



**British
Geological Survey**

NATURAL ENVIRONMENT RESEARCH COUNCIL

Operations Report - BGS Project 04/04 Marine Geophysics Survey 2004 Outer Bristol Channel

Coastal Geoscience and Global Change Programme

Internal Report IR/05/082



This page is blank

BRITISH GEOLOGICAL SURVEY

INTERNAL REPORT IR/05/082

Operations Report - BGS Project 04/04 Marine Geophysics Survey 2004 Outer Bristol Channel

D. J. Smith

Coastal Geoscience and Global Change Programme

Internal Report IR/05/082

Key words

Report; Marine; Geophysical
Survey; Multibeam Bathymetry;
Swath Bathymetry; Sidescan
Sonar; Surface Tow Boomer;
Seismic Reflect.

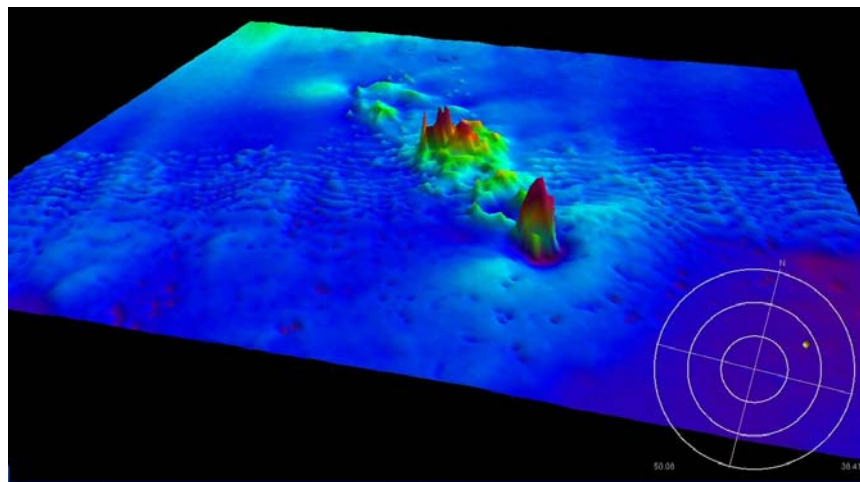
Front cover

Recovery of Klein 5000 SSS

Bibliographical reference

D. J. SMITH. 2004. Operations
Report - BGS Project 04/04
Marine Geophysics Survey 2005
Outer Bristol Channel *British
Geological Survey Internal
Report*, IR/05/082.

© NERC 2005



Edinburgh British Geological Survey 2005

BRITISH GEOLOGICAL SURVEY

The full range of Survey publications is available from the BGS Sales Desks at Nottingham and Edinburgh; see contact details below or shop online at www.thebgs.co.uk

The London Information Office maintains a reference collection of BGS publications including maps for consultation.

The Survey publishes an annual catalogue of its maps and other publications; this catalogue is available from any of the BGS Sales Desks.

The British Geological Survey carries out the geological survey of Great Britain and Northern Ireland (the latter as an agency service for the government of Northern Ireland), and of the surrounding continental shelf, as well as its basic research projects. It also undertakes programmes of British technical aid in geology in developing countries as arranged by the Department for International Development and other agencies.

The British Geological Survey is a component body of the Natural Environment Research Council.

Marine Operations and Engineering, 2A Nivensknowe Road, Loanhead, Midlothian EH20 9AU

☎ 0131-448-2700 Fax 0131-448-2545
e-mail: djsm@bgs.ac.uk

Keyworth, Nottingham NG12 5GG

☎ 0115-936 3241 Fax 0115-936 3488
e-mail: sales@bgs.ac.uk
www.bgs.ac.uk
Shop online at: www.thebgs.co.uk

Murchison House, West Mains Road, Edinburgh EH9 3LA

☎ 0131-667 1000 Fax 0131-668 2683
e-mail: scotsales@bgs.ac.uk

London Information Office at the Natural History Museum (Earth Galleries), Exhibition Road, South Kensington, London SW7 2DE

☎ 020-7589 4090 Fax 020-7584 8270
☎ 020-7942 5344/45 email: bgs london@bgs.ac.uk

Forde House, Park Five Business Centre, Harrier Way, Sowton, Exeter, Devon EX2 7HU

☎ 01392-445271 Fax 01392-445371

Geological Survey of Northern Ireland, 20 College Gardens, Belfast BT9 6BS

☎ 028-9066 6595 Fax 028-9066 2835

Maclea Building, Crowmarsh Gifford, Wallingford, Oxfordshire OX10 8BB

☎ 01491-838800 Fax 01491-692345

Parent Body

Natural Environment Research Council, Polaris House, North Star Avenue, Swindon, Wiltshire SN2 1EU

☎ 01793-411500 Fax 01793-411501
www.nerc.ac.uk

Foreword

This report covers the operation of RV Prince Madog, BGS Project 04/04 a marine geophysical survey in the Outer Bristol Channel, carried out from 18th - 28th August 2004. This operation is a continuation of project 03/03 November 2003 using high-resolution geophysics to map the seabed bed of the outer Bristol Channel. This cruise was undertaken for the Outer Bristol Channel Marine Habitat Study, which is funded by the Aggregate Levy Sustainability Fund For Wales (administered by the Welsh Assembly Government) and the Sustainable Land Won and Marine Dredged Aggregate Minerals Programme of ODPM (administered by MIRO) with a contribution from the Crown Estate and BMAPA.

Acknowledgements

As with any offshore work programme, this project was a team effort, with each and every person playing their full part in the continuous 24-hour operations. A full list of the BGS personnel taking part is included in the report and their contribution to the success of the operation is hereby acknowledged. Grateful thanks are also due to Captains Steve Duckworth and, the other officers and crew of the RV Prince Madog, the technical support provided by the University of Bangor and Vosper Thornycroft, for their efforts and assistance to make this an efficient and smooth operation. Thanks also Alister Skinner for the report review and Ceri James for the 'Introduction'.

Contents

Foreword	i
Acknowledgements	i
Contents	ii
Summary	iii
1 Introduction	1
2 Narrative	2
3 Equipment	5
3.1 Multibeam Bathymetry	5
3.2 Sidescan Sonar – Klein 5000	6
3.3 Surface Tow Boomer	7
3.4 Navigation, Processing and Data Logging	8
3.5 Vessel.....	8
Appendix 1 Time Utilisation Diagram	9
Time Utilisation for total ship time (excluding Menai bridge to Milford Haven return steaming time)	9
Appendix 2 Summary Daily Log	10
Appendix 3 Equipment Layback Diagram from project 03/03	23
Appendix 4 Line Summary Sheets	24
Appendix 5 Personnel on Board	26
Appendix 6 Glossary	27

Summary

This report describes the operation for BGS Project, managed and run by BGS Marine Operations and Engineering. The report covers the mobilisation on the 18th August, the geophysical survey and the demobilisation on the 28th August 2004. The main objective of the survey was to provide baseline physical and geological data for the sustainable development of sea-bed resources. This survey is part of a larger BGS project 'The Outer Bristol Channel Marine Habitat Study'

The operational aims of the survey project were:

- To continue with a planned programme, (started last year) of 100% data coverage for 11 corridors, 1km wide of multibeam and sidescan sonar
- Additionally run the centre line for each corridor with surface tow boomer
- Map any interesting features found during the survey

The geophysical techniques employed were high-resolution multibeam bathymetry, high-resolution sidescan sonar and single channel seismic reflection, (surface tow boomer). All systems were digitally recorded.

The vessel used was the RV Prince Madog. This platform proved reliable. Laboratory space was adapted to provide an adequate area. An over the side pole mounted multibeam transducer produced good data collected in marginal weather conditions, the data suffering slightly from pole vibrations. Line steering was vastly improved from the 2003 survey and was adequate for this project.

Although an improvement upon project 03/03 the poor weather played a large part in the survey. This only allowed 4 lines of surface tow boomer to be completed.

1 Introduction

The British Geological Survey Project 04/04 was a marine geophysical survey (multibeam, sidescan sonar and seismic reflection) across the Outer Bristol Channel. This survey was part of a marine habitat, biodiversity and geodiversity survey in the outer Bristol Channel, providing baseline physical, geological and biological data for the sustainable development of sea-bed resources and provide information and input into the planning and regulatory process with regard to marine conservation

The overall aim of the project is to integrate geological and biological information gathered through geophysical and benthic surveys into a comprehensive interpretation of marine habitats. The study is designed to incorporate new survey data gathered through modern techniques with the historical records held in the archives of the National Museum of Wales and the British Geological Survey and other organisations. The final outputs will produce detailed bedform, sediment and faunal distributions, and interpretations. The results will be disseminated through interactive multimedia applications, public exhibition and forums, and publications.

Pressure on marine resources in the Bristol Channel continues to develop with a number of issues including aggregates, fisheries and wind farm developments. There are also legislative obligations with regard to marine conservation, in a European context with the *Habitats Directive* and in national initiatives such as the designation of Carmarthen Bay, the Pembrokeshire Coast and Lundy as candidate Special Areas of Conservation. Within this framework the Welsh Assembly Government under section 121 of the Government of Wales Act 1998 has a duty to promote sustainable development in the exercise of its functions and this includes its obligations within the marine environment.

To inform the policy and decision making process in terms of developments in the marine environment requires knowledge of its current physical state. This includes the morphology, geology, biology and sediments of the sea-bed. Baseline information on these is essential for strategic management and the conservation of biological diversity. Responsible stewardship requires an understanding of the way the marine environment functions and how the sea may respond to human activity. It also means involving stakeholders as an integral part of policy making.

The project has been designed to supply up-to-date, robust, and independent science for the policy making process — as well as providing information, through innovative media, to the public at large as stakeholders in the marine environment

This report only deals with the operation for the marine geophysical survey conducted between 18th and 28th August 2004.

2 Narrative

All times are GMT.

2.1.1 Mobilisation

The mobilisation on board the RV Prince Madog took place on the 18th August at Milford Haven, the vessel having sailed from its home port of Menai Bridge the previous day.

The equipment was efficiently and speedily loaded onto the vessel and took considerably less time than last years project at Menai Bridge due to direct access to the quay side instead of the long gangway at Menai Bridge.



RV Prince Madog
Milford Haven

After deck of RV Prince
Madog during
mobilisation



The majority of survey equipment was mounted in the Wet Lab as this gave easy access and viewing of the after deck and there was insufficient available space in the Dry Lab to mount all the systems. The Dry Lab was used for the offline SSS mosaic, data backup and QA system and by the geologist for geological interpretation.

2.1.2 Survey

19th August: 07:15 the vessel sailed from Milford Haven after the multibeam transducer had been wet tested the previous day. 08:00 stopped in Dale Roads, the outer part of the estuary to deploy the multibeam pole. Unfortunately an extra washer was needed to be fitted to the mounting of the pole. The sea state too poor in Dale Roads to fit the washer so the vessel sailed back to Milford. For the rest of the day the multibeam system was calibrated and sorting out problems in changing the transducer beam width from 210 to 150 degrees. It was fortuitous that the port authority had given permission to calibrate in the estuary, as the weather in the Bristol Channel was too poor to calibrate the multibeam. 19:00 Due to the poor weather the vessel returned to Milford Haven. Throughout the day there were problems with integrating the Klein SSS data into the Coda recording system. Further testing was done to resolve these problems. Through the evening the SSS and boomer were wet tested and set up.

20th August: 07:00 leave Milford Haven, wind moved around to north, forecast 5-6 occ 7. 09:45 Stop for a temperature and conductivity (TC) dip 5km SW of corridor 9. Run lines 1-4 in corridor 9 using SSS and multibeam, sea state was rough to start with and moderated throughout the day.

21st August: After completion of line 4, SSS was recovered and a TC dip was carried out. Survey recommenced with SSS and multibeam. After completion of line 6, the SSS was recovered, and the STB deployed to run line 7 along the centre of corridor 9. A power cut abort line 7 at 13:57. Line 8 was started at 14:46 continuing the STB line. Line 9 was a multibeam only line between corridors 9 and 8, followed by line 10 and 11, STB lines along the centre of corridors 8 and 7 respectively. 10 minutes of STB data was lost on line 10 whilst kelp and rubbish was removed from the catamaran.

22nd August: Continue with line 11, problems with STB signal. 05:00 Wind increasing from 4-5 SE to 5-7 SW. STB recovered after line 11 and SSS deployed. Lines 12-16 completed with SSS and multibeam. The multibeam POS-MV lost position on line 14, this was aborted and rerun as line 15.

23rd August: 00:00 online 17, weather deteriorating, complete line at 00:43 and head slowly for anchor at Caldey Island. Wind moderated and pulled up anchor at 09:20. 10:00 deployed SSS and ran lines 18 & 19. SSS recovered and TC dip carried out followed by completion of lines 20 and 21. There were various multibeam acquisition failures throughout these lines.

24th August: 00:00 online 22. Completed lines 22 to 28. 3m swells were observed on line 26 in following seas causing 10 deg roll. Multibeam data existed for this line, so continue collecting SSS data.

25th August: 00:00 online 29 again multibeam acquisition crashed for short period. At the end of line SSS recovered for transit to corridor 5. 05:40 commence line 30 after deploying SSS. At the end of line 30 the SSS was recovered and a TC dip performed. Head for corridor 4 and deploy SSS, more problems with multibeam acquisition system, start line 32 at 15:53. Lines 31 to 39 were completed by 22:59, head for corridor 5.

26th August: 00:00 SOL 40, various problems with multibeam acquisition crashing on this line and line 41. Navigation failure on the multibeam caused line 41 to be aborted and picked up as line 41a. lines 42 and 43 were completed by 12:00. The SSS was recovered and the vessel sailed to Tenby to drop off Ray Wilton. At 16:02 line 44 was started. Wind increasing limiting available options. 22:00 anchor behind Caldey Island.

27th August: 00:00 at anchor. 07:09 wind dropped recommence survey, completed lines 48-54 and started line 55 at 22:37

28th August: Ended line 55 at 02:15 in order to arrive at Milford Haven by 06:00. Demob and clear vessel by 11:00.

2.1.3 Demobilisation

The vessel tied up at Milford Haven at 06:00 on the 28th August. The demobilisation of the vessel took place that morning, being clear of the vessel by 11:00.

3 Equipment

3.1 MULTIBEAM BATHYMETRY

The multibeam system comprised of:

- Multibeam transducer - Reson Seabat 8101, pole mounted
- Multibeam power supply and transceiver – Reson 81-P, inboard
- Acquisition system - Quinsy7 QPS software
- QC and post processing system - Caris Hips and Sips offline
- Motion sensor - Applanix POS MV 320
- SV Probe – Navitronics SVP15
- Differential GPS corrections – BGS Trimble NT300D receiver
- Over the side pole for transducer – manufactured and provided by vessel manager, Vosper Thornycroft (VT).

The multibeam facility was provided by Netsurvey Ltd. Netsurveys do not own any multibeam systems or motion sensors and as such had in turn hired this equipment. Netsurvey did not wish to be involved in the provision of a pole for mounting the transducer on the vessel, or insurance for equipment. In addition to the hired in equipment Netsurvey provided the acquisition, post processing and QC software plus two engineers to mobilise/demobilise and operate the multibeam system. The acquisition system was mounted on the vessel in almost identical positions to project 03/03, see report IR/04/012 for details.

3.1.1 Transducer mounting

The transducer was mounted on the same pole as project 03/03. Although this pole was found to suffer from vibrations when beam on to the swell producing small artefacts in the data, this noise was within agreed limits. It was assumed that as this survey was being carried out in August as opposed to November (project 03/03), the weather would not be any worse than the previous year and there would be no greater induced noise than already seen, this proved to be the case.

The bracket that connected the transducer to the pole did not arrive with the Reson system. Fortunately the vessel was able to manufacture a suitable alternative.

3.1.2 Operation

Overall the multibeam system performed well.

Periodic checks were made of sound velocity of the water column. This was achieved by using a sound velocity probe.

The multibeam engineers were able to clean and process most of the data collected during the survey. This was achieved using Caris Hips and Sips on a separate processor in the spare time online and during weather down time.

Whilst there were generally fewer problems (then the previous survey) with the multibeam system overall, the Quinsy acquisition system did not perform consistently well, there were far too many crashes and reboots. This resulted in both loss of data and corrupting the database with the

consequence that the data already collected could not be viewed on line. No satisfactory explanation for these crashes was forthcoming from Netsurveys.

3.2 SIDESCAN SONAR – KLEIN 5000

The Sidescan Sonar system comprised of:

Towfish – Klein 5000

Winch & Cable – SES electric winch and slinging and BGS provided 400m of high quality 18mm co-axial cable

Block – SES block and electronic radio metering facility

Transceiver

Processor - PC running Klein Sonar Pro

Acquisition – CODA DA200 with Klein 5000 digital interface

Paper record – BGS owned Ultra 120 TLR

Navigation data – mixture of BGS Trac C and vessels survey Trimble 300NT

This sidescan was chosen for this project as it claimed to be able to collect high-resolution data at high vessel speed to match the speed that the multibeam data can be collected. The previous survey (Bristol Channel 2003) utilised the Edgetech MP-X, with good results, although there were many technical problems (see Report IR/04/012). The Klein tow fish is well built and performed well. The surface control transceiver worked well, only the Ethernet connection proved unreliable. The surface PC with the Klein acquisition software only recorded data in a propriety format and also proved unreliable, locking up when in monitor mode.

The BGS CODA system was utilized to record the Klein data in CODA format. However it proved very difficult to integrate all the data from the towfish, navigation, time data from the Trimble and the cable layback from the sheave. This was due to a combination of the way the CODA system accepted the towfish and other external navigation and time data, and that the Klein transceiver would not accept an NMEA GGA navigation string. A great deal of effort and time was used during the first two days to come up with a solution that would accept, SSS data, other towfish data (heading, pitch roll etc), navigation, time and automatic layback. A work around was achieved. This has since been superseded by a more flexible data interface that CODA have produced in the latest Klein 5000 interface software.



Lab setup for SSS, ST Boomer, Multibeam



Deployment of Klein 5000 SSS

3.3 SURFACE TOW BOOMER

The Surface Tow Boomer system comprised of:

Source1 – Applied Acoustics catamaran with EG&G 500J plate

Source2 – Applied Acoustics variable frequency plate on above catamaran

Receiver – Teledyne 7 channel hydrophone

Power source – Applied Acoustics CSP3000 for EG&G plate and modified CSP300 for the variable frequency plate

Signal conditioning – BGS amplifier & filter unit

Acquisition – CODA DA200

Paper record – Ultra 120 TLR

Navigation data – mixture of BGS Trac C and vessels survey Trimble 300NT

The above system was mobilised with the loaned variable frequency boomer plate, power cable and power source. Source 2 had been loaned by Applied Acoustics for trial purposes.

The catamaran was towed on the starboard side and the hydrophone on the port side at the end of a 2m pole.

The weather conditions encountered and priority on collecting multibeam data on the project dictated that the boomer was only run on 4 lines. The variable frequency plate did appear to penetrate through the large sand waves.



Applied Acoustics variable frequency S.T.Boomer Plate



7 Channel, 10m Hydrophone

3.4 NAVIGATION, PROCESSING AND DATA LOGGING

For everything except the multibeam system the positioning of the vessel used the vessel's survey DGPS system, (Trimble NT300D). The multibeam was independently positioned using the POS MV 320 system.

VT and Bangor University (Ray Wilton) had addressed the problem of steering straight lines (project 03/03) by integrating university's navigation computer to the vessels auto pilot and using DGPS and not GPS. This worked really well with a repeater display in the wet lab.

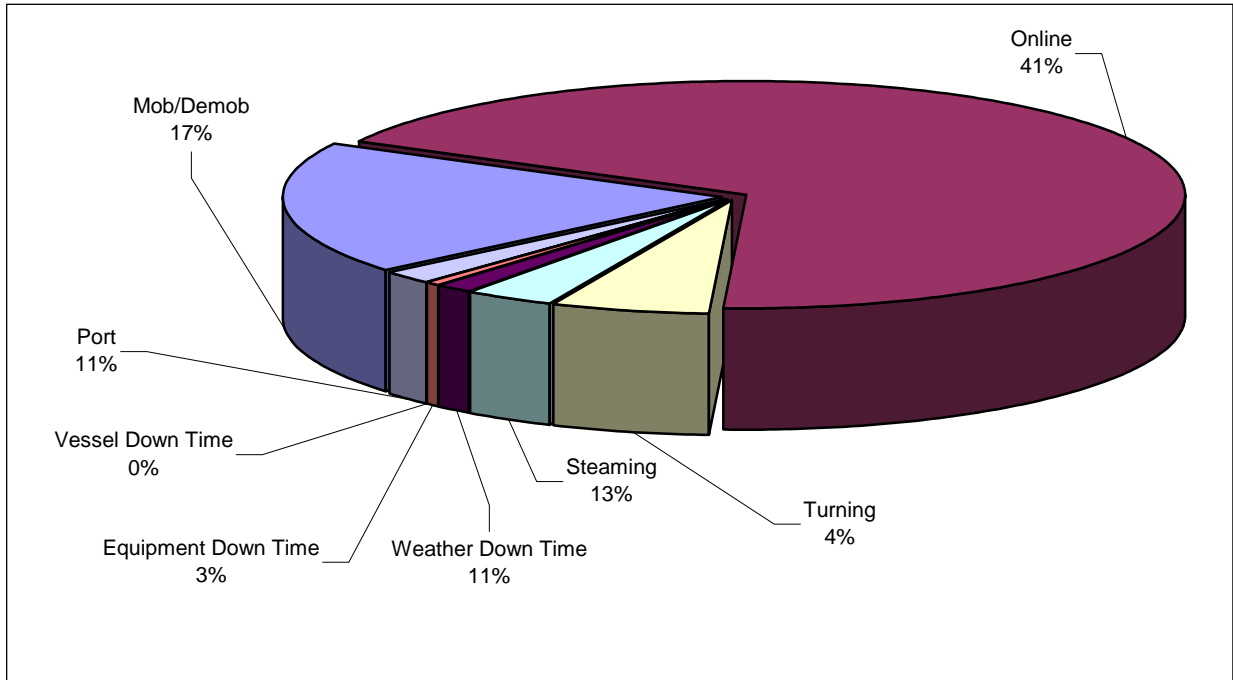
The BGS Trac C navigation computer was used as a backup, provide a navigation string to the CODA system, monitor the lines run and log the navigation data.

3.5 VESSEL

The vessel performed well in that it had no equipment down time.

Appendix 1 Time Utilisation Diagram

TIME UTILISATION FOR TOTAL SHIP TIME (EXCLUDING MENAI BRIDGE TO MILFORD HAVEN RETURN STEAMING TIME)



Appendix 2 Summary Daily Log

All Times quoted are GMT

IR/05/082

Project 04/04 Summary Daily Log

Date: 17th August

08:00 Personnel travel BGS Edinburgh and Keyworth to Carmarthen

18:00 Arrive at Carmarthen

Note: vessel sails Menai Bridge to Milford Haven

Total km of completed lines: 0

	Today (hours)	Total (hours)
Mob/Demob, setting up		0.0
On line		0.0
Turning		0.0
Steaming		0.0
Weather downtime		0.0
Equipment downtime		0.0
Vessel downtime		0.0
Port		0.0

IR/05/082

Project 04/04 Summary Daily Log

Date: 18th August

08:00 BGS personnel travel Carmarthen to Milford Haven

09:30 Join vessel and start mobilisation

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up	16	16
On line		
Turning		
Steaming		
Weather downtime		
Equipment downtime		
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 19th August

- 07:15 Sail, weather poor, too rough to go into Bristol Channel to calibrate multibeam
- 08:00 Stop to deploy multibeam pole. Pole cannot be deployed, extra washer required. Head back to Milford Haven and calmer water.
- 09:30 Perform figure of eight to check POS-MV motion sensor nav.
- 09:45 Transit to Dale Roads for further multibeam calibration. Having problems getting CODA to recognise turns counter.
- 12:10 Stop to perform TC calibration, problems acquiring stored data in probe. Problems setting Reson to 150 deg beam from 210 deg, down load patch. Multibeam calibrated
- 20:00 Along side Milford Haven, weather too poor to transit into Bristol Channel
- 21:10 Deploy SSS and perform tests
- 20:30 Deploy Boomer and test.
- 24:00 Spend rest of night setting up and testing SSS and Boomer systems

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up	20	36
On line		
Turning		
Steaming		
Weather downtime	4	4
Equipment downtime		
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 20th August

00:00 Alongside Milford Haven
 07:00 Sail
 09:45 Deploy SV probe 5km SW corridor 9
 10:30 Deploy SSS
 11:43 SOL BC9L01, Dir NE, SSS+MB
 15:10 EOL BC9L01
 15:21 SOL BC9L02, Dir SW, SSS+MB
 18:58 EOL BC9L02
 19:11 SOL BC9L03, Dir NE, SSS+MB
 21:17 Multibeam system crashed
 21:23 Multibeam system online
 22:07 EOL BC9L03
 22:15 SOL BC9L04, Dir SW, SSS+MB

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	12	12
Turning	2	2
Steaming	3	3
Weather downtime	7	11
Equipment downtime		
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 21st August

00:00 Cont line BC 9L04
 01:04 EOL BC9L04
 01:11 SSS recovered to deck
 01:30 Commence SV Dip
 01:34 Complete SV Dip
 01:45 SSS Deployed
 02:08 SOL BC9L05, Dir NE, SSS+MB
 05:24 EOL BC9L05
 05:34 SOL BC9L06, Dir SW, SSS+MB
 07:37 Various problems with CODA crashing, recorded SSS data on Sonar Pro
 08:51 EOL BC9L06
 08:55 SSS recovered
 09:25 STB deployed
 10:22 SOL BC9L07, Dir NE STB + Multibeam
 13:57 Power failure in Lab abort line BC9L07
 14:46 SOL BC9L08, Dir NE STB + Multibeam, continuation of line BC9L07
 16:29 EOL BC9L08
 16:31 SOL BCXL09, Dir S, Multibeam only line between corridors 9&8
 16:58 EOL CBXL09
 17:01 SOL BC8L10, Dir SW STB + Multibeam
 22:03 Boomer data noisy, pulled in and cleared kelp and rubbish off Catamaran
 22:43 EOL BC8L10, Head for centre line of corridor 7
 23:38 SOL BC7L11, Dir NE, SSS+MB

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	22	36
Turning	2	4
Steaming		3
Weather downtime		11
Equipment downtime		
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 22nd August

00:00 Online BC7L11
 01:34 Wind speed increasing 20knots SE
 02:52 Problems with STB signal, remove kelp from Cat, reset acquisition system
 05:44 EOL BC7L11 and recover STB, hydrophone
 06:00 SSS deployed
 06:35 SOL BC7L12, Dir SW, SSS+MB
 07:10 Vessel off course to avoid pots
 10:01 EOL BC7L12
 10:12 SOL BC7L13, Dir NE, SSS+MB
 13:36 EOL BC7L13
 13:44 SOL BC7L14, Dir SW, SSS+MB
 13:50 Problems with multibeam POSMV, abort line, run back to start
 14:17 POSMV OK, SOL BC7L15, Dir SW, SSS+MB
 17:40 EOL BC7L15, 2m swells
 17:49 SOL BC7L16, Dir NE, SSS+MB
 19:35 Quincy crash, short loss of data
 21:02 EOL BC7L16
 20:14 SOL BC7L17, Dir SW, SSS+MB
 23:04 Bring SSS to surface to check

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	21.5	57.5
Turning	2	6
Steaming		3
Weather downtime		11
Equipment downtime	0.5	0.5
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 23rd August

00:00 Online BC7L17
 00:43 EOL BC7L17
 00:55 SSS recovered, weathered off head slowly north
 05:30 At anchor, Caldey Island
 09:20 Wind dropped, raise anchor
 10:00 Deployed SSS
 10:10 SOL BC10L18, Dir NE, SSS+MB
 12:58 EOL BC10L18
 15:51 SOL BC10L19, Dir SW, SSS+MB
 16:04 Recover SSS and perform TC dip
 16:25 Deploy SSS
 16:41 SOL BC10L20, Dir NE, SSS+MB
 17:27 Quincy crashed for 10 minutes
 19:20 EOL BC10L20
 19:26 SOL BC10L21, Dir SW, SSS+MB
 22:29 EOL BC10L21, Dir NE, SSS+MB
 23:21 Multibeam crashed for 2 minutes

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	13	70.5
Turning	1	7
Steaming		3
Weather downtime	10	21
Equipment downtime		0.5
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 24th August

00:00 Online BC10L22
 01:21 EOL BC10L22
 01:28 SOL BC10L23, Dir SW, SSS+MB
 01:56 Wind SW, 25 knots, gusting 30 knots
 04:24 EOL BC10L23
 05:24 SOL BC8L24, Dir NE, SSS+MB
 06:23 Swell approx. 3m confused sea
 08:24 EOL BC8L24
 08:33 SOL8L25, Dir SW, SSS+MB
 12:43 SOL BC8L26, Dir NE, SSS+MB, multibeam poor, 10 deg roll
 12:43 EOL BC8L26
 17:01 SOL BC8L27, Dir SW, SSS+MB, large 3-4m swell head on
 20:26 EOL BC8L27
 20:34 SOL BC8L28, Dir NE, SSS+MB, wind dropped, large following
 sea
 23:41 EOL BC8L28
 23:48 SOL BC8L29, Dir SW, SSS+MB

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	22	92.5
Turning	2	9
Steaming		3
Weather downtime		21
Equipment downtime		0.5
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 25th August

00:00 On line BC8L29
 03:11 Multibeam crashed for 2 minutes
 03:47 EOL BC8L29, SSS recovered for transit to corridor 5
 05:05 Deploy SSS
 05:40 SOL BC5L30, Dir NE, SSS+MB
 08:47 EOL BC5L30
 09:06 SOL BC5L31
 12:47 EOL BC5L31, recover SSS and perform TC dip, head for corridor 4
 13:33 Deploy SSS, problems with multibeam
 13:58 SOL BC4L32, Dir NE, SSS+MB
 17:05 EOL BC4L32, head for corridor 3
 18:10 SOL BC3L33, Dir NE, SSS+MB
 18:35 EOL BC3L33
 18:39 SOL BC3L34, Dir SW, SSS+MB
 19:01 EOL BC3L34
 19:07 SOL BC3L35, Dir NE, SSS+MB
 19:29 EOL BC3L35
 20:04 SOL BC3L36, Dir NE, SSS+MB
 20:23 EOL BC3L36
 20:29 SOL BC3L37, Dir SW, SSS+MB
 20:52 EOL BC3L37
 20:58 SOL BC3L38, Dir NE, SSS+MB
 21:18 EOL BC3L38
 22:27 SOL BC3L39, Dir NE, SSS
 22:59 EOL BC3L39

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	22	112.5
Turning	2	11
Steaming		3
Weather downtime		21
Equipment downtime		0.5
Vessel downtime		
Port		

Project 04/04 Summary Daily Log

Date: 26th August

00:00 SOL BC5L40, Dir SW, SSS+MB
 02:23 Several multibeam crashes until 02:37
 03:35 EOL BC5L40
 03:43 SOL BC5L41, Dir NE, SSS+MB
 04:45 BC5L41 line aborted nav failure on multibeam
 05:13 SOL BC5L41a, Dir NE, SSS+MB
 05:14 Various nav failures on multibeam
 07:32 EOL BC5L41a
 07:38 SOL BC5L42, Dir SW, SSS+MB
 10:59 EOL BC5L42
 11:05 SOL BC5L43, Dir NE, SSS+MB
 12:00 EOL BC5L43, recover SSS and head to Tenby to drop off Ray Wilton
 14:45 Arrive Tenby
 15:20 Head towards centre line of corridor 11
 15:40 Deploy SSS
 16:40 SOL BC11L44, Dir NE, SSS+MB
 17:05 EOL BC11L44
 17:11 SOL BC11L45, Dir SW, SSS+MB
 19:45 EOL BC11L45
 19:56 SOL BC11L46, Dir NE, SSS+MB
 21:10 EOL BC11L46
 21:22 SOL BC11L47, Dir NW, SSS+MB
 21:45 EOL BC11L47
 22:00 Weather deteriorating, anchor behind Caldey Island

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	16	128.5
Turning	1	12
Steaming		3
Weather downtime	2	23
Equipment downtime	1	1.5
Vessel downtime		
Port	4	4

Project 04/04 Summary Daily Log

Date: 27th August

00:00 Anchored behind Caldey Island
 06:00 Transit to corridor 11
 07:09 SOL BC11L48, Dir NE, Multibeam only
 07:15 Deploy SSS and record
 09:29 EOL BC11L48
 09:37 SOL BC11L49, Dir SW, SSS+MB
 12:29 EOL BC11L49
 12:30 SOL BC11L50, Dir NE, SSS+MB
 15:21 EOL BC11L50
 15:26 SOL BC11L51, Dir SW, SSS+MB
 18:17 EOL BC11L51
 18:19 SOL BCXL52, transit line from end of 51 to corridor 8, Dir S, SSS+MB
 19:13 EOL BCXL52
 19:17 SOL BC8L53, Dir NE, SSS+MB
 22:17 EOL BC8L53
 22:18 SOL BCXL54, transit line from end of 53 to corridor 9, Dir N, SSS+MB
 22:35 EOL BCXL54
 22:37 SOL BC9L55, Dir SW, SSS+MB

Total km of completed lines:

	Today (hours)	Total (hours)
Mob/Demob, setting up		36
On line	16	144.5
Turning	1	13
Steaming		3
Weather downtime	7.0	30
Equipment downtime		1.5
Vessel downtime		
Port		4

IR/05/082

Project 04/04 Summary Daily Log

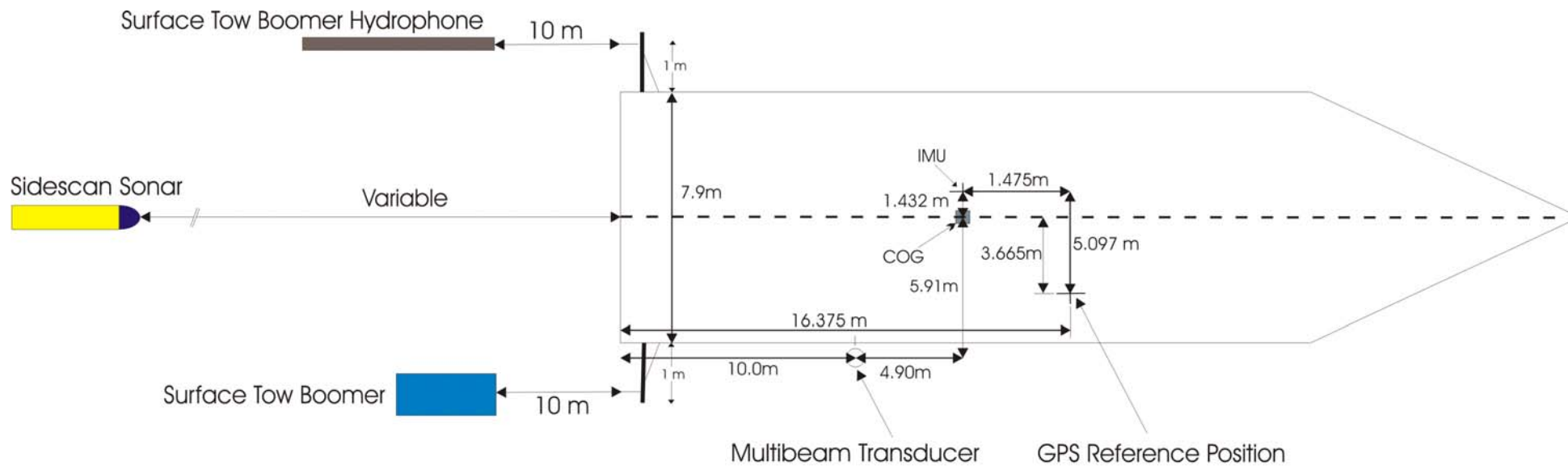
Date: 27th August

00:00 On line BC9L55
02:15 EOL BC9L55
02:30 Head for Milford Haven
06:00 Along side Milford Haven

Total km of completed lines:


	Today (hours)	Total (hours)
Mob/Demob, setting up	5	41
On line	2	146.5
Turning		13
Steaming	4	7
Weather downtime		30
Equipment downtime		1.5
Vessel downtime		0
Port		4

Appendix 3 Equipment Layback Diagram from project 03/03



RV PRINCE MADOG - PROJECT BGS03/03


Appendix 4 Line Summary Sheets

British Geological Survey Marine Operations			Line Summary Log Sheet 1 of 2			Vessel : RV Prince Madog						
PROJECT 04/03			BRISTOL CHANNEL MARINE HABITAT STUDY - GEOPHYSICAL SURVEY 2004			 British Geological Survey <small>NATURAL ENVIRONMENT RESEARCH COUNCIL</small>						
Line	Start			End			Length	Total	Equipment Run			Comments
No.	Date	J. Day	Time	Date	J. Day	Time	(km)	(km)	Multibeam	SSS	S.T.Boomer	
BC9L01	20-Aug	233	11:40	20-Aug	233	15:10		0.00	X	X		DIR NE
BC9L02	20-Aug	233	15:21	20-Aug	233	18:58		0.00	X	X		DIR SW
BC9L03	20-Aug	233	19:11	20-Aug	233	22:07		0.00	X	X		DIR NE
BC9L04	20-Aug	233	22:15	21-Aug	234	1:04		0.00	X	X		DIR SW
BC9L05	21-Aug	234	2:08	21-Aug	234	5:24		0.00	X	X		DIR NE
BC9L06	21-Aug	234	5:34	21-Aug	234	8:51		0.00	X	X		DIR SW
BC9L07	21-Aug	234	10:22	21-Aug	234	13:57		0.00	X		X	DIR NE, Electric power failure in lab, abort line
BC9L08	21-Aug	234	14:46	21-Aug	234	16:30		0.00	X		X	DIR NE
BCXL09	21-Aug	234	16:31	21-Aug	234	16:58		0.00	X			DIR S-SW
BC8L10	21-Aug	234	17:01	21-Aug	234	22:43		0.00	X		X	DIR SW
BC7L11	21-Aug	234	23:38	22-Aug	235	5:44		0.00	X		X	DIR NE
BC7L12	22-Aug	235	6:35	22-Aug	235	10:01		0.00	X	X		DIR SW
BC7L13	22-Aug	235	10:12	22-Aug	235	13:36		0.00	X	X		DIR NE
BC7L14	22-Aug	235	13:44	22-Aug	235	13:50		0.00	X	X		DIR SW, Line aborted problem with POSMV
BC7L15	22-Aug	235	14:17	22-Aug	235	17:40		0.00	X	X		DIR SW
BC7L16	22-Aug	235	17:49	22-Aug	235	21:02		0.00	X	X		DIR NE
BC7L17	22-Aug	235	20:14	23-Aug	236	0:43		0.00	X	X		DIR NE
BC10L18	23-Aug	236	10:10	23-Aug	236	12:58		0.00	X	X		DIR SW
BC10L19	23-Aug	236	13:01	23-Aug	236	15:51		0.00	X	X		DIR SW
BC10L20	23-Aug	236	16:41	23-Aug	236	19:20		0.00	X	X		DIR NE
BC10L21	23-Aug	236	19:26	23-Aug	236	22:24		0.00	X	X		DIR SW
BC10L22	23-Aug	236	22:29	24-Aug	237	1:21		0.00	X	X		DIR NE
BC10L23	24-Aug	237	1:28	24-Aug	237	4:24		0.00	X	X		DIR SW
BC8L24	24-Aug	237	5:24	24-Aug	237	8:24		0.00	X	X		DIR NE
BC8L25	24-Aug	237	8:33	24-Aug	237	12:38		0.00	X	X		DIR SW
BC8L26	24-Aug	237	12:43	24-Aug	237	16:58		0.00	X	X		DIR NE
BC8L27	24-Aug	237	17:01	24-Aug	237	21:26		0.00	X	X		DIR SW
BC8L28	24-Aug	237	20:34	24-Aug	237	23:41		0.00	X	X		DIR NE
Totals Page/Survey							0.00	0.00	24			

AA = Applied Acoustics Multi-frequency Boomer plate

SSS = Klein 5000

Multibeam = Reson 8101

British Geological Survey Marine Operations			Line Summary Log Sheet 2 of 2			Vessel : RV Prince Madog						
PROJECT 04/03			BRISTOL CHANNEL MARINE HABITAT STUDY - GEOPHYSICAL SURVEY 2004			 British Geological Survey <small>NATURAL ENVIRONMENT RESEARCH COUNCIL</small>						
Line No.	Start			End			Length	Total	Equipment Run			Comments
	Date	J. Day	Time	Date	J. Day	Time	(km)	(km)	Multibeam	SSS	S.T.Boomer	
BC8L29	24-Aug	237	20:34	25-Aug	238	3:47		0.00	X	X		DIR SW
BC5L30	25-Aug	238	5:40	25-Aug	238	8:47		0.00	X	X		DIR NE
BC5L31	25-Aug	238	9:06	25-Aug	238	12:47		0.00	X	X		DIR SW, SSS layback incorrect 23m too much, multibeam data lost database
BC4L32	25-Aug	238	13:54	25-Aug	238	17:05		0.00	X	X		DIR NE, 15:53-16:29 No SSS data
BC3L33	25-Aug	238	18:10	25-Aug	238	18:35		0.00	X	X		DIR NE, short lines over video sites
BC3L34	25-Aug	238	18:39	25-Aug	238	19:01		0.00	X	X		DIR SW, short lines over video sites
BC3L35	25-Aug	238	19:07	25-Aug	238	19:29		0.00	X	X		DIR NE, short lines over video sites
BC2L36	25-Aug	238	20:04	25-Aug	238	20:23		0.00	X	X		DIR NE, short lines over video sites
BC2L37	25-Aug	238	20:29	25-Aug	238	20:52		0.00	X	X		DIR SW, short lines over video sites
BC2L38	25-Aug	238	20:58	25-Aug	238	21:18		0.00	X	X		DIR NE, short lines over video sites
BC4L39	25-Aug	238	22:27	25-Aug	238	22:59		0.00		X		DIR NE
BC5L40	26-Aug	239	0:00	26-Aug	239	3:36		0.00	X	X		DIR SW
BC5L41	26-Aug	239	3:43	26-Aug	239	4:45		0.00	X	X		DIR NE
BC5L41a	26-Aug	239	5:13	26-Aug	239	7:32		0.00	X	X		DIR NE
BC5L42	26-Aug	239	7:38	26-Aug	239	10:59		0.00	X	X		DIR SW
BC5L43	26-Aug	239	11:05	26-Aug	239	12:00		0.00	X	X		DIR NE
BC11L44	26-Aug	239	16:02	26-Aug	239	17:05		0.00	X	X		DIR NE
BC11L45	26-Aug	239	17:11	26-Aug	239	19:45		0.00	X	X		DIR SW
BC11L46	26-Aug	239	19:56	26-Aug	239	21:10		0.00	X	X		DIR NE. weather deteriorating
BC11L47	26-Aug	239	21:22	26-Aug	239	21:45		0.00	X	X		DIR NW over wreck, 40 knot winds
BC11L48	27-Aug	240	7:09	27-Aug	240	9:29		0.00	X	X		DIR NE
BC11L49	27-Aug	240	9:37	27-Aug	240	12:29		0.00	X	X		DIR SW
BC11L50	27-Aug	240	12:30	27-Aug	240	15:21		0.00	X	X		DIR NE
BC11L51	27-Aug	240	15:26	27-Aug	240	18:17		0.00	X	X		DIE SW
BCXL52	27-Aug	240	18:19	27-Aug	240	19:13		0.00	X	X		DIR S, Transit line to corridor 8 SW end of survey area
BC8L53	27-Aug	240	19:17	27-Aug	240	22:17		0.00	X	X		DIR NE
BCXL54	27-Aug	240	22:18	27-Aug	240	22:35		0.00	X	X		DIR N, Transit line to corridor 9
BC9L55	27-Aug	240	22:37	28-Aug	241	2:15		0.00	X	X		DIR SW

Totals Page/Survey	0.00	0.00
--------------------	------	------

AA = Applied Acoustics Multi-frequency Boomer plate
SSS = Klein 5000
Multibeam = Reson 8101

Appendix 5 Personnel on Board

Name	Position
BGS	
Dave Smith	<i>Electronic Engineer- Party Chief</i>
Ceri James	<i>Marine Geologist</i>
Sally Phillpot	<i>Marine Geologist</i>
Christian Wilson	<i>Marine Geologist</i>
Michael Wilson	<i>Electronic Engineer</i>
Netsurvey	
Robert Bertram	<i>Multibeam Surveyor</i>
Tony Vail	<i>Multibeam Surveyor</i>
Bangor University	
Ray Wilton	<i>Engineer</i>
RV Prince Madog	
Steve Duckworth	<i>Master</i>
Jim Scarisbrick	<i>Chief Officer</i>
A.V Williams	<i>Chief Engineer</i>
Neil Holmes	<i>2nd Engineer</i>
Phil Jones	<i>Bosun</i>
Dave Williams	<i>Seaman</i>
Mike Downey	<i>Seaman</i>
Eiffion Pritchard	<i>Chief Cook</i>

Appendix 6 Glossary

<i>BGS</i>	British Geological Survey
<i>BMAPA</i>	British Marine Aggregate Producers Association
<i>EOL</i>	End of line
<i>GMT</i>	Greenwich Mean Time
<i>IT</i>	Information Technology
<i>MIRO</i>	Mineral Industry Research Organisation
<i>ODPM</i>	Office of the Deputy Prime Minister
<i>SOL</i>	Start of line
<i>SSS</i>	Sidescan Sonar
<i>TC Dip</i>	Instrument to provide the speed of sound of water by measuring Temperature, Conductivity and Pressure
<i>VT</i>	Vosper Thornycroft