Cefas report C3018

Sanitary Surveys (England & Wales)

Review of Progress, Processes and Outcomes 2007-2011

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Publication date: November 2012

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Executive Summary

Four years experience of undertaking Sanitary surveys in England and Wales had been gained by the end of March 2011, so it was considered appropriate to conduct a review of progress, procedures and outcomes. This review concludes that the reports meet the legislative requirement and are generally fit for purpose. Some relatively minor changes to the approach are suggested, including simplification in some areas, a more quantitative approach to assessment of bacterial loadings from watercourses and sewage works, and the provision of a more flexible and forward looking sampling plan. For those areas which had been surveyed, there was a relatively minor net increase in the recommended monitoring effort. Where existing monitoring points had been relocated, this resulted in a slight tendency for higher *E. coli* results, but in some cases the reverse occurred, and no changes in classification resulted from any of these relocations. Sampling plans have for the most part adopted the principle of individual classification zones (CZs) being represented by single monitoring points. This aids classification and enforcement decisions based on both time series analysis and high level results. The reports have been generally well received by consultees (Local Enforecement Authorities, EA) and other stakeholders , although some surveys have delayed the classification process. A questionnaire to formally capture and evaluate stakeholder opinions is proposed. Circulation of final reports at the time of writing has been limited and mainly in response to specific requests. Recently legal and technical issues relevant to placing the reports in the public domain have been resolved allowing final reports to be made available via the internet.

Table of contents

1 Introduction

Under EC Regulation 854/2004, there is a requirement for EU Member States intending to classify bivalve mollusc production and relaying areas to undertake a number of tasks collectively known (in the UK) as 'sanitary surveys'. Specifically, Annex II (Chapter II paragraph 6) of the regulation determines that 'if the competent authority decides in principle to classify a production or relay area it must:

(a) make an inventory of the sources of pollution of human or animal origin likely to be a source of contamination for the production area;

(b) examine the quantities of organic pollutants which are released during the different periods of the year, according to the seasonal variations of both human and animal populations in the catchment area, rainfall readings, waste-water treatment, etc.;

(c) determine the characteristics of the circulation of pollutants by virtue of current patterns, bathymetry and the tidal cycle in the production area; and

(d) establish a sampling programme of bivalve molluscs in the production area which is based on the examination of established data, and with a number of samples, a geographical distribution of the sampling points and a sampling frequency which must ensure that the results of the analysis are as representative as possible for the area considered.'

Therefore, the main purpose of sanitary surveys is to inform the sampling plans for the microbiological monitoring programme and classification of bivalve mollusc production areas (BMPAs) and ensure they are designed in such a way to be best protective of public health. In addition to better targeting the extent of the classified area, the location of representative monitoring points (RMPs) and frequency of sampling for microbiological monitoring, sanitary survey may serve to help to target future water quality improvements and improve analysis of their effects on the BMPA. Improved monitoring should lead to improved detection of pollution events and identification of the likely sources of pollution. Remedial action may then be possible either through funding of improvements in sources of contamination or as a result of changes in land management practices. Sanitary surveys may also help the shellfish industry and regulators to identify coastal areas suitable for the development of new aquaculture operations.

Since April 2007, The Centre for Environment, Fisheries & Aquaculture Science (Cefas) has been undertaking sanitary surveys for new BMPAs in England and Wales, on behalf of the competent authority, the Food Standards Agency (FSA). At the time of writing this report, a total of 23 sanitary surveys have been finalised under the memorandum of understanding (MoU) between the FSA and Cefas. Therefore, sufficient experience of sanitary surveys has been accrued to allow an evaluation of the programme in England and Wales. The FSA requested that Cefas undertakes a review of the programme to help focus future surveys and resource. This report reviews various aspects of the programme, including:

- Public health outcomes in terms of whether an increased level of protection is conveyed to the consumer (e.g. changes to classifications arising from revised sampling plans in existing areas).
- Resources involved in both completing the surveys and implementing the sampling plans.
- Strengths, weaknesses and relevance to the design of sampling plans of various aspects of the sanitary survey process.
- Stakeholder opinions on aspects of the process such as quality of assessments and associated costs and benefits.

From these assessments, a series of recommendations to improve the process are made.

2 Summary of the sanitary survey process in England and Wales

A summary of the main elements within the sanitary survey process is shown in Figure 1 below.

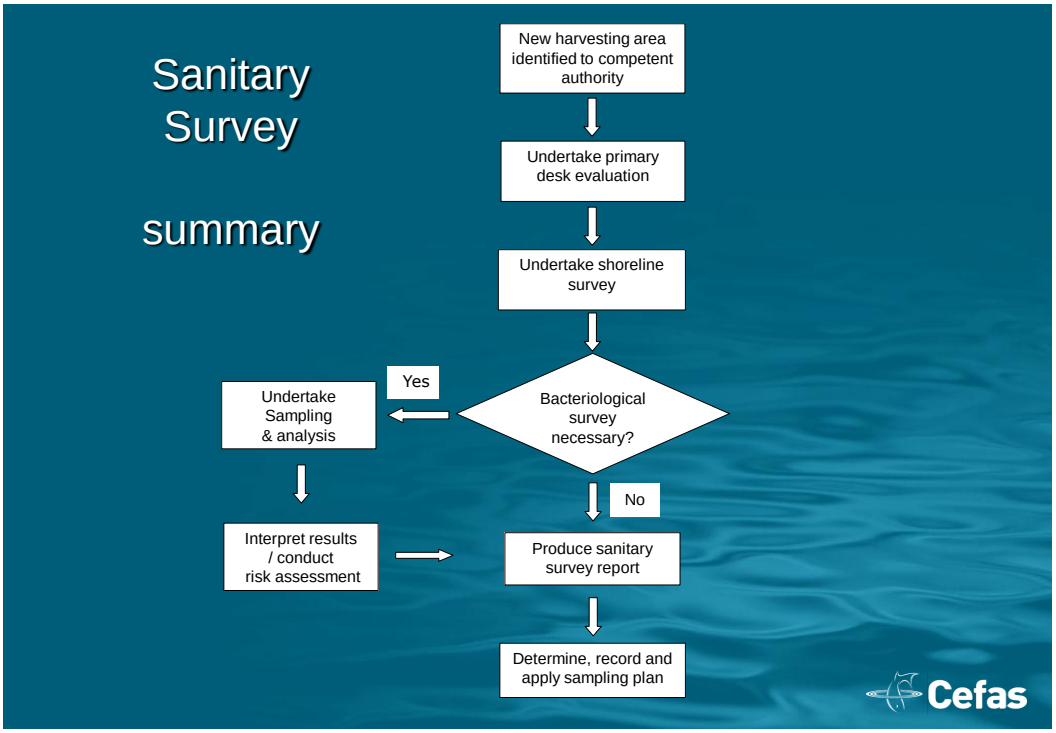

Figure 1. Process Summary

During the period under review completed applications for new bivalve harvesting areas have been forwarded from members of the industry or local enforcement authorities (LEAs) to Cefas. Once all the key information required has been received and any points requiring clarification have been discussed with the local authority and/or industry applicant and suitably resolved, the request is logged and the process starts. A formal letter of acceptance of the application is sent to the applicant at this stage. Where the application requests the classification of an area adjacent to an existing classified area (e.g. within the same estuary), or is for a new species within an area classified for another species, the sanitary survey is expanded to include an assessment of the existing classified area. Requests for relevant data and information for the desk study are submitted to the appropriate bodies (e.g. the Environment Agency (EA), fisheries authorities[1], water companies, etc.). A shoreline survey is carried out, which principally involves a physical survey of potential sources of contamination to the shellfishery, but usually also involves some bacteriological

[1] *From 1st April 2011 Sea Fisheries Committees were superseded by Inshore Fisheries and Conservation Authorities (IFCAs) in England and in Wales, Welsh Government Fisheries (WGF)*

sampling and the gathering of information on the exact location and nature of the fishery. Following the shoreline survey and an initial desk evaluation of pollution sources, a bacteriological survey may be carried out to evaluate spatial differences in levels of contamination within the shellfish area over a period of time. Information from the desk study, the shoreline survey and any bacteriological survey is collated and analysed, and presented in the sanitary survey report. The report also includes an overall assessment of sanitary conditions within the area, and based on this assessment recommendations are made for the design of the hygiene monitoring programme and a draft sampling plan is produced. The boundaries of the classified area(s) may be revised to reflect the area(s) over which the sampling plan will adequately reflect the extent of faecal contamination. The report and recommendations are reviewed by stakeholders such as the Local Enforcement Authority (LEA), the local fisheries authority and the EA before they are finalised. The sanitary survey process, from receipt of application to finalisation of the sampling plan typically takes over a year. Following adoption of the sampling plan, a further 3 month period of monitoring is required before provisional classification can be awarded, although in some cases results from any bacteriological survey may be used in determining a preliminary classification.

3 Summary statistics on sanitary surveys finalised to date

A total of 23 sanitary surveys had been finalised under the current service level agreement at the end of March 2011. These are listed in Table 1. More detailed explanations of the individual surveys are presented in Appendix 1.

Table 1. Summary of sanitary surveys undertaken to end March 2011

Area	Before survey			After survey						Net change*	
	No. RMPs	No. Classification Zones	No. Sps.	No. RMPs	No. Classification Zones	No. Species.	Months taken to 1st draft	Months taken to finalisation	Months taken to classification	No. RMPs	No. Classification Zones
Beaulieu	2	1	1	4	4	2	12	14	NA	0	+3
Blakeney	3	3	2	4	4	2	10	11	NA	0	0
Camel**	11	7	3	13	13	4	14	17	14	-1	+3
Dart (2009)	6	2	2	8	8	2	13	17	NA	+2	+6
Dart (2010)	8	8	2	10	10	2	13	17	14	0	0
Dee**	3	3	2	4	4	2	12	19	8	0	0
Dovey	0	0	0	2	2	1	10	14	12	0	0
Exe	0	0	0	1	1	1	7	18	NA	0	0
Helford	9	4	3	11	11	3	9	19	19	+1	+6
Kingsbridge	1	1	1	2	2	2	9	12	7	0	0
Lyme Bay (Chit Rocks)	0	0	0	1	1	1	5	11	8	0	0
Medina	3	3	1	7	7	4	8	14	NA	0	0
Morecambe Bay	3	3	2	7	7	2	7	19	22	0	0
Port Quin Bay	0	0	0	3	3	3	7	9	NA	0	0
Porthallow Cove	0	0	0	1	1	1	14	15	20	0	0
Portland Harbour 2008	3	3	2	4	4	3	7	15	5	0	0
Portland Harbour 2009	4	4	3	8	8	4	14	17	NA	0	0
Silloth	5	3	3	6	6	3	20	29	26	+1	+3
Southampton Water	4	1	1	8	5	2	14	18	40	0	+2
St Austell Bay	0	0	0	2	2	1	14	16	20	0	0
Swansea Bay	6	3	2	7	7	2	7	16	15	-1	+2
Upper Blackwater	3	3	2	7	5	3	15	23	NA	+1	+1
Walton Backwaters	4	4	2	10	10	3	5	14	5	+3	+3

**Excludes new fisheries*

*** Bacteriological survey results used towards classification*

NA – No classification awarded yet

As all these surveys were prompted by an application (or applications) for further classifications within these areas, a rise in the number of RMPs and classified zones is unsurprising, and these new classifications necessitated a large proportion of the recommended increased monitoring effort. The total net increase in numbers of RMPs for existing classified fisheries was 6 over the 23 surveys, so the increase in monitoring effort arising was small. The number of zones for existing fisheries increased by 28 but the majority of this increase was attributable to former zones being represented by several RMPs, whereas the general sanitary survey approach is for one RMP to represent each zone, which streamlines classification decisions and facilitates enforcement. Therefore the increased number of zones did not usually result in increased number of RMPs.

Some surveys were relatively uncomplicated, involving a single new aquaculture site in a new area, whilst others involved multiple species and zones spread over a wide geographical area such as a major estuary.

The principle of one RMP representing one zone was generally applied in the recommendations. Recommended zones were generally established to contain the existing fishery, but to exclude any other potentially more contaminated areas. Experience is beginning to suggest that zone boundaries should be set with some foresight regarding the potential development of the fishery rather than tightly around the existing bed/farm. This latter approach has led to the need to repeat sanitary surveys of the same area on some occasions as the shellfish have moved or expanded geographically, in some cases into areas which were formerly classified, but were declassified as boundaries were reduced in line with best information available on the previous sanitary survey (e.g. Dart). It is therefore recommended that where possible classification zone boundaries should not be excessively restrictive, and that the harvester should be consulted in detail about the future of the fishery at an early stage in the process. The application for classification form has been improved to prompt consideration of future fishery expansion requirements. However, there is a need to consider exclusion of potentially more contaminated areas which may not be fully represented by the sampling plan.

It is considered that an appropriate balance was struck between providing a representative sampling plan with respect to the survey findings, identifying enforceable areas, and keeping sampling effort within an appropriate scale.

Surveys took an average of 11 months to progress to first draft stage from receipt of application, and an average of 16 months to the issue of the final sampling plan. The average time taken for the classification of a new fishery was 16 months, but not all have been classified to date for reasons such as non-compliance with class B rendering the fishery unviable. Therefore there is room for improvement in this respect – dependant on resources available and FSA priorities. Table 1 shows that there were some considerable delays during the consultation. Some of the lengthiest delays were caused by deliberations with the LEA about the practicalities of the sampling plans. For example, the Fal report was drafted in March 2010, and the sampling plan is yet to be agreed with the LEA. Affordability within local authority budgets is often a major factor here. However, in some cases these delays may be avoided by earlier consultation on for example, locations where an RMP should not be placed on stock availability, access or health and safety grounds. Alternatively, reports could be finalised at the point at which recommendations for best practise are made and any variation to the recommend plans progressed as revisions as part of the classification implementation process.

In five cases, classifications for new fisheries (on the basis of bacteriological survey results) were awarded before the issue of the final sampling plan to prevent unnecessary delays to the industry (Table 1). Over the course of the programme to date the average cost of each survey is in the region of £22,000. This average figure includes 7 draft report submissions and several more in progress, plus significant development work early in the programme.

4 Sanitary survey outcomes

4.1 Public health protection outcomes

The principle behind the design of the sampling plan is for it to optimise protection of public health. Therefore RMPs are set at the point or points within the fishery where highest levels of contamination are expected, and boundaries are set to ensure shellfish beds which are subject to differing levels of contamination (to the extent they may receive different classifications) are classified separately, and limited to prevent expansion of the fishery into potentially more heavily contaminated areas.

It was not possible to assess the relative public health outcomes of sampling plans for new areas or new species in existing areas. However where existing beds are reviewed there is an opportunity to re-evaluate sampling point locations to be most protective of public health. In 36 cases existing RMPs were deemed sufficiently representative of a zone, and In 19 cases existing RMPs were relocated on the basis of the sanitary survey recommendations. Table 2 presents summary information on *E. coli* monitoring results before and after these RMPs were moved for the 17 which had some monitoring data for the new location, based on all samples taken at the new RMP location, and the same number of most recent samples taken from the old RMP location. It must be noted that these comparisons are generally based on low sample numbers so must be treated with some caution. Changes to sources of contamination which may be in part responsible for any observed changes were not taken into account, nor were environmental conditions such as antecedent rainfall and time of year.

On 8 occasions geometric mean results were worse following the relocation of the RMP, and on 9 occasions they improved. Three of the comparisons showed a statistically significant change in mean values, and in all three cases these were actually associated with an improvement in results at the new RMP. Two of these instances arose in the same survey (Silloth). This suggests that the quality of the associated assessments may require improvement in some cases, perhaps thorough acquisition of additional data or bacteriological survey. On 11 occasions the peak result has been greater post sanitary survey, with no change on one occasion and a lower peak result on 6 occasions. On 6 occasions a higher proportion of results exceeding the class B threshold (4600 *E. coli* MPN/100g) have arisen post survey, with no change in 7 cases and a decrease in 4 cases. It should be noted that the classification process is based on peak *E. coli* results and therefore the higher proportion of exceeding results is more informative than average figures in the context of

the assessment. None of these changes to existing RMPs have translated to a change in classification from the time of survey to the classifications in force at the last review (September 2011).

Table 2. Comparison of *E. coli* monitoring results before and after RMPs were relocated on the basis of survey recommendations

Area	Zone	Species	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)	Classification	
			RMP	No	GM	Max	%> 230	%> 4600	RMP	No.	GM	Max	%> 230	%> 4600		Before	Current
Blakeney	Wells- The Pool	Mussels	B006N	7	779	16000	86%	14%	B006R	7	771	2400	100%	0%	0.987	B	B
Blakeney	Simpool Head	Mussels	B006C	11	90	500	27%	0%	B006S	11	194	1700	36%	0%	0.279	B	B
Blakeney	South Side	Pacific oysters	B006K	10	320	1400	60%	0%	B006T	10	494	2400	70%	0%	0.382	B	B
Camel	Town Bar*	Cockles	B035H	12	521	16000	58%	17%	B035Y	12	812	54000	75%	25%	0.646	B	NC
Camel		Cockles	B035G	12	545	9100	75%	25%							0.671	B	NC
Camel	Longlands	Pacific oysters	B035I	20	490	5400	70%	5%	B035I	20	538	9200	75%	10%	0.842	B	B
Camel	Ball Hill	Pacific oysters	B035Q	20	546	9200	60%	10%	B035Q	20	156	1800	40%	0%	0.014	B	B
Helford	South of Port Navas Bar	Native oysters	B034A	34	206	36000	53%	3%	B034V	34	368	9200	65%	9%	0.190	B	B
Helford	Porth Navas Quay	Native oysters	B034E	10	134	1300	40%	0%	B034Y	10	167	3500	50%	0%	0.810	B	B
Helford	Porth Navas Quay	Pacific oysters	B034N	21	229	1300	62%	0%	B034W	21	223	16000	43%	5%	0.960	B	B
Helford	Porth Navas Quay	Mussels	B034J	22	693	16000	82%	14%	B034X	22	618	35000	59%	9%	0.800	B	B
Kingsbridge	Geese quarries	Pacific oysters	B029D	26	408	3500	73%	0%	B029D	26	463	9200	73%	8%	0.706	B	B
Silloth	Silloth – South	Mussels	B059A	14	360	3500	57%	0%	B059L	14	94	1300	21%	0%	0.032	B	B
Silloth	Silloth – Dubmill Point	Mussels	B059E	14	231	2400	57%	0%	B059O	14	160	2400	43%	0%	0.584	B	B
Silloth	Silloth South	Cockles	B059B	12	844	9200	75%	17%	B059M	12	169	1700	42%	0%	0.013	B	B
Southampton Water	Hamble estuary	Native oysters	B021L	13	302	1100	54%	0%	B021Y	13	257	3500	46%	0%	0.694	B	B
Southampton Water	Off Fawley	Native oysters	B021H	13	189	2400	38%	0%	B021Z	13	550	5400	77%	8%	0.067	B	B

T-test results highlighted in yellow show statistically significant change in mean result.
GM = Geometric mean
NC = not classified
Highest (old vs. new) geometric mean result, maximum result and proportion of results exceeding classification thresholds are in red

4.2 Other sanitary survey outcomes

Although the ultimate reason for these surveys is compliance with EC Regulation 854/2004, on some occasions the sanitary surveys have served other useful purposes. They provide solid background information for any investigations into causes of abnormally high *E. coli* results in shellfish or shellfish associated outbreaks of illness. In some cases (Dovey, Swansea Bay, Beaulieu, Camel) they have been taken into consideration by the EA to inform other monitoring programmes and investigations (shellfish waters, bathing waters). In other cases the information presented has been considered by the EA in targeting sewage treatment works improvements (Morecambe Bay). Information gathered during shoreline surveys on sewage discharges which the EA were not aware of is passed to them for possible enforcement action.

The uploading of finalised sanitary survey reports onto the internet will make them accessible to a much larger audience and should increase their usefulness across a wider range of interest groups. Perhaps illustrative of the wider utility of sanitary survey assessments is the fact that over the period relevant to this analysis Cefas received at least 30 requests for the provision of copies of sanitary survey reports. Most of these came from members of the shellfish industry, scientists at universities and other government research institutes, harbour officers, coastal zone management officers, members from nature conservation groups, etc.

5 Evaluation of the process

This section aims to assess the different parts of the sanitary survey process principally in terms of their relevance to the assessment and the design of the sampling plan. The four main elements are the application for classification, desk study, the shoreline survey and, in some cases, a bacteriological survey.

5.1 Application

Since late 2010, all applications have been channelled through the relevant LEA, who should in effect act as sponsors of the process. This allows pre-screening of applications by the authority responsible for enforcement and fosters consistency in process. On some occasions, an application has been accepted and a sanitary survey carried out, but the fishery has not materialised (e.g. Port Quin Bay). Our procedures now therefore recommended that before an application is accepted, best efforts should be made to verify that the fishery is viable and all required permissions have been granted, in principle at least. This may involve Cefas in liaison with the Crown Estates, fisheries management bodies and conservation authorities such as Natural England as appropriate. Fisheries may however fail for reasons that cannot always be foreseen, so it is possible that surveys may be undertaken but not subsequently needed despite the vetting of applications. As noted in section 3, it is important to confirm industry intentions regarding requirement for future expansion of bivalve mollusc production. Despite this opportunities for fishery exploitation or aquaculture development not previously anticipated may present themselves over time.

5.2 Desk study

The desk study forms the bulk of the sanitary survey report. The overall structure, format and levels of detail of the reports, which have evolved somewhat during the programme, seem logical, easy to navigate and fit for purpose. Whilst it is believed that all assessments produced to date satisfy the legal requirements, there may be scope for improvement in some areas. This may include both removing unnecessary detail, e.g. conservation designations, information on bathing water assessments/standards, but also providing more focus on assessment in some areas e.g. application of bio-solids and/or water circulation.

5.2.1 Fishery section

This section presents details of the fisheries, and generally carries the level of detail appropriate to inform the contents of the sampling plan. Experience to date has shown that early consultation with

harvester or IFCAs/WG in case of wild fisheries will help, and may also help streamline the review process and minimise revision of the sampling plan as the fishery develops. The shoreline survey has proved valuable in confirming the exact location of the fishery and industry intensions regarding fisheries future development both in terms of extent and species to be harvested. It is also recognised that the situation on the ground can change in an unforeseeable manner. It is recommended that the harvester is consulted on the draft report to confirm the factual content of the fishery section.

5.2.2 Pollution sources

An accurate inventory of contamination sources is fundamental to the assessment. Information on sewage discharges is drawn from Cefas databases, and from directed requests made to the EA. This information on the type, size and location of these discharges has been sufficient to make a robust assessment of their potential impacts. The information on continuous discharges is also generally sufficient to make an estimate of bacterial loadings they generate, which would allow a direct comparison with other inputs such as watercourses which are flow gauged and have been sampled for *E. coli*. Therefore it is recommended that likely bacterial loadings should be estimated, where possible, and with appropriate caveats. Further information on their performance and in the case of intermittent discharges, spill data has not consistently been available, and this has constrained the quality of the assessment in some cases. More direct contact and better developed relationships with the water companies may serve to improve the quality and completeness of information on sewage discharges. Our procedures have therefore been amended to include the water companies as standard consultees on the full reports and they will also be consulted on the accuracy and completeness of the sewage discharges section at the earliest possible stage during the sanitary survey process.

Information on livestock is obtained from Defra or Welsh Government in the form of numbers of each livestock type by small sub-catchment area. This provides a broad indication of numbers of livestock and their distribution in the wider area, but does not provide information at the field level which may be of use in some cases. It can be supplemented with shoreline survey observations but these are only a snapshot of the situation on the day. Land cover information can also be of use in identifying areas of pasture and arable land providing an indication on livestock distribution on a finer scale. Information on application of slurry and manure to land is not generally available either through Defra or the EA, so assessment of this source of contamination is usually made through the number and type of livestock within each sub-catchment, land cover types and general patterns of

application in the UK. Detailed information on application of bio-solids to land, particularly that adjacent to bivalve harvesting areas and land management in this respect would significantly aid the sanitary assessment. It is understood that water companies hold some information on sewage sludge applications and Defra and the EA hold some information on the storage and application of manures. It is therefore planned that further attempts to obtain information on this subject from these bodies will be undertaken. Cross-government and industry high level agreement on the supply of this data would assist the process.

Sewage inputs from boats are difficult to assess aside from noting their spatial distribution (locations of moorings and marinas and navigation routes) and their seasonal patterns of use. Merchant shipping should be of little relevance as they are not permitted to make overboard discharges in coastal waters so should be ignored unless evidence is presented to the contrary. All smaller vessels such as dinghies and small powerboats do not have onboard toilets and are also of lesser relevance. This leaves small to medium sized private vessels such as yachts, motor cruisers and some fishing vessels as the main potential impacting source in this category, perhaps in particular those in overnight occupancy. Investigations should be focused on their numbers, locations, and patterns of occupation. The best source of information is usually direct liaison with a local harbourmaster in addition to shoreline observations, information gleaned form nautical charts and almanacs and aerial photography. There is evidence in the literature that waste discharges from boats are responsible for periodic deteriorations in water quality in the proximity of marinas and ports. There is also some evidence implicating these sources to outbreaks of infectious disease in humans in the USA. However, it is worth noting that they have not been strongly implicated as a major source of marked seasonal peaks in sampling results in the summer in areas where they are present in large numbers in England and Wales.

Wildlife needs to be taken into account under the legislation, and in some cases may be a significant source. However, its diffuse nature means that it does not usually have much bearing on sampling plans aside from in cases where there are for example well defined roosting areas or feeding aggregations. The species of relevance are almost always wildfowl, waterbirds and seabirds, and possibly seals on occasion. Presenting and discussing conservation designations is pointless in the sanitary survey context and has been discontinued. It is considered that information from BTO/WEBs counts, the breeding seabird survey, and the SMRU seal count data complemented with any other information on wildlife aggregations identified through the shoreline survey and liaison

with the LEA/harvester would be sufficient to inform the sanitary survey assessment with respect to this source.

Graphical presentation of seasonal variation in apportionment from differing pollution sources is a useful addition now routinely incorporated in the reports.

5.2.3 Bacteriological monitoring results

Of most importance is the detection of spatial patterns in levels of contamination as this is of direct relevance to the positioning of the RMPs, and so this should be the primary objective of any analyses of bacteriological monitoring results. Results should be always be presented graphically by monitoring point and mapped thematically, and statistical comparisons of mean result and results in relation to classification thresholds should be undertaken where possible. This approach should allow more robust and transparent conclusions to be drawn, although it is recognised the locations or time period sampled may not always be best placed to inform the assessment. Analysis of results against, rainfall, river flow and tide do not generally prove directly useful in determining the sampling plan as there is currently no provision for targeting collection of classification samples to certain conditions, however analysis by season may facilitate seasonally split classifications for existing sites where current RMPs are retained and a sufficiently long data set exists. On occasion they do provide indirectly useful supporting information to other parts of the assessment, such as the interpretation of which sources are of greatest significance and examination of the quantities of organic pollutants in relation to rainfall readings is specifically mentioned in EC Regulation 854/2004. The current lengthy analyses of results against rainfall and river flow could be scaled back without significantly detracting from the overall conclusions reached in this respect. Improvements to methods of analysis in respect to tides have been made recently. Whilst bacteriological sampling results are of direct relevance, compliance details for bathing waters are not relevant in the sanitary survey context and it is recommended that these are not presented.

5.2.4 Circulation patterns

Sources of information for this section are quite variable, ranging from bathymetric charts and basic tidal information (tidal curves and tidal steam diamonds), to lengthy modelling and observational studies undertaken for a wide range of purposes. The purpose of this section is to present information to assess the geographic profile of impacts from the various identified sources. In early reports often, less relevant information from detailed studies were presented at length (e.g. long term patterns of sediment transport), but basic simple statements of great relevance (e.g. tidal

stream directions, strengths and an estimate of tidal excursion) were not always included. The end result means that often these sections were not particularly accessible to the lay reader and did not always present reasoned conclusions of relevance to the assessment. The current report format where more detailed information is contained in a series of appendices means that the essential information can now be summarised in the overall assessment section and is therefore more easily digested by the lay reader. It is recommended that in future a fairly standard approach is taken to assessments, encompassing bathymetry, tidal stream information and a discussion of how wind and density effects may modify circulation in the area, supplemented with information from more detailed studies where available. Whilst any detailed studies of potential but marginal relevance should not be ignored, it is recommended that less emphasis is placed upon them, even in the absence of more relevant studies. Information from local sources (e.g. fishermen and harbour authorities who regularly work the area) may also be of value to the assessment. These measures will ensure that these evaluations are pertinent to the assessment, and comprehensible to all end users.

5.2.5 Other minor elements of the desk study

It is recommended that population census information is presented as this is of potential relevance to the assessment, and a legislative requirement, although it does not usually directly influence the sampling plan. The seasonality of population levels should also continue to be examined, but targeted towards actual population levels where this information exists (e.g. sewage works seasonal population calculations, hotel occupancy rates,) rather than listing tourist attractions.

Information on meteorology is required for the assessment, and the correct (fairly basic) levels of detail are presented.

River catchment physical information which may be incorporated includes land use, and possibly elevation and soil permeability, although these are not always all presented in detail and rarely influences outcomes in England and Wales. This information is usually too generalised to allow firm conclusions to be fully developed. A more quantitative assessment of riverine inputs treating them as a point source may be appropriate. Flow gauging, bacterial monitoring results and possibly even reference values from the literature for bacterial concentrations in different watercourses would allow a rough estimate of bacterial loading carried in by each watercourse to be generated, for direct comparison with sewage inputs. This potential approach has been adopted in some other

studies and whilst subject to many assumptions it would permit a quantitative comparison of the bacterial loadings from rivers with that generated from continuous sewage discharges.

5.2.6 Assessment, recommendations and sampling plan

The overall assessment should draw clear and robust conclusions in a manner accessible to the lay reader. It should end with a brief summary section covering the main points that dictate the recommendations. Recommendations are presented as a series of numbered points, which are clear and unambiguous. This has generally been achieved, although on occasion the logic behind the recommendations has not always been immediately transparent.

Sampling plans are clearly presented via a table listing RMP details and a map showing the locations of RMPs and zone boundaries. A comments column or footnote in the sampling plan summary table indicating to those implementing the sampling plan under what circumstances each RMP should be used, and how the plan has changed post survey, may be a useful addition. Generally, coordinates are presented as both national grid references and latitude and longitudes with the relevant datums stated for each set of coordinates. This is useful and should be adopted as standard procedure as sampling officers will sometimes need to refer to either coordinate system depending on circumstances. Occasional mistakes were found in some sampling plans, usually associated with co-ordinates of boundaries and RMPs. It is therefore recommended that the sampling plan maps and tables are checked and acknowledged as verified by an individual other than the author(s) before release. A procedure should be written to ensure quality control in this respect.

5.3 Shoreline Survey

The primary aim of shoreline surveys is to confirm the location of sources of contamination identified in the desk study and record the nature and location of previously unknown sources. Additional activities may include establishing further details about the fishery, and taking samples for bacteriological analysis. For best coverage the entire shoreline of the area (e.g. estuary) within which the fishery is located should be walked. Due to resource considerations, the shoreline surveys under this programme have not always provided this level of coverage, and so it is possible that some items of importance have been overlooked. In general therefore effort has been focused on accessible areas closet to the fishery and at locations where an initial assessment has indicated a positive need to verify information. In some surveys the use of a boat has proved invaluable to access areas which would be otherwise difficult to reach on foot or in a timely manner by road and pedestrian means. Boat work also provides the opportunity to collect a limited amount of

hydrographic data and collect water samples from differing depths in the case of some long line operations . Spot flow gauging of stream and riverine sources alongside bacteriological sampling can provide a snapshot estimate of the bacteriological loading carried by each watercourse, but this has not always been a routine procedure. As mentioned in section 5.2.5, this would provide useful information for a broad comparison of rivers and sewage discharges in terms of their magnitude as a source of contamination, and this should be undertaken where possible. It is however recognised that resources are insufficient to spend long periods of time walking the entire shore of major estuaries.

Typically, the shoreline survey is attended by a representative from the LEA, and on some occasions a meeting is held with the harvester(s) or EA officers. The local knowledge provided by these parties is often of great benefit, with Cefas providing experience and continuity of approach. It should be noted there has been a variable level of commitment from some LEA officers who do not always accompany Cefas staff for the whole survey. Comprehensive systems to ensure staff safety and to maintain biosecurity at fishery sites during shoreline surveys are in place.

Before undertaking a shoreline survey, the desk study should be sufficiently progressed to allow it to be verified. The main example of this is the information on discharges and new and existing shellfish resources, maps and details of which should be prepared and taken on site. This is now standard practice.

The reports generated from shoreline surveys have varied in structure, in some cases they were presented in the form of a self-contained report but in others they contained brief summary information that would have benefited from the addition of more context. The backbone of the report should be lists of observations and sample results, each accompanied by a map of their locations, and photographs where possible. Track lines indicating the shoreline survey path should also be shown on maps. Information on predicted tides (and where available actual water levels recorded on the day), weather, dates, time, personnel in attendance should also be reported. Some brief text under headings such as fishery, livestock, sewage discharges etc should also be presented, but detailed conclusions should not be drawn as the survey is essentially a list of observations, and the overall assessment and recommendations form the final part of the full survey report. Other details sometimes presented in shoreline survey reports, such as the location of bathing waters monitoring points are not necessarily relevant unless actually sampled at the time of the survey and can be left out.

5.4 Bacteriological survey

These provide hard data on spatial patterns in levels of contamination within shellfish, and the results may be counted towards preliminary classification thereby speeding up the sanitary survey/classification process. As such, they are often of considerable value. They do however represent a considerable investment in time from the LEA, and in analysis costs given that they may require 10 sets of samples taken from several locations. Their utility would be further increased if specific anticipated worst-case conditions could be targeted. However this is usually not possible as it requires event responsive sampling (rather than scheduled) which is over and above the LEA resources. Additionally, this approach may preclude the use of the bacteriological data for classification purposes.

Bacteriological surveys are often used as a mechanism for obtaining preliminary classification before the survey is completed. Potentially the points monitored may not align with the most appropriate RMP location, in which case the results should not be used for ongoing classification purposes.

5.5 Periodic review

The good practice guide indicates that sanitary surveys should be reviewed every 6 years, but the legislation does not specify any requirement. No periodic reviews of sanitary surveys have yet been undertaken in England and Wales. Full reviews are likely to be time consuming as almost all sections would have to be updated with new information. However, unless there are major changes to contamination sources or to the fisheries, it is unlikely that the sampling plans would require significant adjustment. Hence in such cases a comprehensive review would result in the expenditure of significant resources for little benefit relative to a survey of a new area. Therefore, instead of adopting the default GPG position of a full review every 6 years, there may be a case for undertaking these at a lesser frequency (e.g. 12 years as is the case in the USA) with more limited targeted reviews on a more regular (e.g. 3 year) basis which are capable of capturing any changes which may significantly affect the sampling plan. The targeted reviews could consider any changes in the fishery, the major contaminating influences (primarily sewage discharges and moorings/harbours/marinas) and possibly recent microbiological monitoring results or new hydrographic data. They may potentially highlight the need for a full review in some cases. A system whereby statutory authorities have a standing brief to notify the competent authority of any changes which may affect the sanitary status of an area may not be fully reliable in all cases.

5.6 Viral assessment

The vast majority of illness outbreaks associated with the consumption of shellfish contaminated by infectious agents in the UK are caused by norovirus. Norovirus outbreaks occur despite the associated shellfish batches being in compliance with the hygiene legislation, and are usually associated with oysters which are consumed raw. Although there are no viral standards within the hygiene regulations, which are based entirely on *E. coli*, it seems there may be some public health gains to be made from consideration of viral as well as bacterial contamination during the sanitary survey process, at oyster sites at least. A recent EFSA report[2] suggested that sanitary surveys should be used as a basis for managing production areas in such a way to minimise the potential for viral contamination.

Suggestions in this direction include some discussion in the reports of the rapidly growing scientific literature concerning the risk factors associated with high levels of norovirus in shellfish, increased emphasis on human sewage inputs in oyster assessments (with possible exclusion areas around these) and viral testing as part of bacteriological surveys. The FSA are currently undertaking an investigation into norovirus levels in oyster fisheries around the UK, and the results from sites where sanitary surveys are or have taken place would benefit the sanitary survey assessment.

5.7 Consultation

Once a draft report has been reviewed and approved by the FSA, it is then passed to a short list of stakeholders for consultation. These are generally limited to the EA and the relevant fisheries authority regarding factual accuracy of the appropriate sections, and the LEA primarily regarding the appropriateness of the sampling plan. Amendments identified during review have generally been relatively minor and not resulted in significant changes to the overall assessment. The most major issues were generally raised by the LEAs with respect to the practicalities of the sampling plan. These issues relate to access problems for some RMPs, insufficient shellfish at other RMPs for repeated sampling, and resource issues associated with any increase in monitoring effort rather than the robustness of the sampling plan in public health protection terms. In some cases such discussions have resulted in delays to the finalisation of the reports. Whilst increased efforts are now made to avoid such issues primarily through dialogue with the LEAs, it is anticipated that such issues will continue to arise from time to time.

2 EFSA Panel on Biological Hazards (2011). Scientific Opinion on an update on the present knowledge on the occurrence and control of foodborne viruses. EFSA Journal 9(7), 2190.

It is recognized that these are lengthy documents and external reviewers may find it difficult to devote the necessary time for something which may be outside of their regular role. The bodies consulted are certainly stakeholders and so these consultations should continue, and it is not proposed that any funding should be offered for this. There may be some merit in requesting some additional stakeholders to be involved in the review process. Cefas recommends that (if appropriate) the harvester be consulted as well as the local water company. This would help ensure that the fishery is properly described and assessed, and that information on sewage discharges is accurate and complete. No reports have been circulated to external stakeholders since this recommendation was made, so it is not possible to assess the usefulness of such consultations at present.

6 Stakeholder experiences

The original proposal for this review included the solicitation of stakeholder opinions on the sanitary survey process. These would include;

- the LEAs (specifically sampling officers in areas subject to sanitary surveys)
- shellfish harvesters and the SAGB
- the EA (NW, Wales, SW, Southern, Thames, Anglian)
- the IFCAs (North Western, Cornwall, Devon & Severn, Southern, Kent & Essex, Eastern) and Welsh Government Fisheries Unit

Opinions on the quality of surveys, reports, assessments and communications with the sanitary survey team, the benefits of the process, and the associated costs and timelines should be sought. It is considered that the most efficient approach may be through a brief written questionnaire combining a scoring system with free text boxes. This would provide some numerical scoring for comparison across stakeholder groups, whilst offering the opportunity for general comments, criticisms and suggestions for improvements to be made. A possible structure for this is presented in Appendix II.

The stakeholder survey could be conducted as an on-line consultation, with associated RMSS feeds and email notification targeting key interest groups. Another approach may be via structured telephone interviews, and whilst this may elicit a better and response rate from a potentially less biased selection of respondents, it would probably be considerably more labour intensive.

No survey of stakeholder opinions has taken place to date. It would require additional effort, there may be personal data issues, and the approach taken would require development in close liaison with the FSA and if undertaken by Cefas, approval by Cefas data management experts. We recommend that this is considered with a view to making a decision on whether to proceed with a formal review of stakeholder opinion.

Unsolicited feedback received on sanitary surveys has generally been complimentary regarding the standard of the reports, and critical of the delays to classification incurred by the process.

7 Summary of main conclusions

Major conclusions regarding the England & Wales sanitary survey programme to date are as follows :

- Reports meet the requirement and are generally fit for purpose.
- Simplification and standardisation is possible in some areas (e.g. hydrographic assessment).
- A more quantitative assessment allowing comparison of loadings from watercourses and sewage works could be developed, but for this flow measurement and sampling of all freshwater inputs would be required during the shoreline survey.
- Sampling plans should be as 'forward looking' as possible to avoid ongoing revisions and delays in consultation and to be able to respond to likely future changes in the extent of fisheries.
- Use of preliminary classifications and bacteriological survey results has reduced harvester delays, but the time taken to produce drafts and for review of these drafts still has potential to be reduced.
- Monitoring effort as indicated by the number of RMPs increased only slightly overall following sanitary surveys when existing fisheries only were considered.
- Where RMPs have been relocated, this has resulted in slight tendency towards higher mean *E. coli* results. However, no changes to classification have occurred as a consequence.
- The reports have served other useful purposes (e.g. used by EA to inform bathing and shellfish waters investigations) and their value to others will be increased when made available on the internet.
- Provision of detailed information on bio-solids application and management especially in the close vicinity of shellfisheries would allow this diffuse but managed and potentially important source of pollution to be assessed.
- A brief questionnaire to be completed by appropriate stakeholders is suggested, and feedback from the FSA is now sought on how and when this should be taken forward.

8 Specific recommendations

Specific recommendations identified in this report are listed below, for consideration by the FSA and subsequent discussion with Cefas.

8.1 Shoreline survey

- For best shoreline survey coverage the entire shoreline of the area (e.g. estuary) within which the fishery is located should be walked.
- Spot flow gauging of stream and riverine sources alongside bacteriological sampling can provide a snapshot estimate of the bacteriological loading carried by each watercourse and should be conducted where possible.
- Before undertaking a shoreline survey, the desk study should be sufficiently progressed to allow it to be verified.
- The shoreline survey report should include lists of observations and sample results, each accompanied by a map of their locations, and photographs where possible, but should not contain detailed analyses or conclusions.

8.2 Desk study & sampling plan

- The bacterial loadings generated by sewage works should be estimated, where possible, and with appropriate caveats.
- An assessment of the relative bacterial loadings carried by watercourses should also be presented, where possible, and with appropriate caveats.
- Further efforts should be made within government to establish a mechanism for obtaining specific information on the field application of manures, slurries and sewage sludge.
- The assessment of the impacts of boats should be generally be confined to vessels likely to have overnight occupancy, without on-board holding tanks, with information from shoreline observations, harbourmasters, nautical almanacs and aerial photography.
- The assessment of the impact of wildlife should generally be confined to BTO/WEBs counts, the breeding seabird survey, and seal count data complemented with any other information on wildlife aggregations identified through the shoreline survey and liaison with the LEA/harvester
- Historic bacteriological monitoring results should be always be presented graphically by monitoring point and mapped thematically, and statistical comparisons of mean result and results in relation to classification thresholds should be undertaken where possible.

- Analyses of historical bacteriological monitoring results against rainfall and river flow could be simplified without significantly detracting from the overall conclusions reached in this respect. We recommend this simplification is adopted for future reports.
- It is recommended that in future a fairly standard approach is taken to hydrographic assessments, encompassing bathymetry, tidal stream information and a discussion of how wind and density effects may modify circulation in the area, supplemented with information from more detailed studies and information from local sources where available.
- It is recommended that population census information should continue to be presented, but the assessment of seasonality should be restricted to actual or predicted population increases.
- The risk of viral contamination should be considered and factored into the assessment and resulting sampling plans.
- Sampling plan maps and tables should be checked and acknowledged as verified by an individual other than the author(s) before release. A procedure should be written to ensure quality control in this respect.
- Where possible classification zone boundaries should not be excessively restrictive, and that the harvester should be consulted in detail about the future of the fishery at an early stage in the process.

8.3 Consultations

- Water companies should also be included as standard consultees and should be consulted on the discharges section before the first draft is produced to avoid delays during formal consultation.
- It is recommended that the harvester is consulted on the draft report to confirm the factual content of the fishery section.
- LEAs should be briefly consulted on practicalities of proposed RMPs before the first draft is produced to avoid delays during formal consultation. Alternatively, reports could be finalised at the point at which recommendations for best practise are made and any variation to the recommend plans progressed as revisions as part of the classification implementation process.

8.4 Periodic review

- We recommend that a policy decision is taken on the periodic review frequency. The EU GPG default position is a full review every 6 years. However, there may be a case for

undertaking full reviews at a lesser frequency (e.g. 12 years as is the case in the USA) with more limited targeted reviews on a more regular (e.g. 3 year) basis. If adopted 3 yearly reviews should be sufficiently in depth to capture any changes which may significantly affect the sampling plan.

8.5 Stakeholder opinion survey

- It is recommended that the FSA consider whether to proceed with a stakeholder opinion survey. If such a survey is considered justified, its design would require significant input from the FSA.

9 Appendix 1 - Summary statistics and brief discussion of outcome for each finalised sanitary survey

Beaulieu

Reason for survey - Application to harvest Manila clams (unclassified area for this species)

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Beaulieu oysters (3.64km^2)	Native oysters	B023A	Bucklers Hard	SU 4098 0017
		B023B	Needs Ore	SZ 4272 9773

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Bucklers Hard (0.6664km^2)	Native oysters	B023A	Bucklers Hard	SU 4098 0017	Beaulieu oysters zone split into two, existing RMP for this part retained.
Needs Ore (2.945km^2)	Native oysters	B023B	Needs Ore	SZ 4272 9773	Beaulieu oysters zone split into two, existing RMP for this part retained.
Bailey's Hard (0.3574km^2)	*Tapes* spp.	B023E	Bailey's Hard	SU 3960 0145	New classification zone and RMP
Baileys Hard to Carpenters Dock (exact area not shown in report)	*Tapes* spp.	B023F	Carpenters Dock	SU 3933 0190	Recommended that this zone should not be harvested on hygiene grounds, but RMP provided in case required. Not sampled to date.

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable

Brief discussion of outcome

The existing sampling plan for oysters was retained, but the zone was split in two, so there was no increase in the number of RMPs for the existing fishery. A new classification zone and RMP was established for Manila clams. It was recommended that the Baileys Hard to Carpenters Dock extension of the Manila clam zone was not harvested on hygiene grounds, but an RMP was provided just in case. This has not yet been sampled.

Blakeney

Reason for survey - Application to harvest mussels from Wells Harbour (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Simpool (2.60km2)	Mussels	B006C	Simpool	TF 9925 4518
Morston Strand (2.60km^2)	Pacific oyster	B006K	Morston Strand	TF 9940 4490
Wells Beacon (1.44km^2)	Mussels	B006N	Wells Beacon	TF 9180 4550

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Wells Harbour	Mussels	B006Q	Wells Harbour	TF 9171 4379	New zone and RMP
Wells- The Pool (0.01km^2)	Mussels	B006R	Wells- The Pool	TF 9181 4545	Formerly Wells beacon (B006N). Zone decreased and RMP moved 53m
Simpool Head (0.08km^2)	Mussels	B006S	Simpool Head	TF 9942 4532	Formerly Simpool (B006C). Zone decreased and RMP moved 221m
South Side (<0.01km^2)	Oysters	B006T	South Side	TF 9950 4495	Formerly Morston Strand (B006K). Zone and RMP moved 115m

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone *	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP	No.	Geometric mean	Max	%> 230	%> 4600	RMP	No.	Geometric mean	Max	%> 230	%> 4600	
Wells- The Pool	B006N	7	779	16000	86%	14%	B006R	7	771	2400	100%	0%	0.987
Simpool Head	B006C	11	90	500	27%	0%	B006S	11	194	1700	36%	0%	0.279
South Side	B006K	10	320	1400	60%	0%	B006T	10	494	2400	70%	0%	0.382

Brief discussion of outcome

One new zone was created for a new shellfish bed outside of the existing zones. There was no change to the number of previously existing zones or RMPs. The areas of the three existing zones were decreased significantly to encompass just the existing fishery. RMPs for these zones were moved between 53 and 221m to better reflect contaminating influences. Numbers of results post implementation are perhaps too small for a robust comparison with the

larger number of samples taken before. The results after implementation appear to deteriorate slightly at Simpool Head and South Side, but not to the extent that classification would be likely to change. At Wells The Pool the geometric mean was very similar before and after, but the high result with possible classification implications arose at the old RMP. No significant differences were found between geometric mean results of old and new RMPs.

Camel

Reason for survey - Application to harvest mussels from Ball Hill and Porthilley Rock and peppery furrow shells from Tregunna (unclassified areas).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Camel cockles (1.007km^2)	Cockle	B035K	Little Petherick Creek (C)	SW 9238 7395
	Cockle	B035H	Lower Town Bar (Iron Bridge) (C)	SW 9270 7427
	Cockle	B035G	Upper Town Bar (C)	SW 9244 7492
Gentle Jane mussels (0.0994km^2)	Mussel	B035B	Gentle Jane/P. Cove (M)	SW 9390 7468
Pinkson Creek mussels (0.0529km^2)	Mussel	B035M	Pinkson Creek (M)	SW 9459 7360
Trebetherick Rocks mussels (0.3934km^2)	Mussel	B035J	Trebetherick Rocks (M)	SW 9251 7775
Pinkson Creek oysters (0.0529km^2)	Pacific oyster	B035R	Pinkson Creek (C gigas)	SW 9461 7358
Ball Hill oysters (0.4404km^2)	Pacific oyster	B035Q	Ball Hill Oyster (OYG)	SW 9344 7425
Porthilley/Longalnds/Gentle Jane oysters (0.3625km^2)	Pacific oyster	B035L	Porthilley Rock (C. g)	SW 9342 7533
	Pacific oyster	B035I	Longlands (C. g)	SW 9379 7475
	Pacific oyster	B035A	Gentle Jane/P. Farm (C. g)	SW 9392 7468

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Little Petherick Creek (0.1409km^2)	Cockle	B058K	Little Petherick Creek	SW 9238 7395	Camel cockles zone split into two and boundaries adjusted slightly. This RMP is retained for classification monitoring within Little Petherick Creek.
Town Bar (0.8846km^2)	Cockle	B058Y	Town Bar	SW 9248 7420	Camel cockles zone split into two and boundaries adjusted slightly. This RMP replaces B035H (231m away) and B035G (721m away)
Gentle Jane (0.0307km^2)	Mussels	B035B	Gentle Jane	SW 9390 7468	Classified zone reduced in area, existing RMP retained.
Trebetherick Rocks (0.2187km^2)	Mussels	B035J	Trebetherick Rocks	SW 9251 7775	Classified zone reduced in area, existing RMP retained.
Pinkson Creek (0.07608km^2)	Mussels	B035M	Pinkson Creek	SW 9459 7360	Classified zone increased in area, existing RMP retained.
Porthilley Cove (0.01512km^2)	Mussels	B035X	Porthilley Cove	SW 9342 7533	New zone and RMP.

Ball Hill (0.03979km^2)	Mussels	B035U	Ball Hill	SW 9342 7428	New zone and RMP.
Gentle Jane (0.03071km^2)	Pacific oysters	B035A	Gentle Jane	SW 9392 7468	Classified zone (Porthilley/Longalnds/Gentle Jane oysters) split into 3 and reduced in area, existing RMP retained.
Porthilley Rock (0.01512km^2)	Pacific oysters	B035L	Porthilley Rock	SW 9342 7533	Classified zone (Porthilley/Longalnds/Gentle Jane oysters) split into 3 and reduced in area, existing RMP retained.
Pinkson Creek (0.1017km^2)	Pacific oysters	B035R	Pinkson Creek	SW 9461 7358	Classified zone increased in area, existing RMP retained.
Longlands (0.0269km^2)	Pacific oysters	B035I	Longlands	SW 9354 7483	Classified zone (Porthilley/Longalnds/Gentle Jane oysters) split into 3 and reduced in area. New location for B035I (moved by 264m), but old RMP code used. Note on SHS indicates coordinates changed 21/10/09.
Ball Hill (0.03979km^2)	Pacific oysters	B035Q	Ball Hill	SW 9342 7429	Classified zone reduced in area. New location for B035Q (moved by 46m), but old RMP code used. Note on SHS indicates coordinates changed 21/10/09.
Tregunna (0.038km^2)	Peppery furrow shells	B035S	Tregunna (A)	SW 9600 7416	New classification zone and RMP.

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone (post survey name used)	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	
Town Bar*	B035H	12	521	16000	58%	17%	B035Y	12	812	54000	75%	25%	0.646
	B035G	12	545	9100	75%	25%							0.671
Longlands (pre and post 21/10/09)	B035I	20	490	5400	70%	5%	B035I	20	538	9200	75%	10%	0.842
Ball Hill (pre and post 21/10/09)	B035Q	20	546	9200	60%	10%	B035Q	20	156	1800	40%	0%	0.014

*Gap from 2007 to 2010 between last sample from old RMP and first sample from new RMP.

Brief discussion of outcome

For cockles, the zone was split in two and the number of RMPs were reduced from three to two. Within the Town Bar zone, the results from the new RMP (replacing two old RMPs) were slightly higher. For Pacific oysters, the number of RMPs remained at 5, but the three previous zones were increased to five. Two of these RMPs were moved. For one of these results were very similar before and after, but at the other results were significantly lower at the new RMP. For mussels the three existing zones and RMPs were retained, and two new RMPs and zones were created for the new fishery sites. A new zone and RMP was created for the new peppery furrow shell fishery. Therefore, the overall number of RMPs, excluding those created for the new fisheries were reduced by one. Results were generally higher at the relocated Town Bar RMP and the new Longlands RMP, but lower at the relocate Ball Hill RMP.

Dart (2009)

Reason for survey - Application to harvest Pacific oysters at Blackness Point (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Dart (*C. gigas*) (1.416km^2)	Pacific oyster	B028H	Sandridge Boathouse	SX 8658 5618
	Pacific oyster	B028B	Waddeton	SX 8741 5599
	Pacific oyster	B028G	Flat Owers	SX 8750 5550
Dart (*Mytilus* spp.) (1.416km^2)	Mussels	B028E	Sandridge Boathouse	SX 8658 5618
	Mussels	B028F	Waddeton	SX 8741 5599
	Mussels	B028C	Flat Owers	SX 8750 5550

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Sandridge Boathouse (0.0973km^2)	Pacific oyster	B028H	Sandridge Boathouse	SX 8658 5618	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Waddeton (0.1651km^2)	Pacific oyster	B028B	Waddeton	SX 8741 5599	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Flat Owers (0.3894km^2)	Pacific oyster	B028G	Flat Owers	SX 8750 5550	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Higher Gurrow Point (0.2799km^2)	Pacific oyster	B028J	Higher Gurrow Point	SX 8741 5599	Original Dart zone split into 4, and reduced in size. New RMP.
Sandridge Boathouse (0.0973km^2)	Mussels	B028E	Sandridge Boathouse	SX 8658 5618	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Waddeton (0.1651km^2)	Mussels	B028F	Waddeton	SX 8741 5599	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Flat Owers (0.3894km^2)	Mussels	B028C	Flat Owers	SX 8750 5550	Original Dart zone split into 4, and reduced in size. No change to this RMP location.
Higher Gurrow Point (0.2799km^2)	Mussels	B028K	Higher Gurrow Point	SX 8741 5599	Original Dart zone split into 4, and reduced in size. New RMP.

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable as no existing RMPs were moved.

Brief discussion of outcome

During consultation on the draft recommendations, the industry advised that the area at Blackness Point no longer required the classification which had been applied for, so recommendations for this site were removed from the report. For the existing fisheries, the recommendations for mussels and Pacific oysters were identical. The overall classified area was reduced from 1.416km^2 to 0.932km^2 and the previous single zone for each species was split into four. The number of RMPs increased from 3 to 4 for each species.

Dart (2010)

Reason for survey - Application to harvest mussels and Pacific oysters at Lower Gurrow Point and Kingswear.

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Sandridge Boathouse (0.0973km^2)	Pacific oyster	B028H	Sandridge Boathouse	SX 8658 5618
Waddeton (0.1651km^2)	Pacific oyster	B028B	Waddeton	SX 8741 5599
Flat Owers (0.3894km^2)	Pacific oyster	B028G	Flat Owers	SX 8750 5550
Higher Gurrow Point (0.2799km^2)	Pacific oyster	B028J	Higher Gurrow Point	SX 8741 5599
Sandridge Boathouse (0.0973km^2)	Mussels	B028E	Sandridge Boathouse	SX 8658 5618
Waddeton (0.1651km^2)	Mussels	B028F	Waddeton	SX 8741 5599
Flat Owers (0.3894km^2)	Mussels	B028C	Flat Owers	SX 8750 5550
Higher Gurrow Point (0.2799km^2)	Mussels	B028K	Higher Gurrow Point	SX 8741 5599

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Sandridge Boathouse (0.2790km^2)	Pacific oyster	B028H	Sandridge Boathouse	SX 8658 5618	Slight adjustment of zone boundaries, existing RMP retained.
Waddeton (0.1528km^2)	Pacific oyster	B028B	Waddeton	SX 8741 5599	Slight adjustment of zone boundaries, existing RMP retained
Flat Owers	Pacific	B028G	Flat Owers	SX 8750 5550	Slight adjustment of zone boundaries, existing RMP retained

(0.1835km^2)	oyster				
Higher Gurrow Point (0.2129km^2)	Pacific oyster	B028J	Higher Gurrow Point	SX 8741 5599	Zone boundaries adjusted slightly to include new site at Lower Gurrow Point. Existing RMP retained.
Kingswear (0.06492km^2)	Pacific oyster	B028M	Kingswear	SX 8860 5075	New zone and RMP
Sandridge Boathouse (0.2790km^2)	Mussels	B028E	Sandridge Boathouse	SX 8658 5618	Slight adjustment of zone boundaries, existing RMP retained
Waddeton (0.1528km^2)	Mussels	B028F	Waddeton	SX 8741 5599	Slight adjustment of zone boundaries, existing RMP retained
Flat Owers (0.1835km^2)	Mussels	B028C	Flat Owers	SX 8750 5550	Slight adjustment of zone boundaries, existing RMP retained
Higher Gurrow Point (0.2129km^2)	Mussels	B028N	Lower Gurrow Point	SX 8768 5577	Zone boundaries adjusted slightly to include new site at Lower Gurrow Point. RMP for this zone relocated 348m from Higher Gurrow Point (B028K) to Lower Gurrow Point.
Kingswear (0.06492km^2)	Mussels	B028M	Kingswear	SX 8860 5075	New zone and RMP

Comparison of results before and after implementation for existing zones where RMP has been moved

The only RMP which moved was B028N which replaced B028K. However, neither of these RMPs have ever been sampled so no comparison of results is possible.

Brief discussion of outcome

New zones and RMPs were created for the oyster and mussel fisheries at Kingswear. The boundaries of the existing zones were adjusted slightly to encompass the new site at Lower Gurrow Point, and the number of existing RMPs remained unchanged. One of the existing mussel RMPs was moved slightly, but neither the old or the new RMP have been sampled so no comparison of results was possible. The overall number of RMPs, excluding those created for the new fisheries at Kingswear, remained unchanged.

Dee

Reason for survey - Application to harvest a new (unclassified) cockle bed at Thurstaton.

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Dee (West Kirby) (10.47km^2)	Cockles	B045M	West Kirby – Tells tower	SJ 2070 8550*
Dee (Thurstaton) (15.18km^2)	Cockles	B045G	Thurstaton – Yacht club	SJ 2320 8310
Dee – *Mytilus* spp. (32.66km^2)	Mussels	B045O	Caldy Blacks	SJ 2255 8378

*Actually falls within a prohibited area. Area of 1.701km^2 became prohibited sometime during the course of the sanitary survey.

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Dee (West Kirby) (8.876km^2)	Cockles	B045M	West Kirby – Tells tower	SJ 2070 8550	Area reduced. RMP remains in same location.
Dee (Thurstaton) (1.701km^2)	Cockles	B045G	Thurstaton – Yacht club	SJ 2320 8310	Falls in prohibited area. Not sampled since before the report was finalised.
Dee (Thurstaton) (8.633km^2)	Cockles	B045W	Thurstaton West	SJ 22879 82824	New RMP just outside prohibited zone. Classified zone reduced.
Dee (Caldy Blacks) (11.03km^2)	Mussels	B045O	Caldy Blacks	SJ 2255 8378	Classified zone for mussels reduced, RMP remains the same.

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable

Brief discussion of outcome

For mussels, the RMP remained in the same place and the classified area was reduced significantly. For cockles at West Kirby the RMP remained in the same place and the classified area was reduced slightly. For cockles at Thurstaton, part of this zone became prohibited while the sanitary survey was underway. A new RMP was created on the border of the prohibited zone and the area classified was reduced. It was recommended that monitoring was continued within the prohibited zone but this was not implemented. The overall number of RMPs, excluding those created for the new fishery, remained unchanged.

Dovey

Reason for survey - Application to harvest mussels from 3 beds at Aberdovey (unclassified areas).

Monitoring arrangements before survey
None

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Aberdovey – West (0.0234km^2)	Mussels	B041M	Mussel Bed No 1	SN 6142 9590	New zone and RMP
Aberdovey – East (0.0050km^2)	Mussels	B041O	Mussel Bed No 3	SN 6248 9614	New zone and RMP

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable.

Brief discussion of outcome
Two new zones and RMPs were created to cover three new mussel beds.

Exe

Reason for survey - Application for the classification of Shelly Bank for *Tapes* spp. and *Venerupis* spp

Monitoring arrangements before survey

None for Shelly Bank. Although there were several other classified bivalve fisheries within the Exe the monitoring arrangements were not reviewed as part of this survey.

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Shelly Bank ($0.021km^2$)	*Tapes* spp.	B26AZ	Shelly Bank	SX 9944 8156	New RMP and classification zone.

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable.

Brief discussion of outcome

One new RMP and potential classification zone were established. Despite a total of 40 samples taken from Shelly Bank, it has never been classified. This was because the results dictated a C classification, which made the fishery unviable. Sampling continued until September 2010, after which it was abandoned. Existing shellfisheries within the Exe were not reviewed as part of this survey.

Helford

Reason for survey - Application to harvest Pacific oysters from Bosahan Cove (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Helford (*O. edulis*) (2.168km^2)	Native oyster	B034A	Calamansack Bar	SW 7528 2664
	Native oyster	B034D	Groyne Point	SW 7403 2612
	Native oyster	B034E	Porth Navas	SW 7557 2750
Helford (*C. gigas*) (1.017km^2)	Pacific oyster	B034M	Calamansack Bar	SW 7528 2664
	Pacific oyster	B034N	Porth Navas	SW 7557 2750
Helford (*Mytilus* spp.) (2.168km^2)	Mussels	B034G	Calamansack Bar	SW 7528 2664
	Mussels	B034H	Groyne Point	SW 7403 2612
	Mussels	B034J	Porth Navas	SW 7557 2750
Helford Point (*Mytilus* spp.) (0.123km^2)	Mussels	B034O	Helford Point	SW 7622 2630

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
East of Groyne Point	Native oyster	B034S	East of Groyne Point	SW 7445 2643	Former Helford native oyster area split into 3 (total area now 1.027km^2). This RMP effectively replaces Groyne Point for this species, moved 524m.
South of Port Navas Bar	Native oyster	B034V	South of Port Navas Bar	SW 7533 2672	Former Helford native oyster area split into 3 (total area now 1.027km^2). This RMP effectively replaces Calmanasack Bar for this species, moved 95m.
Porth Navas Quay	Native oyster	B034Y	Porth Navas Quay	SW 7546 2675	Former Helford native oyster area split into 3 (total area now 1.027km^2). This RMP effectively replaces Porth Navas for this species, moved 184m.
East of Groyne Point	Pacific oyster	B034Q	East of Groyne Point	SW 7445 2643	New zone and RMP for this species. Part overlap with old Helford zone.
South of Port Navas Bar	Pacific oyster	B034T	South of Port Navas Bar	SW 7533 2672	Former Helford Pacific oyster area split into 3 (total area now 1.027km^2). This RMP effectively replaces Calmanasack Bar for this species, moved 95m.
Porth Navas Quay	Pacific oyster	B034W	Porth Navas Quay	SW 7546 2675	Former Helford Pacific oyster area split into 3 (total area now 1.027km^2). This RMP effectively replaces Porth Navas for this species, moved 184m.
Bosahan Cove	Pacific oyster	B034P	Bosahan Cove	SW 7725 2652	New classification zone (0.167km^2) and RMP.
East of Groyne Point	Mussels	B034R	East of Groyne Point	SW 7445 2643	Former Helford mussel area split into 3 (total area now 1.027km^2). This RMP effectively replaces Groyne Point for this species, moved 524m.

South of Port Navas Bar	Mussels	B034U	South of Port Navas Bar	SW 7533 2672	Former Helford mussel area split into 3 (total area now 1.027km^2). This RMP effectively replaces Calmanasack Bar for this species, moved 95m.
Porth Navas Quay	Mussels	B034X	Porth Navas Quay	SW 7546 2675	Former Helford mussel area split into 3 (total area now 1.027km^2). This RMP effectively replaces Porth Navas for this species, moved 184m.
Helford Creek	Mussels	B034O	Helford Creek	SW 7622 2630	Formerly referred to as Helford Point. Classified zone and RMP location otherwise unchanged in recommendations.

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone (post survey name used)	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	
East of Groyne Point (Native oysters)	B034D						B034S	Not sampled as yet					-
South of Port Navas Bar (Native oysters)	B034A	34	206	36000	53%	3%	B034V	34	368	9200	65%	9%	0.19
Porth Navas Quay (Native oysters)	B034E	10	134	1300	40%	0%	B034Y	10	167	3500	50%	0%	0.81
South of Port Navas Bar (Pacific oysters)	B034M						B034T	Not sampled as yet					
Porth Navas Quay (Pacific oysters)	B034N	21	229	1300	62%	0%	B034W	21	223	16000	43%	5%	0.96
East of Groyne Point (mussels)	B034H						B034R	Not sampled as yet					
South of Port Navas Bar (Mussels)	B034G						B034U	Not sampled as yet					
Porth Navas Quay (Mussels)	B034J	22	693	16000	82%	14%	B034X	22	618	35000	59%	9%	0.80

Brief discussion of outcome

The main classification zone for the three species was split into 3 and each of these new zones was assigned a new RMP. The smaller Helford Point (or Helford Creek) mussel zone and RMP remained unchanged. A new zone and RMP was created for Pacific oysters at Bosahan Cove. The total number of RMPs changed from 9 to 11, giving a total net increase of 1, although sampling has not yet been undertaken at 4 of the new RMPs. Results were generally similar before and after where RMPs had been moved in terms of geometric mean and proportions exceeding the classification thresholds.

Kingsbridge

Reason for survey - Application to harvest mussels within an area only classified for Pacific oysters.

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Salcombe – C. gigas (0.2193km^2)	Pacific oysters	B029D	Geese quarries	SX 7555 4148

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Geese quarries (0.2193km^2)	Pacific oysters	B029D	Geese quarries	SX 7585 4168	No change to boundaries. RMP moved 355m but same RMP code used and coordinates adjusted on SHS. Note on SHS indicates that coordinates were adjusted on 30/4/09.
Geese quarries (0.0001km^2)	Mussels	B029E	Geese quarries	SX 7556 4148	New classification zone and RMP.

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone (post survey name used)	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	
Geese quarries (pre and post 30/04/09)	B029D	26	408	3500	73%	0%	B029D	26	463	9200	73%	8%	0.706

Brief discussion of outcome

A new zone and RMP was created for a new mussel fishery. The RMP for the existing Pacific oyster fishery was relocated, with similar but slightly higher results arising at the new location.

Lyme Bay (Chit Rocks)

Reason for survey - Application to harvest mussels at Chit Rocks (unclassified area).

Monitoring arrangements before survey
None

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Chit Rocks ($0.016km^2$)	Mussels	B090L	Chit Rocks East	SY 1218 8684	New species and zone.

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
This report addressed a single new mussel bed some distance from other classified areas, and recommended a single zone and RMP for this bed.

Medina

Reason for survey - Applications to harvest hard shell clams, manila clams and cockles in areas partly overlapping prohibited area (on the basis of native oyster sample results) .

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Castle Point & Squadron (3.17km^2)	Native oyster	B063E	Castle Point	SZ 51200 96800
	Native oyster	B063D	Squadron	SZ 49300 96800
Medina Wharf (Prohibited area, 0.65km^2)	Native oyster	B063B	Wharf	SZ 50010 95100

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Castle Point & Squadron	Native oyster	B063E	Castle Point	SZ 51200 96800	No change recommended to RMP or zone boundaries
	Native oyster	B063D	Squadron	SZ 49300 96800	No change recommended to RMP or zone boundaries
Medina Wharf	Native oyster	B063B	Wharf	SZ 50010 95100	No change recommended to RMP or zone boundaries. Prohibited area.
Folly Point	Hard clam	Not used	Folly Point	SZ 50887 92715	New zone and RMP. No zone boundaries specified by sanitary survey
Fairlee STW outfall	Manila clam	Not used	Fairlee STW outfall	SZ 50490 91164	New zone and RMP. No zone boundaries specified by sanitary survey
Fairlee STW outfall	Cockle	Not used	Fairlee STW outfall	SZ 50490 91164	New zone and RMP. No zone boundaries specified by sanitary survey
Fairlee STW outfall	Hard clam	B063F	Fairlee STW outfall	SZ 50490 91164	New zone and RMP. No zone boundaries specified by sanitary survey

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable

Brief discussion of outcome

No changes were made to the existing arrangements for the native oyster fishery. RMPs were established to be best representative of the two areas (overlapping) areas indicated in the applications. Only three samples of hard clams were taken within these areas and levels of contamination in these dictated that the areas be prohibited.

Morecambe Bay

Reason for survey - Application to harvest cockles at Aldingham (declassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Roosebeck Bed 1 (2.5km^2)	Pacific oysters	B048A	Roosebeck Bed 1	SD 2630 6480
Flookburgh (120 km^2)	Cockles	B48AA	Flookburgh	SD 4000 7130
		B48AC	Flookburgh	SD 3740 6640

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Leven Island (28km^2)	Cockles	5 along transect	Leven Island West	5 possible locations	New zone and RMPs. Slight overlap with old Flookburgh zone.
	Cockles	5 along transect	Leven Island East	5 possible locations	New zone and RMPs. Slight overlap with old Flookburgh zone.
Aldringham & Newbiggin (44km^2)	Cockles	5 along transect	Aldringham	5 possible locations	5 possible RMPs replace B28AF (which is one of the new ones on the transect). New zone
	Cockles	B48AE	Newbiggin	SD 2760 4683	Old RMP reinstated. New zone
Flookburgh (54km^2)	Cockles	B48AC	Flookburgh	SD 3740 6640	Existing RMP retained together with B48AA. Area decreased.
	Cockles	B48AA	Flookburgh	SD 4000 7130	Existing RMP retained together with B48AC. Area decreased.
Roosebeck Bed 1 (2.5km^2)	Pacific oyster	B048A	Roosebeck Bed 1	SD 2630 6480	No change to zone or RMP.

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
Monitoring arrangements for Pacific oysters remained the same. The old Flookburgh zone was decreased in size but the same RMPs were retained. New zones and RMPs were created for Leven Island and Aldringham & Newbiggin. For these two zones a transect sampling strategy was recommended so the RMP is located at the point best protective of public health where stocks were available to sample. There was no net change to the number of RMPs.

Porth Quin Bay

Reason for survey - Application to harvest farmed mussels, Pacific oysters and king scallops in Port Quin Bay (unclassified area).

Monitoring arrangements before survey
None

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Port Quin Bay ($0.0179km^2$)	Mussels	B035Z	Sandinway Beach	SW 9396 8072	New zone and RMP
Port Quin Bay ($0.0179km^2$)	Pacific oysters	B35AA	Sandinway Beach	SW 9396 8072	New zone and RMP
Port Quin Bay ($0.0179km^2$)	King scallops	B35AB	Sandinway Beach	SW 9396 8072	New zone and RMP

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable.

Brief discussion of outcome
Three zones and three RMPs were created for the new fishery, which is yet to be established.

Porthallow Cove

Reason for survey - Application to harvest mussels at Porthallow Cove (unclassified area).

Monitoring arrangements before survey
None

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Porthallow Cove ($0.31km^2$)	Mussels	B034Z	Porthallow South	SW 8024 2338	New RMP and zone.

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
This report addressed a mussel farm some distance from other classified areas, and recommended a single zone and RMP for this area.

Portland Harbour 2008

Reason for survey - Application to harvest Pacific oysters from Bincleaves Breakwater (new species in existing mussel area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Harbour – Bincleaves Breakwater (0.193 km^2)	Mussels	B25AA	Lyme Bay Shellfish	SY 69310 77460
Harbour – Eastern Breakwater (0.546km^2)	Mussels	B025J	Harbour SE 3 Ropes	SY 70500 74900
Harbour Several Order (Scallops) (2.186km^2)	Scallops	B025T	Several Order Scallop Bed	SY 68061 76239

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Harbour – Bincleaves Breakwater (0.193 km^2)	Mussels	Not listed	Portland Hbr – Bincleaves Breakwater (mussels)	SY 68560 77810	No change to zone boundaries. Recommended that RMP should be moved 820m, but the original RMP (25AA) for this species and zone continued to be used.
Harbour – Bincleaves Breakwater (0.0093km^2)	Pacific oysters	B25AB	Portland Hbr – Bincleaves Breakwater (*C. gigas*)	SY 68790 77754	New RMP and classification zone.
Harbour – Eastern Breakwater (0.546km^2)	Mussels	B025J	Harbour SE 3 Ropes	SY 70500 74900	No change to RMP or to zone boundaries.
Harbour Several Order (Scallops) (2.186km^2)	Scallops	B025T	Several Order Scallop Bed	SY 68061 76239	No change to RMP or to zone boundaries.

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
Aside from the requested new zone and RMP for Pacific oysters at Bincleaves Breakwater, only one change was made to the existing monitoring arrangements. This was the relocation of RMP B25AA to better capture peak levels of contamination. However, this recommendation was not implemented, possibly relating to a subsequent relocation of this site to another part of the harbour,

Portland Harbour 2009

Reason for survey - Application to harvest native and Pacific oysters from the several order, and also addresses the mussel/oyster farm moving from Bincleaves Breakwater to North eastern breakwater.

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Harbour – Bincleaves Breakwater (0.193 km^2)	Mussels	B25AA	Portland Hbr – Bincleaves Breakwater (mussels)	SY 68560 77810
Harbour – Bincleaves Breakwater (0.0093km^2)	Pacific oysters	B25AB	Portland Hbr – Bincleaves Breakwater (*C. gigas*)	SY 68790 77754
Harbour – Eastern Breakwater (0.546km^2)	Mussels	B025J	Harbour SE 3 Ropes	SY 70500 74900
Harbour Several Order (Scallops) (2.186km^2)	Scallops	B025T	Several Order Scallop Bed	SY 68061 76239

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Harbour – Bincleaves Breakwater (0.193 km^2)	Mussels	B25AA	Portland Hbr – Bincleaves Breakwater (mussels)	SY 68560 77810	Existing zone and RMP maintained
Harbour – Bincleaves Breakwater (0.0093km^2)	Pacific oysters	B25AB	Portland Hbr – Bincleaves Breakwater (*C. gigas*)	SY 68790 77754	Existing zone and RMP maintained
Harbour – Eastern Breakwater (0.546km^2)	Mussels	B025J	Harbour SE 3 Ropes	SY 70500 74900	Existing zone and RMP maintained
Harbour Several Order (Scallops) (2.186km^2)	Scallops	B025T	Several Order Scallop Bed	SY 68061 76239	Existing zone and RMP maintained
North Eastern Breakwater (0.1367km^2)	Mussels	B25AE	North Eastern Breakwater	SY 6997 7672	New zone and RMP
North Eastern Breakwater (0.1367km^2)	Pacific oysters	TBA	North Eastern Breakwater	SY 6997 7672	New zone and RMP
Several Order (2.186km^2)	Native oysters	B25AC	Several Order	SY 6756 7563	New zone and RMP
Several Order (2.186km^2)	Pacific oysters	TBA	Several Order	SY 6756 7563	New zone and RMP

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
Four new zones and RMPs were created for the new fisheries, and all other monitoring arrangements were unchanged from the previous sanitary survey recommendations.

Silloth

Reason for survey - Application to harvest Pacific oysters at Dubmill Scar (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Silloth – *Mytilus* spp. (55.56km^2)	Mussels	B059H	Silloth/Beckfoot	NY1100 5430
	Mussels	B059A	Beckfoot	NY 0760 5170
	Mussels	B059E	Dubmill Point	NY 0770 4500
Silloth – *C. edule* (18.97km^2)	Cockles	B059B	Beckfoot Fats	NY 0850 5050
Dubmill – C. gigas (0.446km^2)	Pacific oysters	B059K	Dubmill	NY 0720 4518

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Silloth – South (11.89km^2)	Mussels	B059L	Lees Scar	NY 1005 5345	New RMP. Part of original wider mussel zone which was reduced and split into 4. One old mussel RMP falls in this new zone (B059A), located 3000m away.
Silloth – Mawbray (2.089km^2)	Mussels	B059N	Mawbray	NY 0757 4704	New RMP. Part of original wider mussel zone which was reduced and split into 4. No old mussel RMPs fall within this new zone.
Silloth – Dubmill Point (1.343km^2)	Mussels	B059O	Dubmill Point	NY 0715 4579	Replaces B059E (moved 958m). Part of original wider mussel zone which was reduced and split into 4.
Silloth (9.739km^2)	Mussels	B059P	Silloth Channel	NY 0678 5262	New RMP – effectively replaces B059A. Part of original wider mussel zone which was reduced and split into 4. This new zone has a partial overlap with the new Silloth – South zone.
Silloth South (2.853km^2)	Cockles	B059M	Catherinehole Scar	NY 0986 5456	Replaces B059B, 2480m away. Zone reduced to 2.853km^2
Silloth – Dubmill Scar (0.446km^2)	Pacific oysters	B056K	Dubmill Scar	NY 0720 4518	RMP was identified for initial monitoring alongside sanitary survey process. Retained after sanitary survey.

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone (post survey name used)	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	
Silloth – South (mussels)	B059A	14	360	3500	57%	0%	B059L	14	94	1300	21%	0%	0.032
Silloth – Dubmill Point	B059E	14	231	2400	57%	0%	B059O	14	160	2400	43%	0%	0.584
Silloth South (cockles)	B059B	12	844	9200	75%	17%	B059M	12	169	1700	42%	0%	0.013
Silloth	B059A						B059P	Not sampled					

Brief discussion of outcome

A new zone and RMP were created for Pacific oysters. Monitoring here was carried out alongside the sanitary survey in order to speed up the classification process. The areas classified for cockles and mussels were reduced considerably, and the number of RMPs for mussels was increased from 3 to 4, although one of these has yet to be sampled. Geometric mean levels of *E. coli* were lower post survey at all three RMPs which were moved, and in 2 cases the difference in mean result was statistically significant.

Southampton Water

Reason for survey - Application to harvest unclassified species (manila clams) within area classified for native oysters.

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Southampton Water (15.89km^2)	Native oyster	B021S	Weston Shelf	SU 4332 0918
	Native oyster	B021D	Netley	SU 4530 0770
	Native oyster	B021L	Hamble estuary	SU 4780 0530
	Native oyster	B021H	Off Fawley*	SU 4990 0310

*Lies outside zone but still listed as an RMP for this zone

Monitoring results for native oysters are also used to classify hard clams.

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Southampton Water (East) (6.1km^2)	Native oyster	B021S	Weston Shelf	SU 4332 0918	RMP not moved. Part of old Southampton Water zone.
	Native oyster	B021D	Netley	SU 4530 0770	RMP not moved. Part of old Southampton Water zone.
Hamble estuary (3.778km^2)	Native oyster	B021Y	Hamble estuary	SU 4876 0530	Replaces B021L, moved by 1030m. Part of old Southampton Water zone.
Off Fawley (5.204km^2)	Native oyster	B021Z	Off Fawley	SU 4813 0325	Replaces B021H, moved 1760m. Part of old Southampton Water zone.
Southampton Water (East) (6.1km^2)	Manila clam	TBA	Weston Point	SU 4300 0978	New RMP and zone. Not sampled.
	Manila clam	B021U	Netley Castle	SU 4464 0845	New RMP and zone.
Southampton Water (West) (6.425km^2)	Manila clam	B021V	Hythe Knock	SU 4253 0917	New RMP and zone.
	Manila clam	B021W	Bird Pile	SU 4426 0713	New RMP and zone.

Comparison of results before and after implementation for existing zones where RMP has been moved

Zone	Old RMP *E. coli* results (MPN/100g)						New RMP *E. coli* results (MPN/100g)						T-test (p value)
	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	RMP ID	No.	Geometric mean	Max	%> 230	%> 4600	
Hamble estuary	B021L	13	302	1100	54%	0%	B021Y	13	257	3500	46%	0%	0.694
Off Fawley	B021H	13	189	2400	38%	0%	B021Z	13	550	5400	77%	8%	0.067

Brief discussion of outcome

For native oysters, the area classified was reduced, split into 3 zones and assigned 4 RMPs. Of these 4 RMPs, two were existing RMPs and two were replacement RMPs. Results were very similar to the former RMP at one of these replacement RMPs, and at the other results were worse on average and in terms of classification thresholds. For Manila clams two new zones, each with 2 RMPs were recommended. The sampling plan did not mention hard clams, which were formerly classified using the results from native oysters, so presumably this arrangement was intended to continue.

St Austell Bay

Reason for survey - Application to harvest mussels at Ropehaven (unclassified area).

Monitoring arrangements before survey
None

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Ropehaven (small) (0.004km^2)	Mussels	B070W	St Austell Bay	SX 0441 4929	New zone and RMP. RMP is representative of extent of site at time of survey. Initial monitoring recommended at top and bottom of ropes to assess vertical differences. Used for classification monitoring.
Ropehaven (entire lease) (0.275km^2)	Mussels	B070Y	Ropehaven (West Corner)	SX 0397 4945	New zone and RMP. RMP is representative of entire lease area into which fishery may expand. Initial monitoring recommended at top and bottom of ropes to assess vertical differences. Not yet used for classification monitoring.

Comparison of results before and after implementation for existing zones where RMP has been moved
Not applicable

Brief discussion of outcome
This report addressed a single new mussel farm some distance from other classified areas, and recommended a single zones and RMPs for the current extent of the farm, and for the entire lease area into which the farm may expend. The former has been used for classification.

Swansea Bay

Reason for survey - Application to harvest mussels from Queens Dock (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Swansea Bay S & Knab Rock (9.179km^2)	Mussels	B037F	Knab Rock (M)	SS 6210 8800
	Mussels	B037I	Swansea Bay S (M)	SS 6290 8930
Swansea Bay Mumbles (0.8205km^2)	Mussels	B037G	Mumbles (Swansea Bay south)	SS 6340 8850
Swansea Bay (117.9km^2)	Native oysters	B037M	Swansea Bank 3 (O. ed)	SS 6400 8755
	Native oysters	B037K	Swansea Bank 1 (O. ed)	SS 6600 9000
	Native oysters	B037L	Swansea Bank 2 (O. ed)	SS 6940 8880

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Queen's Dock (0.4036km^2)	Mussels	B037U	Queen's Dock	SS 6765 9210	New zone and RMP
Swansea Bay N (2.982km^2)	Mussels	B037E	Swansea Bay N	SS 6550 9180	New zone and RMP
Swansea Bay S (5.391km^2)	Mussels	B037V	West Cross	SS 6206 8909	Partial overlap with former Swansea Bay S & Knab Rock zone, also encompasses entire Swansea Bay Mumbles zone. Former RMPs B037I and B027F lie within this new zone.
Swansea Bay West (4.737km^2)	Mussels	B037R	Swansea Bay West	SS 6390 9070	Partial overlap with former Swansea Bay S & Knab Rock zone, new RMP outside this former zone. Former RMP B037G lies within this new zone.
Swansea West Fairway (3.714km^2)	Mussels	B037W	Swansea West Fairway	SS 6609 9126	Slight overlap with former Swansea Bay S & Knab Rock zone, new RMP outside this former zone.
Mumbles Road (8.038km^2)	Native oysters	B037X	Mumbles Road	SS 6297 8873	Part of former Swansea Bay zone. Former RMP B037M lies within this zone.
Green Grounds (10.08km^2)	Native oysters	B037Y	Green Grounds	SS 6979 8834	Part of former Swansea Bay zone. Former RMP B037L lies within this zone.

Comparison of results before and after implementation for existing zones where RMP has been moved

Yet to be implemented so no comparisons possible

Brief discussion of outcome

A new zone and RMP was created for the new mussel fishery. The number of RMPs for the existing mussel fisheries increased from three to four. The number of native oyster RMPs was reduced from three to two.

Upper Blackwater

Reason for survey - Application to harvest mussels and Native oysters south of Osea Island (unclassified area).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Thirslet Creek (6.069km^2)	Pacific oysters	B014M	Thirslet Creek	TL 9560 0770
Goldhanger (6.013km^2)	Pacific oysters	B014D	Goldhanger	TL 9250 0770
Blackwater mussels (22.56km^2)	Mussels	B014G	Thirslet Creek	TL 9560 0770

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Goldhanger (4.763km^2)	Pacific oysters	B014D	Goldhanger	TL 9250 0770	Zone decreased in size, RMP remains in same location.
Thirslet Creek (7.532km2)	Mussels	B014G	Thirslet Creek	TL 9560 0770	Part of former Blackwater mussels zone which extends out of the survey area into the outer estuary, RMP remains in same location.
South of Osea Island (5.755km^2)	Mussels	B014Q	Ford Creek	TL 8970 0660	New zone and RMP
	Mussels	B014R	Lawling Creek	TL 9170 0490	New zone and RMP
South of Osea Island (5.755km^2)	Native oysters	B014L	Ford Creek	TL 8970 0660	New zone and RMP
	Native oysters	B014K	Lawling Creek	TL 9170 0490	New zone and RMP
Thirslet Creek (7.532km2)	Native oysters	B014M?	Thirslet Creek	TL 9560 0770	Zone expanded slightly, existing RMP retained.

No recommendation was made for the continued monitoring of Pacific oysters at Thirslet Creek.

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable

Brief discussion of outcome

Survey only addressed the upper Blackwater estuary, which contains only a small part of the existing native oyster and mussel zones which mainly lie in the outer reaches of the estuary. The three existing RMPs within the survey area were retained. New zones were created for mussels and native oysters south of Osea Island, both of which had 2 RMPs.

Walton Backwaters

Reason for survey - Application to harvest Pacific and native oysters on a year round basis (formally seasonal classification) and application to harvest Manila clams (new species).

Monitoring arrangements before survey

Zone	Species	RMP	RMP name	RMP Location
Walton Backwaters (2.529km^2)	Native oysters	B011G	Kirby Creek	TM 2214 2478
Walton Backwaters (2.529km^2)	Pacific oysters	B011Q	Twizzle	TM 2427 2367
Mill lane holding ponds (zone not officially defined but encompasses a holding pond of very small area).	Pacific oysters	B011E	Mill lane	TM 2512 2231
Mill lane holding ponds (zone not officially defined but encompasses a holding pond of very small area).	Native oysters	B011M	Mill lane	TM 2512 2231

Recommended monitoring arrangements

Zone	Species	RMP	RMP name	RMP Location	Comment
Kirby Creek (0.386km^2)	Native oysters	B011G	Kirby Creek	TM 2214 2478	Original Walton Backwaters zone split into 3. This RMP, which used to be used for the entire former zone for this species is retained.
The Wade (1.39km^2)	Native oysters	B011U	The Wade	TM 2302 2361	Original Walton Backwaters zone split into 3. New RMP.
Twizzle (0.9379km^2)	Native oysters	B011F	Twizzle	TM 2427 2367	Original Walton Backwaters zone split into 3. New RMP.
Mill lane holding pond	Native oysters	B011E	Mill lane	TM 2512 2231	RMP retained (but Pacific oyster RMP for the holding ponds not listed in new sampling plan).
Kirby Creek (0.386km^2)	Pacific oysters	B011R	Kirby Creek	TM 2214 2478	Original Walton Backwaters zone split into 3. New RMP.
The Wade (1.39km^2)	Pacific oysters	B011S	The Wade	TM 2302 2361	Original Walton Backwaters zone split into 3. New RMP.
Twizzle (0.9379km^2)	Pacific oysters	B011Q	Twizzle	TM 2427 2367	Original Walton Backwaters zone split into 3. This RMP, which used to be used for the entire former zone for this species is retained.
Kirby Creek (0.386km^2)	Manila clams	B011T	Kirby Creek	TM 2214 2478	Original Walton Backwaters zone split into 3. New RMP.
The Wade (1.39km^2)	Manila clams	B011V	The Wade	TM 2302 2361	Original Walton Backwaters zone split into 3. New RMP.
Twizzle	Manila	B011W	Twizzle	TM 2427 2367	Original Walton Backwaters zone split into 3. New RMP.

(0.9379km^2)	clams				

Comparison of results before and after implementation for existing zones where RMP has been moved

Not applicable

Brief discussion of outcome

The former Walton Backwaters classification zone for Pacific and native oysters was split into three, with two new RMPs established and the original one retained for each species. The same zoning and monitoring arrangements were recommended for the new species (Manila clams). It was recommended that monitoring of native (but not Pacific) oysters should cease at the Mill Lane holding ponds.

10 Appendix 2 - First draft of stakeholder opinions survey questionnaire

Quality of sanitary report	Good				Poor
Relevance of information presented					
Quality of information presented					
Quality of analysis					
Robustness of conclusions					
Clarity of maps/figures					
Ease of understanding					
Please enter any comments on the quality of the survey report in this box					

Process	Good				Poor
Quality of communications from the sanitary survey team					
Relevance of shoreline survey					
Relevance of bacteriological survey					
Time required to complete the survey					
Consultation on draft reports and response to consultees					
Please enter any comments on the sanitary survey process in this box					

Outcomes	Good				Poor
Sampling plans appropriate/improvement on existing?					
Useful summary of fishery					
Overall understanding of contaminating influences in area					
Potential to drive water quality improvements					
Contribution to improvement in public health protection					
Usefulness of report to wider audiences					
Please enter any comments on the outcomes of sanitary surveys in this box					

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