



11 March 2019

SEMINAR ON THE EFFECTIVE IMPLEMENTATION OF IALA STANDARDS

The Sheraton Istanbul Atakoy, Istanbul, Turkey

The use of IALA Standards, Recommendations and Guidelines to ensure appropriate Aid to Navigation Assessment and Delivery

Roger Barker
Trinity House



SOLAS Chapter V: Regulation 13



- ¹ Each Contracting Government undertakes to provide, as it deems practical and necessary either individually or in co-operation with other Contracting*
 - 2. In order to obtain the greatest possible uniformity in aids to navigation, Contracting Governments undertake to take into account the international recommendations and guidelines* when establishing such aids.*
- affic

** Refer to the appropriate recommendations and guidelines of IALA and SN/Circ.107 - Maritime Buoyage System*



NAVGUIDE 2018

MARINE AIDS TO NAVIGATION MANUAL

8TH EDITION
INTERNATIONAL ASSOCIATION OF MARINE
AIDS TO NAVIGATION AND LIGHTHOUSE AUTHORITIES

Standards



Recommendations



Guidelines

AtoN Planning and Service Requirements

Obligations and regulatory compliance

AtoN Planning
(Offshore signals, bridge signals, traffic signals, MBS, fairway design)

Virtual marking

Levels of service
(objectives, Availability and Categories)

Risk Management

Quality management

AtoN Design and Delivery

Visual signalling
(Vision, Colour, Conspicuity, Rhythmic characters)

Range and performance
(visual and audible)

Design, Implementation & Maintenance

Power systems

Floating AtoN
(buoys, moorings, stability...)

Environment, Sustainability & Legacy

Radionavigation Services

Satellite positioning and timing

Terrestrial radio positioning and timing (including eLoran, eChayka, R-mode)

RACON & Radar positioning

Augmentation services including SBAS & GBAS

Vessel Traffic Services

VTS implementation

VTS operations

VTS data and information management

VTS communications

VTS technologies

VTS Auditing and assessing

VTS additional services

Training and Certification

Training and assessment

Competency certification and revalidation

Simulation in training

Human factors and ergonomics

Capacity building

Digital Communications Technologies

Wide/Medium bandwidth systems
(AIS & VDES)

Narrow bandwidth systems
(NAVDAT, MF beacons)

Harmonised maritime connectivity
(Maritime Internet of Things (Intelligent sensors, AtoN monitoring))

Information Services

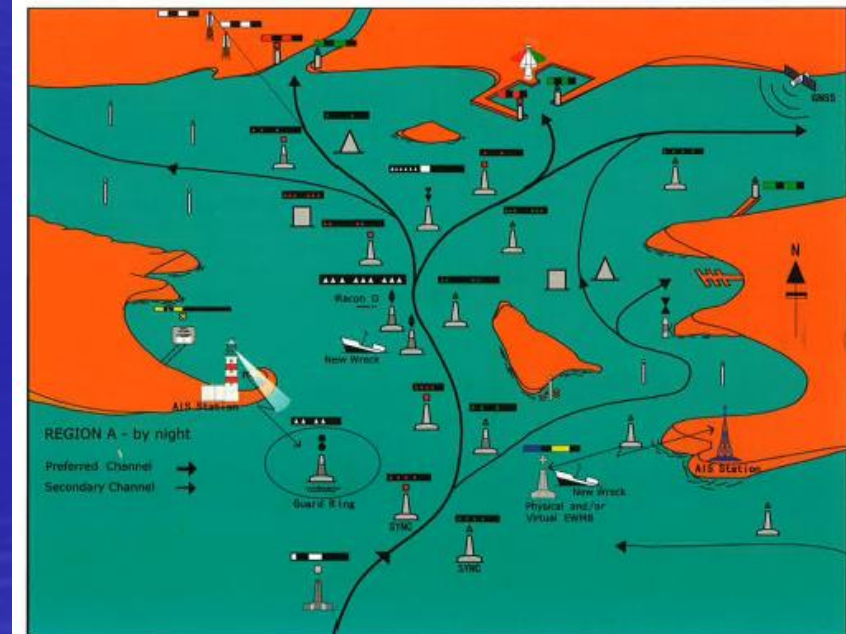
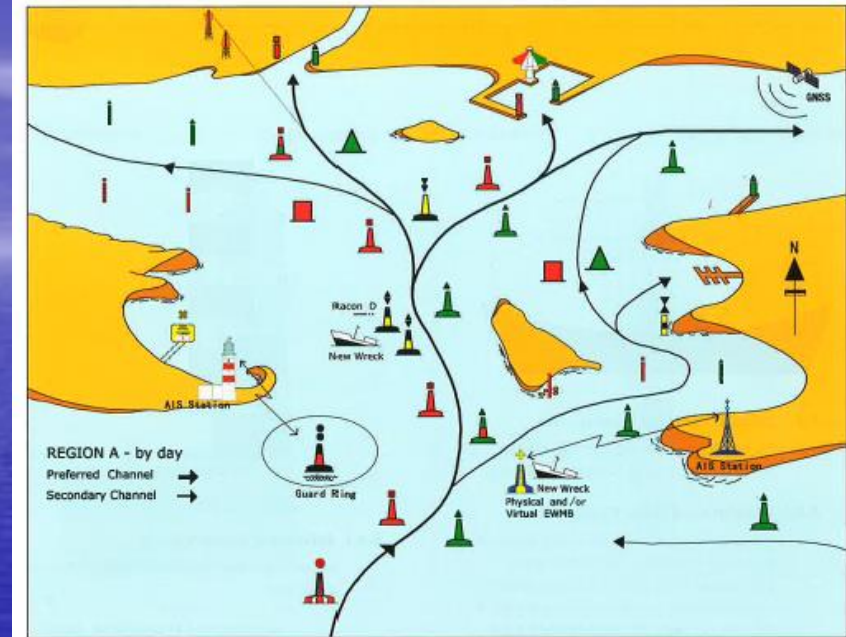
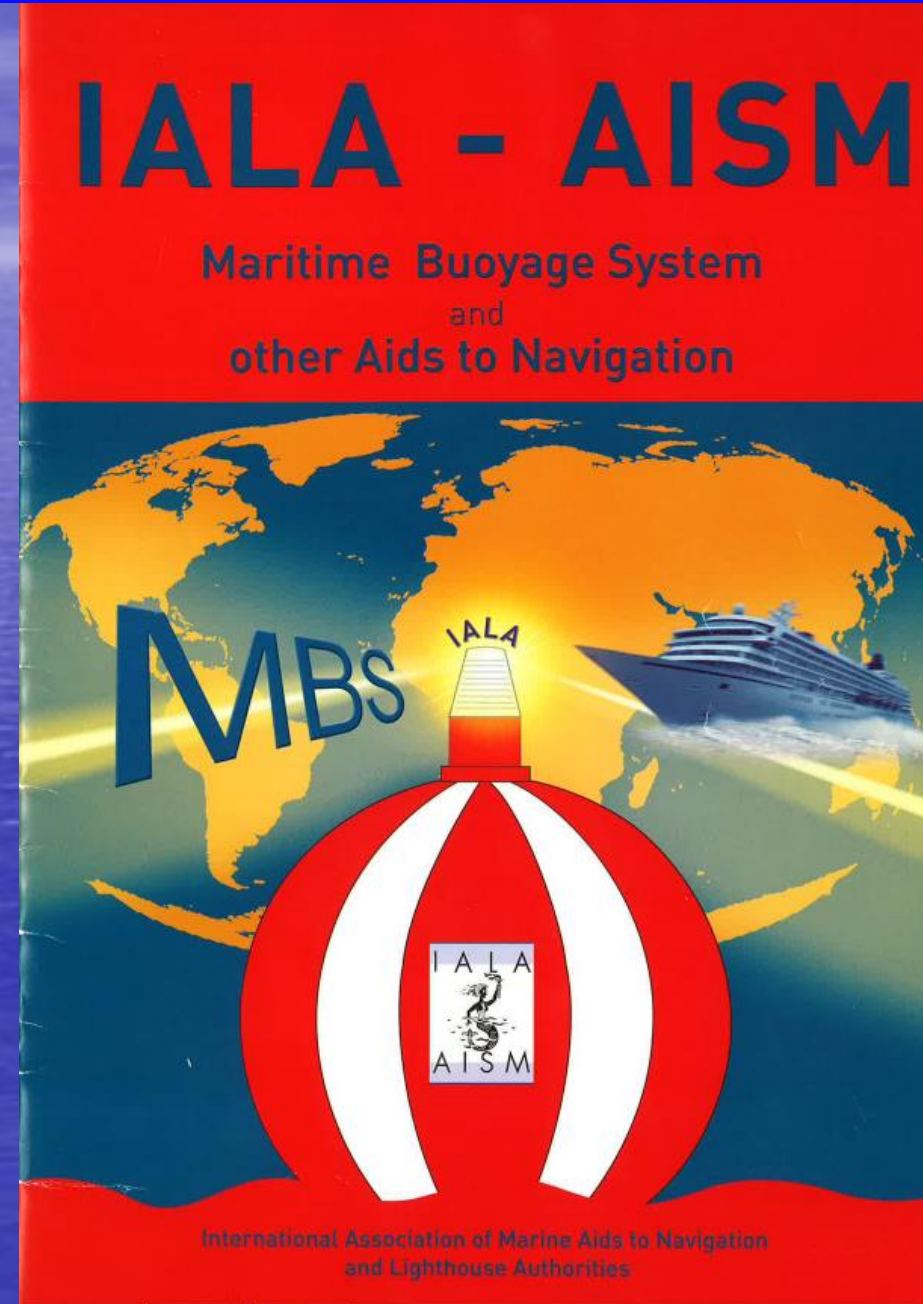
Data models and data encoding
(MSPs, IVEF, S-100, S-200, ASM)

Data exchange systems

Terminology, symbology and portrayal

Standard 1010 – AtoN Planning & Service Requirements

The IALA Maritime Buoyage System



Standard 1010 - Risk Management

| | | | | | | | |
|----------------------|-------|---|-----|------|--|---------|--|
| 1.4. Risk Management | R1002 | Risk Management for Marine Aids to Navigation | ARM | Nor. | | [G]1018 | Risk Management (May 2013) |
| | | | | | | G1123 | The Use of IALA Waterway Risk Assessment Programme (IWRAP MkII) (June 2017) |
| | | | | | | G1124 | The Use of Ports and Waterways Safety Assessment (PAWSA MkII) Tool (June 2017) |
| | | | | | | G1138 | The Use of the Simplified IALA Risk Assessment Method (SIRA) (Dec 2017) |
| | | | | | | [G]1104 | The Application of Maritime Surface Picture for Analysis in Risk Assessment and the Provision of [Marine] Aids to Navigation Service Delivery (Dec 2013) |



IALA GUIDELINE

G1124

THE USE OF PORTS AND W
ASSESSMENT (PAWSA) MK

Edition 1.0

June 2017

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International Association of Marine Aids to Navigation and Lighthouse Authorities
Association Internationale de Signalisation Maritime

Edition 1.0

June 2017

Revokes IALA Recommendation O-134
IALA Risk Management Tool for Ports and

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IALA MODEL COURSE

L1 3

AIDS TO NAVIGATION MANAGER TRAINING
LEVEL 1 - USE OF THE IALA RISK
MANAGEMENT TOOLS

Edition 2.0

December 2015

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Education

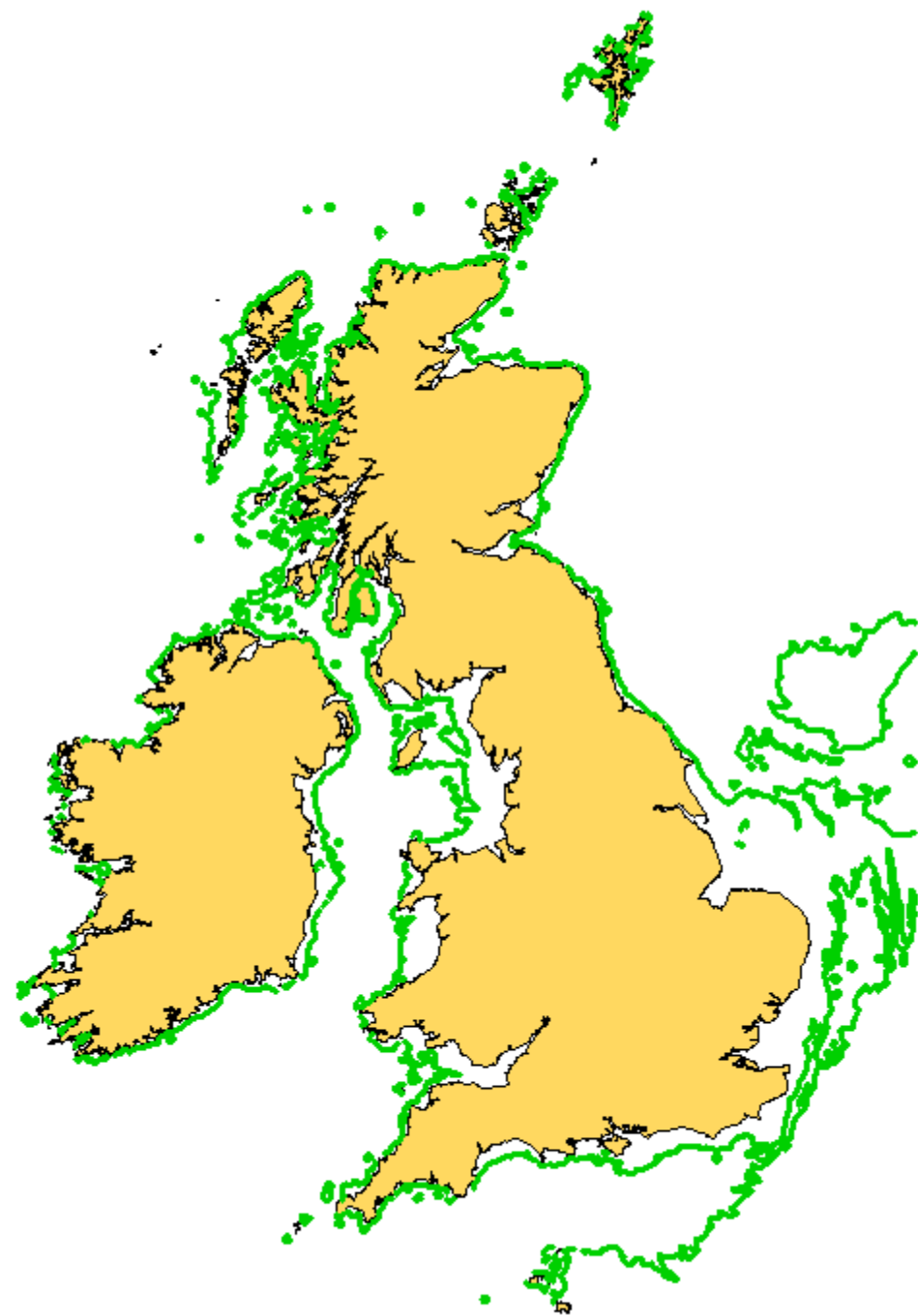
line 1018

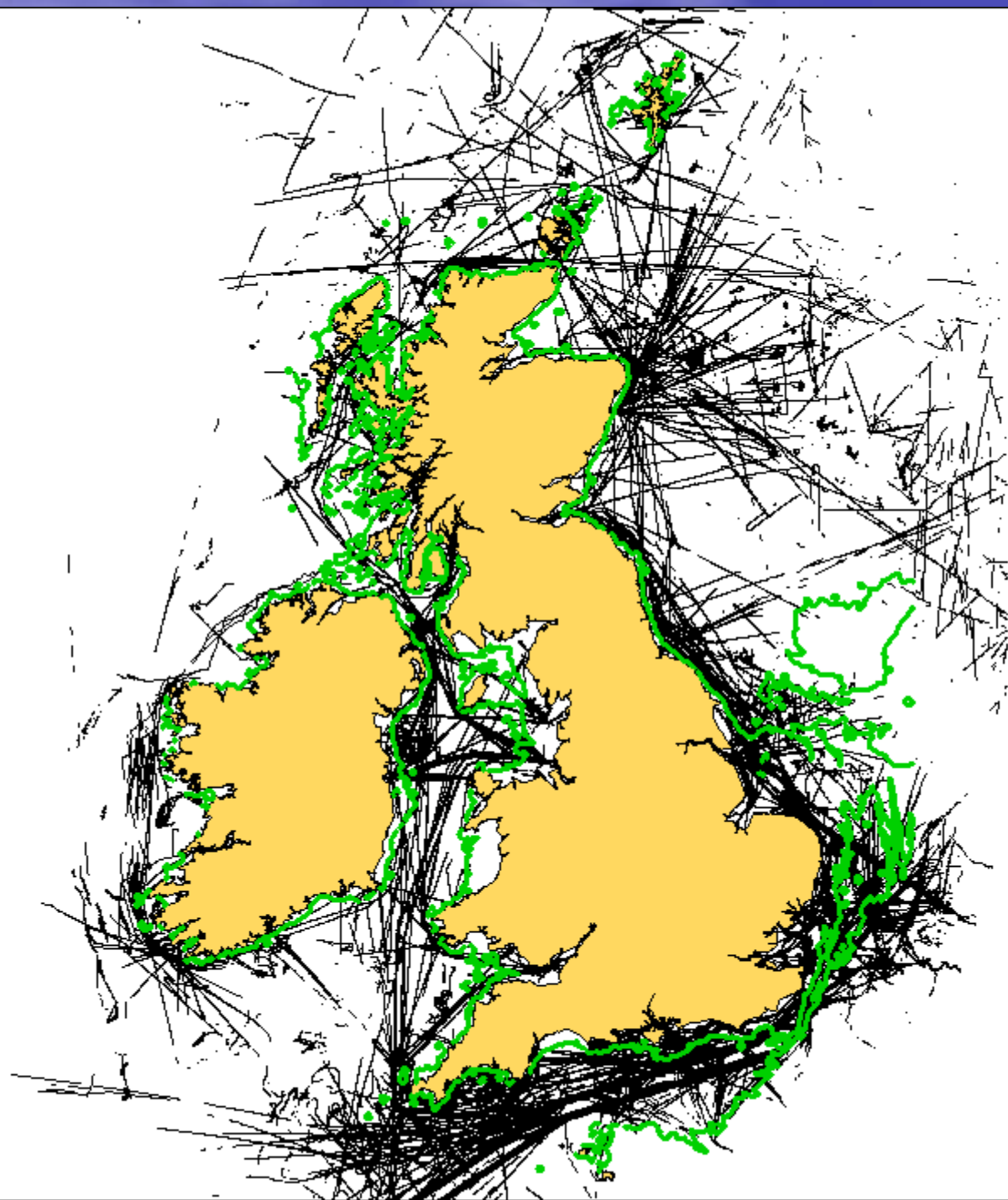


ON AS A TOOL FOR
ND AtoN PLANNING

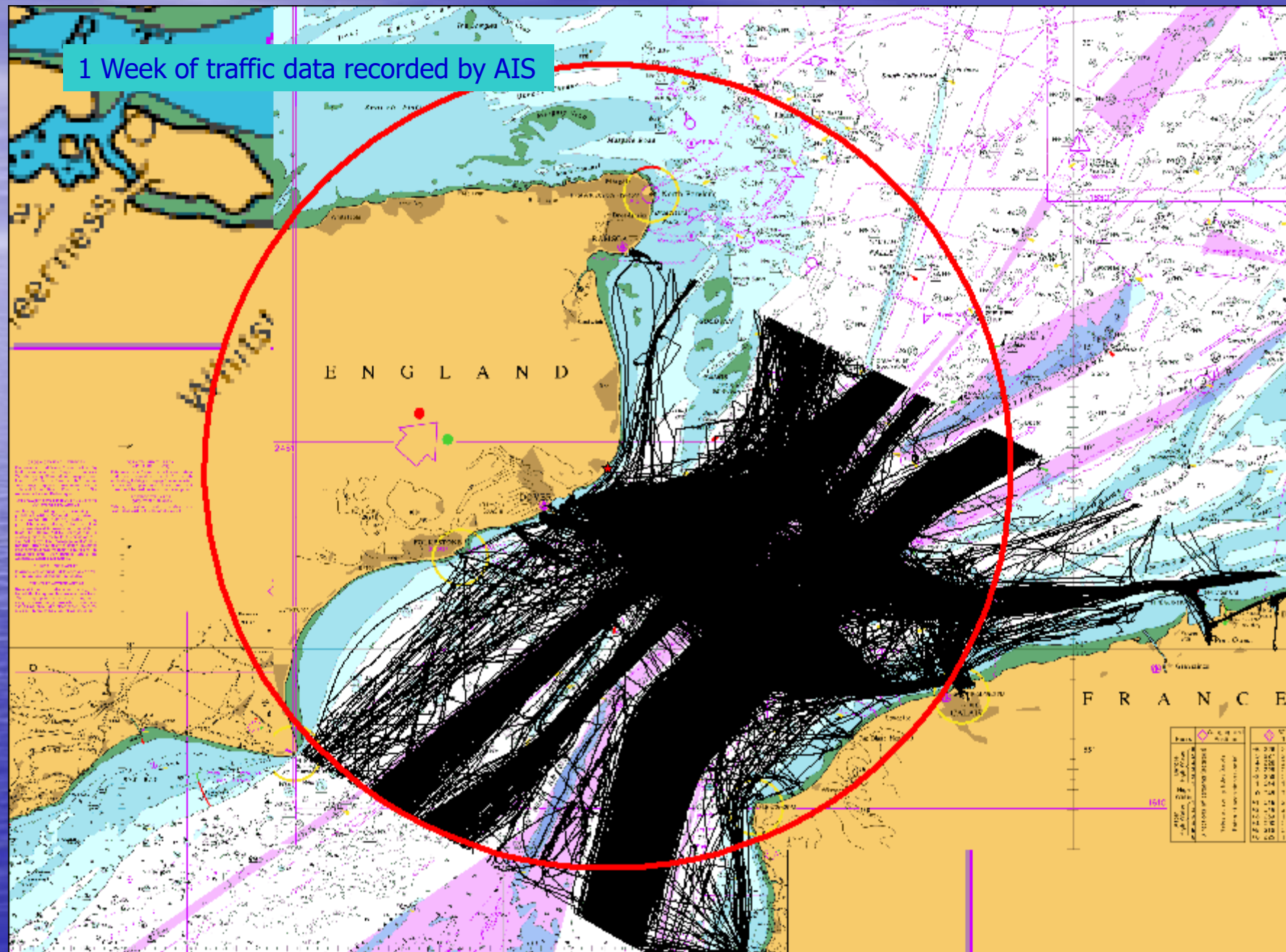
Volume of traffic and degree of risk







1 Week of traffic data recorded by AIS



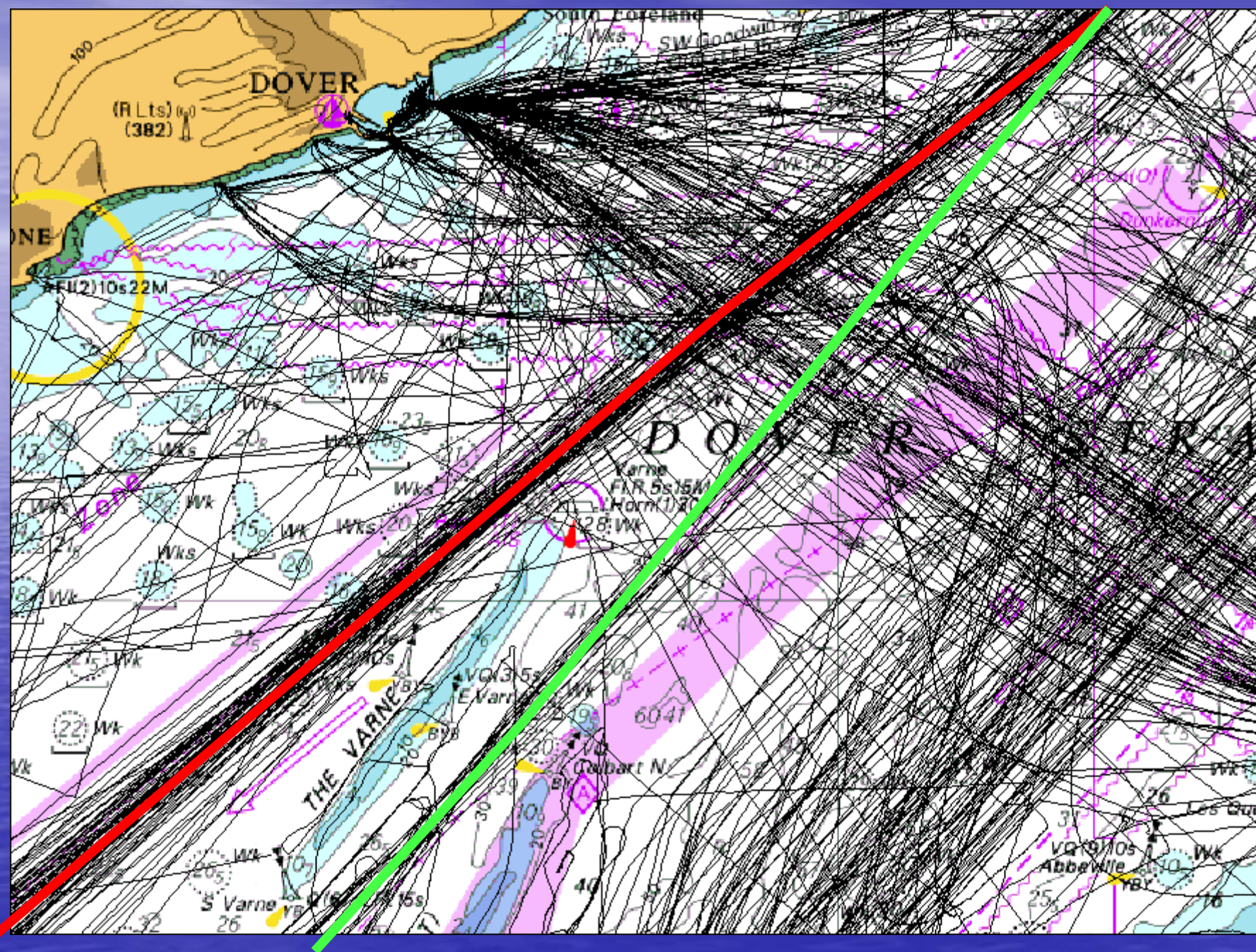
1 Day of traffic data recorded by AIS

ENGLAND

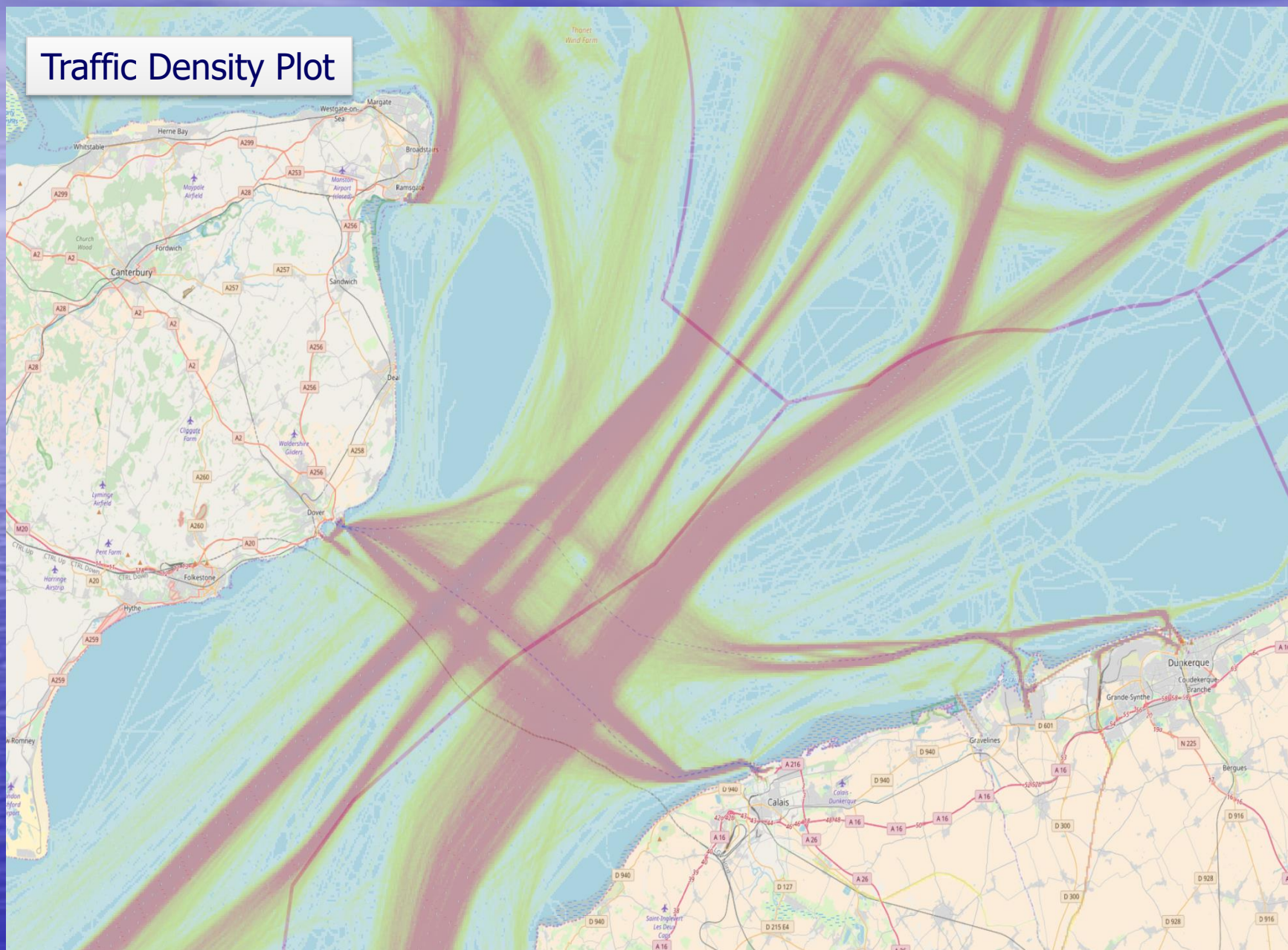
FRANCE

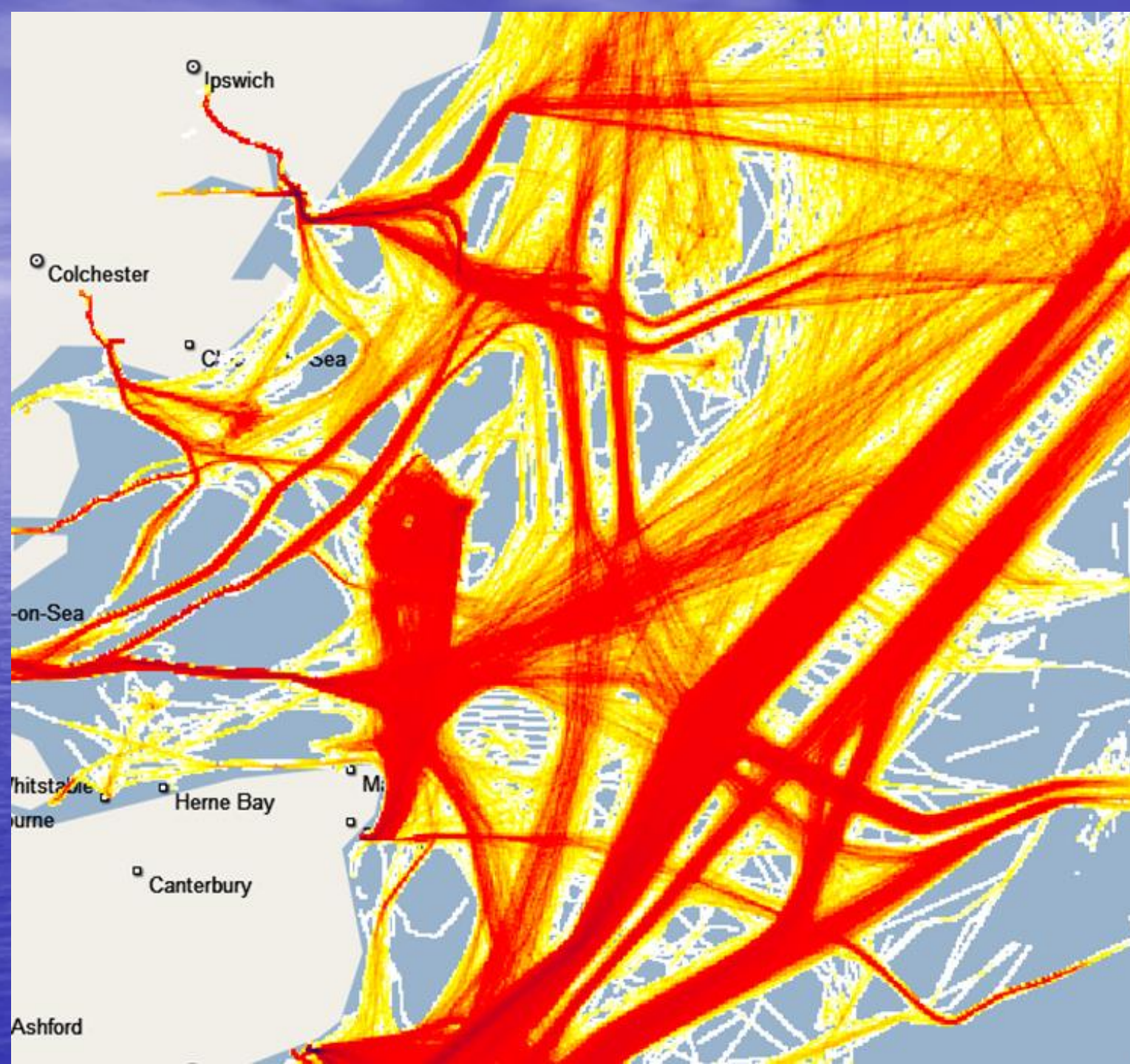
Legend:

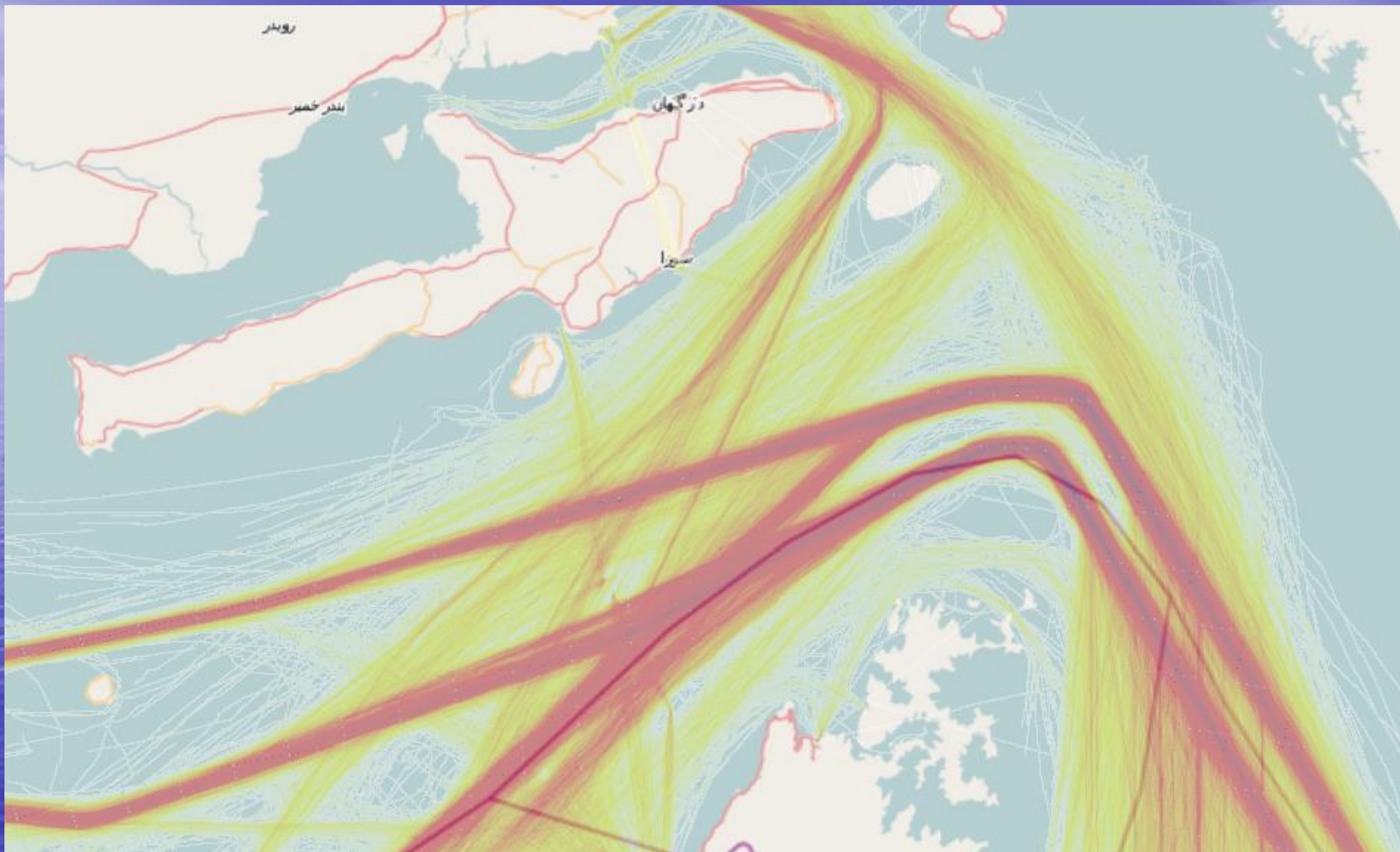
| Symbol | Description |
|-----------------------------|---------------------------|
| Black line | Ship movement track |
| Red dot | Ship position at 00:00:00 |
| Green dot | Ship position at 01:00:00 |
| Yellow dot | Ship position at 02:00:00 |
| Purple dot | Ship position at 03:00:00 |
| Pink dot | Ship position at 04:00:00 |
| Blue dot | Ship position at 05:00:00 |
| Orange dot | Ship position at 06:00:00 |
| Brown dot | Ship position at 07:00:00 |
| Grey dot | Ship position at 08:00:00 |
| Light blue dot | Ship position at 09:00:00 |
| Light green dot | Ship position at 10:00:00 |
| Light purple dot | Ship position at 11:00:00 |
| Light pink dot | Ship position at 12:00:00 |
| Light orange dot | Ship position at 13:00:00 |
| Light brown dot | Ship position at 14:00:00 |
| Light grey dot | Ship position at 15:00:00 |
| Light light blue dot | Ship position at 16:00:00 |
| Light light green dot | Ship position at 17:00:00 |
| Light light purple dot | Ship position at 18:00:00 |
| Light light pink dot | Ship position at 19:00:00 |
| Light light orange dot | Ship position at 20:00:00 |
| Light light brown dot | Ship position at 21:00:00 |
| Light light grey dot | Ship position at 22:00:00 |
| Light light light blue dot | Ship position at 23:00:00 |
| Light light light green dot | Ship position at 24:00:00 |

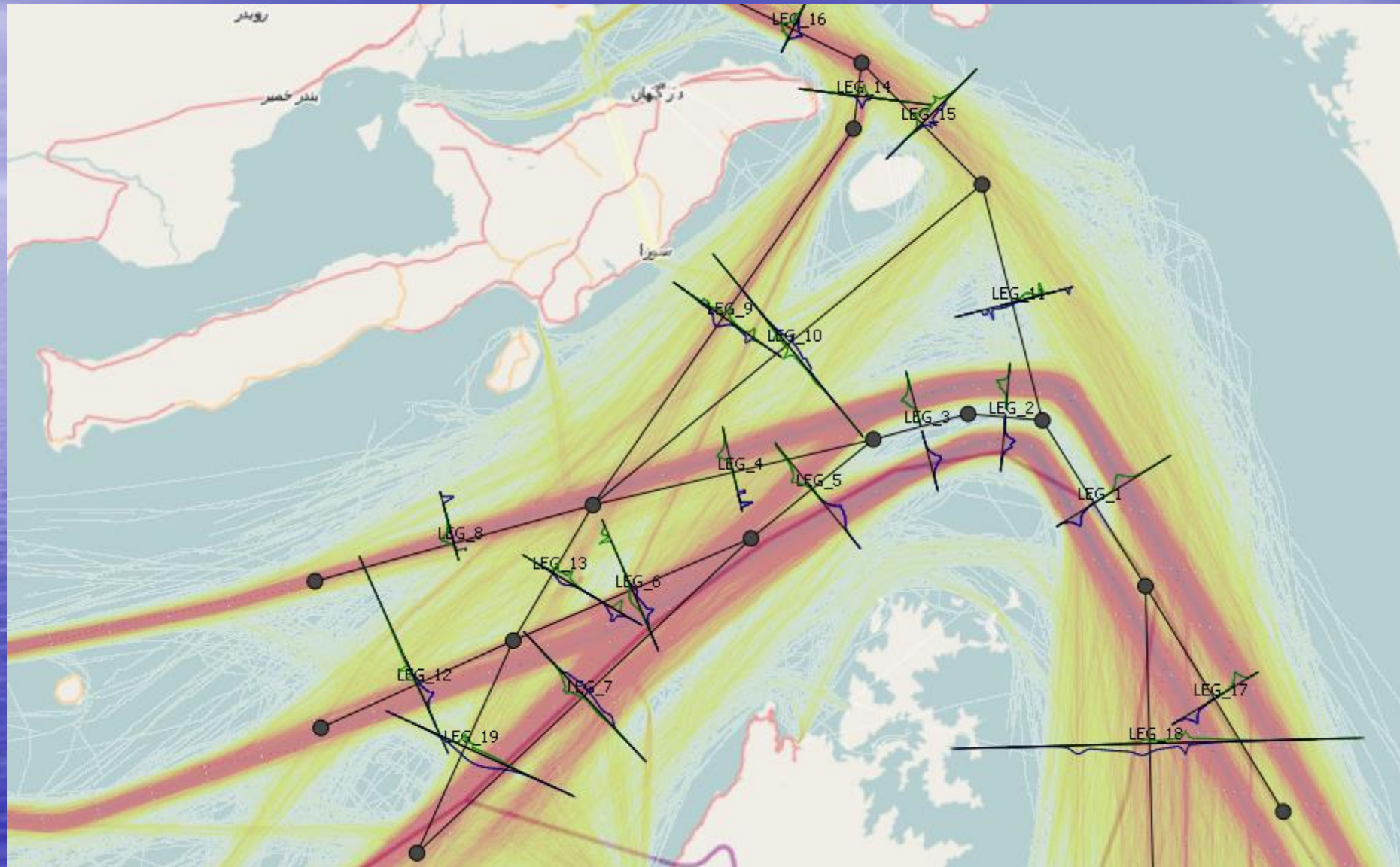


Traffic Density Plot









IWRAP Mk2 Extended v3.3.0 - Licensed to Roger Barker (Trinity House) - by GateHouse - Expires 28 Jan 2011 - [Job View]

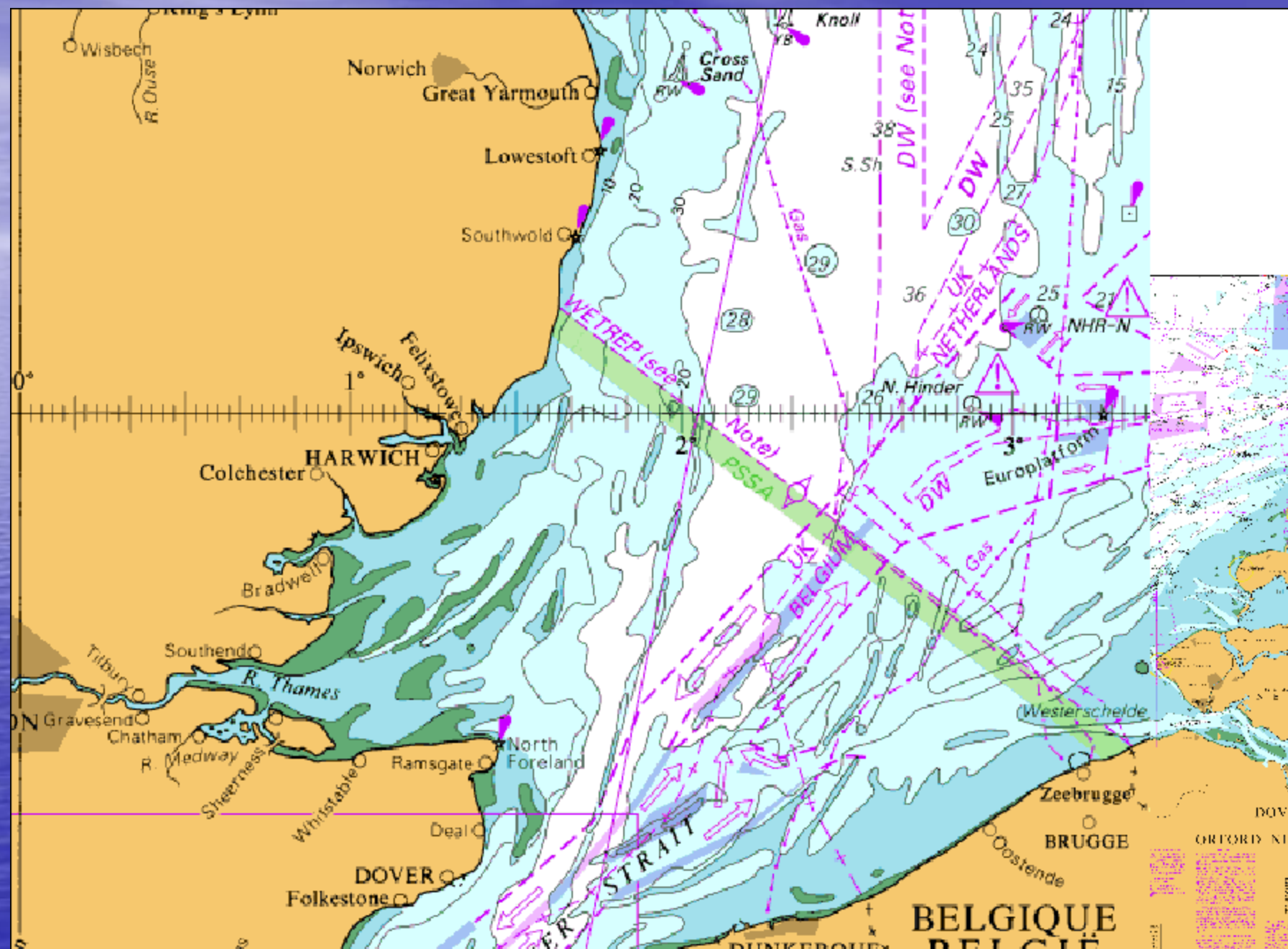
File Edit Tools Settings Data Model Actions Map View Help

Jobs

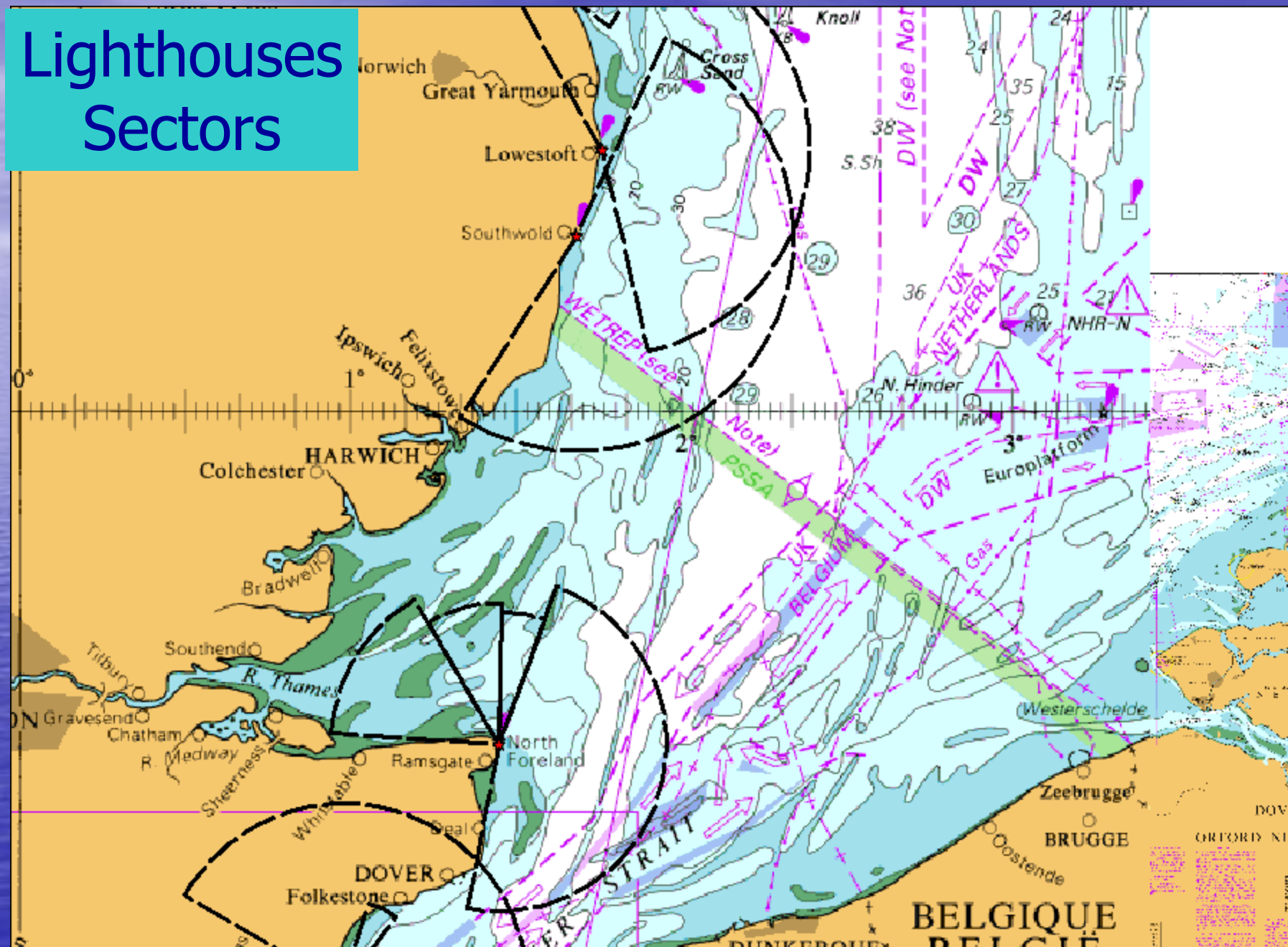
| State | Name | Algorithm | Model | Started | Completed |
|-----------|--------------------------|---------------|--------------------|---------------------|---------------------------|
| Completed | SMT 2 | Incident v1.0 | 003-Roger Paris... | Tue 18. Jan 00:3... | Tue 18. Jan 00:39:24 2011 |
| Completed | SMT1 | Incident v1.0 | 003-Roger Paris... | Tue 18. Jan 00:2... | Tue 18. Jan 00:20:47 2011 |
| Completed | Test 03 - Ground | Incident v1.0 | 003-Roger Paris... | Thu 13. Jan 10:3... | Thu 13. Jan 10:33:20 2011 |
| Completed | Test 03 - paris | Incident v1.0 | 003-Roger Paris... | Thu 13. Jan 10:3... | Thu 13. Jan 10:31:40 2011 |
| Completed | Revised Dover - Trond | Incident v1.0 | Dover_Trond v1.1 | Wed 22. Dec 10:... | Wed 22. Dec 10:35:24 2010 |
| Completed | Dover - back at TH | Incident v1.0 | Dover rhb1 v1.5 | Mon 29. Nov 10:... | Mon 29. Nov 10:57:49 2010 |
| Completed | Roger later test | Incident v1.0 | Dover rhb1 v1.4 | Thu 18. Nov 12:... | Thu 18. Nov 12:03:51 2010 |
| Completed | Dover 2 | Incident v1.0 | Dover rhb1 v1.4 | Thu 18. Nov 11:... | Thu 18. Nov 11:57:40 2010 |
| Completed | Dover 1 | Incident v1.0 | Dover rhb1 v1.3 | Thu 18. Nov 10:... | Thu 18. Nov 10:35:31 2010 |
| Completed | Hatter 2 with groundings | Incident v1.0 | Hatter RHB 2 v1.2 | Wed 17. Nov 15:... | Wed 17. Nov 15:49:22 2010 |
| Completed | Hatter 1 | Incident v1.0 | Hatter RHB 2 v1.2 | Wed 17. Nov 15:... | Wed 17. Nov 15:03:50 2010 |
| Completed | Test 6 | Incident v1.0 | 002-Roger Paris... | Wed 17. Nov 10:... | Wed 17. Nov 10:40:01 2010 |
| Completed | Test 5 | Incident v1.0 | 002-Roger Paris... | Wed 17. Nov 10:... | Wed 17. Nov 10:39:30 2010 |
| Completed | Test 4- am 17th | Incident v1.0 | 002-Roger Paris... | Wed 17. Nov 08:... | Wed 17. Nov 08:33:46 2010 |

Results

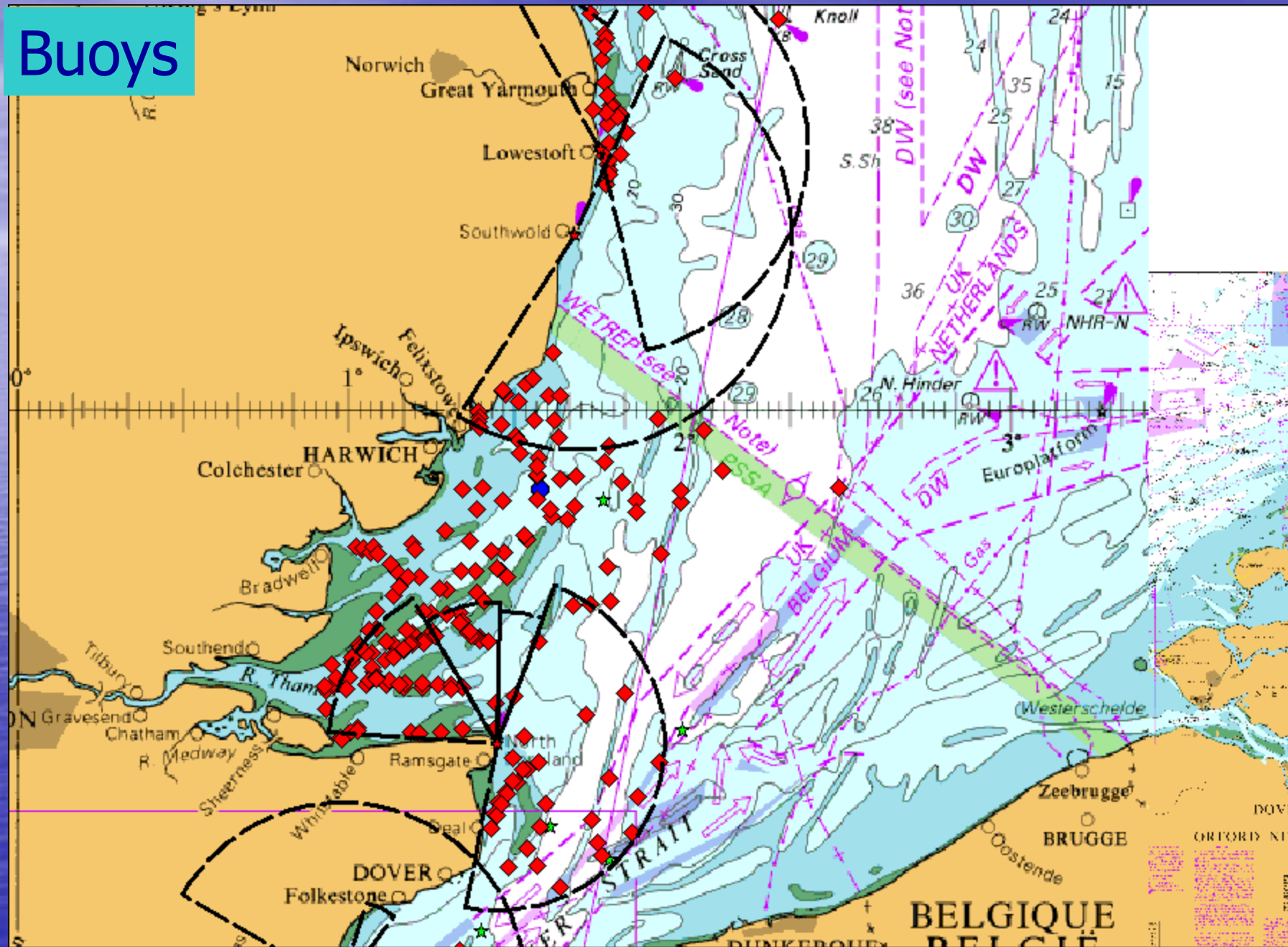
| | SMT1 | SMT 2 | Unit |
|--------------------|-------------|-------------|----------------|
| Powered Grounding | 0 | 0.101241 | Incidents/Year |
| Drifting Grounding | 0 | 0.138527 | Incidents/Year |
| Total Groundings | 0 | 0.239768 | Incidents/Year |
| Overtaking | 0.0003448 | 0.00149128 | Incidents/Year |
| HeadOn | 1.13873e-06 | 0.000545787 | Incidents/Year |
| Crossing | 0.00105619 | 0.00539827 | Incidents/Year |
| Merging | 0.000117865 | 0.000766928 | Incidents/Year |
| Bend | 0.000532078 | 0.00362934 | Incidents/Year |
| Area | 6.49847e-08 | 9.91125e-08 | Incidents/Year |
| Total Collisions | 0.00205214 | 0.0118317 | Incidents/Year |



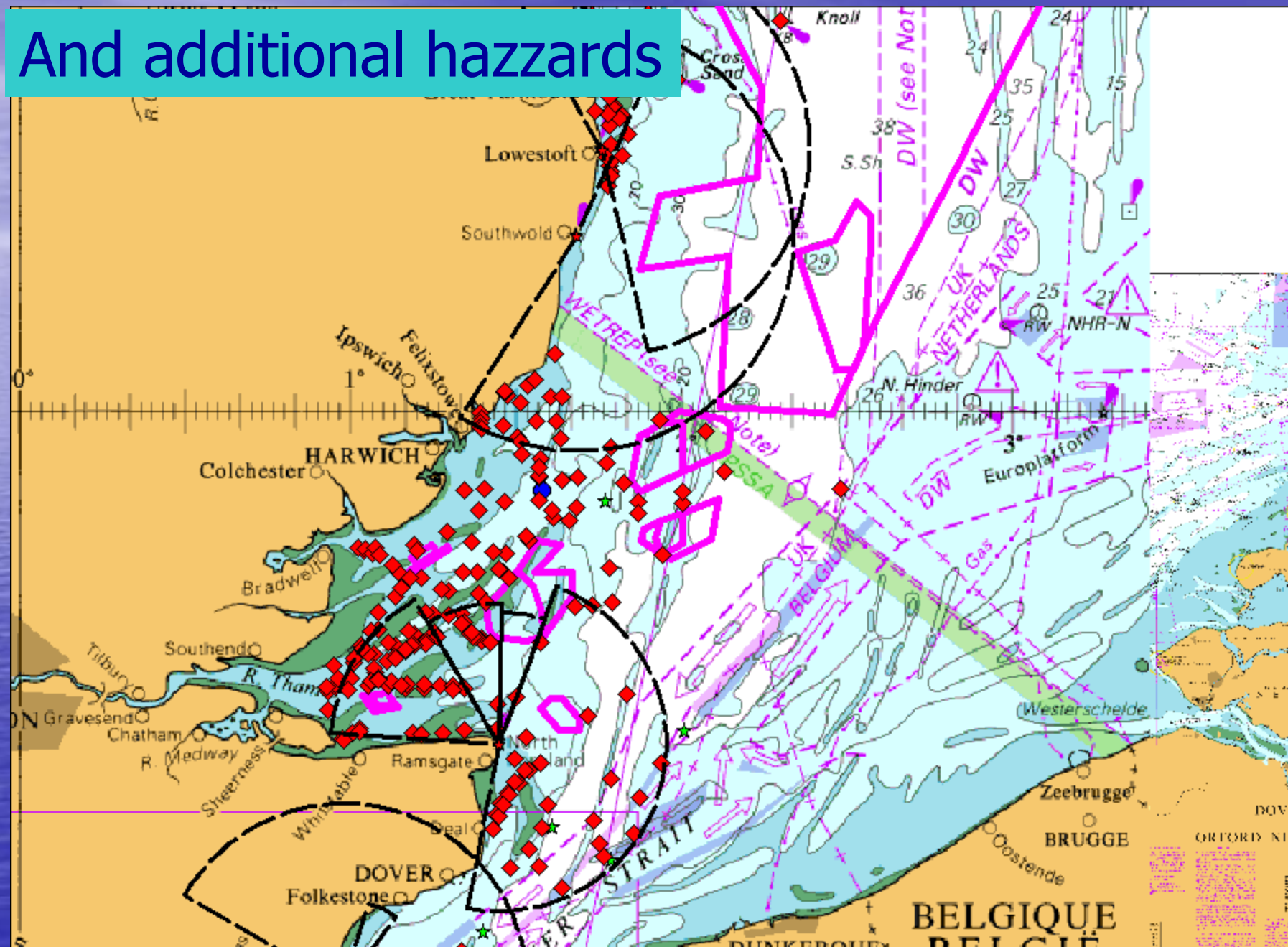
Lighthouses Sectors

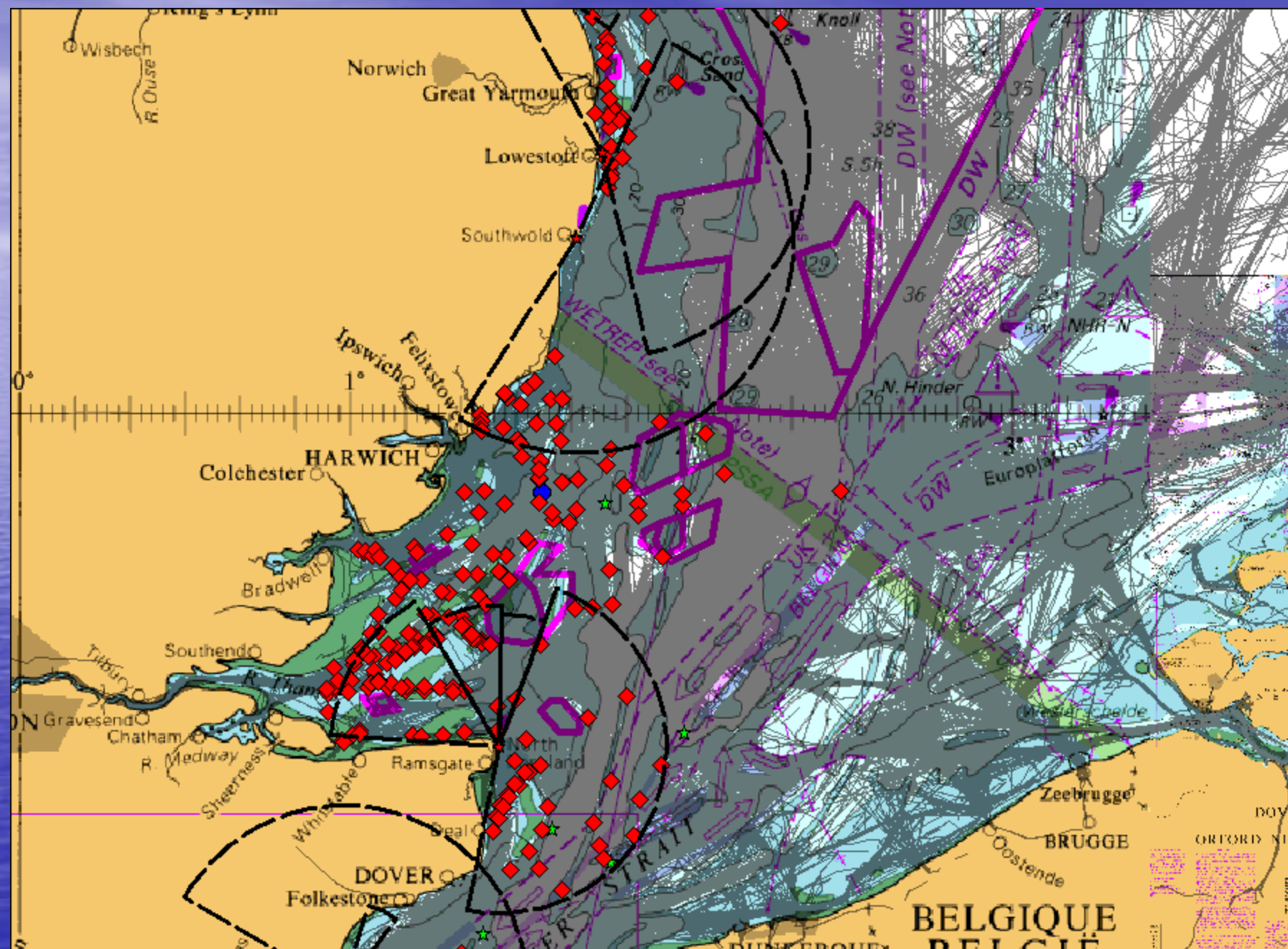


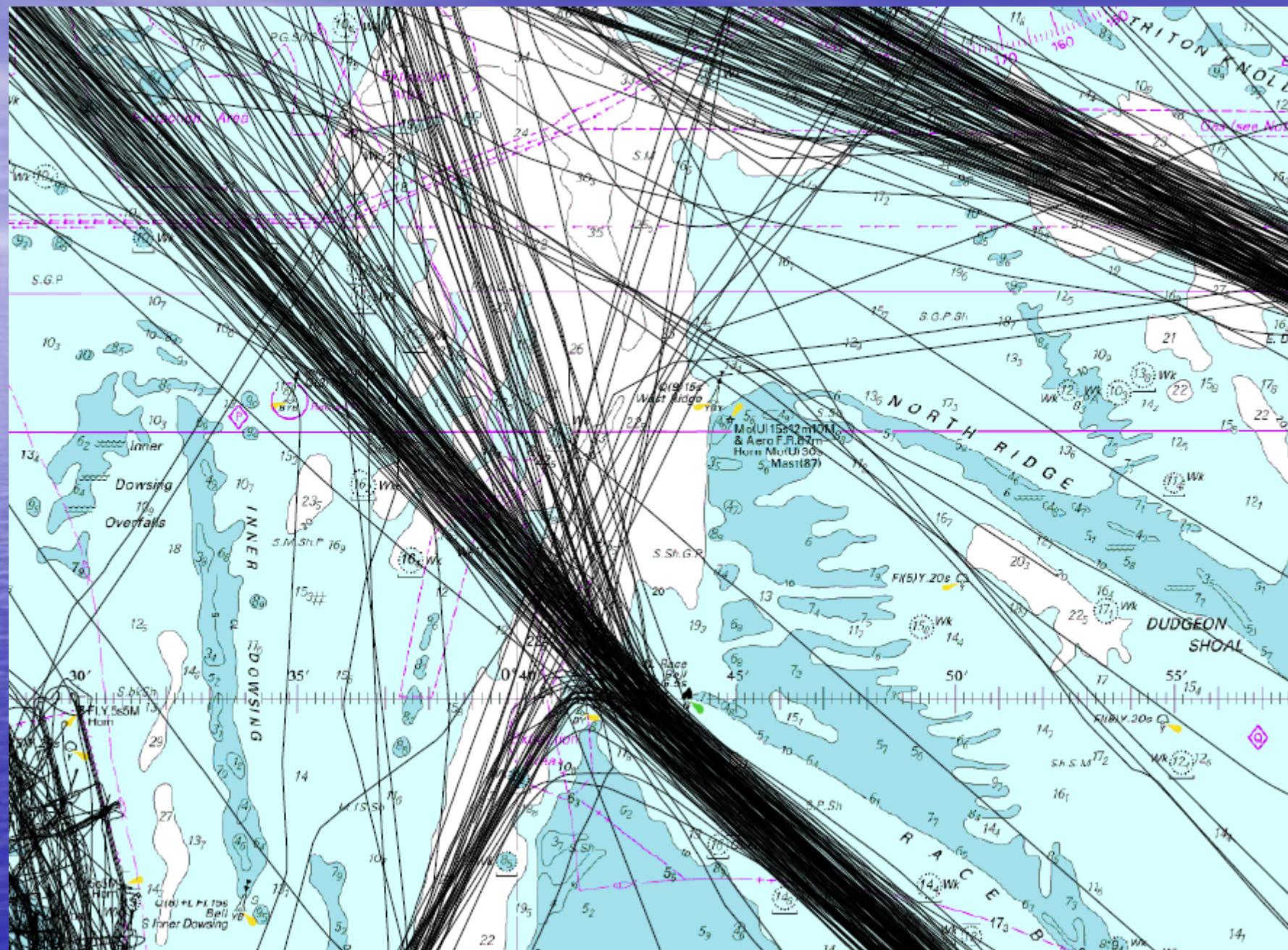
Buoys

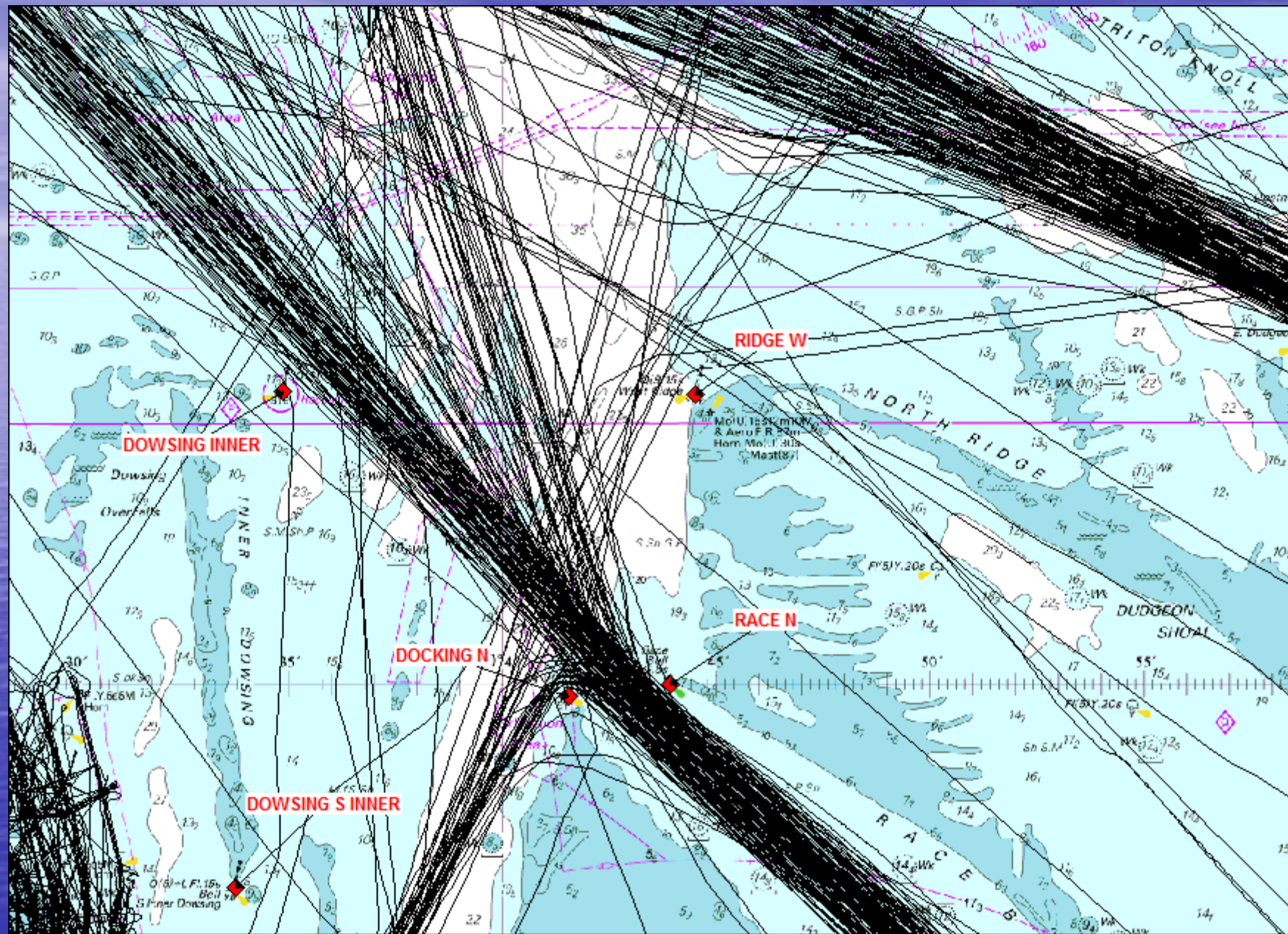


And additional hazards

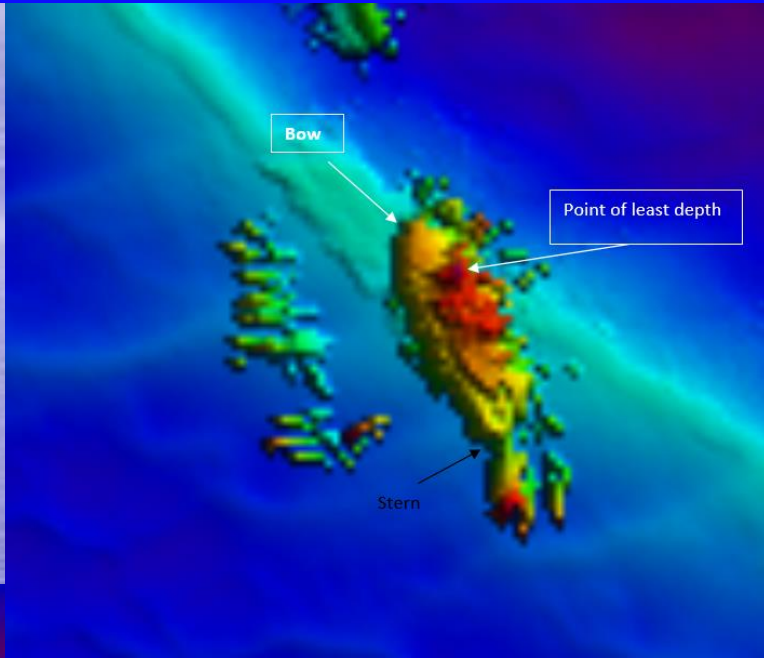








Wrecks & New Dangers



Survey Conclusions

Least Depth

5.10m LAT

LAT/LONG

52° 25.230' N 001° 43.67' E

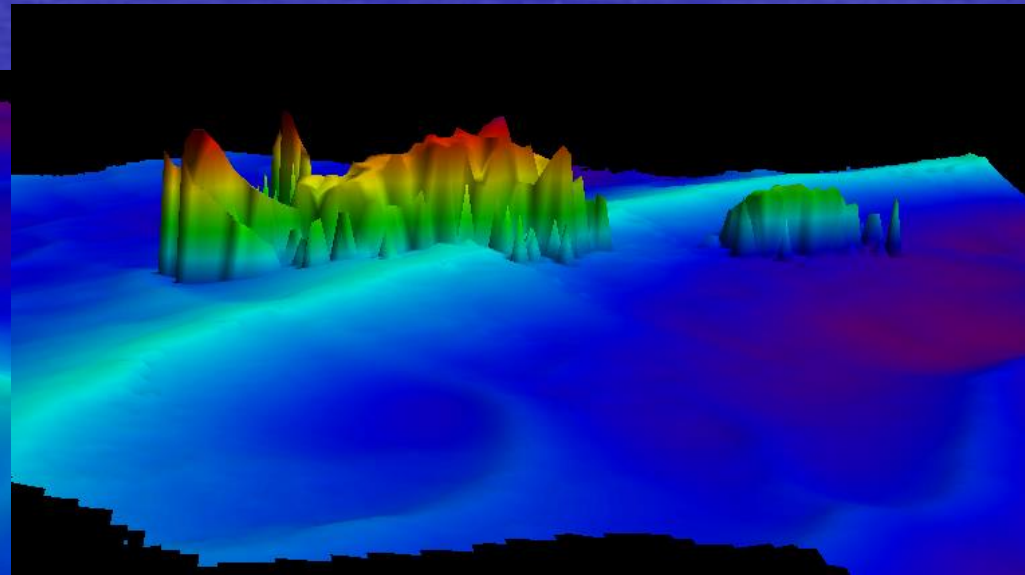
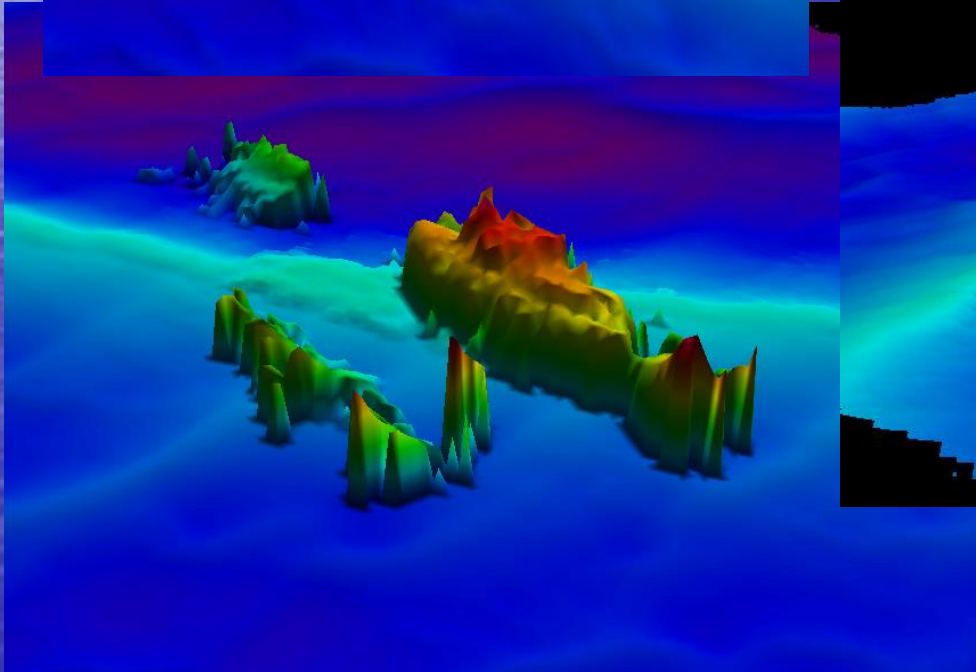
Surround Depths

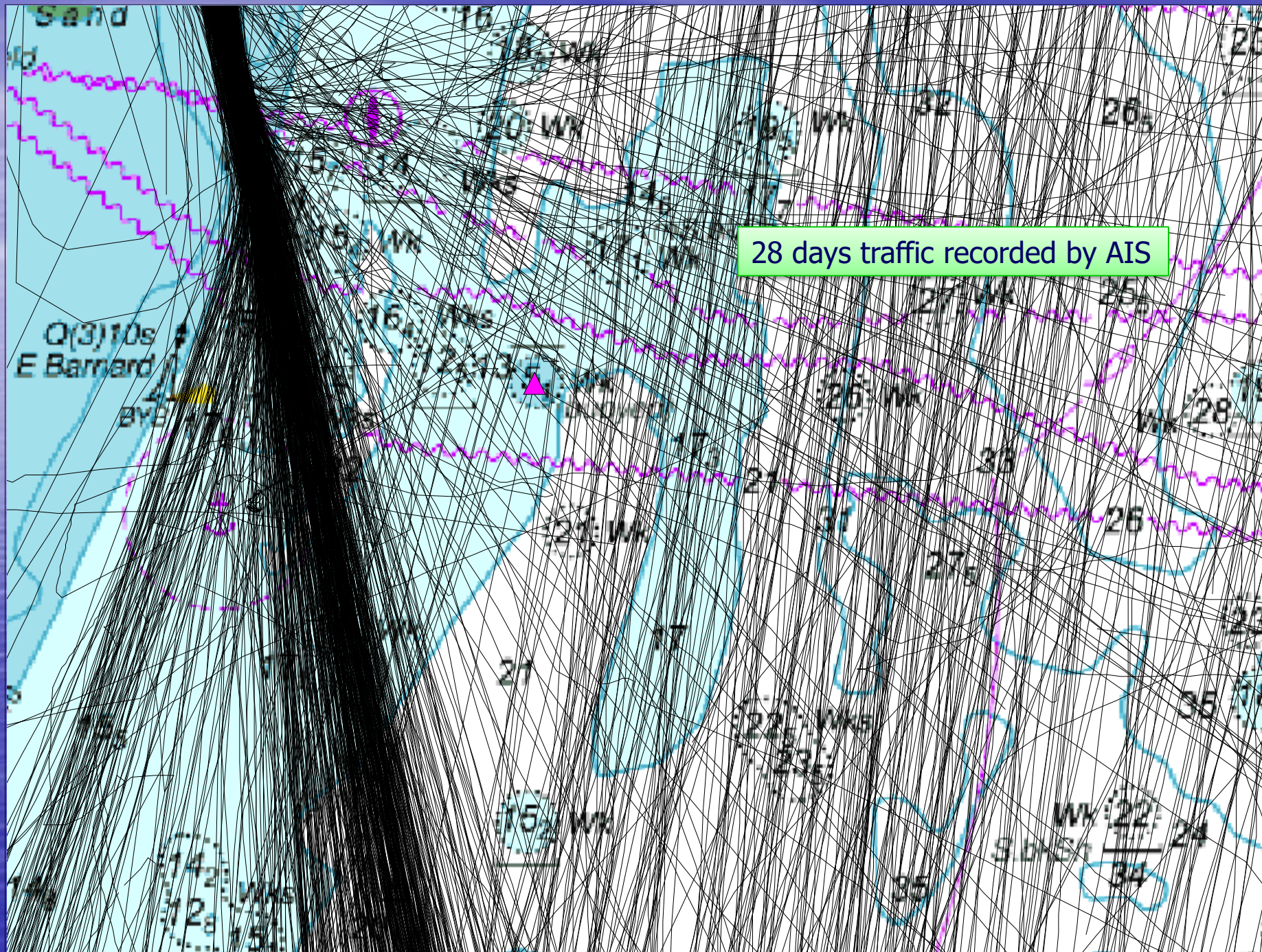
12.5m – 24m LAT

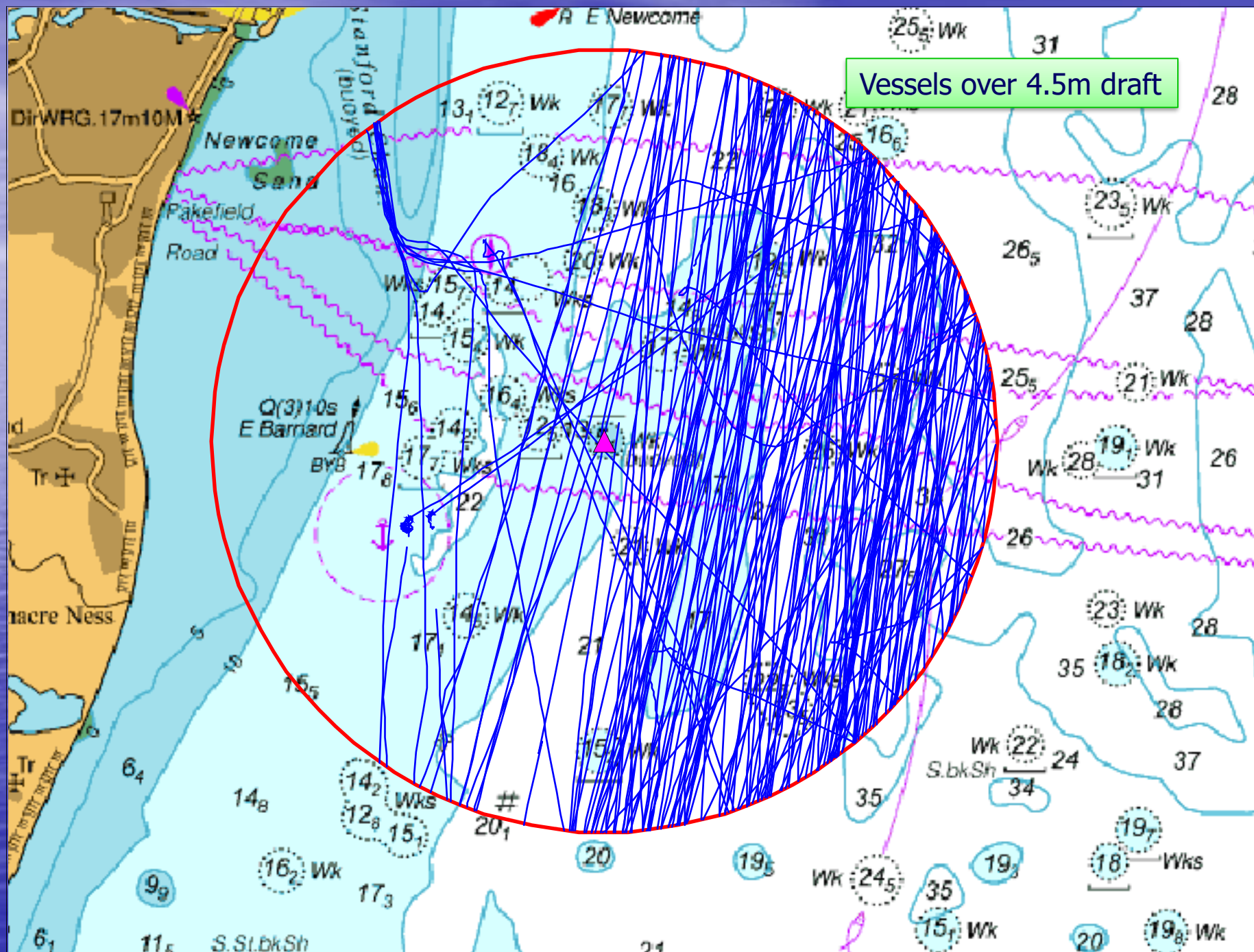
Orientation

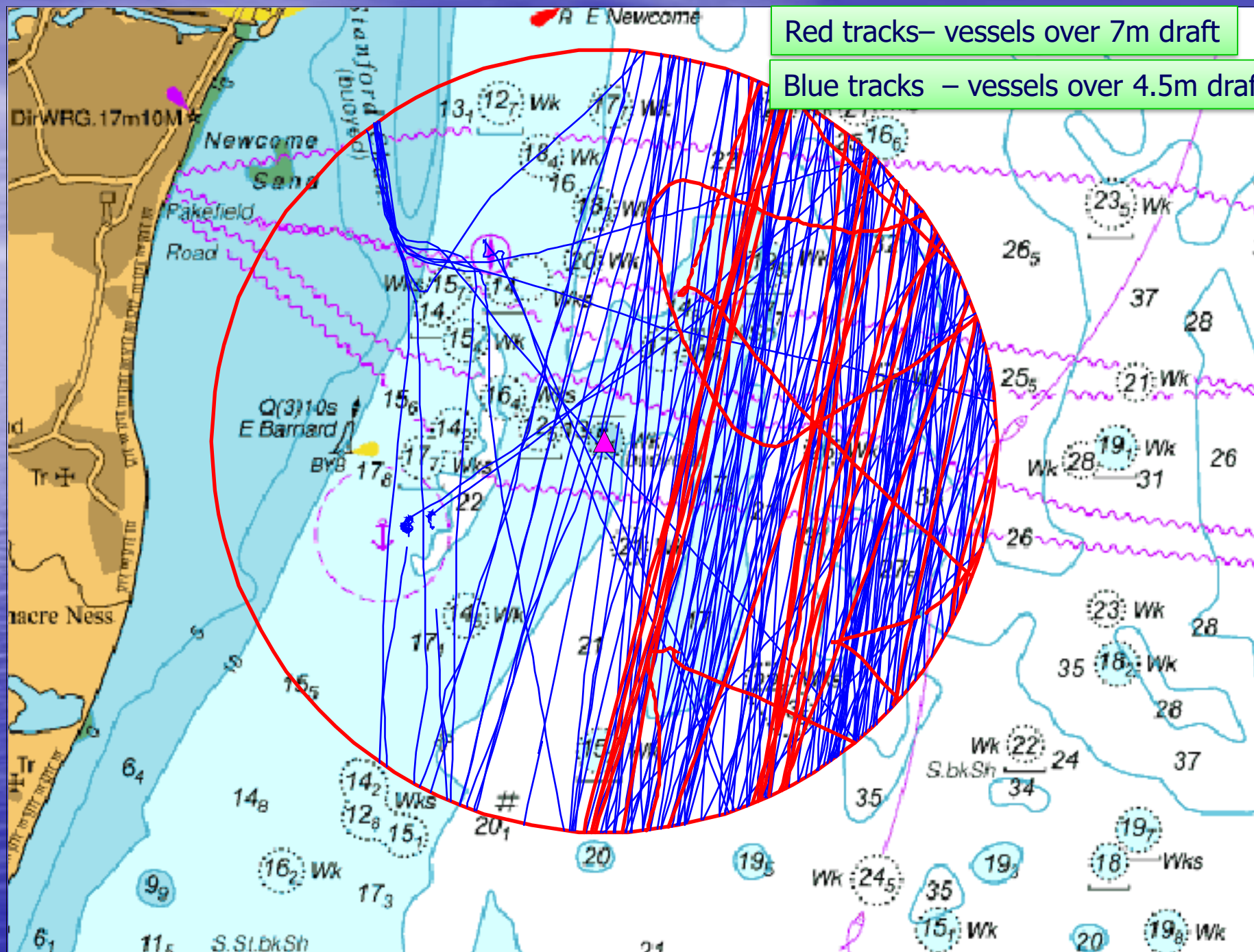
Heading 350° approx.

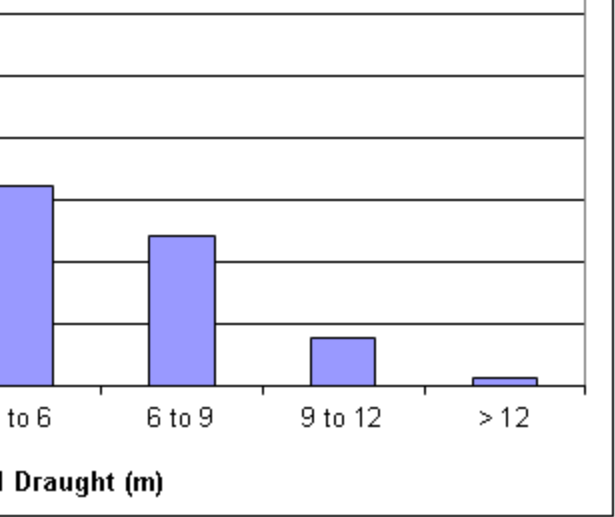
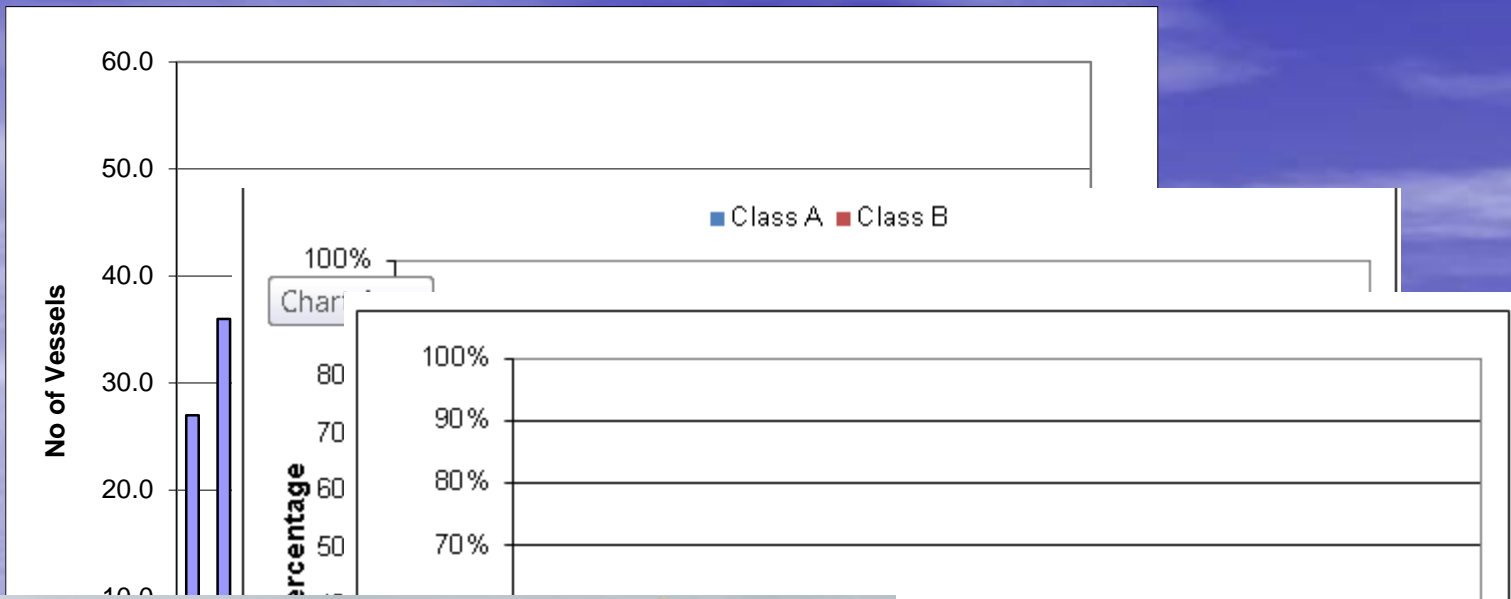
Laying upright











| | | | |
|-----|----|-----|------|
| 373 | 0 | 373 | 42 % |
| 106 | 0 | 106 | 12 % |
| 39 | 0 | 39 | 4 % |
| 872 | 11 | 883 | 99 % |

Total by Class

| B | All |
|-----|-------|
| 0 % | 5 % |
| 0 % | 0 % |
| 0 % | 0 % |
| 0 % | 2 % |
| 0 % | 0 % |
| 0 % | 15 % |
| 0 % | 11 % |
| 1 % | 5 % |
| 0 % | 3 % |
| 0 % | 42 % |
| 0 % | 12 % |
| 0 % | 4 % |
| 1 % | 100 % |

Standard 1020 – AtoN Design and Delivery

| | | | | | | | | | |
|---|------------------|----------------|--|-----|------|--|---------|---|-----|
| IALA1020 AtoN Design and Delivery | 2.1. Visual AtoN | R0106 E-106 | The Use of Retroreflecting Material on Aids to Navigation Marks within the IALA Maritime Buoyage System(June 2017) | ENG | Nor. | | New | Guideline on Retroreflective materials | ENG |
| | | R0108 E-108 | The Surface Colours used as Visual Signal on Aids to Navigation (Dec 2017) | ENG | Nor. | | G1134 | Surface Colours Used as Visual Signals on AtoN (Dec 2017) | ENG |
| | | R0110 E-110 | The Rhythmic Characters of Lights on Aids to Navigation (June 2012) | ENG | Nor. | | [G]1116 | Selection of Rhythmic Characters and Synchronisation of Lights for [Marine] Aids to Navigation (Dec 2015) | ENG |
| | | R0112 E-112 | Leading Lights (Dec 2005) | ENG | Nor. | | [G]1023 | Design of Leading Lines (Dec 2005) | ENG |



IALA RECOMMENDATION

E-112
LEADING LIGHTS

Edition 1.1
December 2005

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IALA RECOMMENDATION

E-110
RHYTHMIC CHARACTERS OF LIGHTS ON
TO NAVIGATION

Edition 4.0
December 2016

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IALA GUIDELINE

1116
SELECTION OF RHYTH-
SYNCHRONISATION C
NAVIGATION

Edition 1.0
December 2016

Revokes IALA Guideline 1069

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GUIDELINE


G1134
SURFACE COLOURS USED AS VISUAL SIGNALS
ON AtoN

Edition 1.0
December 2017

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Table 2 *Rhythmic character of lights*

| | Class | Abbreviation | General description | IALA Specification | Particular use in the IALA Maritime Buoyage System |
|-----|------------------------|--------------|--|---|--|
| 1 | FIXED LIGHT | F | A light showing continuously and steadily. | <p>A single fixed light should be used with care because it may not be recognized as an aid to navigation light.</p> <p>_____</p> <p>_____</p> | A single fixed light shall not be used. |
| 2 | OCCULTING LIGHT | | A light in which the total duration of light in a period is longer than the total duration of darkness and the intervals of darkness (eclipses) are usually of equal duration. | A light in which the total duration of light in a period <i>is clearly</i> longer than the total duration of darkness and all the eclipses are of equal duration. | |
| 2.1 | Single-occluding light | Oc | An occulting light in which an eclipse is regularly repeated | <p>The duration of an appearance of light should not be less than three times the duration of an eclipse. The period should not be less than 2 s</p>  <p>Example: $l = 3 \text{ s}$; $d = 1 \text{ s}$; $p = 4 \text{ s}$</p> | A single-occluding <i>White</i> light indicates a safe-water mark. |

Marine Spatial planning and Offshore structures

IALA Recommendation O-139

on

The Marking of Man-Made Offshore Structures

Edition 2

December 2013

Edition 1: December 2008



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| | | | | | | | |
|----------------------------|------------------|--|-----|------|--|--------------|--|
| 2.2. Range and Performance | R0200 E-200-0 | Marine Signal Lights Overview | ENG | Inf. | | New | Navigation (June 2017) May be converted into Guideline (There is presently no guidance or range checks of lighted AtoN shou conducted. The WWA has develop to do this which could be added as |
| | R0201 E-200-1 | Marine Signal Lights - Colours | ENG | Nor. | | | No document |
| | R0202 E-200-2 | Marine Signal Lights - Calculation, Definition and Notation of Luminous Range | ENG | Nor. | | | No document |
| | R0203 E-200-3 | Marine Signal Lights – Terms of Measurement | ENG | Nor. | | G1065 | AtoN Signal Light Beam Vertical Di (Dec 2017) |
| | | | | | | New | Existing E200-3 will be converted i guideline on Measurement |
| | | | | | | New G1133 | guideline G1133 Marine Signal Lig Calculation of Luminous Intensity. |



GUIDELINE

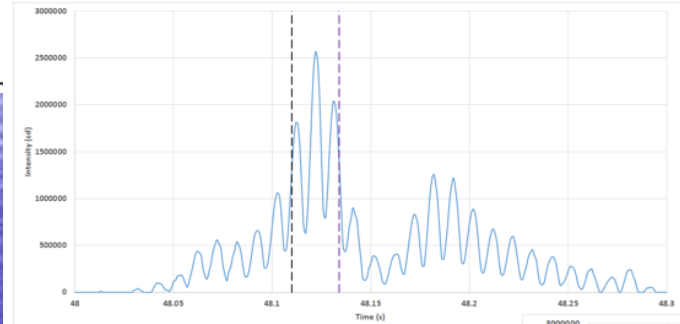
G1135

DETERMINATION AND CALCULATION OF EFFECTIVE INTENSITY

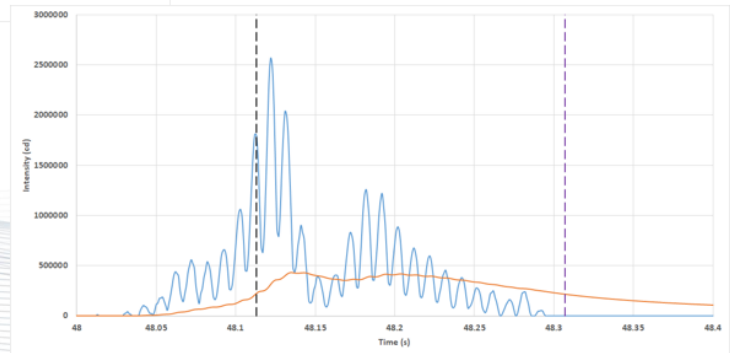
Edition 1.0

December 2017

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Current IALA Method
Result: 24 ms



Proposed Alternative using the
Modified Allard Method as a filter
(shown in orange)
Result: 194 ms



IALA GUIDELINE

G1004

LEVEL OF SERVICE

Edition 3.0

June 2017

5 CALCULATION OF AVAILABILITY

Availability should be calculated using the following equation, with the most accurate time available and is calculated over a continuous three (3) calendar year period and expressed as a percentage:

$$\text{Availability} = \frac{\text{Total Time} - \text{Down Time}}{\text{Total Time}}$$

Equation 1 Availability expressed as a percentage (%)

Where:

Total Time is the time that an AtoN or System of AtoN should be performing its specified function.

Down Time is the sum of the periods during which the AtoN or system of AtoN are unable to perform its specific function.

It does not include those periods when the mariner has been notified of a discrepancy by prior publications through a Preliminary Notice to Mariners.¹

The IALA Guideline on Availability and Reliability of Aids to Navigation should be consulted for further information on calculating availability. A failure is the malfunction of an AtoN or system of AtoN to display its proper characteristics or to be on its assigned position for its intended use by the mariner. As such, a failure of a technical function is not necessarily considered an AtoN discrepancy.

For example, if the main power supply has failed but the light continues to function at normal intensity on standby power, this is not considered a failure, since the AtoN continues to provide its characteristics to the mariner. The failure may be caused by equipment malfunction, or scheduled or unscheduled maintenance work.

| Aid to Navigation | Category | No Units | Days Out | Days Possible | No of Faults | Days Available | IALA Target % | Availability % |
|-------------------|----------|----------|----------|---------------|--------------|----------------|---------------|----------------|
| AIS | 3 | 33 | 204.55 | 35,088 | 12 | 34,883.45 | 97.0 | 99.42 |
| DAYMARK | 3 | 554 | 23.02 | 591,469 | 6 | 591,445.98 | 97.0 | 100.00 |
| DIR Light | 1 | 1 | 0.06 | 1,097 | 1 | 1,096.94 | 99.8 | 99.99 |
| HAZARD WARNING | 3 | 114 | 224.34 | 121,855 | 20 | 121,630.66 | 97.0 | 99.82 |
| LIGHT | 1 | 70 | 42.44 | 75,902 | 52 | 75,859.56 | 99.8 | 99.94 |
| LIGHT | 2 | 187 | 194.03 | 194,402 | 46 | 194,207.97 | 99.0 | 99.90 |
| LIGHT | 3 | 271 | 559.75 | 292,300 | 75 | 291,740.25 | 97.0 | 99.81 |
| POSITION | 1 | 89 | 70.99 | 89,621 | 13 | 89,550.01 | 99.8 | 99.92 |
| POSITION | 2 | 129 | 97.34 | 138,437 | 16 | 138,339.66 | 99.0 | 99.93 |
| POSITION | 3 | 252 | 80.08 | 271,457 | 17 | 271,376.92 | 97.0 | 99.97 |
| RACON | 1 | 55 | 67.58 | 56,506 | 35 | 56,438.42 | 99.8 | 99.88 |
| SEC LIGHT | 1 | 11 | 1.86 | 11,838 | 2 | 11,836.14 | 99.8 | 99.98 |
| TOPMARK | 2 | 201 | 318.41 | 214,190 | 32 | 213,871.59 | 99.0 | 99.85 |
| TOPMARK | 3 | 121 | 96.22 | 126,421 | 8 | 126,324.78 | 97.0 | 99.92 |

Training
[The WWA]

Influencing

SUCCESS

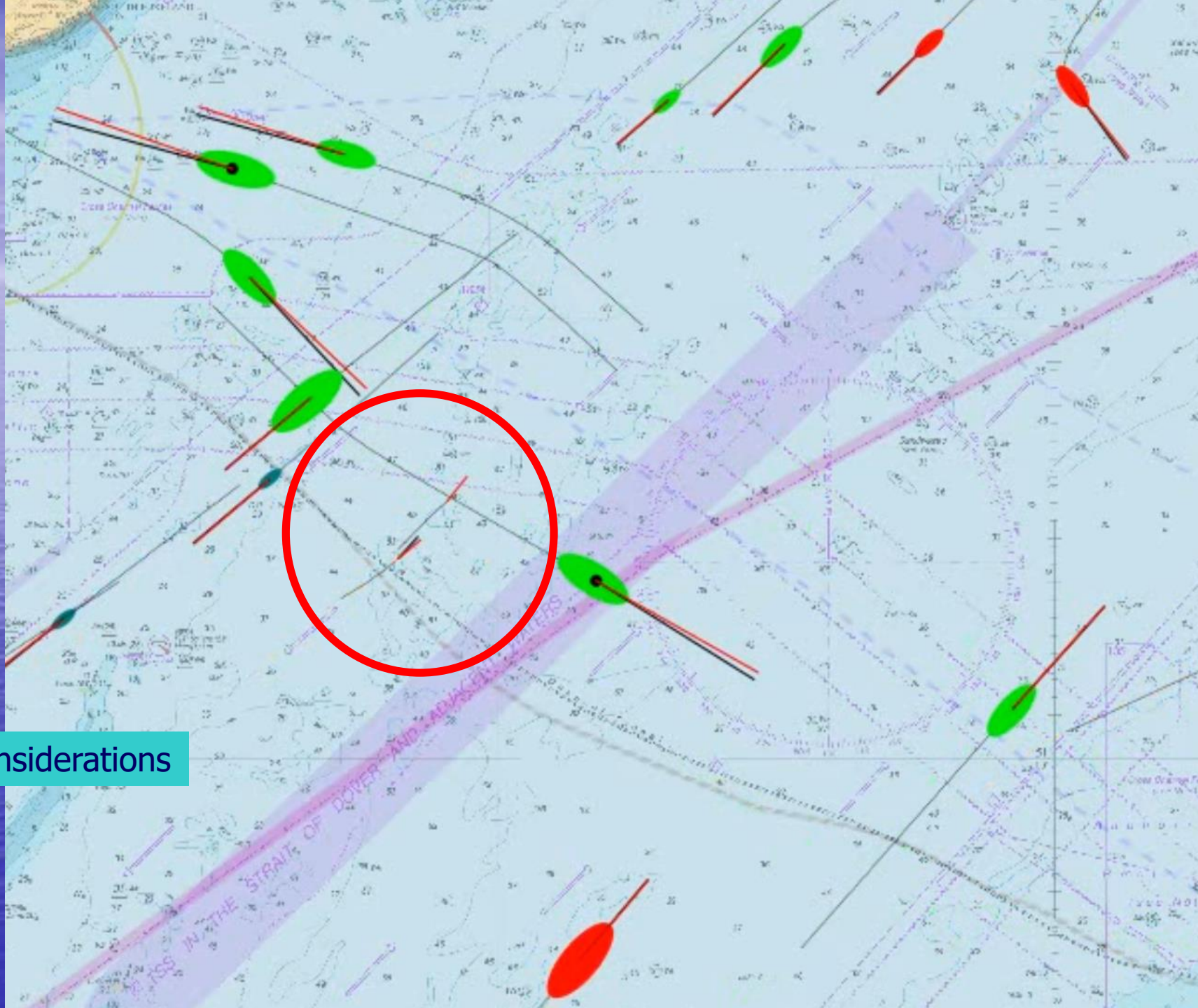
VTS

ACHIEVING SUSTAINABLE PLANET

E-Navigation
& Radio
Navigation

Innovation

Collaboration
[The Committees]



Further risk considerations

