# SR617_Seafish Inshore VMS Pilot Project_SFA003

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**SR617_Seafish VMS Project Report_SFA003**

## Summary:

The Inshore Vessel Monitoring Systems (VMS) project was initiated to pilot and assess inshore vessel tracking systems to instil confidence in fishermen's compliance with local environmental management agreements (statutory and voluntary). Seafish was approached by the South West Inshore Fishermens Association (SWIFA) to look at a vessel monitoring system for inshore scallop vessels. This project objective was to provide a means of verifying that vessels fishing inshore where able to provide evidence of compliance with voluntary and statutory agreements.

Two vessel monitoring systems were trialled on five vessels fishing from various ports in the Southwest of England. The two VMS systems on trial recorded the vessels position, using an internal GPS, transmitting the positions using either mobile phone (GPRS) or VHF (very high frequency) technology to shore. These positions were then recorded and displayed on a computer using marine charting software accessible via a password protected website.

The trial demonstrated that both systems could provide a secure and cost effective means of monitoring inshore fishing vessels. The systems proved capable of accurately reporting vessels positions up to twice every minute, with vessels being able to be monitored in 'real-time' via a website. The costs of the systems varied between £1000-£2,500 per vessels depending on the option chosen, with the added advantage of having very low or zero transmission costs. Utilising mobile phone or VHF can be seen to provide a cost effective alternate for monitoring inshore fisheries.

The GPRS units installed on all five vessels proved to be the most suitable system tested, having the added benefit of storing the vessels positional data when the vessel is out of GPRS coverage.

It is possible to fit tamper detection devices to both the systems under test to ensure the validity of the position reporting supplied by the vessels.

## Acknowledgements

Seafish would like to thank the fishermen and owners involved with the trial who had the systems fitted on their vessels. Barry Wason MFV Palatine, Stefan Glinski MFV Pride of Cornwall, David Pascoe MFV Little Pearl, Nick Prust MFV Trevose, Jason, Skipper of the Pisces and all those at Carter fishing.

Thanks to Trinity House for their permission to fit a mast at the Lizard lighthouse.

Thanks must also go to Jim Portus (SWFPO), Nathan de Roxarieux (Seafood Cornwall) and the members of the Southwest Inshore Fishermen's Association (SWIFA) for their support, guidance and assistance.

Lastly thanks to Mike Armstrong and Tim Price of Cybit/Bluefinger). Mike who carried out the VMS fittings all the vessels and technical wizardry and Tim who had to deal with my exhaustive list of needs and wants.

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# 1. Introduction

The Inshore VMS project was initiated to pilot and assess inshore vessel tracking systems to instill confidence in fishermen's compliance with local environmental management agreements (statutory and voluntary). Seafish was approached by the South West Inshore Fishermens Association (SWIFA) to look at a vessel monitoring system for scallop vessels working in Lyme Bay, an area that at that time had a voluntary agreement that fishermen would refrain from fishing in designated areas. This project objective was to provide a means of verifying that vessels fishing inshore where able to provide evidence of compliance with voluntary and statutory agreements.

Whilst this project was being setup and the tender for the VMS system was underway an area amounting to 60 miles$^2$ in Lyme Bay was closed to all forms of bottom trawling including scalloping. Although this closure had a dramatic impact on a number of SWIFA members restricting the areas in which they could fish and negated the initial objective of the project, SWIFA members were still keen to participate in the pilot study. Three SWIFA members put their vessels forward to have VMS units fitted. The skippers of a further two ring net vessels working out of Newlyn and fishing in the Mounts Bay area in Cornwall also agreed to have units fitted to their vessels.

The acquisition of the VMS units went out to public tender. Tenders were invited from companies to provide a VMS system that utilised an alternative communications system to the satellite system which could provide a cost effective solution for inshore vessels.

The satellite systems, currently employed by the over 15m fleet, provide excellent coverage, though initial capital costs and the ongoing communications costs were seen as restrictive for the smaller inshore vessels. The range provided by satellite communications is not necessarily required by inshore vessels working relatively close to the shore. It was deemed more applicable for these vessels to employ a more cost effective alternative.

Three tenders were received by Seafish; of these, two were from UK based firms (OLRAC and Cybit/Bluefinger) the other tender was received from a Slovenian based firm (Bluetracker). After comparison of the three tenders and in consultation with the project partners the tender from the UK firm Cybit/Bluefinger was chosen as being the best and most cost effective solution to use for the pilot study, they also were the only firm to offer both a GPRS (mobile phone technology) system as well as a system utilising VHF TDMA technology.

The pilot project was set to run for 6 months with analysis of the performance of the units collected during this period. Of the five vessels which agreed to have the VMS units fitted the two vessels based in Mounts Bay had both a GPRS and a VHF system fitted, so a comparison could be made between the two systems. The other

three vessels working from different ports had GPRS units fitted to assess range and communications coverage.

## 2. Background

Proving compliance with local environmental management agreements (statutory and voluntary) can be a legal requirement (e.g. following an Appropriate Assessment) as well as demonstrating a commitment to environmental protection that will improve the industry's image. Merchants, retailers and restaurants are increasingly demanding responsibly caught seafood and compliance with local environmental agreements is a requirement under the Seafish Responsible Fishing Scheme and Marine Stewardship Council accreditation.

Demonstrating compliance with voluntary agreements may lessen the risk of draconian regulations being introduced to prohibit access to traditional fishing grounds in marine protected areas. Proving compliance through the use of an inshore vessel tracking system would also help with gear conflict resolution in areas where permanent and flexible arrangements to segregate mobile and static gear fisheries exist, such as Cardigan Bay and the Start Point Potting Box agreement.

## 3. Overview

VMS Options for Fisheries

There are a number of options available to fisheries, all the systems available use the (Global Positioning System) GPS to monitor the vessels movements. They differ with respect to the method and ability of transmitting that data to shore. Systems currently available include:-

- Satellite monitoring systems– uses satellite communications to relay the data to a land based monitoring system. Currently being used by all registered fishing vessels over 15m in length. Cost ~£3,000 per unit + transmission costs and service contract. Transmission cost ~ £1.00 per day for the over 15m vessels reporting every 2 hours. The coverage is excellent and will operate offshore as well as inshore.

- GPRS (mobile phone technology) – This technology utilises the coverage from land based mobile phone masts. A version of this system was trialled as part of this Seafish trial. The levels of phone coverage will depend on the mobile phone mast network and area over which coverage is required. Coverage, as with mobile phones, can be patchy in some areas, in order to optimise coverage and performance the systems many systems use a marine quality antenna. During periods of signal loss, systems have the capability to continue logging the vessels position and transmit the positions when the signal is resumed. Cost ~ £1,300 per unit (including transmission costs). The costs of transmissions are arranged on a contract basis, as with mobile phones. The coverage will depend on the area though in most areas should be good to around 6-12 miles offshore.

- VHF TDMA (radio frequency transmissions) – This technology uses a dedicated radio frequency to transmit the data. In order to do this shore based transceiver stations need to be set up to cover the area in which the vessels are to be monitored. The communication between the vessel and the shore station needs to be 'line of sight'. Depending on the height of the aerials on the vessels and masts ashore transmissions are possible up to 40 miles. This system is used in Iceland on ~2000 inshore vessels with shore based stations covering the whole of the Icelandic coast. This system was also tested by Seafish on two 'ring net' vessels fishing in Mounts bay in Cornwall with 2 shore based stations covering the area. Cost ~ £2,000 per unit for each vessel and a further £2,000 for each shore station. The benefit of this system is that there are no transmission costs once the system is set up, other than a VHF license cost ~ £60 p.a., the system provides a completely private network. The system currently under test only records the vessel position if the vessel is in range of the shore station and does not log the position when out of range.

- Simple Data logger – The simplest system to track vessels would be a GPS linked to a data logger to record position. You can buy devices such for as little as £100. Unlike the systems outlined above which work in 'real time', this system will need to be down loaded to a computer at regular intervals. Although this may be sufficient for some fisheries this unit may cause auditing issues as it can easily be removed and transferred between vessels. Situating one of these units inside a tamper proof box on the vessel would provide a simple and cost effective tracking system.

- Automatic Information System (AIS) – This system is widely used by merchant vessels and is mandatory for vessels over 3000 tonnes. It works by integrating a standardised VHF transceiver system with an electronic navigation system, such as a Global Positioning System (GPS) receiver, this system can be interrogated via satellite (long-distance) or using VHF (short-distance). This is primarily used for marine traffic management purposes, but also for location tracking. The information is available to other vessels fitted with the appropriate AIS transponder, and to shore stations. To access the vessels position information the user needs to subscribe to the system, but once subscribed the user will have access to all the vessels on the system. Due to the open access element it may not be applicable to fisheries monitoring.

There are also Hybrid systems available on the market, which use both satellite and mobile phone communication systems to transmit vessels positions. When working offshore out of range of GPRS coverage the units transmit the vessel positions using a satellite communications network. In coastal waters when a mobile network is available the systems sends additional data utilising the low cost and wide bandwidth

of GPRS. This type of system was not tested as part of the Seafish trial due to budget limitations.

## 4. Methodology:

A tracking system for vessels less than 15m, working inshore, was piloted with the cooperation of South West Inshore Fishermen's Association (SWIFA) & Seafood Cornwall members off the South West coast of England.

The project involved three stages:

*(a) Developing a system that meets the requirements of monitoring inshore fisheries (polls at least every 15 minutes) is suitable for inshore fisheries and provides a cost effective solution both in terms of the initial capital cost of the equipment and the ongoing communications costs.*

*(b) Piloting the tracking devices on 5 vessels operating in the South West, determining:*

- *i. Practicality of operating the tracking devices at sea*
- *ii. Monitoring vessel movements*
- *iii. Reporting compliance through an assessment of coverage and frequency of reporting.*

*(c) Recommending a tracking method and monitoring system for inshore vessels.*

## 5. Equipment Specifications

### 5.1. GSM GPRS (Mobile Phone system)

BlueFinger fitted five commercial fishing vessels MFV's Palatine, Pisces, Trevose, Little Pearl and The Pride of Cornwall with GSM Asset Locator units, with a combined GPS/GSM antenna. During the course of the study the Palatine operated within the Lyme Bay area, the Trevose operated in Lyme Bay and the North Coast of Cornwall and Devon, The Pisces operated within the Cardigan Bay area and Little Pearl and The Pride of Cornwall operated from Newlyn in Mounts Bay Cornwall.

Vessels are positioned using a 12 channel GPS receiver integrated into the device. The tracking unit collects and stores the vessels movement activity every 30 seconds when mobile, reporting every hour when the vessel is inactive for a period of time i.e. in Harbour. The positional data is then transmitted back to the control centre, using the shore based mobile phone mast network, at predetermined intervals, integrated into the database and are then ready for presentation to the user via Saffire On-Line an internet based mapping/ charting package. The installed unit on the vessel has the added benefit of storing data when the vessel is out of GPRS coverage; the data is then transmitted when the vessel returns to coverage.

**GSM & GPS aerials fitted to the MFV Palatine**

The Asset Locator solution has the operational advantage of being able to be deployed with battery backup so that should main power supply fail then the system can continue to report as normal. This system may also have tamper detection switches fitted to the IP (waterproof) box so that an alarm is triggered on the system and a position report is generated showing the precise location and time of the tampering.

### 5.2. Tracs TDMA (VHF System)

The Tracs TDMA GPS radio-tracking unit, as with the mobile phone system is positioned using a 12 channel GPS receiver. The vessels position is then transmitted to shore using a VHF radio signal. Operating in time division multiple access mode (TDMA), the system is able to operate in areas of changing radio line-of-sight obstruction. The auto repeat functionality, which forms an integral part of the system, which allows a vessels position to be relayed via other vessels operating on the network, enables it to extend the range of operation beyond standard radio VHF range.

At the core of the tracking unit is a radio/modem that can cover most VHF frequencies that would be selected by users in fishing operations. A selectable power output of between 500 mW and 2W (Watts) is available; the integral radio/modem provides data communication between a numbers of tracking units. Transmission of position reports, messages, differential GPS corrections and other serial data can be multiplexed in the data message. The GPS receiver also provides precise timing in order to synchronise the system. The ruggedised mobile tracking unit can be fitted on to each vessel.

The transmission of data is over a single VHF channel and tracking units time-share access to the network. At set-up, each tracking unit is allocated a number of “time

slots" within the overall time frame, depending on how much data is to be transferred from point-to-point.

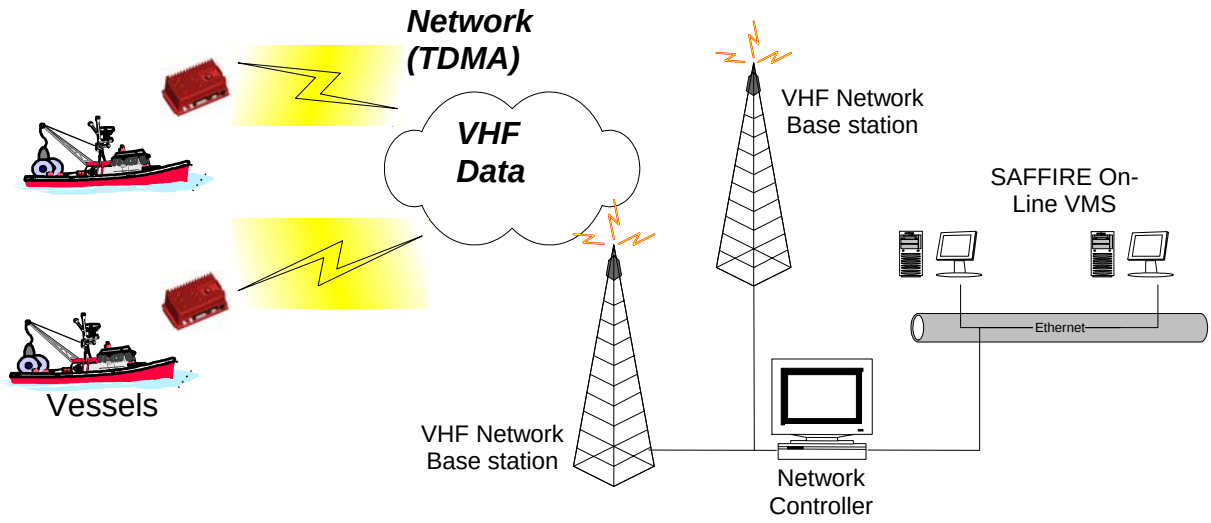
Time slots can be allocated at the base tracking station to broadcast data for reception by all tracking units on the network. The base station data is broadcast by assigning the delivery address as "zero", which means all tracking units detect and receive the data packets.

This system requires a network of VHF masts to be set up. The number of masts required will depend on the size of the area wishing to be covered and its geographical complexity. The system essentially works on a line of sight basis, though vessels operating the system are capable of relaying other vessels positions, area with numbers of coves or inlets or areas of low lying land may require larger numbers of shore based stations to be set up.


**TDMA Base Station at Newlyn Office**

For the pilot study carried out in Mounts Bay, two shore base stations where set up one on the Lizard lighthouse the other in an office in Newlyn. The vessels signals were relayed to a computer in the Newlyn office which then updated Saffire the online charting package via an internet link.

## 5.3. TDMA Transponder

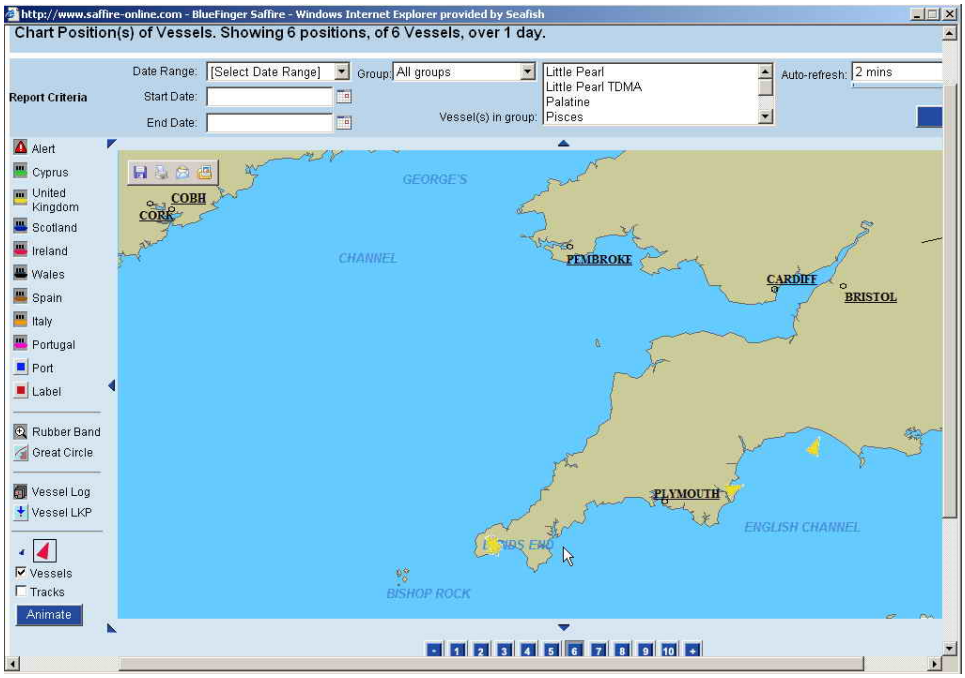



**TDMA System Architecture**

## 5.4. Saffire online

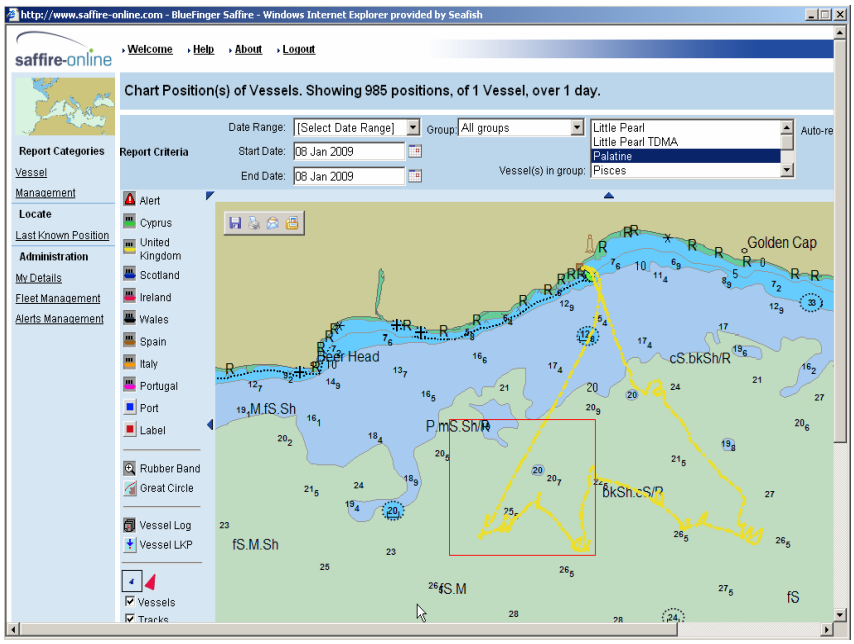
Saffire-Online is an internet based maritime tracking service used to monitor vessel positions. The system has been developed by Cybit/Bluefinger to provide a maritime tracking option to complement their Fleetstar-online system which monitors some 40,000 vehicles.

Access to vessel location data is via a password protected website where access to individual vessel locations is authorised by the administrator. Whilst individual skippers may have limited access to their vessels information, the appropriate fisheries administrators may view all the relevant vessels. The limiting of access to vessels positions worked well during the pilot study as some of the skippers of vessels being monitored under this pilot did not wish other skippers to know where they were fishing. This was achieved though limiting the access to certain vessels positional data to just the skipper and owner of that vessel.



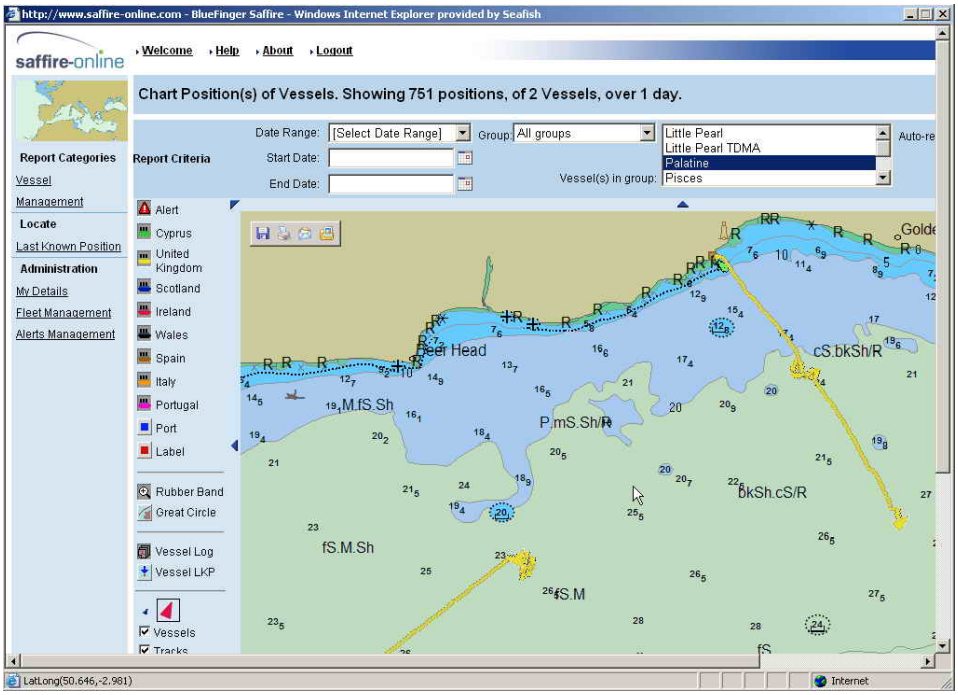

**Vessels are shown as yellow triangles on the chart**

Saffire-online allows the user to plot and track vessels position in 'real time' this can be done on an individual boat basis or as a group of vessels. Vessels positional data is also regularly archived so historic positional data can be investigated. Saffire-online also has a replay function which plots the track of the vessel on the chart over the period specified. Daily reports can also be produced by the software to assess vessels movements over a given period.




**Vessels track. The red box denotes the area wishing to be zoomed into.**

Positional data collected by the vessels can be exported from Saffire-online as an Excel spreadsheet or PDF document which allows the user to then import the vessels positions into any other mapping packages.




**Two vessels tracks displayed on the chart using the zoom function.**

The saffire-online website is still in the development stages. During the course of the pilot study the online system proved to be slow and difficult to access and navigate around the website. Improvements were made through feedback during the project, though these were limited. At the end of the project saffire-online still requires further development to bring it to a full commercial level, and meet performance levels currently being demonstrated by Fleetstar-online.

## 6. Security

The fitting of a tamper proof system is likely to be a prerequisite for VMS units fitted in order to ensure the integrity of the positional data being transmitted.
Vessels involved in the pilot project were not fitted with tamper proof units though anti tampering systems could easily be installed.

It is possible to fit tamper detection switches to the systems under test where an alarm is triggered on the monitoring software and a position report is generated showing the precise location and time of the tampering on the chart. A battery back up can also be installed so that if there is a power failure or power is removed the unit still reports. The system can also support inclusion and exclusion zones, so that alerts can be sent to/from vessels as they move in and out of areas of importance such as voluntary closed areas or MPA's. This can be enhanced so that a concierge service can be employed to escalate a calling process.

Installing these addition security features will ensure the integrity of the data being transmitted by the vessels and instill confidence in the positional data being received.

## 7. Results

The five vessels positions were monitored during a six month period from January to June 2009. The performance of the two VMS systems is assessed with recommendations given for an inshore tracking system.

*(a) Developing a system that meets the requirements of monitoring inshore fisheries (polls at least every 15 minutes) is suitable for inshore fisheries and provides a cost effective solution both in terms of the initial capital cost of the equipment and the ongoing communications costs.*

The systems chosen for the pilot project met the initial requirements of inshore fisheries – reliable, easy to install, good range of transmitting and frequency of reporting at a cost efficient price.

One of the main requirements for inshore fisheries is to provide a high frequency of reporting. The over 15m vessels are currently only required to report every 2 hours. When looking at inshore fisheries the areas of interest, in many cases, will be relatively small. With a reporting rate of every 2 hours vessels my have the ability to

enter and exit an area during a period without recording their position within that area.

In order that vessels positions could be more accurately recorded a frequency of reporting of every 15 minutes was seen as a minimum requirement. Depending on the size of the area of interest and the method of fishing used in the area, reporting frequency may need to be as frequent as every 5 minutes. Due to the costs associated with using satellite communications technology, transmitting positions data at these frequency levels is likely to be restrictively expensive, particularly with respect to the smaller class of vessels worked inshore.

The two systems chosen for the pilot project use communications technology that is capable of meeting the transmission frequency requirements at a cost effective price, providing positional data from the vessels at 30 second intervals.

Due to the logistics of setting up a network of masts for the Tracs TDMA system proved a much more difficult system to commission. To ensure a high percentage of coverage for the monitoring area, the sites for the shore based masts need to be carefully chosen, with the ideal positions being at a reasonable height above sea level, close to the coast with a good panorama of vision and within 'line of sight' range of at least one other mast in the network. The mast position will also need to have the facility to provide power to the unit, and one of the mast facilities will require internet access. In larger areas or areas with more complex geography more masts will be required.

The area chosen for the pilot project, Mounts bay in Cornwall, used two shore masts to demonstrate the coverage of the Tracs TDMA system. One of these masts was situated on the Lizard lighthouse. Installing this mast required permission to be granted by Trinity House who operate this lighthouse. As this facility is unmanned arrangements needed to be made to have someone from Trinity House present during fitting to ensure health and safety protocols were met. The other mast was situated on the roof of a Seafish office in Newlyn the office being in an ideal location sited 100 metres above sea level and with 'line of sight' to the mast on the Lizard some 11 miles away. The base unit and computer were also situated in the Newlyn office with a connection to the internet. A VHF licence must also be applied for from OFCOM in order to operate the Tracs TDMA units. Two vessels based in Newlyn were also fitted with similar Tracs TDMA units alongside a GPRS unit.

Due to the geographical complexities of some areas of the coast this system may be restrictively expensive due to the number of masts required to provide suitable coverage.

The GPRS units do not require shore based masts to be setup as the vessels position data is received by the existing mobile phone (O2) network. Once installed the units on the vessels could immediately transmit positions data via this network. The level of mobile mast coverage will depend on the geographical area. Areas of

coverage around the UK including along the coast are available from the network suppliers and OFCOM.

*(b) Piloting the tracking devices on 5 vessels operating in the South West, determining:*

*(i) Practicality of operating the tracking devices at sea*

The systems fitted to the vessels comprised of a compact unit, encompassing the electronics and GPS receiver, a GPS aerial and antenna. The electronics units were fitted in the wheelhouses of the five vessels with the aerials fitted externally to the wheelhouse roof. The units were 'stand alone' only requiring a power supply from the vessel. Comments from the skippers, were that once fitted they were forgotten about. A marine quality antenna was fitted to the vessels to ensure best coverage in the areas being worked. No problem with the GPRS hardware fitted to the vessels was encountered during the period of the pilot study.

*(ii) Monitoring vessel movements*

Vessel movements were monitored using the Saffire-Online charting package the frequency of reporting was set at the optimum level with the units reporting positions every 30 seconds. Vessel positions could then be viewed in 'real time' via the saffire-online charting software. Both systems proved capable of providing the data at the 30 second resolution though problems arose with the capabilities of the saffire-online software in handling and plotting the positions on the chart.

Feedback was given by Seafish as problems with the system were encountered, a number of the problems were rectified by the software engineers, though there are still many issues that need to be resolved if the system is to fully meet the needs of industry. Skippers and owners of the vessels on the project found the charting software slow and cumbersome to operate, with several skippers having issues when trying to view vessels position data on their home computers. Saffire-online also had problems when plotting the vessels positions on the chart, and could not handle the amount of positional data being received from the vessels.

The problems with saffire-online affected both the data being received by the Tracs TDMA and GPRS units. Of the two systems the GPRS units proved to be the most reliable systems with few problems encountered. The Tracs TDMA system proved problematic as it relied on a PC to relay the vessels positional data via an internet connection to the saffire-online website. There were a number of ongoing issues with the Tracs TDMA system and on numerous occasions positional data was not received by the base computer due to glitches in the system. The computer also required regular restarts in order to ensure continuity of data and required someone to check the system on a regular basis to ensure positions were being received. If the base computer stopped receiving the signals or the program crashed positional data from the vessels would be lost for that period until the problem was noticed and the program restarted. An automatic restart was setup on the computer by the

software engineers though this did not fully rectify the problems as a vessels positional data could 'lockup' on the system and would no longer show the vessels current position.

*(iii) Reporting compliance through an assessment of coverage and frequency of reporting.*

The GPRS system proved very capable of providing an excellent level of coverage in the pilot areas at a frequency of every 30 seconds. The system was let down by problems with the saffire-online software. Although the positional data from the vessels was being received successfully and could be view in text format, the software proved problematic when trying to view the data as tracks plotted on the chart. As the GPRS system is capable of storing the vessels positions if the signal is lost, transmitting them when the signal is restored. Vessels movements in all areas returned excellent levels of coverage. In the majority of areas coverage was in 'real time' (within a minute of the vessel transmitting its position) the use of a marine quality aerial improved the mobile signal coverage over what is normally seen with a standard mobile phone. Signals were received successfully from the vessels in areas where fishermen had seen poor or no signal on their own mobile phones.

The Tracs TDMA system did not perform to the same level, due mainly to the issue with the base computer station. As the system was not manned on a daily basis there were lengthy periods where the vessels positions were lost. There were also a number of issues with the signal being lost from the onboard units and on a number of occasions those the vessels fitted with both systems would lose the Tracs signal but still record their position via the GPRS unit.

With the installation of tamperproof devices to these systems these types of systems they will be capable of providing similar levels of security to those being demonstrated by the units currently fitted to the over 15m vessels.

*(c) Recommending a tracking method and monitoring system for inshore vessels.*

The GPRS unit proved by far to be the most consistent performer of the two systems with minimal problems with the hardware. It is the cheaper of the two systems and although there are ongoing communications charges in the form of a contract fee, these are at a low rate with respect to the frequency of reporting available. The problems encountered with the Tracs system, the logistics of setting up a network of masts onshore and the need for regular monitoring of the base unit far outweigh the benefit of free transmission costs.

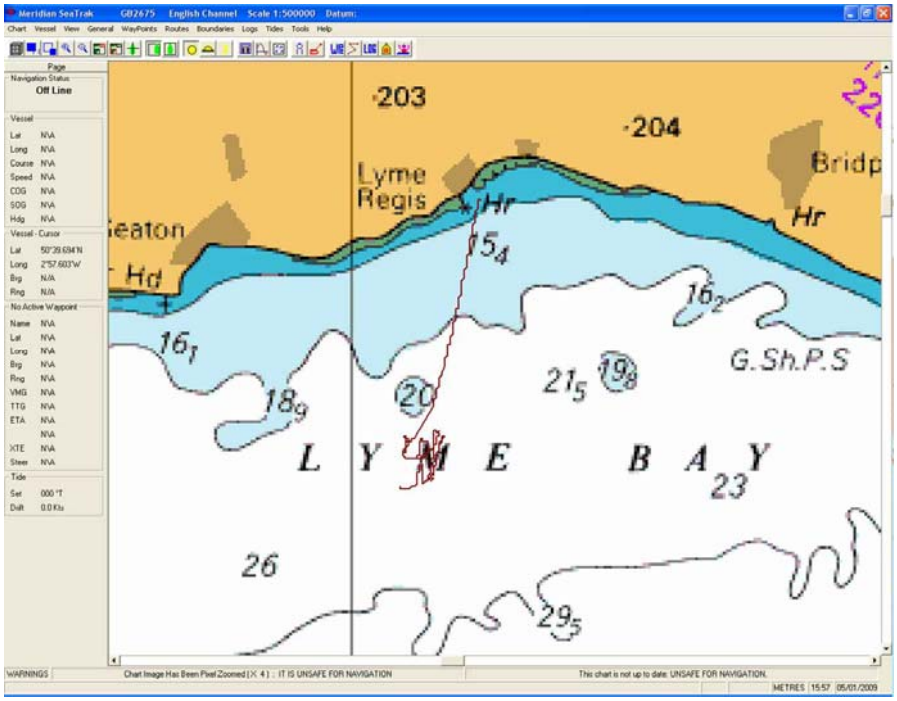
Currently, Fleetstar-online, the road version of Saffire-online, supports 20 second updates. If Saffire online was developed to this level, which Cybit/Bluefinger say is entirely possible, the GPRS option would provide the complete package for inshore vessel monitoring. To bring Saffire-online to the same level as Fleetstar-online would require further investment or a commitment by a number of vessels to purchase the system.

The reduced transmission costs and low initial capital cost make the GPRS mobile phone system a cost effective alternative to satellite based systems. To ensure the system is auditable tamperproof switches, triggered alarms and internal batteries could be integrated to provide security and assurances that the systems are operating effectively.

Current VMS systems are capable of delivering accurate and timely reports on vessels positions. The systems under test also have the capability of sending additional data, such as catch reports, meteorological or environmental data, alongside the positional data for limited or no additional cost. Integrating electronic data collection systems with VMS technologies will provide fishermen with the tools to assist in stock assessment, discard mitigation and monitoring and assessment of environmental impact.

## 8. Compatibility

The positional data reported by the vessels and stored on the online charting system is compatible with other charting packages. Positional data can be exported as either an Excel or PDF file. This data can then simply be imported to other charting software packages.




**Positional data exported from Saffire-online to a Meridian SeaTrak chart format.**

## 9. Costs

The costs will vary depending on the number of vessels adopting the technology and the length of contract signed. There are a number of options available for the purchase of the equipment

- Initial capital purchase – single one off payment
- Initial capital purchase + monthly rental
- Monthly Rental

An example of the costs for 250 GPRS units on a three year package (***as at June 09***) is shown below;

**Option 1 Saffire On-Line GSM Asset Locator vessels 3 year package**

*Subject to vessel inspection*

***Inclusions:***

- 36 months warranty
- Tamper alert switch
- Training - Set up and training ½ day on-site session:

Saffire-Online, software, licenses, airtime line rental (including 2 minute positioning transmitted on a 5 minute basis via GPRS data download), testing, commissioning and 36 month full service warranty

| Saffire-Online | No. of Vessels | Capital Purchase In Vessel Equipment | Monthly Rental 36 month rental |
|---|---|---|---|
| GPRS | 250 | £1,120.00 per vessel | £5.00 per unit per month |

- **Please note that training is included – normally £500**

BlueFinger will provide in-depth and focused client user training for a single ½day session. This will cover not only system functionality but also advice and guidance as to how to put the technology to work within the local authority environment.

## 10. Conclusion

The monitoring of fishing vessels is becoming more important as fishermen are required to prove compliance with localised management agreements. The inshore fleet in particular will need to comply with the agreements set out in the New Inshore Marine Natura 2000 sites – Special Areas of Conservation and Special Protected Areas. Adoption of VMS technology by fishermen will be vital in proving compliance

with the regulations being introduced and assist in ensuring that access to traditional fishing grounds are maintained. Adoption of a VMS system on a voluntary basis may also attract part funding from the European Fisheries Fund.

When choosing a VMS it is very important to clearly set out the requirements for the system, such as the monitoring area, number of vessels, range and frequency of reporting. Systems must also meet any legislative requirements such as the security of the positional data being collected and compatibility with current software systems.

The GPRS mobile phone VMS system proved to be the most applicable system for inshore fisheries monitoring. This technology is advancing all the time as consumer demand drives companies to improve the speed and access to communications technology. Having a knock on effect for VMS adopted by fisheries as the technology becomes cheaper and more accessible enabling even the smallest of vessels access to this technology.

At present less than one percent of fishing effort in the UK is sampled, this being done using onboard observers, a very expensive means of data collection. In order to provide accurate management decisions quality information is needed and fishermen can assist with this. Enabling fishermen, through the use of technology, to sample their catches and environment, and collect statistically robust data. Fishermen will have a direct impact on the development of a sustainable and profitable future for the catching sector.

## 11. Gear Conflict

During the course of the project VMS data from one of the trials vessels was being used to resolve a gear conflict. A request was made by Eddie Derriman, Chief Fisheries Officer for Cornwall Sea Fisheries Committee to access one of the vessels positional data to assess whether the VMS vessel had been in the area at the time when the conflict had taken place. Permission was given by the owners of the vessel to make the VMS data available to define whether any interaction had taken place. VMS data provides a useful method of resolving gear conflicts as it provides hard evidence as to a vessels movements. Reporting at the frequency levels demonstrated in this trial (every 30 seconds) provides conclusive evidence as to where the vessel has been.

## 12. Further work

Currently VMS systems only provide data on the vessels position, speed and heading, there is no indication as to whether the vessel is fishing or transiting through an area. By linking devices such as motion detectors fitted to the winch, or temperature sensors fitted to the fishing gear, periods when the vessel is fishing, ‘steaming’ or just ‘laying to’ could be defined.

Taking this a step further integrating data such as retained and discarded fish, marine sighting or meteorological information to positional data provided by the VMS will be invaluable in improving science and assisting assessments.

Work will be required to develop electronic systems providing fishermen with the tools to collect this information, which could easily be adopted as part of their daily working routine. The information could then be transmitted using the VMS communications systems to a website where various organisations could access the data relevant to them.

## 13. VMS Options for Inshore Fisheries

VMS Options for Inshore Fisheries

| | Satellite | GSM - Mobile Phone | VHF | Data Logger | AIS |
|---|---|---|---|---|---|
| **Coverage** | Worldwide | Inshore 10-30 miles | Up to 40 miles | Worldwide | Worldwide |
| **Frequency of reporting** | From every 3 minutes | Every 30 seconds | Every 30 seconds | Every minute | Every minute |
| **Reporting method** | Realtime | Realtime | Realtime | Historic | Realtime |
| **Accessability** | Internet | Internet | Internet | Manual Download | Internet |
| **Capital costs per vessel** | From £1,200 | From £560 | From £2,000 | From £100 | £1,550 |
| **Transmission costs** | £17 per month for hourly reporting | £5 per month 2 for two minute reporting | Free | N/A | £125 subsciption per month |
| **Shore Infrastucture** | None required | None required | £2,000 per mast | None required | None required |
| **Security** | Tamperproof | Tamperproof | Tamperproof | | Open subsciption |
| **Installation** | £200 | £200 | £200 | £100 | £200 |
| **Cost per Vessel ( 3 years coverage at a frequency rate of every 5 minutes)** | **£8,744** | **£1,300** | **£2,500** | **£250** | **£4,750** |