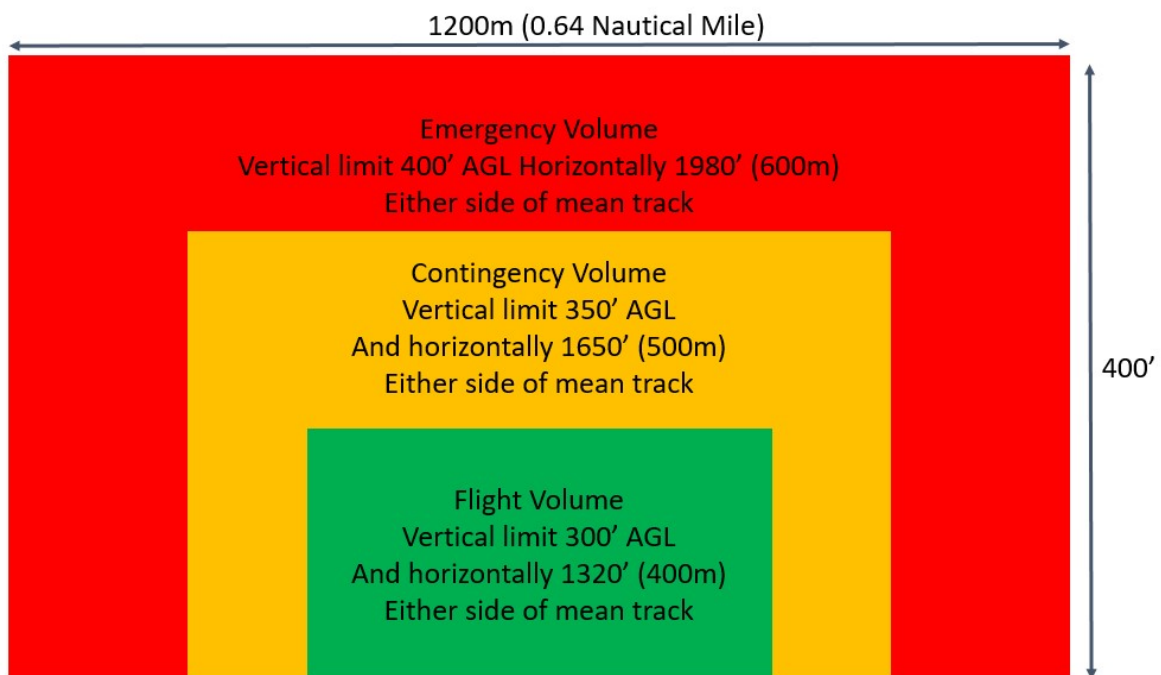
- BAe Warton to provide a DACS
- BAe Systems Submarines support through Walney Island ATC.
- EDF energy support to facilitate and development of scheduled RPAS operations within R444 in accordance with ONR process.

3.2 TDA dimensions

We have increased the lateral width of the TDAs from 800' to 1200m. We have done this for the following reasons.

- The main cause of concern for this Airspace Change is Height not Width of the TDA's
- It is impossible to draw an 800' wide TDA on a 1:250,000 chart, yet alone a 1:500,000 chart.
- If Electric Aviation cannot draw a 800' TDA on a chart, what chance do GA pilots have?
- The OSC for the RPAS dictates a 600m either side of track TDA to allow a rate 1 turn through 180 degrees using the thrust prop. Whilst the same RPAS can make the turn, by transitioning and turning whilst in vertical flight almost upon itself, this procedure, although planned, has not passed through the OSC amendment process yet. Thus by increasing the width of the TDA, the established OSC procedures may be supported.

This makes the final proposed TDA cross section as follows:



The final proposed TDA cross section.

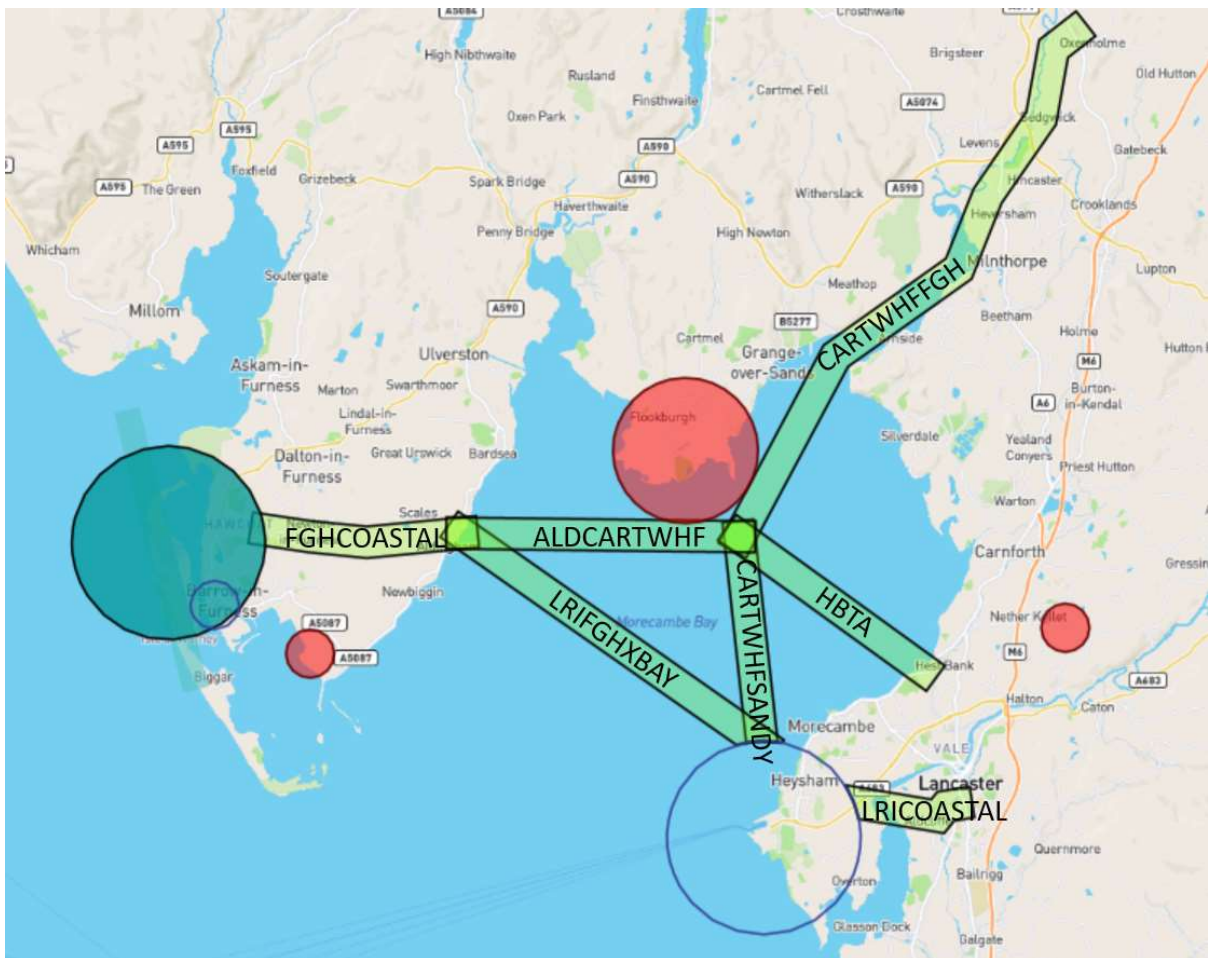
3.3 The Morecambe Bay TDA Routes

We provide the following TDA's as routes:

- Hest Bank Test area
- Lancaster Royal Infirmary to Furness General Hospital
- Furness General Hospital to Westmorland General Hospital
- Westmoreland General Hospital to Lancaster Royal Infirmary

These routes are broken down into numbered TDA sectors.

The sectors are labelled as follows:



The Route Sector TDA's

3.3.1 Hest Bank Test area (HBTA)



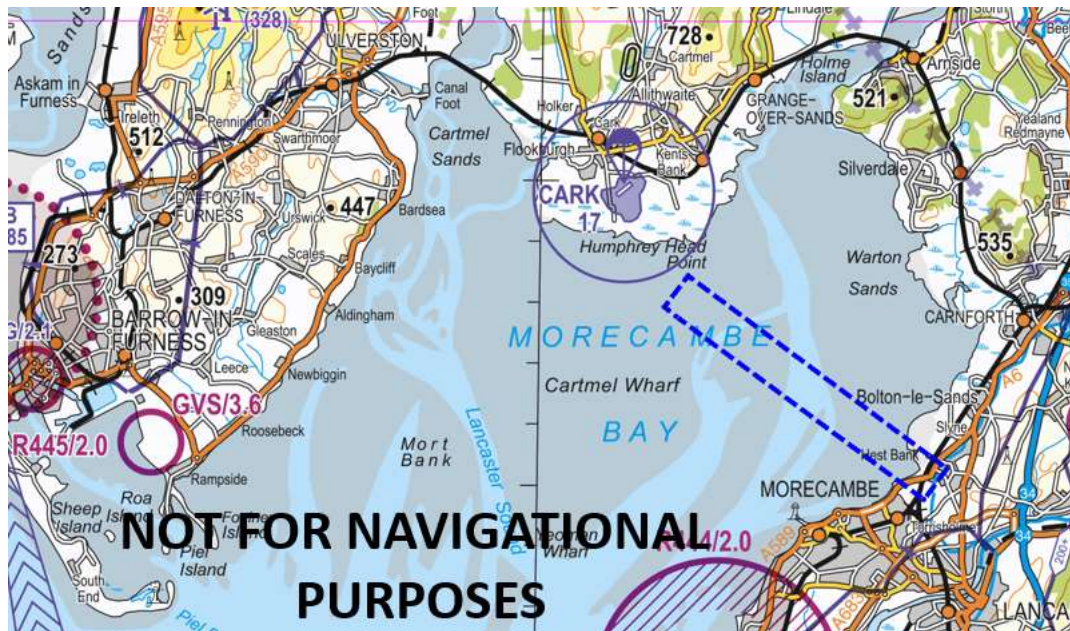
The Hest Bank Test Area Route HBT1

The Hest Bank Test Area (HBTA) is a small TDA designed to enable the RPAS to be tested for communications and to allow BAe at Walney to confirm their activities are mutually exclusive with the operation of the RPAS. Whilst the RPAS is operating in this TSA leg BAe Warton will also be testing their ability to review the location of the RPAS and operate a DACS accordingly.

The Hest Bank test Area TDA is a polygon created from the following co-ordinates:

| | |
|-----------|-----------|
| -2.815841 | 54.092063 |
| -2.808411 | 54.0889 |
| -2.819167 | 54.080165 |
| -2.933942 | 54.1289 |
| -2.941389 | 54.132055 |
| -2.930646 | 54.140801 |
| -2.815841 | 54.092063 |

This is indicated on the CAA 1:250,000 chart found below:



The Hest Bank Test Area (HBTA) indicated on CAA 1:250,000 chart ©CAA/NATS
 Contains OS data © Crown copyright 2021.

Image

The rationale for the location of this TDA is to leave as much of Morecambe Bay open to low level military traffic as possible. We are aware of the fast jet entry route to the lakes at Ulveston and have deliberately tried to keep clear of this location.

3.3.2 Lancaster Royal Infirmary to Furness General Hospital (LRIFGH)



The LRIFGH Route

The LRIFGH TDA is formed of three polygons created from the following co-ordinates:

LRICOASTAL (The area from Lancaster Royal Infirmary to R444) area bounded by:

| | |
|-----------|-----------|
| -2.858785 | 54.036165 |
| -2.859364 | 54.037771 |
| -2.860454 | 54.040008 |
| -2.861806 | 54.042195 |
| -2.863415 | 54.044322 |
| -2.865273 | 54.046377 |
| -2.866886 | 54.047895 |
| -2.816366 | 54.042921 |
| -2.812793 | 54.045533 |
| -2.802914 | 54.046467 |
| -2.793867 | 54.047322 |
| -2.790964 | 54.036673 |
| -2.802935 | 54.035542 |
| -2.808819 | 54.03124 |
| -2.858785 | 54.036165 |

LRIFGHXBAY (The area from R444 to Aldingham Junction) area bounded by:

| | |
|-----------|-----------|
| -2.903757 | 54.062441 |
| -2.906536 | 54.062729 |
| -2.910478 | 54.062972 |
| -2.91444 | 54.063053 |
| -2.918402 | 54.062972 |
| -2.922344 | 54.062729 |
| -2.926248 | 54.062324 |

| | |
|-----------|-----------|
| -2.930095 | 54.061761 |
| -2.93052 | 54.06168 |
| -3.096496 | 54.13 |
| -3.104023 | 54.133088 |
| -3.093507 | 54.141929 |
| -2.91017 | 54.066452 |
| -2.902669 | 54.063352 |
| -2.903757 | 54.062441 |

FGHCOASTAL (The area from Furness General Hospital to the coast) area bounded by:

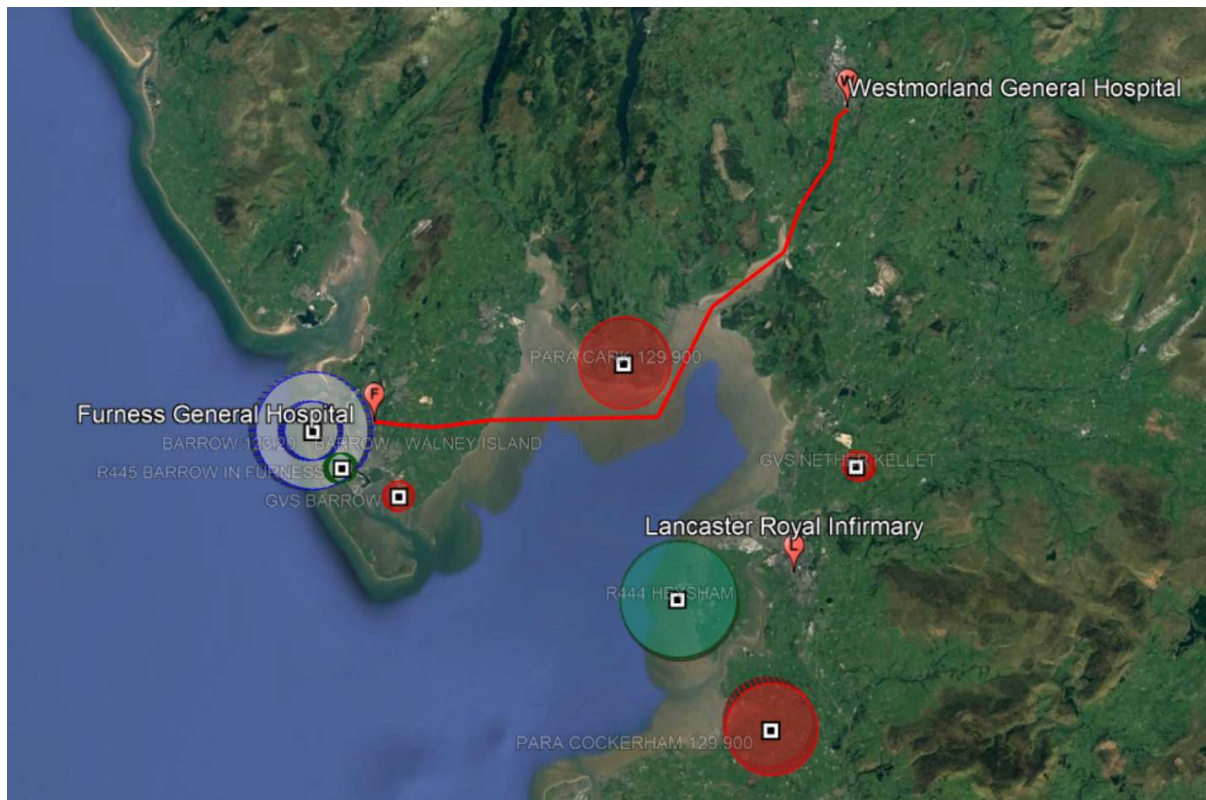
| | |
|-----------|-----------|
| -3.179192 | 54.13861 |
| -3.14711 | 54.13672 |
| -3.092083 | 54.139795 |
| -3.08294 | 54.140303 |
| -3.08121 | 54.129567 |
| -3.147156 | 54.125884 |
| -3.181458 | 54.127905 |
| -3.207322 | 54.13016 |
| -3.216404 | 54.130951 |
| -3.213712 | 54.141618 |
| -3.179192 | 54.13861 |

These three areas are presented on the CAA 1:250,000 chart found below:



The LRFHG TD
indicated on CAA 1:250,000 chart ©CAA/NATS
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3.3.3 Furness General Hospital to Westmorland General Hospital (FGHWGH)



The FGHWGH Route

The FGHWGH TDA is formed of three polygons created from the following co-ordinates:

FGHCOASTAL (The area from Lancaster Royal Infirmary to R444) area bounded by:

| | |
|-----------|-----------|
| -3.179192 | 54.13861 |
| -3.14711 | 54.13672 |
| -3.092083 | 54.139795 |
| -3.08294 | 54.140303 |
| -3.08121 | 54.129567 |
| -3.147156 | 54.125884 |
| -3.181458 | 54.127905 |
| -3.207322 | 54.13016 |
| -3.216404 | 54.130951 |
| -3.213712 | 54.141618 |
| -3.179192 | 54.13861 |

ALDCARTWHF

| | |
|-----------|-----------|
| -2.92846 | 54.138668 |
| -2.919278 | 54.138597 |
| -2.919523 | 54.127813 |
| -3.091349 | 54.129037 |
| -3.10053 | 54.129096 |
| -3.100332 | 54.139879 |
| -2.92846 | 54.138668 |

CARTWHFWGH

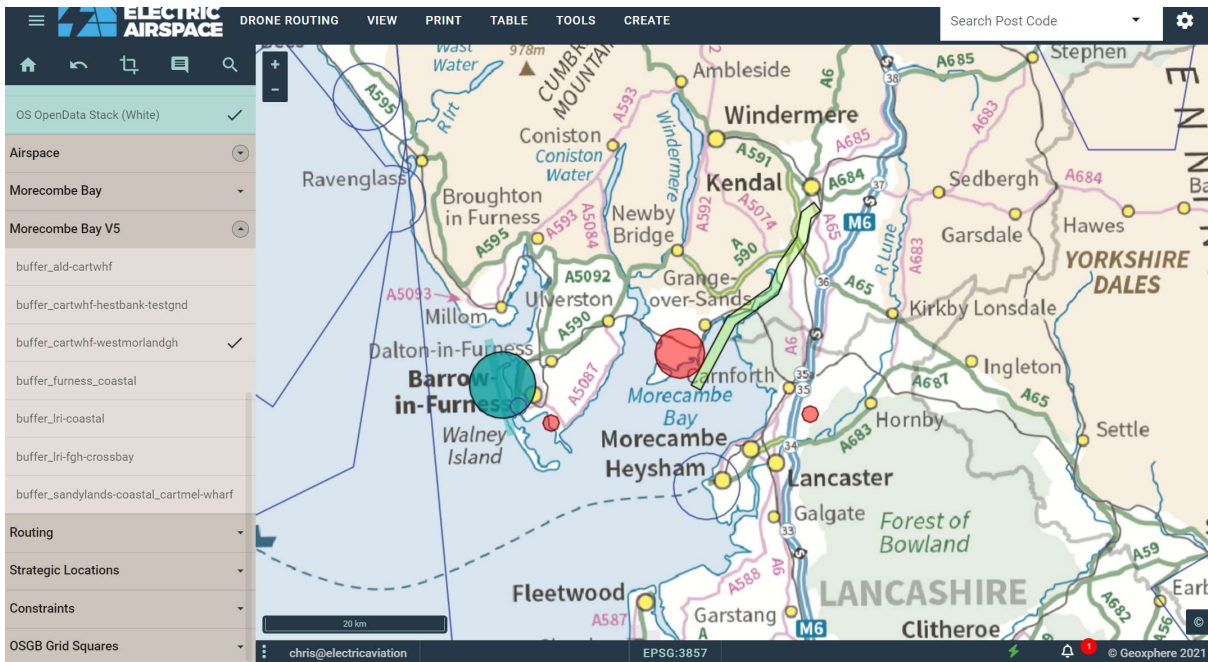
| | |
|-----------|-----------|
| -2.879305 | 54.198961 |
| -2.807807 | 54.228654 |
| -2.791556 | 54.252566 |
| -2.783847 | 54.259629 |
| -2.760706 | 54.278837 |
| -2.753106 | 54.303389 |
| -2.738725 | 54.309973 |
| -2.731463 | 54.313297 |
| -2.720098 | 54.304804 |
| -2.736214 | 54.297428 |
| -2.743299 | 54.274569 |
| -2.768553 | 54.253614 |
| -2.775095 | 54.247622 |
| -2.792724 | 54.221697 |
| -2.865125 | 54.191636 |
| -2.920495 | 54.130728 |
| -2.924813 | 54.12597 |
| -2.941019 | 54.131041 |
| -2.879305 | 54.198961 |

These three areas are presented on the CAA 1:250,000 chart found below:

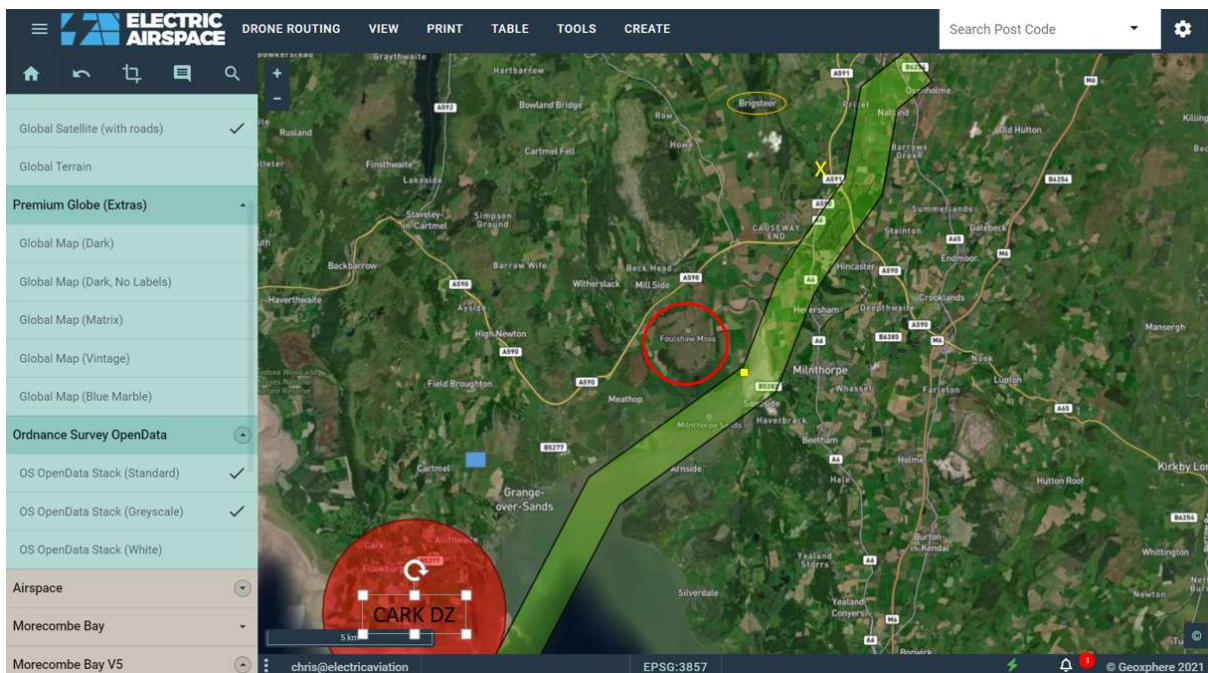


The FGHWGH TDA
indicated on CAA 1:250,000 chart ©CAA/NATS
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It is worth noting that the route from Cartmel Wharf has been designed to minimise disruption to wildlife, whilst taking into account feedback from the paragliders, the model aircraft clubs and the National Trust.



The route from Cartmel Wharf to Westmoreland General Hospital

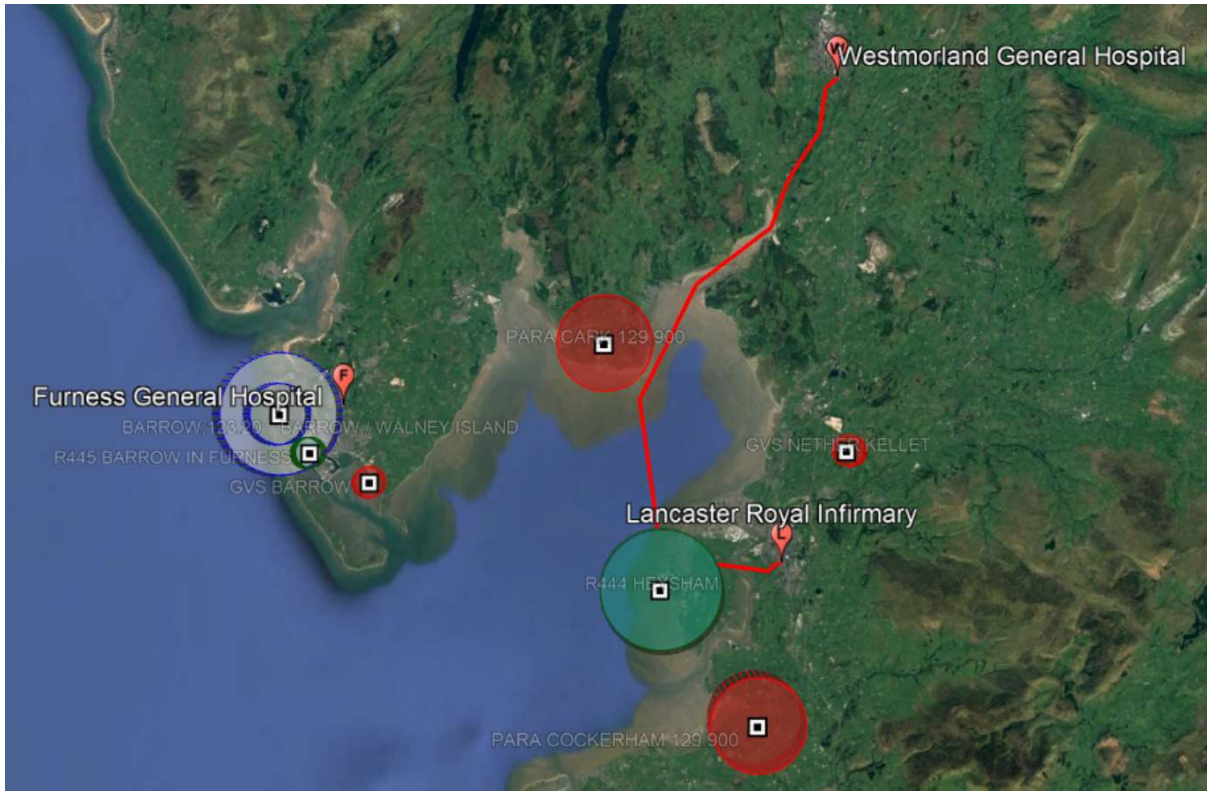


The route from Carmel Wharf to Westmoreland General Hospital showing land features

On the map above it can be seen how the route has been deliberately designed to miss the Ospreys at Foulshore Moss, marked with a red circle. Also of note is the design of the TDA around Sizergh Castle, marked with a yellow "X" and the Brigsteer paraglider launch site, marked with an orange ellipse.

Finally an emergency landing point has been negotiated with a land owners at Foulshore, such that should there be any issues with wildlife, the RPAS may make a safe and dedicated landing and hold position at Foulshore.

3.3.5 Westmoreland General Hospital to Lancaster Royal Infirmary (WGLRI)



The WGLRI Route

The LRIFGH TDA is formed of three polygons created from the following co-ordinates:

CARTWHFWGH

| | |
|-----------|-----------|
| -2.879305 | 54.198961 |
| -2.807807 | 54.228654 |
| -2.791556 | 54.252566 |
| -2.783847 | 54.259629 |
| -2.760706 | 54.278837 |
| -2.753106 | 54.303389 |
| -2.738725 | 54.309973 |
| -2.731463 | 54.313297 |
| -2.720098 | 54.304804 |
| -2.736214 | 54.297428 |
| -2.743299 | 54.274569 |
| -2.768553 | 54.253614 |
| -2.775095 | 54.247622 |
| -2.792724 | 54.221697 |
| -2.865125 | 54.191636 |
| -2.920495 | 54.130728 |
| -2.924813 | 54.12597 |
| -2.941019 | 54.131041 |
| -2.879305 | 54.198961 |

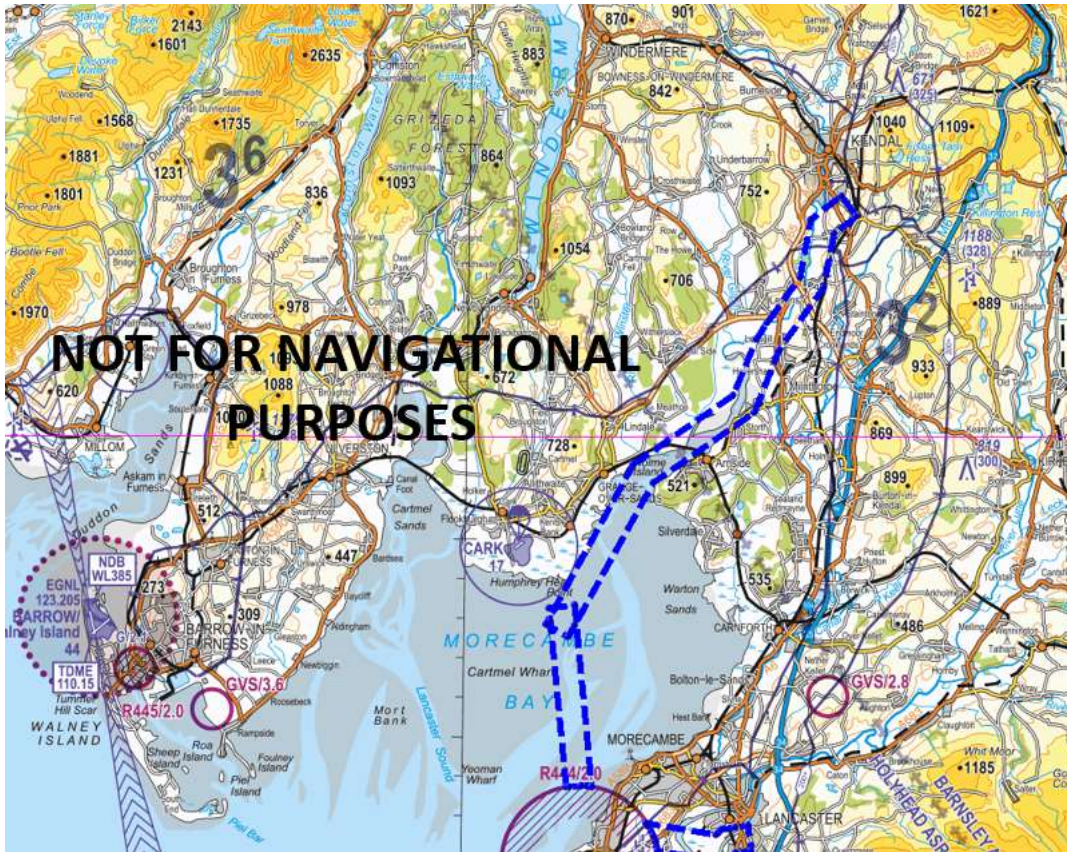
CARTWHFSANDY

| | |
|-----------|-----------|
| -2.906342 | 54.062709 |
| -2.906536 | 54.062729 |
| -2.910478 | 54.062972 |
| -2.91444 | 54.063053 |
| -2.918402 | 54.062972 |
| -2.922344 | 54.062729 |
| -2.92474 | 54.062481 |
| -2.937728 | 54.132689 |
| -2.938721 | 54.13805 |
| -2.920462 | 54.139215 |
| -2.906342 | 54.062709 |

LRICOASTAL (The area from Lancaster Royal Infirmary to R444) area bounded by:

| | |
|-----------|-----------|
| -2.858785 | 54.036165 |
| -2.859364 | 54.037771 |
| -2.860454 | 54.040008 |
| -2.861806 | 54.042195 |
| -2.863415 | 54.044322 |
| -2.865273 | 54.046377 |
| -2.866886 | 54.047895 |
| -2.816366 | 54.042921 |
| -2.812793 | 54.045533 |
| -2.802914 | 54.046467 |
| -2.793867 | 54.047322 |
| -2.790964 | 54.036673 |
| -2.802935 | 54.035542 |
| -2.808819 | 54.03124 |
| -2.858785 | 54.036165 |

These three areas are presented on the CAA 1:250,000 chart found overleaf:



The WGHLGH TDA
 indicated on CAA 1:250,000 chart ©CAA/NATS
 Contains OS data © Crown copyright 2021.

3.3.6 TDA Operation

It is our aim to use the TDA's through a managed process, notified by NOTAM, keeping the route sectors to a minimum. There will be a period of test and validation for all the systems including the interaction with the ATC units at Walney Island and Warton airfields. We would aim to activate the Hest Bank Test range TDA sector to undertake these trials.



indicated on CAA 1:250,000 chart ©CAA/NATS
Contains OS data © Crown copyright 2021.

We would then look to go from coast to coast from Hest Bank on the Lancashire coast, via ALDCARTWHF TDA sector to Aldingham Junction on the Cumbria coast.



indicated on CAA 1:250,000 chart ©CAA/NATS
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We would then look to extend operations to Furness General Hospital bringing into play the FGI Coastal TDA sector



indicated on CAA 1:250,000 chart ©CAA/NATS
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We would then look to move operations from Hest Bank and to activate the CARTWHFWGH TDA sector closing down the HBTA TDA sector



indicated on CAA 1:250,000 chart ©CAA/NATS
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We would then look to activate the LRICOASTAL TDA sector along with the CARTWHFSANDY and the LRIFGHCROSSBAY TDA sectors to enable the full routes to be operated. Thus the operational TDA that we would propose for this Airspace Change Proposal is as found overleaf.



The Final TDA network proposed
 indicated on CAA 1:250,000 chart ©CAA/NATS
 Contains OS data © Crown copyright 2021.

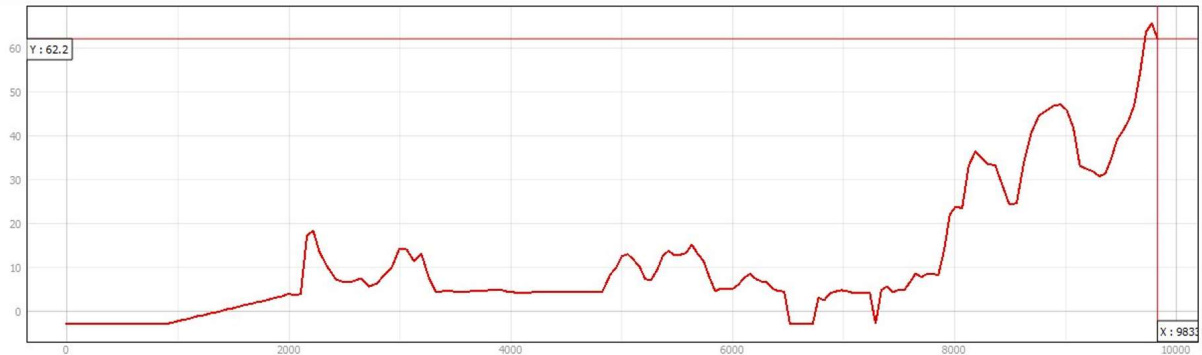
It is our ambition to activate and fly as much of the TDA as quickly as possible, such that there is not a constant change in TDA sector activation.

3.3.7 AGL v AMSL

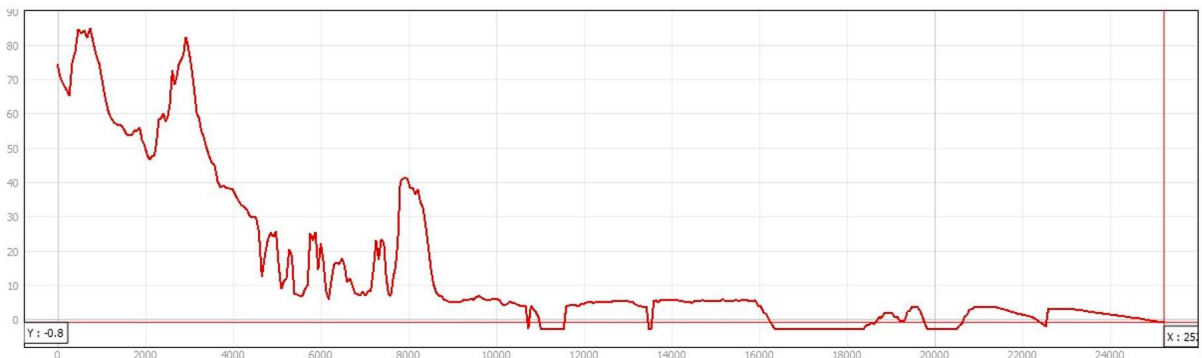
The majority of the flight volume of the TDA's in support of Airspace Change Proposal ACP2021-022 are over the sea.

The TDA sectors LRICOASTAL, FGHCOASTAL and CARTWHFWGH are overland and have the following height profiles:

LRICOASTAL max elevation = 65m, thus the TDA will extend to 615' amsl

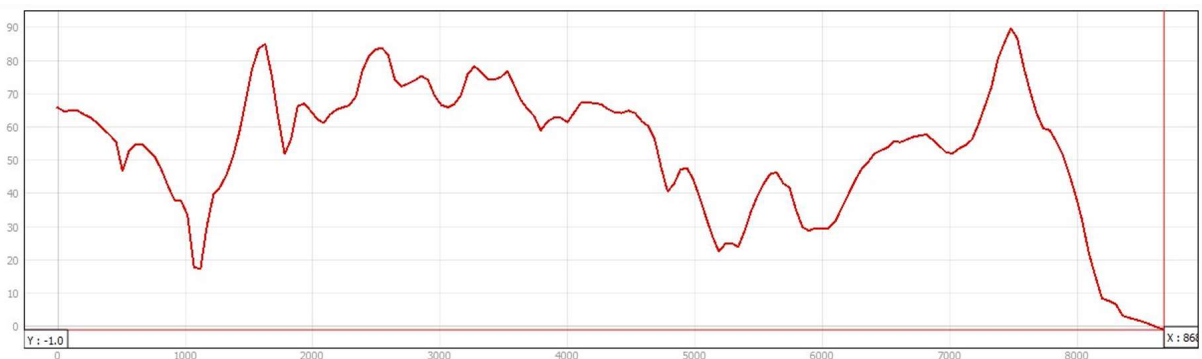


CARTWHFWGH max elevation = 85m thus the TDA will extend to 681' amsl



CARTWHFWGH elevation shown with WGH on the LHS

FGHCOASTAL max elevation = 90m thus the TDA will extend to 697' amsl



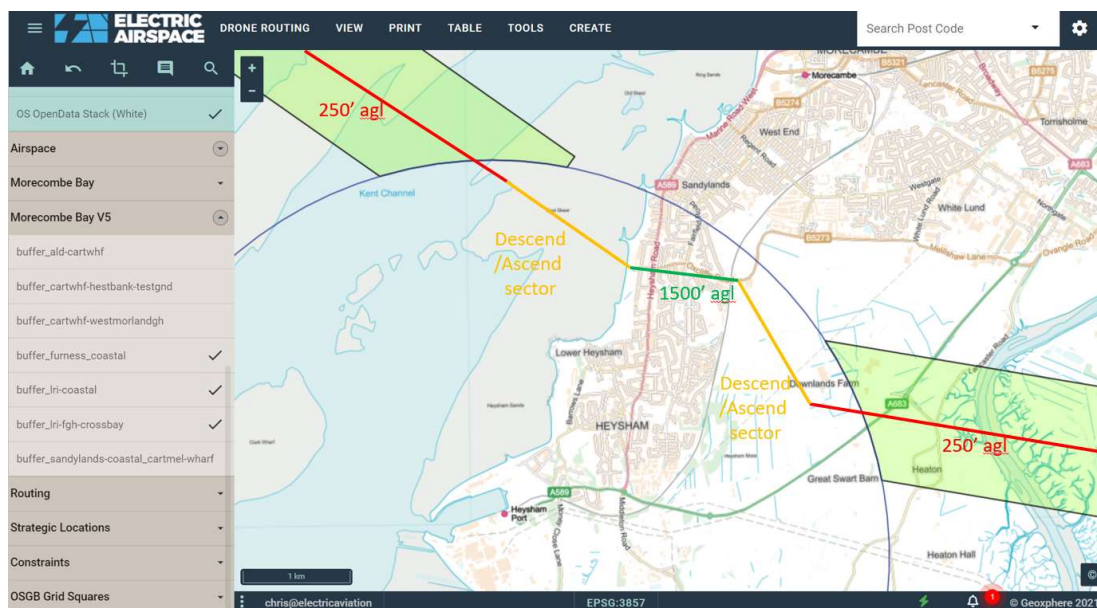
3.3.8 The Use of R444

We have the support of EDF to route through and rise above the urban population at Sandylands, within R444 the restricted zone surrounding Heysham Power Station.

As R444 is a restricted zone, it can be considered segregated airspace, thus there is no need for our Airspace Change Request to apply for a TDA within R444.

We believe that our usage of R444 is a clever use of existing segregated airspace.

It would be our intention to enter R444 at 250' cruise level, climb to 1500' to provide vertical clearance and glide clear potential, over the urban conurbation at Sandylands, before descending back down to 250 agl over either open farmland or the sea before continuing on track. The ascent/descent may be straight climb/descent or orbital flight to gain/lose height or transition to VTOL operations for climb/descent.



Electric Airspace planning shows the route through R444

The proposed route keeps the RPAS under 1500' giving a further 500' clearance for the microlight and landplanes that infringe the zone consistently in terms of height.

The proposed route also keeps the RPAS' operation 2.9 kilometres from Heysham Power Station providing a 800m buffer from the edge of R444, allowing for the microlights who cannot manage their climb approaching R444 from the North East.

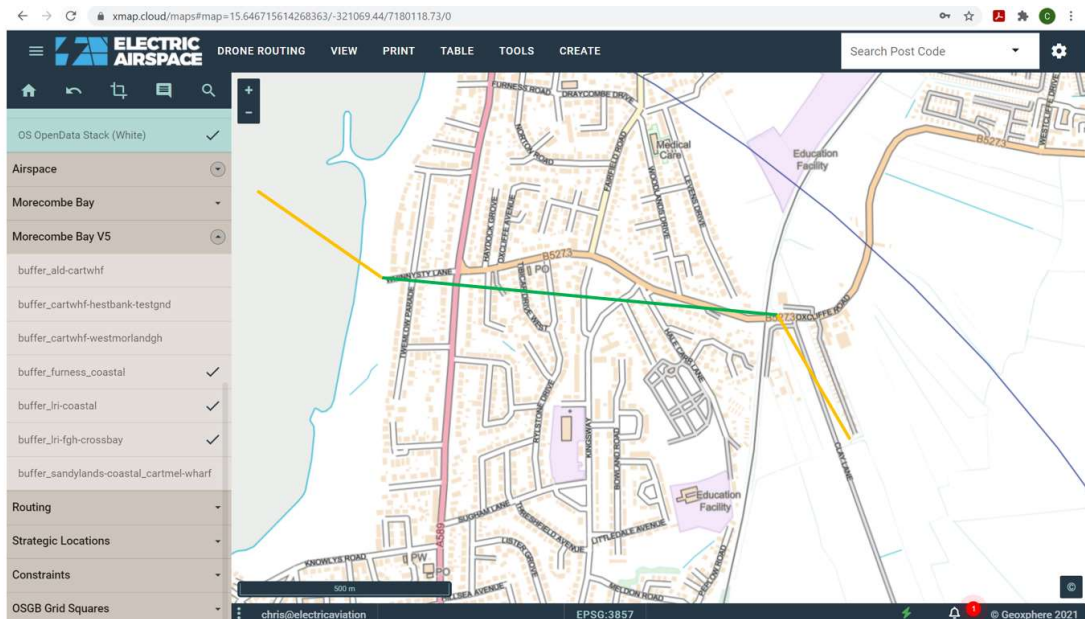
In effect the RPAS would operate 22% inside the R444 zone, providing 78% separation from the Power Station.

This is overflight of 861m which at 33m/s represents an overflight time of 26.09 seconds.

At a height of 1500' the RPAS should not be heard nor seen.

We have actively avoided all urban areas that might be contentious such as schools, cemeteries etc.

Using our XMAP Electric Airspace portal we are able to identify every property along the route.



Electric Airspace Planning shows each property

We suspect this may be the first time that a request to use Restricted segregated airspace has been mooted for RPAS operations and as such we await the CAA's response before proceeding with the Office of Nuclear Regulation assessment.

3.3.8 Rule of Thumb for other airspace users regarding Morecambe Bay

For this airspace change and for the ninety days it may be active, it is simply a case of drawing a line between Walney Island Airfield and Heysham Power Station, and realising that low level flight across Morecambe Bay to the north of this line (shown red below) below 500' will require use of the DACS service from Warton Radar.



The reminder line across Morecambe Bay indicated on CAA 1:250,000 chart ©CAA/NATS Contains OS data © Crown copyright 2021.

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