



Executive Summary

This paper sets out the RYA position in relation to the development of *offshore renewable wave energy*. It is intended to enable developers accurately to take account of recreational boating concerns when developing their Environmental Statements and Navigational Assessments.

In summary, the RYA believes that the impact that offshore renewable wave energy has on recreational boating can be minimised provided developers fully consider the following key points which are drawn from the paper that follows:

- **Collision risk.** The RYA believes that the collision risk posed by wave energy arrays and associated infrastructure to recreational craft can be minimised by specifying:
 - A minimum underwater clearance of 4 metres below chart datum for submerged Wave Energy Converters and associated infrastructure assuming flat water conditions. However, given the nature of these devices and the high wave energy environments that they will be located in, the RYA proposes that an underwater clearance of 8 metres below chart datum would give an appropriate safety margin for submerged devices and associated infrastructure
 - Appropriate location, charting, marking and lighting of wave energy arrays
- **Charting, marking and lighting.** The RYA supports the guidance provided by the MCA, UKHO and General Lighthouse Authorities on the charting, marking and lighting of wave energy arrays and works with them to identify site specific issues that may occur.
- **Navigational and communication equipment.** Any proposed development should account for any effect on small craft navigation and communication equipment in detail.
- **Location.**
 - Recreational routes, general sailing areas, racing areas and access to boating facilities and anchorages must be accounted for when examining the impacts of wave energy developments and their associated infrastructure
 - Poorly sited wave energy arrays and those that are built within the 12nm limit may increase the risk to Safety of Navigation and discourage visiting boaters to the area. This would have an adverse effect not only on visitors but also on the local economy
- **Sailing and racing areas.** Any interference or adverse impact caused by a wave energy array that encroaches into a racing or sailing area would create a significant negative impact on boating and diminish its value for recreation.
- **Cumulative and in-combination effects.** The RYA expects development site plans to include all adjacent developments that may have cumulative and in-combination effects on shipping and navigation.

The Royal Yachting Association – who we are

The RYA is the national body for all forms of recreational and competitive boating. It represents dinghy and yacht racing, motor and sail cruising, RIBs and sportsboats, powerboat racing, windsurfing, inland cruising and personal watercraft. The RYA manages the British sailing team and Great Britain was a top sailing nation at the 2000, 2004, 2008 and 2012 Olympic Games.

The RYA is recognised by all Government offices as being the negotiating body for the activities it represents; as such, it takes an active role in influencing policy and has been a voice for recreational boating for more than a century.

The RYA currently has over 100,000 personal members, the majority of whom choose to go afloat for purely recreational non-competitive pleasure on coastal and inland waters. There are an estimated further 500,000 boat owners nationally who are members of over 1,500 RYA affiliated clubs and class associations.

The RYA also sets and maintains an international standard for recreational boat training through a network of over 2,200 RYA Recognised Training Centres in 20 countries. On average, approximately 160,000 people per year complete RYA training courses. RYA training courses form the basis for the small craft training of lifeboat crews, police officers and the Royal Navy and are also adopted as a template for training in many other countries throughout the world.

The RYA Position

The RYA recognises the UK Government's and devolved administrations' efforts to promote renewable energy¹. We note that it is Government policy that any potential adverse impacts, including long-term and cumulative adverse impacts, as well as any measures to avoid, reduce or compensate for any adverse impacts should be taken into account. We further note that when considering cumulative effects, the Environmental Statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence²).

Our primary purpose in engaging in consultation regarding the development of offshore energy developments is to secure navigational safety and to ensure that recreational boating interests are not adversely affected. The RYA has made objections to some proposed developments on grounds explained in this document. As more issues have come to light, we have reviewed our position on offshore energy development. We recognise that some marine renewable schemes may provide opportunities to benefit recreational sailors, e.g. active breakwater types of power generation can provide areas of sheltered water which will allow local sailing clubs to thrive.

This position paper sets out our concerns from a general perspective regarding wave energy and should enable developers accurately to take account of recreational boating concerns in their environmental impact assessments. This paper is one of three position papers discussing renewable energy, with the other two addressing wind and tidal energy.

¹ The UK Renewable Energy Strategy 2009

² National Policy Statement for Renewable Energy Infrastructure (EN-1)

In summary the concerns of recreational boating and offshore renewable energy developments relate to:

1. Navigational safety
 - a. Collision risk
 - b. Risk management and emergency response
 - c. Marking and lighting
 - d. Effect on small craft navigational and communication equipment
2. Location
 - a. Loss of cruising routes and impact on offshore racing
 - b. Squeeze into commercial routes
 - c. Effect on sailing and racing areas
 - d. Cumulative and 'in combination' effects
3. End of life
 - a. Dereliction
 - b. Decommissioning
4. Consultation

The MCA has developed guidance³ on the issues that need to be taken into consideration when assessing the impact on navigational safety and emergency response (search and rescue and counter pollution) caused by offshore renewable energy installation developments, proposed for United Kingdom internal waters, territorial sea or in a Renewable Energy Zone beyond the territorial sea. The RYA expects this guidance to be used by offshore renewable energy developers seeking consent to undertake marine works. Furthermore, the RYA expects to be consulted on matters that may affect recreational craft during any type of assessment on proposed marine works.

The RYA expects applications and accompanying supporting documents for development consent to be consistent with the instructions and guidance set out in the Overarching National Policy Statement for Energy (EN-1) and the National Policy Statement for renewable energy infrastructure (EN-3).

1 Navigational Safety

Wave energy convertors (WECs) capture the energy carried by waves. There are many types of WECs and these can interact in different ways with recreational and other small craft. Most WECs are located at or close to the sea surface with an attachment on the seabed. The RYA expects that no device will interfere with navigation by other legitimate users of the sea. Clearly, it is submerged and semi-submerged devices located in or near cruising routes around the UK coast that cause the RYA the most significant concern.

Prior to departure, mariners are required to make a passage plan based on assessments of weather, tides, limitations of the vessel and crew, and navigational dangers. Offshore renewable energy developments are an additional navigational hazard to the mariner. However, if sited sensitively, well designed and managed effectively these developments can satisfy the safety issues of concern to recreational boating.

Collision risk

The RYA believes that poorly designed wave energy developments could pose a significant risk of collision to recreational craft. Navigation around well marked and clearly visible static hazards is a part of sailing. However, as is pointed out in MGN372, *'Unlike wind farms, systems using wave or*

³ (MGN 371(M+F) Offshore Renewable Energy Installations (OREIs) - Guidance on UK Navigational Practice, Safety and Emergency Response Issues, MGN 372(M+F) Offshore Renewable Energy Installations (OREIs): Guidance to Mariners Operating in the Vicinity of UK OREIs.

tidal energy may not be clearly visible to the mariner.' The consequences of collision with the mechanisms, particularly when parts are moving and when they are deployed as an array are serious.

The RYA believes that wave converter sites must adhere to certain consistent design parameters that are nationally agreed to reduce the risk of collision with recreational craft. There are two main hazards that must be considered:

- Collision with submerged and semi-submerged converter mechanisms.
- Underwater collision with sub-surface structures, inter-array and export cable protection, rock armour and scour protection. It is important that where cables cannot be buried, the most appropriate type of cable protection is used taking into account the water depth and mariners using the area. The risk of underwater collision can also be increased where cables cross other cables and water depths are significantly reduced.

The RYA believes that the collision risk posed by wave energy arrays and associated infrastructure to recreational craft can be minimised by specifying:

- **a minimum underwater clearance of 4 metres below chart datum for submerged and semi-submerged WECs and associated infrastructure, assuming flat water conditions. However, given the nature of these devices and the high wave energy environments that they will be located in, the RYA proposes that an underwater clearance of 8 metres below chart datum would give an appropriate safety margin for submerged devices and associated infrastructure**
- **appropriate location, charting, marking and lighting of wave energy arrays**

The RYA has developed its position on minimum clearances on the available data. These data are taken from the Royal Ocean Racing Club (RORC) Rating Office's database. For more detail see the final section on *Developing RYA policy on minimum clearance depth*.

Risk management and emergency response

A particular issue with WECs is the risk of damage which may result from submerged and semi-submerged components in areas where small vessels navigate. Vessels and lives have been lost through collision with shipping containers washed overboard and collision with WECs is likely to pose a similar risk. We recognise that this risk can be reduced by following industry standards and having effective maintenance and monitoring schedules.

Risk management provisions should be formulated from the results of a site specific risk assessment that accounts for small craft of less than 24m LOA recognising the significant differences between small and large vessels. This distinction is important when it comes to equipment and other requirements for small and large craft. Guidance was developed in 2005 to outline the requirements for assessing the navigation impacts of offshore renewable energy installations⁴; this is currently being updated by the MCA and should be closely followed throughout any assessment.

For recreational craft, such an assessment should take into account the following parameters:

- The number, size and type of local vessels
- The number, size and type of national and international vessels
- Annual events that are not covered in a short term monitoring

⁴ Guidance on the Assessment of the Impact of Offshore Wind Farms: Methodology for Assessing the Marine Navigational Safety Risks of Offshore Wind Farms. 2005. DTI.

- Wave height and sea state conditions
- Seasonal variations including weather conditions
- Seasonal variations in vessel number, size and type including weather conditions
- Proximity to ports of refuge
- A range of possible incidences including loss of propulsive power and failure of navigational systems

Risk assessment consists of an objective evaluation of actual and potential hazards and subsequent evaluation of any associated risks. During the assessment, assumptions and uncertainties must be clearly considered and presented. Part of the difficulty in risk management is that measurement of both of the quantities in which risk assessment is concerned - potential loss and probability of occurrence - can be very difficult to measure and the chance of error in measuring these two concepts is large.

As the number of vessels using an area varies with the season, any monitoring should be carried out in the high season. However, it is not the number of vessels passing through an area that is important but the number passing through in adverse conditions and when waves are most vigorous. Moreover, local vessels will quickly gain experience of wave energy arrays and the biggest risks are likely to be to visitors.

General information on areas is given in the *UK Coastal Atlas of Recreational Boating* (mentioned later) and RYA can provide additional more detailed information about particular sites on request. The degree of hazard will vary according to the type of device. Some types are no more hazardous than existing reefs and buoys. The major hazards are likely to be from attenuators and oscillating wave surge converters.

Experience learned from wind farms should be factored into any navigational risk assessment to provide an accurate and realistic predicted level of risk and to enable proportionate and practical measures to be implemented where a risk is shown to be intolerable. By their nature, wave energy arrays will be located in areas where waves are expected to be frequent and powerful making small craft navigation more challenging.

In order to effectively manage the risk of a vessel in distress drifting towards a wave energy array, there needs to be an effective Emergency Response System in place. This will require the ability to shut down the moving parts when an emergency call is reported. In some cases, where traffic is high and WECs cannot be immobilised, a stand-by safety vessel may be required.

Safety zones

The RYA's opinion remains that the simple declaration of a safety zone around an offshore renewable energy installation that seeks to exclude small craft on a wholesale basis is likely to be unnecessary, impracticable and disproportionate. In our view, such a restriction on small craft right of navigation and legitimate use of the sea is not justifiable in terms of safety alone and it must be recognised that there is little possibility of enforcing such zones. In some locations, a safety zone may increase risk of collision if small craft are consequently forced to use commercial craft shipping lanes.

European standards are now being considered where small craft less than 24m LOA are exempt from any operational safety zones. The German Government was the first to recognise the negative implications of imposing safety zones on small craft and has exempted small craft from such zones.

In principle the RYA has no objection to the creation of *advisory or precautionary zones* but such zones must be designed and implemented on a case-by-case basis and with due respect to the right of navigation. The RYA believes that the purpose of any *advisory or precautionary zones*

should be to warn vessels to navigate with particular caution but they should not permanently restrict navigation or exclude recreational vessels.

The RYA does, however, understand that there may be occasions when it may be prudent to impose short-term temporary restrictions, for example during engineering, maintenance or construction works. Such temporary restrictions should be promulgated through clear and timely Notices to Mariners. These need to show clear start and end dates and must be promulgated well in advance of any works. Notices to Mariners should not simply advise mariners to avoid an entire wave energy site, but instead should highlight the areas where works will be undertaken and define the location(s) of such safety zone(s). Many vessels visit the UK from continental Europe and this should be taken account of in any communication.

Cables and anchoring

In most cases, small craft will not anchor within an offshore renewable energy installation. However, in emergency situations arising in or near a wave energy array, it may be perfectly possible to anchor a drifting vessel safely to ensure no damage is done provided that cables are buried to a sufficient depth to avoid being uncovered to avoid 'snagging' anchors. Cable burial should take into account shifting sediments on the seabed.

Where export cable corridors have not been surveyed in detail or there is a possibility that inter-array and export cabling cannot be successfully buried, it is important that alternative types of cable protection are carefully considered and set out in the Environment Statement; this should take account of the depth of water and the type of mariner using the area. Where there is any possibility that rock protection might be used which might reduce the depth of navigable water, particularly where cables cross, the RYA would expect this to be fully discussed in the Environmental Statement.

Charting, marking and lighting

The requirements for charting, marking and lighting wave energy arrays should be consistent with IALA requirements and guidelines. This has been achieved for offshore wind and should be replicated for wave and tidal devices. There appear to be no precedents that can be drawn on from around the world.

IALA Recommendation O-139 on *The Marking of Man-Made Offshore Structures* was written before the advent of tidal or wave farms. Some types of device can be marked in the same way as existing offshore hazards but there is as yet no experience with large scale attenuator or oscillating wave surge WEC arrays. Experience has shown that attenuators may not be seen until vessels are close to them, particularly in vigorous wave conditions. Clearly submerged WECs will remain unseen no matter how benign conditions are and the RYA therefore strongly supports the need for stakeholders to work with the MCA and General Lighthouse Authorities to develop appropriate guidelines for marking WECs by day and by night.

Unlike wind farms, wave energy arrays will be difficult if not impossible to see from the height of eye in a small vessel. Effective charting of wave energy arrays is thus essential. However, charts used by the majority of recreational sailors are updated less frequently than Standard Navigational Charts and there is no easy way to amend electronic charts until a new edition is published. For that reason it is important that information about wave energy arrays is widely promulgated, for example at marinas and harbours from which departing vessels might navigate near to wave energy sites, and by publishing information in the relevant pilot guides, almanacs and sailing directions. Developers should follow the advice provided by the MCA and UKHO.

The RYA supports the guidance provided by the MCA, UKHO and General Lighthouse Authorities on the charting, marking and lighting of wave energy arrays and works with them to identify site specific issues that may occur.

Effect on small craft navigational and communication equipment

WECs are unlikely to have an adverse effect on VHF, GPS and mobile phone reception, although large quantities of steel, cabling and the transmission of electrical power may interfere with magnetic compasses. Submerged WECs will be undetected on radar unless marked by Racons. This causes particular concern when large developments are sited close to commercial shipping lanes and recreational craft may be squeezed between the lane and the wave energy array.

Any proposed development should account for any effect on small craft navigation and communication equipment in detail.

2 Location

The location of offshore energy installations may conflict with access for recreational craft. It should also be noted that commercial routes and shipping lanes do not represent those routes taken by the vast majority of recreational craft. The RYA, has collated recreational routes into the *UK Coastal Atlas of Recreational Boating* which is available from the RYA. The lines in the atlas represent corridors of varying width that are most commonly used as cruising routes. In addition, the atlas marks sailing areas, racing areas and the location of marinas, RYA affiliated clubs and RYA Recognised Training Centres. The *UK Coastal Atlas of Recreational Boating* should be used to inform decision making when planning the location of offshore energy developments. When writing an Environmental Statement local knowledge should be sought through the RYA.

Loss of cruising routes and impact on offshore racing

When examining the routes and location of wave devices it is important to recognise that sailing boats behave differently to power driven craft and that their actual line of travel may 'zigzag' across their intended direction of travel upwind as they are dependent on the wind direction. The *UK Coastal Atlas of Recreational Boating*, the RYA's spatial dataset⁵, should be consulted together with other available information to inform the siting of the developments and individual installations and the potential provision of navigation routes through the larger sites.

Along many stretches of coast, recreational craft may need to seek shelter in poor weather. Sheltered harbours and anchorages and routes to these harbours of refuge should be protected. In many case these are identified in the Atlas.

Loss of routes would also lead to an increased distance of travel. This has environmental implications for powered craft and safety implications for all craft. Some routes, typically narrow channels or strong tidal flows, may already be hazardous at times to navigate through and creating additional obstacles in these areas may seriously compromise navigational safety. There are also safety issues with the creation of additional tidal stream turbulence in confined areas where craft may be moving slowly and tidal currents may be strong.

- **Recreational routes, general sailing areas, racing areas and access to boating facilities and anchorages must be accounted for when examining the impacts of wave energy developments and their associated infrastructure.**
- **Poorly sited wave energy arrays and those that are built within the 12nm limit may increase the risk to Safety of Navigation and discourage visiting boaters to the area. This would have an adverse effect not only on visitors but also on the local economy.**

⁵ A dataset with associated geographic information (e.g. lat/long coordinates) which can be mapped to provide a visual representation.

Squeeze into commercial routes

Recreational routes differ from commercial routes as recreational craft essentially aim to keep out of the major commercial navigation routes by travelling in the shallower adjacent waters or taking entirely different routes. As a result, the examination of commercial routes through AIS plotting alone will not ensure the safe positioning of offshore renewable energy installations (OREI); recreational boating must also be taken into account when assessing the impact on navigational risk. This may require routes through large developments to be identified or inshore routes for smaller craft to be safeguarded, particularly where there is a wave energy array close inshore and a different type of development further out. Marking the channel rather than arrays should be considered. The cumulative impact of all marine developments is becoming increasingly important when assessing these issues of squeeze.

Effect on sailing and racing areas

Most of the general day sailing and racing areas are close to the shore and in sheltered waters. The Netherlands and Germany have already excluded any development within 12nm of the shore in order to retain 'open space' for its amenity and recreational value. Recreational activity is important to the health and wellbeing of the community as well as providing economic support for the local coastal economies. Retaining the undisturbed remoteness of some waters will be important in terms of its wilderness and amenity value.

Any interference or turbulence or adverse impact created by a wave energy arrays in a sailing or racing area would create a significant negative impact on the site and diminish its value for recreation.

Cumulative and 'in-combination' effects

As a result of the large increase in the number and scale of projects, it has been recognised that the cumulative effects of offshore renewable energy projects have potential implications for small and large craft alike. Existing and future offshore developments by other EU Member States may also add to the cumulative effects.

There is an awareness that the intended development of offshore wave energy arrays could also lead to in-combination effects (effects arising from these developments with other activities; e.g. wind and tidal renewable installations, fishing and offshore oil and gas activities and those associated with UK and European Marine Protected Areas, including Marine Conservation Zones) that might impact all mariners. The cumulative and in-combination effects of offshore energy installations on navigation routes will be increasingly significant and must be taken into account in future siting proposals and plans.

Currently it is common practice for developers to provide site plans that show their proposed development in isolation. Examples of this are readily available in application documents for developments in the Irish Sea and in the southern North Sea. This is confusing and fails to provide a visual understanding of the cumulative and in-combination effects on shipping and navigation that might be caused by other adjacent offshore developments in the area. As the number and complexity of future developments increases, the RYA expects development site plans to include all adjacent developments that may affect shipping and navigation safety.

The RYA expects development site plans to include all adjacent developments that may have cumulative and in-combination effects on shipping and navigation.

3 End of Life

Dereliction

Whilst we would hope that these installations remain economically viable for the lifetime of the structures, the RYA would support measures taken by Government to secure the financial provision for removing the structures, prior to consents being given. This will ensure that after the installation ceases to produce electricity for whatever reason, derelict structures that are not charted, marked and lit and remain a hazard to navigation or anchoring are removed from UK waters.

Decommissioning

Equally, any decommissioning plan needs to ensure that the structures are completely removed. Any parts of the structure remaining after the commercial operation of the installation may pose a hazard to navigation. However, we recognise that secondary uses may be identified for these structures once energy generation ceases. If structures are to remain in the water, navigational safety must be taken into account and structures should be appropriately charted, marked and lit.

4 Consultation

The RYA's main office in Hamble is a primary point of contact for matters concerning the development of Offshore Renewable Energy Installation sites and the recreational boating sector. Throughout the English regions, RYA Hamble maintains a network of Regional Planning and Environmental Co-ordinators (RPEC) who are able to provide more detailed site specific information for developments that fall within an RPEC's area of responsibility. Developers may find this a useful resource for timely site specific information, particularly at the start-up of any project.

In addition, the RYA's main office maintains close links with its Scottish, Welsh and Northern Irish offices, which work with the relevant jurisdictions and they can provide detailed site-specific information in the same way as the RPECs do for England.

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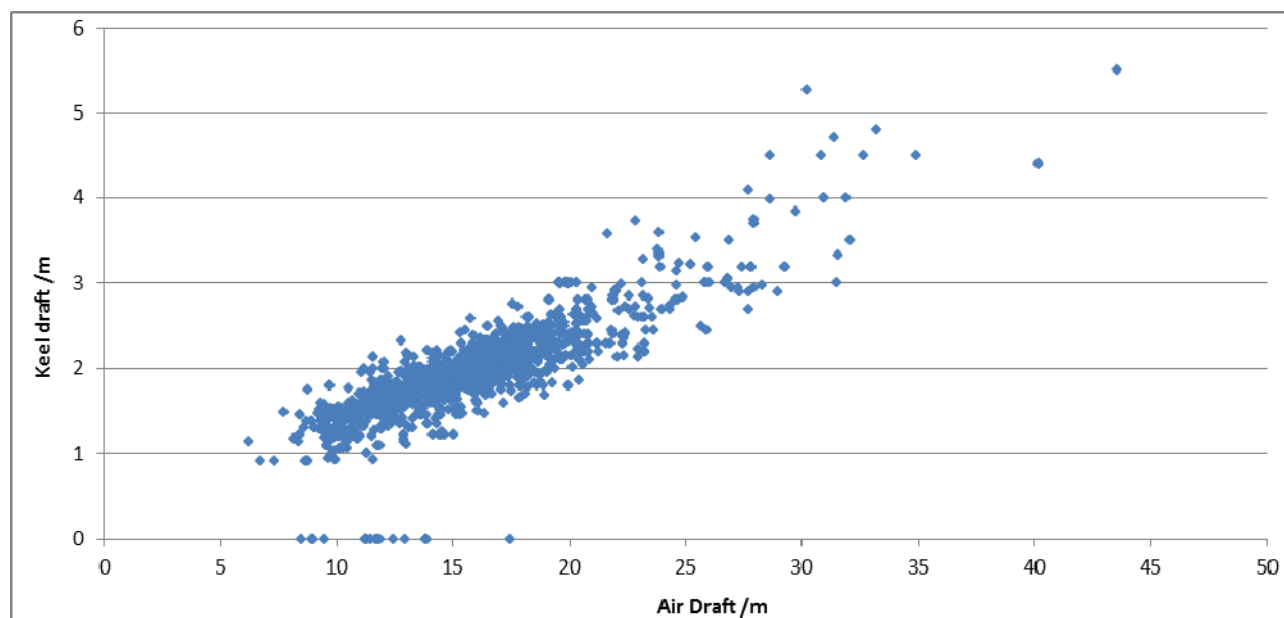
Development of the RYA policy on minimum clearance depth

The RYA originally developed its position on clearance depth on the available data in 2003. This was based on data taken from the Royal Ocean Racing Club (RORC) Rating's Office database which is representative of the types of yachts that are found in common use in UK Waters. Since then the 'Arkenford' survey⁶ carried out by Arkenford, a market research and modelling company, has shown that usage and participation data have remained remarkably stable, which would suggest that the data used for development of the RYA policy on minimum clearance is still valid. The graphs shown below are based on RORC data from 2011.

Although there are other rating systems in use, the RORC system is widely accepted and applied worldwide. Rating is a technical handicapping process that enables adjustments to be made to yacht racing results so as to allow a wide range of different boats to be raced on equal terms. The boats contained in the database are mainly cruisers and yachts. Many yachts taking place in club races are registered with the RORC Rating Office. The RYA believes this data, containing in excess of 2500 records, is a good representation of the type of yacht to be found sailing around the shores of the UK. Although the total number of yachts around the UK has not been specifically quantified because there is no single database that records this information, it is estimated that this represents more than 6% of the total number of boats owned in the UK according to the data on boat ownership and usage supplied by Arkenford and by the British Marine Federation.

The graph below illustrates the range of keel drafts, i.e. the depth of water required for clearance below the vessel's keel, of the yachts registered on the RORC database (Figure 1). Figure 1 shows that the vast majority of yachts have a keel draft of 3 metres or less. Allowing for a safety margin, therefore, the RYA specifies a minimum underwater clearance of 4 metres below Chart Datum to provide a tolerable level of risk.

Figure 1: Graph showing the relationship of keel draft in metres and air draft in metres of the IRC fleet (data collected 2009-2011, sample size = 2543)



⁶ Annual Watersports and Leisure Participation Survey carried out on behalf of RYA, BMF, MCA and RNLI