EA-NCEDS BOX 4

ENVIRONMENT AGENCY

National Centre for Environmental Monitoring and Surveillance

Report No NC/mar/006a
Revision 3.0: September 1996.

National Coastal Baseline Survey Manual

Environment Agency
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CONTENTS

1.0 SAFETY

1.1 POLICY

- **All vessels and staff must comply with Environment Agency, hereafter referred to as Agency, policy:**

  Health and Safety Manual
  Code of Practice - Marine Activities Part I and II

1.2 COSHH & Risk Assessments

- Staff on each vessel are responsible for producing risk assessments of all procedures carried out on vessels and COSHH documentation for all chemicals used on board. These documents must be readily available to all staff who may encounter those chemicals.

1.3 Protective Clothing

- All personnel will wear suitable protective clothing relative to conditions and working environment e.g. lifejackets, hard hats, waterproof clothing, disposable gloves in accordance with Agency guidelines.

1.4 Manning levels

- Vessels will have a minimum of three staff on-board whilst underway. Small boats used to perform calibration runs require two persons in accordance with Agency practice.

1.5 Training

- Staff will be trained in specific aspects of working in the Marine Environment e.g. survival at sea, fire fighting. It is a regional responsibility to ensure that suitable and sufficient training is received by relevant staff although the National Centre may be willing to help in the organisation of such courses if required.

1.6 General Vessel Safety Procedures

- All personnel joining a survey vessels will be briefed on all aspects of EMERGENCY PROCEDURE prior to sailing. Any defects in vessel emergency equipment must be reported immediately to the Master and Regional Line Manager.

2.0 THE NATIONAL BASELINE SURVEY

The Agency has a duty, under the 1991 Water Resources Act, to monitor controlled waters. Controlled waters include estuarine and coastal waters to the three nautical mile limit. The coastal baseline survey was introduced in 1992, and extended nationally in 1993, as a means of meeting this objective.

The surveys provide a means of assessing background levels of contaminants to provide a baseline of water quality in the coastal zone These surveys now take the form of two boat surveys per year in Winter and Summer, around the coast of England and Wales. The four Agency coastal survey vessels (Water Guardian, Sea Vigil, Coastal Guardian and Vigilance) are used to perform the boat work.

The surveys include:

- Spot data:
  - Samples are collected from 121 sites and analysed at NLS laboratories for nutrients, chlorophyll, suspended solids, metals and some for organics. The samples are collected from a depth of 1 m.
  - Vertical profile data (transmission, dissolved oxygen concentrations, temperature and salinity and chlorophyll) are recorded at set depths at the 121 sites.
- Continuous data: underway sampling is performed, such that
  - dissolved oxygen concentrations, conductivity, pH, temperature, depth, salinity, transmission and chlorophyll are measured at 10 second intervals. Data are collected from a towfish at a depth of 4.0 m (when possible) and by probes in a flow cell or moon pool with an intake depth of 1.0 m.
  - nutrient data (phosphorus, ammonia, nitrite, TON and silicate) are collected at 2 minute intervals from a depth of 1 m using a pumped supply to an on-board Skalar autoanalyser.
- Spot and continuous data are gathered from 17 Grid sites spaced around the coast to test the homogeneity of the spot sample sites.

3.0 SAMPLING METHOD

NB please ensure that the site number and time of sampling is clearly marked in the survey log as well as the NLS log sheets

3.1 Preparation of the sample container

☐ The sampling container, a five litre HDPE (high density polyethylene) bottle, should be rinsed at the start of each working day with about 100 ml of 20% Nitric Acid (made by diluting 20 ml concentrated nitric acid with 80 ml deionized water), and rinsed with seawater. Failure to acid rinse containers may result in evaporative concentrations of previous samples or particulate contamination whilst the container is not in use. If it is deemed unsafe to acid rinse then the container must be rinsed at the start and end of each day with de-ionised water and stored in a clean sealed poly bag. The container must be rinsed with sample at each site to reduce cross contamination. The samples must all be collected from over the side of the boat (never from pumped supply), well away from engine discharges and sacrificial anodes.

3.2 TOTAL METALS (except mercury)

☐ Sample is poured directly into a the bottle without allowing the suspended solids to settle. If the sample is allowed to settle then the sample container may be agitated to ensure a good suspension of solids in the sample, but it is preferable to subsample immediately.

3.3 TOTAL MERCURY

☐ Sample is poured directly into a glass bottle containing a few ml of chromic acid as preservative, without allowing suspended solids to settle. In exceptional circumstances the sample container may be agitated to ensure a good suspension of solids in the sample.

3.4 DISSOLVED METALS

☐ A new syringe and filter cartridge are used for each sample. A 60 ml HDPE (high density polyethylene) syringe is filled with sample and rinsed, a 0.45 µm encapsulated filter is attached and about 20 ml of sample run to waste to flush membrane. About 150 ml of sample is filtered into bottle, the syringe being refilled as necessary. No more than one filter should be used for each sample; a smaller sample should be submitted for highly turbid waters.

1. Although the National Sampling protocol suggests more than one filter can be used per dissolved metal sample, for the Baseline survey we require single filters as this is certain to reduce the amount of contamination. Whilst it would be better to perform total and dissolved metals on a single sample this can lead to extra contamination problems and does not fit with the type of consumable supplied by the NLS at present.

3.5 DISSOLVED METALS - BLANK

☐ A new syringe and filter cartridge are used. A 60 ml HDPE (high density polyethylene) syringe is filled with de-ionized water, supplied by the analysing laboratory, and rinsed. A 0.45 µm encapsulated filter is attached and about 20 ml of water run to waste to flush membrane. About 150 ml of water is filtered into bottle, the syringe being refilled as necessary.

A blank determination should be carried out at least once per day or twelve hour period of survey. The blank must be labelled indicating the Date, Time and Reference Number:

Vigilance	60899700
Sea Vigil	60399800
Water Guardian	60199900
Coastal Guardian	60799600

For boats using Llanelli laboratory, logs and labels should be supplied for blanks and used as for all other samples. The date and time of blanks must be entered into the survey log that is sent to the National Centre.

3.6 ORGANICS

☐ The sample must be removed directly from the sea into a glass bottle without using a separate sampling container. An air space roughly level with the neck of the bottle is normally required in the bottle to allow addition of extraction solvent at the laboratory. Do not rinse the bottle prior to filling with sample.

3.7 SUSPENDED SOLIDS

☐ The bottle must be filled directly from the HDPE sampling container, without allowing the particles to settle, and capped. The bottle should be stored in a cool place. DO NOT ALLOW THE SAMPLE TO SETTLE before sub-sampling!!!

3.8 NUTRIENTS

☐ A new syringe and filter cartridge are used for each sample. A 60 ml HDPE syringe is filled with sample and rinsed; a 0.45 µm encapsulated filter is attached and about 20 ml of sample run to waste to flush membrane. About 100 ml of sample is filtered into the bottle, the syringe being refilled as necessary. No more than one filter should be used for each sample. The sample is **immediately** frozen and a temperature of -18°C maintained until the samples are analysed. Where a vessel has to stop generators for overnight stops and there is no shore power they must ensure that they have suitable battery backup to run freezers or the samples must be transported to laboratories immediately.

☐ A second sample is filtered for nutrients, in an identical manner, and retained for analysis by the on-board Skalar autoanalyser at the end of each days work to help AQC procedures.

3.9 CHLOROPHYLL

☐ A one litre volume of sample is filtered through a 4.7 or 7.0 cm diameter GF/C filter paper preferably at atmospheric pressure. During periods when chlorophyll concentrations are lower then a larger volumes of water should be filtered, hopefully improving the precession. If pressure must be used to speed up the filtration then it must be applied below the paper at less than 10 psi as positive pressure will rupture cells and cause chlorophyll leaching. The paper is folded together to trap the residue and wrapped in a small piece of aluminium foil. The sample is frozen in a plastic bag and maintained at -18°C until analysis at the laboratory. When the sample is highly turbid a smaller volume may be filtered providing the volume is clearly marked on each sample bag and the log sheet.

4.0 ANALYTICAL QUALITY CONTROL AND CALIBRATION

4.1 Introduction

- Good quality instrumentation which is regularly calibrated and checked with quality control standards is absolutely essential to any survey. Without confidence in the results produced by the boat, it is not worthwhile leaving port. The main approaches to calibration and quality control recommended here include:
  - standard and reference solutions e.g. pH buffers, zero oxygen water.
  - the use of "physical standards" e.g. standard resistors and transmission filters.
  - the use of cross calibration between two or more units measuring the same determinand.

4.2 pH

- Continuous pH measuring devices must be calibrated at least every 12 hours. If on a long survey it may be necessary to suspend the data collection to recalibrate. The pH should be calibrated using buffers pH 7, 8 & 9. Any greater pH range will exaggerate the errors associated with pH calibration. A low ionic strength pH 7.6 buffer can be supplied by the National Centre and is very useful for highlighting slow response times associated with contaminated electrodes.

  The pH probe should be cross-checked with all other pH measuring devices on board. All devices are lowered into an area of water at the rear of the vessel and after a short period the various readings noted on the log sheet. This will ensure that any drift, or mechanical damage, associated with individual instruments will be detected.

  Most boats will receive or have already taken delivery of new pH instrumentation from PML and these should be used in accordance with the R&D report. Buffers will be made available by Anglian Region.

4.3 Temperature

- Ensure that the calibration from the manufacturer is valid prior to the start of the survey.

  The temperature probe should be cross-checked with all other temperature measuring devices on board. All devices are lowered into an area of water at the rear of the vessel and after a short period the various readings noted. This will ensure that any drift, or mechanical damage, associated with individual instruments will be detected. It is not necessary to use primary temperature standards if the devices are calibrated on an annual basis by the manufacturers.

4.4 Dissolved Oxygen

☐ Continuous dissolved oxygen measuring devices must be calibrated as often as possible but at least every 12 hours. If on a long survey it may be necessary to suspend the data collection to recalibrate. The probe is held in a bucket containing sea water for a few minutes. It is then removed, shaken and placed in a container with moist tissue at the bottom and the readings observed. The 100% value is obtained when the reading from the instrument reaches a maximum. Note the previous 100% readings for QC purposes. The probe is then placed in a beaker containing a saturated solution of sodium sulphite and allowed to stand for about five minutes to allow full removal of dissolved oxygen. The previous value is noted for 0% saturation before inserting the calibration value. This will give details about the drift associated with the equipment since the last calibration. Winkler is no longer the standard technique for DO determinations and has little use as a cross check.

The DO probe should be cross-checked with all other DO measuring devices on board. All devices are lowered into an area of water at the rear of the vessel and after a short period the various readings noted. This will ensure that any drift, or mechanical damage, associated with individual instruments will be detected.

4.5 Conductivity

☐ The conductivity probes should be checked on a daily basis using a resistance loop.

The conductivity probe should be cross-checked with all other conductivity measuring devices on board. All devices are lowered into an area of water at the rear of the vessel and after a short period the various readings noted. This will ensure that any drift, or mechanical damage, associated with individual instruments will be detected.

4.6 Transmission

☐ The transmission must be checked daily and the lenses must be wiped clean. Transmission values for 0%, blocking the light path totally, and 100%, maximum light passage, can be recorded and the raw values recorded to give details about the drift associated with the equipment since the last check. The shutter can be used to check the transmission value when the light passage is partially blocked and this value used to assess stability.

The transmission device should be cross-checked with all other transmission measuring units on board. All devices are lowered into an area of water at the rear of the vessel and after a short period the various readings noted. This will ensure that any drift, or mechanical damage, associated with individual instruments will be detected.

4.6 Chlorophyll

☐ The fluorometer must be calibrated by the manufacturer and one unit e.g. Turner should be cross checked against boat units from other regions to confirm similar operating specification. Chlorophyll standards appear to be so unstable that it is not recommended that they are employed. All data from the fluorometers will only produce trend information that will be post calibrated using laboratory samples.

The fluorometers should be cross-checked with any others devices available on board. All devices are lowered into an area of water at the rear of the vessel, or allowed to examine water removed from that vicinity, and after a short period the various readings noted. This should ensure that any drift, or mechanical damage, associated with individual instruments will be detected. In the case of pumped devices (e.g. Turner) the sample intake should be in the same vicinity as the *in-situ* instrument.

5.0 WATER COLUMN PROFILING

5.1 Introduction

At each of the baseline sites a profile is required to provide an assessment of the water column homogeneity and detect stratification. This data should be logged at 1 second intervals as instrument (s) are slowly lowered from the sea surface to the sea bed or 15 - 20 m in deeper waters. Information required includes depth, temperature, salinity and dissolved oxygen with additional data from transmission and fluorometer if available.

5.2 Method

☐ The instrument (s) are suspended in the water from a frame well away from the engine discharges and lowered slowly and paused at various depths for the readings to stabilize prior to recording. When weather conditions do not permit the near surface measurements to be recorded accurately (due to swell) only the deeper values need be recorded. In very rough sea conditions, vertical profiling should not be attempted on the grounds of health and safety, in this situation it is probable that the water will be well mixed and little stratification will occur.

5.3 Depths

☐ Readings from the probe should be recorded at specific depths in addition to the continuous profile data:

- Surface - if this seems sensible given the prevailing sea conditions
- 0.5 m
- 1 m
- 2 m
- 5 m
- 10 m
- 15 m and then at 5 m intervals to the sea bed.

5.4 Recording (example method)

☐ Data from vertical profiles must be logged in two ways. At the baseline site the Qubit line should be halted and a new line name entered (e.g. VP51 for site 51). The line is then started to record data as the profiler is lowered through the water column. At each depth allow the probes to stabilize and the stable values for temperature, salinity and dissolved oxygen should be recorded into the profiler data sheet (see attached copy). The probe should be recovered slowly with the line still logging to produce a second set of data. Once the probes have been recovered the Qubit line should be stopped and the next baseline point and line selected. Data logged onto paper must be entered into spreadsheet format and sent to the National Centre by the required dates.

NOTE - On-scene conditions such as wind and tide conditions must also be logged on data sheets.

6.0 GENERAL SURVEY PROCEDURES

- During the agreed baseline survey period, or until the assigned survey patch has been covered, the survey vessel and staff will remain available for survey duties. It is the responsibility of the Master to ensure that the vessel is in a seaworthy condition prior to and during the survey period.

- The vessel should only set sail for a survey, or continue, if all the survey equipment is working within tolerance and providing good quality calibrated data. If any of the equipment is not performing then the National Centre must be informed, and will decide whether it should continue, wait for the problem to be resolved or another vessel requested to cover the survey area.

- As a minimum each survey vessel must utilize the following equipment during all parts of the baseline survey:

  - A towed body electrode array analysing at a depth of four metres below the surface. In extremely shallow waters the body may be recovered to a depth of two metres below the surface and returned to four metres as soon as the danger has been passed. Minimum array must include temperature, depth, conductivity, pH, fluorescence, DO and transmission.

  - An electrode array analysing waters at a depth of one metre below the surface i.e. flow cell or moon pool, and used to profile the water column to the sea bed at baseline sample sites. Minimum array must include temperature, depth, salinity, pH, fluorescence and DO.

  - An autoanalyser measuring nitrite, TON, ammonia, phosphate and silicate in real time at two to three minute intervals along track.

  - A sampling device capable of removing a water sample from a depth of 1.0 metres without causing contamination.

7.0 GRID SURVEYS

7.1 Site Selection

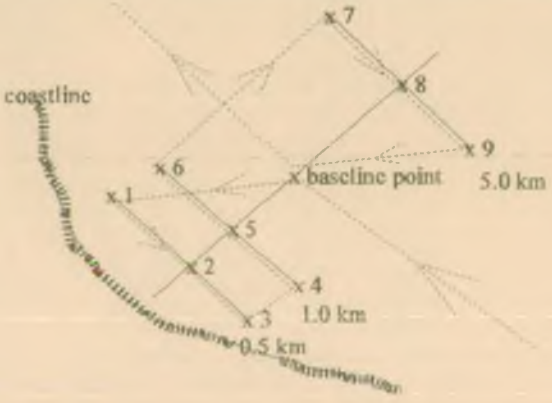
Seventeen sites have been selected around the coast to assess the homogeneity of the coastal waters and the true value of spot laboratory samples. At these sites a multidimensional grid will be surveyed.

7.2 Procedure

The vessel will steam to the standard sampling site and perform the usual procedure for sampling and profiling. Then the following routine will be followed:

A tangential line is drawn between the coast and the 5.0 km coastal limit and three perpendicular tracks at distances 0.5, 1.0 and 5.0 km offshore, each parallel track being 1 km long. At the ends and intersections of these tracks are nine new sampling positions as shown in the diagram.

GRID SURVEY SITE AND ORDER OF SAMPLING FOR SITES



At each of the nine new sites a sample is taken for nutrients, chlorophyll and suspended solids.

7.0 SKALAR OPERATION

7.1 Skalar Analytical Methods

- This section will limit itself to a general routine of operation for the analysis of the five nutrients.

7.2 Precision Testing

- All nutrient autoanalysers used for National Centre Baseline work should be tested in accordance with the WRc Technical Report NS 30, or at the least it must be demonstrated that they work to this specification.

7.3 Continuous Analysis

- The Skalar must be run in semi-continuous mode with filtered samples being analysed corresponding to about 500 metre sample points.
- The sample must be removed from the sea using a peristaltic pump sampling water from a depth of one metre well away from any discharges, preferably the bottom of the hull. The positive pressure side of the pump will feed one of the following arrangements:
  - A 0.45 µm exclusion filter (Whatman Gamma 20, Part No. 1915004) is connected to the output from the pump. The output from the filter will feed a flow cell from which the Skalar auto-sampler can remove samples. The exact time delay from seawater end of pump to sampler should be calculated and used to adjust the sample time.
  - A membrane filter holder, utilizing a 0.45 µm membrane, can be attached to the output from the peristaltic pump and only the water required for analysis is filtered and passes directly into the autoanalyser.
- The clock on the sampler must be checked to ensure that all sampling intervals are at specified times, irrespective of the value on the dial. The sampler timers are consistent but not accurate.

7.4 Reagents

- Reagents for nutrient analysis should have their shelf lives examined, and the findings used to ensure that all reagents are fit for the purpose.

7.5 Standards

- Standards should be retained in a fridge as a concentrated stock solution and diluted with a saline matrix suitable for the type of waters being examined.

- All standards, drifts and AQC samples must be diluted in low nutrient seawater (Ocean Scientific - tel 01428 685245) or Artificial Seawater. Whichever matrix is chosen it must be ensured by analysis that it is free from excessive nutrient contamination. A mixed nutrient calibration curve, including blank, should be analysed every six hours with a drift standards analysed regularly.

7.6 Run Length

- The exact length of each run is of little importance provided sufficient drift, blank and calibration standards are acquired. With the Skalar software it is sometimes easier to process data from runs containing smaller numbers of samples.

7.7 AQC Solutions

- Two reference AQC solutions, one high and one low concentration, should be available during each run and a suitable concentration AQC sample analysed to match the levels of nutrients being analysed, at least every one hundred samples. Check standards should be at the range of the expected data.

7.8 Sample Positioning

- It is imperative that the sample can be traced to a geographical position when the data is being reported:

    - The sampler can be connected to the remote-fix facility of the Qubit, using a micro-switch on the sampling arm.

    - The sampler micro-switch can act on an electronic counter e.g. Newport, to produce a unique number which logs to the Qubit with date and time either with an analogue or digital signal. This is the best solution (details of a suitable counter are available from the National Centre).

    - The exact Qubit clock start time of the autosampler start should be logged. The time to complete a sample cycle is checked to get its exact time and the sampler adjusted to ensure it is an exact even minute. The time for successive samples is then calculated and the data can be merged with the Qubit positional outputs using the Skalpoll software developed at the National Centre.

7.9 Data Returns

- ☐ The Skalar data must be edited and exported into a spreadsheet. Where no timer was used the sample time must be calculated. Skalar data should be supplied to the National Centre as soon as possible, and preferably within two weeks of the completion of the survey, in spreadsheet format, for the attention of Diana Milner.

8.0 QUBIT FORMAT

8.1 Format

☐ The instrument string format, Qubit channel arrangement (QDCF) and QPF order should remain constant for each coastal survey unless a major instrument failure occurs.

8.2 QDCF / QPF Format

☐ The name of each measurement type should contain the source, the instrument name and the determinand. The possible sources are FISH, PROF and POOL for towfish, profiler and moon pool. Please use common sense where other sources are involved (e.g. ECHO). Naming of variables and instruments is left up to the operator, but a short name is preferred. An example of the Vigilance set-up is given below and should be adopted for use on other vessels as this will help tremendously at the data processing stage.

TEST

QDCF No.	Description	QPF Slot (Shuttle)	QPF Slot (Ex-shuttle)
1	Fish Che Cond mmho/cm	0	0 7-13
2	Fish Che Temp °C	1	0 19-25
3	Fish Che Salinity PSU	2	0 31-37
4	Fish Che DO %sat	3	0
5	Fish Che Trans %	4	0
6	Fish Che ChA mg/µg/L	5	0
7	Fish Che pH pH	0	0 7
8	Fish Che T (AUX)	0	0
9	Fish Che Flow L/sec	0	0
10	Fish Che Depth m	6	0
11	Prof Che Cond	0	0
12	Prof Che Temp	7	1
13	Prof Che Salinity	8	2
14	Prof Che Do	9	3
15	Prof Che Trans	0	4
16	Prof Che ChA	0	5
17	Prof Che pH	0	0 6
18	Prof Che Depth	0	0 8
19	Pump Tur ChA	0	0
20	Spare	0	0

NOTES

1) Depth from primary echo sounder should be in slot 10 of the QPF.
2) Slots not filled in the 'ex-shuttle' set-up (i.e. 6, 7 ,8 & 9) may be filled with parameters at the discretion of the Survey Officer.

9.0 PRE-SURVEY ROUTINE

9.1 Sample Sites

☐ The definitive list of sites, with list of determinands to be sampled at each site for the National Baseline Survey, will be agreed and finalized by each vessel and the National Centre, prior to the survey.

9.2 Survey Dates

☐ Dates of flexibility, around the allocated survey period, should be notified to the National Centre as soon as possible.

9.3 Laboratory Samples

☐ Each vessel will liaise with their laboratory contact to ensure that they have sufficient log sheets, bottle labels, consumables and bottles for the allocated sample sites, calibration runs and blanks determinands.

9.4 Qubit Database

☐ Each vessel should check that their Qubit sample site database contains all the correct positions for the survey. They should also ensure that the Data Format is set up in accordance with instructions.

9.5 Skalar Nutrient Analyser

☐ Sufficient reagents must be acquired or prepared for the duration of the survey. Ensure that sufficient filters and consumables are available. Ensure that there are standards and AQC solutions created by two different laboratories.

9.6 Couriers

☐ It is essential to ensure that a courier will be available for transporting water samples to the laboratory as soon after the end of the survey as possible. Any lengthy breaks during the survey may necessitate the transport of samples to the laboratory part way through the survey. It is now national policy that samples are transported in refrigerated vans. Saline nutrients and chlorophyll samples must remain frozen during transit to the laboratory.

9.7 AQC and Calibration Standards

☐ The Survey Officer must ensure that there are sufficient supplies of standards and calibration solutions to maintain the performance of all equipment used during a baseline survey.

10.0 DAILY PROCEDURES

10.1 Communication with the National Centre

☐ Each vessel should make contact with the National Centre as early as possible on each day that survey is to be carried out. If a late start is anticipated then please notify the Survey Planner the previous day to avoid an early wake up call. The National Centre needs to know the location of the boats on a daily basis and be informed promptly when problems arise. This does not need to be a one way communication process.

10.2 Calibration check of instruments

☐ Calibration logs must be completed on a daily basis and submitted to the National Centre with the survey data.

10.3 Beginning/End of survey

☐ When two vessels are starting their portion of the survey from the same port, e.g. Poole, Hull, Milford, they should ideally try to schedule their departures at a mutually convenient time. On departure they should follow the same track for a period of not less than one hour to gain coincident data from probes and autoanalysers.

☐ At the end of the survey all data and log sheets are sent to the National Centre within the timescales given in the Manual. All returns should be labelled for the attention of **Diana Milner**.

12. DATA RETURNS / TIMESCALES

The following data must have arrived at the National Centre (for the attention of Diana Milner) within 2 weeks of the baseline survey being completed:

- Calibration log and Survey Sheets
- Qubit data on optical disk or floppies (QDCFs, RAW DATA and QPFs)
- Profile data on paper **and** in Lotus spreadsheet format (template supplied)
- Edited Skalar data containing sample times and limits of detection

Should vessels have difficulty in meeting these targets please notify the Centre as soon as possible.

National Marine Baseline Survey.

National baseline sites and parameter groups measured.

Base	Site name	Wessex site	BNG Easting	BNG Northing	Longitude	Latitude	Group			Grid
							1	2	3	
1	Berwick	60100100	401443	652107	1 58.62 W	55 45.73 N	1	1	1	
2	Castlehead Rocks	60100200	413450	644616	1 47.16 W	55 41.68 N	1			
3	Shoreston Outcars	60100300	421779	633985	1 39.26 W	55 35.93 N	1	1		
4	Craster	60100400	426513	620379	1 34.83 W	55 47.65 N	1		1	
7	Blyth	60100700	434352	579260	1 27.70 W	55 6.38 N	1		1	
8	Tyne (North)	60100800	438454	569686	1 23.90 W	55 1.20 N	1			
10	Tyne (South)	60101000	439317	568451	1 23.11 W	55 0.53 N	1			
11	Marsden	60101100	440937	566073	1 21.61 W	54 59.24 N	1			
13	Wear (Middle)	60101300	442402	558854	1 20.30 W	54 55.34 N	1		1	
15	Pincushion Rock	60101500	443338	551556	1 19.49 W	54 51.40 N	1	1	1	
16	Blackhall	60101600	449679	538324	1 13.70 W	54 44.23 N	1			
17	Tees (North)	60101700	455462	530528	1 8.40 W	54 40.00 N	1			1
18	Tees (Middle)	60101800	456231	529147	1 7.70 W	54 39.24 N	1	1	1	
19	Tees (South)	60101900	459667	527892	1 4.52 W	54 38.54 N	1			
20	Skinningrove	60102000	472910	521798	0 52.30 W	54 35.15 N	1			
21	Sandsend	60102100	486288	515059	0 40.00 W	54 31.40 N	1	1		1
24	Filey Brigg	60102400	514516	481769	0 14.61 W	54 13.11 N	1	1		
25	Flamborough (North)	60102500	524615	473502	0 5.52 W	54 8.52 N	1		1	1
26	Bridlington	60102600	520418	466428	0 9.54 W	54 4.76 N	1			
28	Beacon Hill	60102800	528006	438358	0 3.30 W	53 49.52 N	1			
29	Withernsea	60102900	536920	426310	0 4.50 E	53 42.90 N	1			
30	Spurn Head	60103000	546422	414537	0 12.80 E	53 36.40 N	1	1	1	1
31	Haile Sand Flat	60303100	547030	405650	0 13.10 E	53 31.60 N	1	1	1	
32	Theddlethorpe	60303200	552061	390130	0 17.20 E	53 23.14 N	1			
33	Chapel St. Leonards	60303300	558791	374579	0 22.80 E	53 14.64 N	1	1	1	
33.1	Skegness	60303310	561065	363243	0 24.50 E	53 8.50 N	1			
34	Outer Dogs Head	60303400	560595	357290	0 23.90 E	53 5.30 N	1			
34.1	Lynn Deep	60303410	561129	348030	0 24.10 E	53 0.30 N	1			
35	Wash	60303500	568866	346069	0 30.95 E	52 59.10 N	1	1	1	
36	Overy, Staithe	60303600	585381	349089	0 45.80 E	53 0.40 N	1			
37	Cley, Lookout	60303700	605814	347878	1 4.00 E	52 59.60 N	1	1	1	1
39	Mundesley	60303900	632565	339254	1 27.50 E	52 54.00 N	1	1	1	
41	Winterton	60304100	651212	318639	1 43.15 E	52 42.40 N	1	1	1	
42	Gorleston	60304200	655611	302520	1 46.30 E	52 33.60 N	1			
43	Kessingland	60304300	656311	286951	1 46.20 E	52 25.20 N	1	1	1	
44	Dunwich Cliffs	60304400	651442	271096	1 41.20 E	52 16.80 N	1			
46	Shingle Street	60304600	639608	242466	1 29.60 E	52 1.70 N	1			
46.1	Felixstowe, Cobbolds	60304610	634500	234000	1 24.80 E	51 57.26 N	1	1	1	1
48	Walton	60304800	627041	219040	1 17.70 E	51 49.40 N	1			
48.1	Holland Radar	60304810	623902	214629	1 14.80 E	51 47.10 N	1			
50	Maplin Bank	60305000	613318	192638	1 4.80 E	51 35.50 N	1			
51	Medway Buoy	60405100	600023	179518	0 52.85 E	51 28.72 N	1	1	1	
52	Shiveringsand Buoy	60405200	614810	173220	1 5.38 E	51 25.00 N	1			
54	East Brake Buoy	60405400	642560	164290	1 28.91 E	51 19.51 N	1			
55	Goodwin Fork Buoy	60405500	640780	152520	1 26.91 E	51 13.22 N	1			
56	South Foreland	60405600	637420	142840	1 23.64 E	51 8.10 N	1	1	1	

57	Sandgate Bay	60405700	623350	133160	1 11.24 E	51 3.22 N	1			
58	Dungeness	60405800	610960	115460	1 0.03 E	50 53.96 N	1			1
61	Beachy Head	60406100	560440	92640	0 16.37 E	50 42.63 N	1	1	1	
63	Brighton	60406300	531560	101530	0 7.98 W	50 47.87 N	1			
66	Selsey Bill	60406600	486600	89740	0 46.42 W	50 42.02 N	1	1	1	
67	Nab Tower	60406700	477220	89080	0 54.40 W	50 41.75 N	1			1
68.1	East Brambles	60406810	454500	99090	1 13.60 W	50 47.30 N	1			
68.2	Calshot	60406820	449950	102320	1 17.45 W	50 49.07 N	1	1	1	
68.3	Dockhead	60406830	442954	109622	1 23.37 W	50 53.03 N	1			
68.4	West Princessa	60406840	467490	89410	1 2.65 W	50 41.98 N	1			
69	St. Catherines	60406900	449780	74450	1 17.82 W	50 34.03 N	1			
70	The Needles	60407000	427320	83450	1 36.82 W	50 38.97 N	1			
73	St. Aldhelms	60507300	391444	74806	2 7.25 W	50 34.33 N	1			
75	Portland Bill	60507500	366887	68905	2 28.03 W	50 31.10 N	1			
78	Seaton	60607800	327371	85782	3 1.67 W	50 40.00 N	1	1	1	
80	Exmouth	60608000	298768	73910	3 25.75 W	50 33.33 N	1			1
83	Start Point	60608300	282855	34413	3 38.48 W	50 11.85 N	1			
85	Bigbury Bay	60608500	260244	41176	3 57.38 W	50 15.20 N	1			
86	Plymouth	60608600	246016	46192	4 9.73 W	50 17.70 N	1	1	1	
87	East Looe	60608700	232461	50530	4 21.25 W	50 19.82 N	1			1
88	Fowey	60608800	216744	48055	4 34.42 W	50 18.20 N	1			
89	Dodman Point	60608900	203301	38283	4 45.43 W	50 12.67 N	1			1
90	St. Antony Head	60609000	191045	31497	4 55.50 W	50 8.77 N	1			
93	Lizard	60609300	171990	9880	5 10.70 W	49 56.70 N	1			
95	Penzence	60609500	151330	23980	5 28.50 W	50 3.78 N	1			
97	Cape Cornwall	60609700	132110	31440	5 44.90 W	50 7.48 N	1	1	1	
100	St. Agnes	60610000	168780	52800	5 14.95 W	50 19.75 N	1			
102	Trevose	60610200	182760	77920	5 4.05 W	50 33.60 N	1			
105	Boscastle	60610500	207848	93942	4 43.33 W	50 42.77 N	1			
108	Hartland Point	60610800	222623	132318	4 31.90 W	51 3.73 N	1			
110	Bull Point	60611000	244082	147356	4 13.93 W	51 12.22 N	1			1
112	Foreland	60611200	272883	153182	3 49.33 W	51 15.78 N	1			
113	Porlock	60511300	287856	150676	3 36.42 W	51 14.62 N	1			
114	Minehead	60511400	302829	147589	3 23.48 W	51 13.12 N	1			
116	Weston-super-Mare	60511600	328422	160435	3 1.67 W	51 20.28 N	1			
117	Clevedon	60511700	337342	171688	2 54.10 W	51 26.42 N	1			
118	Avonmouth	60511800	350046	178825	2 43.18 W	51 30.35 N	1			
119	No. 1 Beacon	60511900	351230	184940	2 42.22 W	51 33.65 N	1	1	1	
122	Lavernock	60812200	319740	166990	3 9.23 W	51 23.75 N	1			
124	Nash Point	60812400	291470	167040	3 33.60 W	51 23.48 N	1			
125	Porthcawl	60812500	279540	175580	3 44.07 W	51 27.95 N	1	1	1	
128	Mumbles	60812800	264920	185970	3 56.93 W	51 33.37 N	1			1
130	Worms Head	60813000	237680	186370	4 20.50 W	51 33.15 N	1	1	1	
134	Caldey Island	60813400	219540	197440	4 36.52 W	51 38.78 N	1	1	1	
137	Turbot Bank	60813700	184870	194230	5 06.42 W	51 36.32 N	1	1	1	
138	St. Anns	60713800	180565	201679	5 10.43 W	51 40.23 N	1	1	1	
139	Skomer	60713900	170162	208214	5 19.70 W	51 43.50 N	1			
142	Strumble Head	60714200	189368	242641	5 04.30 W	52 02.50 N	1			
146	Penly-Badell	60714600	229134	257723	4 30.00 W	52 11.45 N	1			
148	Pen Pigyn	60714800	251196	271016	4 11.00 W	52 19.00 N	1			
151	Pen-Bwch Point	60715100	251567	301984	4 11.50 W	52 35.70 N	1			

154	Pwllheli	60715400	240180	333514	4 22.50 W	52 52.50 N	1	1	1	1	14
156	Bardsey	60715600	214489	322368	4 45.00 W	52 46.00 N	1	1	1		
157	Penrhyn Colmon	60715700	217789	335234	4 42.50 W	52 53.00 N	1				
159	Dylan	60715900	241352	352029	4 22.00 W	53 02.50 N	1				
161	Penrhos	60716100	222588	376813	4 39.60 W	53 15.50 N	1	1	1		
163	Middle Mouse	60716300	239518	396995	4 25.00 W	53 26.70 N	1	1	1		
164	Red Wharf	60716400	255740	384043	4 10.00 W	53 20.00 N	1				
165	Great Orme	60716500	275785	386259	3 52.00 W	53 21.50 N	1	1	1		
166	Llanddulas	60716600	289027	383149	3 40.00 W	53 20.00 N	1			1	15
167	Chester Flat	60716700	302955	385626	3 27.50 W	53 21.50 N	1				
168	Welsh Channel	60716800	311359	390098	3 20.00 W	53 24.00 N	1	1			
170	North Wirral	60717000	321644	395462	3 10.80 W	53 27.00 N	1	1		1	16
171	Formby Point	60717100	323261	408435	3 09.53 W	53 34.00 N	1				
172	Gut	60717200	324086	423257	3 09.00 W	53 42.00 N	1	1	1		
173	Blackpool	60717300	327725	438035	3 05.90 W	53 50.00 N	1				
174	Shell Wharf	60717400	324489	448100	3 09.00 W	53 55.90 N	1	1	1		
175	Hilpsford	60717500	317047	460468	3 16.00 W	54 02.00 N	1				
176	Duddon	60717600	311551	471698	3 21.23 W	54 08.00 N	1	1	1		
178	Calder Hall	60717800	297170	501675	3 35.05 W	54 24.00 N	1	1	1		
179	Whitehaven	60717900	292652	516620	3 39.55 W	54 32.00 N	1	1			
180.1	Maryport	60718010	299955	537044	3 33.20 W	54 43.10 N	1	1	1	1	17
184	Abbey Head	60718400	271290	541294	4 00.00 W	54 45.00 N	1	1	1		
185	Meggerland	60718500	258289	545024	4 12.22 W	54 46.80 N	1				
186	St. Ninians	60718600	250301	536374	4 19.40 W	54 42.00 N	1	1	1		

CHEMICAL DETERMINAND LISTS

Group 1 - Inorganics. Measured at every baseline site

Det Code	Determinand	Units	MRV	Precision %	Bias %
0105	Mercury Total	ug/l	0.01	5 (7)	10
0106	Cadmium Dissolved	ug/l	0.07	5 (9)	10
0135	Suspended Solids 105 C	mg/l	5	5 (6)	10
0145	Solids non-volatile 500)	mg/l	5 (?)	?	10
0189	Orthophosphate	ug/l	1.5	5	10
0729	Chlorophyll-a	ug/l	0.2 (1)	5 (15)	10
3403	Ammoniacal Nitrogen.	ug/l N	7	5	10
3404	Nitrate	ug/l N	0.7	5	10
3420	Silicate	mg.l Si	0.012	5	10
7213	Copper Dissolved	ug/l	0.5	5 (9)	10
7230	Lead Dissolved	ug/l	0.12	5 (9)	10
7243	Zinc Dissolved	ug/l	0.7	5 (9)	10
7354	Arsenic Dissolved	ug/l	1.0	5	10
7373	Chromium Dissolved	ug/l	1.5	5 (9)	10
7427	Nickel Dissolved	ug/l	0.25	5 (9)	10
9991	Total Oxidised Nitrogen	mg/l N	0.007	5	10

Group 2 - Inorganics. (Total metals) measured at one third of all baseline sites (see site selection lists). These samples are taken to cross check internal sampling contaminants.

Lab. Code	Determinand	Units	MRV	Precision %	Bias %
0108	Cadmium total	ug/l	0.07	5 (9)	10
7215	Copper total	ug/l	0.5	5 (9)	10
7229	Lead total	ug/l	0.12	5 (9)	10
7245	Zinc total	ug/l	0.7	5 (9)	10
7356	Arsenic total	ug/l	1.0	5	10
7375	Chromium total	ug/l	1.5	5 (9)	10
7429	Nickel total	ug/l	0.25	5 (9)	10
	Mercury dissolved	ug/l	0.01	5 (7)	10

Group 3 - Organics. Measured at one third of all baseline sites (see site list).

Lab. Code	Determinand	Units	MRV	Precision %	Bias %
3081	Isodrin	ng/l	1.0	15 (25)	10
3082	Hexachloro-benzine	ng/l	1.0	15 (25)	10
3083	Hexachloro-butadiene	ng/l	1.0	15 (25)	10
3142	PCB 28	ng/l	1.0	15 (25)	10
3145	PCB 52	ng/l	1.0	15 (25)	10
3148	PCB 101	ng/l	1.0	15 (25)	10
3151	PCB 118	ng/l	1.0	15 (25)	10
3154	PCB 138	ng/l	1.0	15 (25)	10
3157	PCB 153	ng/l	1.0	15 (25)	10
3160	PCB 180	ng/l	1.0	15 (25)	10
3276	Aldrin	ng/l	1.0	15 (25)	10
3294	DDE-PP'	ng/l	1.0	15 (25)	10
3295	DDE-OP'	ng/l	1.0	15 (25)	10
3296	DDT-OP'	ng/l	1.0	15 (25)	10
3297	DDT-PP'	ng/l	1.0	15 (25)	10
3301	dieldrin	ng/l	1.0	15 (25)	10
3306	Endrin	ng/l	1.0	15 (25)	10
3310	HCH-Alpha	ng.l	1.0	15 (25)	10
3311	HCH-Beta	ng/l	1.0	15 (25)	10
3312	HCH-Delta	ng/l	1.0	15 (25)	10
3313	HCH-Gamma	ng.l	1.0	15 (25)	10
3329	TDE-OP'	ng/l	1.0	15 (25)	10
3330	TDE-PP'	ng.l	1.0	15 (25)	10

Key

( ) Interim values ie currently achievable
(?) No firm information at present

SURVEY VESSEL | DATE | START LOCATION | END LOCATION | Tidal Data

MASTER | SURVEY OFFICER | CHEMIST | CREW

CALIBRATION START OF DAY AIR TEMP PRESSURE

END OF DAY AIR TEMP PRESSURE

	INST (1)			INST (2)			INST (3)		
	PRE	POST	DIFF	PRE	POST	DIFF	PRE	POST	DIFF
DO 0%									
DO 100%									
pH 7									
pH 8									
pH 9									
Tx 0%									
Tx 100%									

AQC CHECKS INST 1 INST 2 INST 3

pH 7.6			
Tx FILTER			
56 OHM			
112 OHM			
INST (T)			
AQC (T)			

pH AQC SATISFACTORY ☐

Tx AQC SATISFACTORY ☐

COND AQC SATISFACTORY ☐ SIGNATURE

TEMP AQC SATISFACTORY ☐

SENSORS CLEANED ☐ .....

IN-SITU CROSS CALIBRATION CHECKS

	INST (1)	INST (2)	INST (3)
Temp			
Cond			
Salinity			
D O			
pH			
Trans			
Ch A			

									MEAN	S D
LOW AQC	AMMONIA									
	TON									
	NITRITE									
	PHOS									
	SILICATE									
HIGH AQC	AMMONIA									
	TON									
	NITRITE									
	PHOS									
	SILICATE									

TIME	SITE	QUBIT LOG

SKALAR LOG

FILENAME	START	STOP	AQC LOW	AQC HIGH	TABLE LAYOUT	COMMENTS

NATIONAL COASTAL BASELINE SURVEYS 1997

As you are aware we have been asked to perform two nationally coordinated baseline surveys during 1997. These will correspond to a Winter and Summer to assess the Winter nutrient high and the Summer nutrient low conditions. The dates for these surveys are:

NATIONAL BASELINE SCHEDULE, JANUARY 1997

Vessel	Jan 6 -10	Jan 13 - 17	Jan 20 - 24	Jan 27 -Jan31
Coastal Guardian	Milford>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>>Solway
Sea Vigil		Humber>>>>	>>>>>>>>>>>	Poole(14 Feb)
Vigilance	Milford>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>>>Poole
Water Guardian	Kings Lynn>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>Berwick

NATIONAL BASELINE SCHEDULE, JULY 1997

Vessel	July 7-11	July 14-18	July 21-25	July 28-
Coastal Guardian	Milford>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>>Solway
Sea Vigil		Humber>>>>	>>>>>>>>>>>	>Poole(5 Aug)
Vigilance	Milford>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>>>Poole
Water Guardian	Kings Lynn>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>Berwick

And for those of you with really good diaries and a trust in the future:

NATIONAL BASELINE SCHEDULE, JANUARY 1998

Vessel	Jan 5 -9	Jan 12 - 16	Jan 19 - 23	Jan 26 -30
Coastal Guardian	Solway>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>Milford
Sea Vigil	Poole >>>>>>	>>>>>>>>>>	>>>>>>>>>>>	>Kings Lynn
Vigilance	Poole >>>>>	>>>>>>>>>>	>>>>>>>>>>>	>>>>Milford
Water Guardian	Berwick >>>>	>>>>>>>>>>	>>>>>>>>>>>	>Kings Lynn