

**BRITISH GEOLOGICAL SURVEY
BGS TECHNICAL REPORT WB/98/42C
Marine Report Series**

Commercial - in - Confidence

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BGS TECHNICAL REPORT WB/98/42C

**BGS Rockall Consortium
Drill Site Survey -
Hatton Bank Regional Survey
RRS 'Challenger'
Project 98/01 Operations Report**

C P Brett

Geographical index

West Shetland, Northern Rockall Trough, Hatton Bank

Subject index

Drill site survey, high resolution seismic, gravity coring

Work was carried out on behalf of

The BGS Rockall Consortium

Bibliographic reference

Brett, C P 1998. BGS Rockall Consortium Drill Site Survey - Regional Survey Hatton Bank, RRS 'Challenger', Project 98/01 Operations Report. **BGS Technical Report WB/98/42C, Marine Report Series**

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1. Introduction

The objectives of this project were twofold: to conduct limited site surveys at proposed borehole locations and to carry out a limited regional survey over part of Hatton Bank.

The site surveys comprised a grid of six, 5km long lines, at nominally 1km spacing, which were run using single channel airgun and sparker, with the higher resolution sparker taking operational priority. In addition a single gravity core was taken at the borehole location. The regional survey was also run using single channel airgun and sparker but in this case the airgun was given operational priority. Survey positioning was by differential GPS.

The vessel used was the RRS Challenger, chartered from NERC Research Vessel Services. She proved most suitable to the task and the gravity coring operations were conducted using the vessel's main winch.

Mobilisation took place in Leith on 26/27 May 1998 with the vessel sailing on 28 May. Eleven potential borehole sites were surveyed, totalling 376km of shallow seismic, and a further 756km of regional survey was completed in the Hatton Bank area. Operations were completed on 15 June and the vessel docked at Galway 18 June.

2. Narrative

The vessel sailed from Leith on the morning of 28 May and headed for Site 380, west of Shetland, arriving on site the following evening. Equipment was deployed and the next few hours spent conducting equipment trials to arrive at the optimum configuration and survey operations commenced shortly after midnight. The site was completed mid morning, after some disruption caused by the presence of the RRS Charles Darwin, collecting seabed samples in the same location.

The vessel moved to Site 394, arriving in the early evening of 30 May and commenced operations immediately on arrival. Some intermittent noise was observed on the sparker hydrophone which was thought to be interference from activity at the nearby Foinaven complex. The site was completed in the early hours of 31 May and the vessel headed for Site 395, some three hours steam away. On deployment of equipment the noise problem had become more severe and certainly could not be attributed to any nearby activity. As the source of the noise was investigated the weather conditions deteriorated and by the time the problem had been identified, as vibration of the airgun hoses, conditions were too poor to work. All gear was recovered and the vessel hove to overnight waiting on improved conditions.

Equipment was deployed again at Site 395 in improving conditions during the morning of 1 June. At the first attempt the data was not acceptable and the the first line was repeated. Thereafter operations continued uninterrupted in moderate conditions and the site was completed that evening when the vessel then headed for Site 392.

Operations at Site 392 were commenced shortly after midnight on 2 June, again in moderate conditions, and were completed mid morning, the vessel then making the short steam to Site 381, which was completed late in the evening.

After overnight passage, operations commenced at Site 389 in the morning of 3 June and were completed that afternoon when the vessel headed for Site 393. The latter was completed early morning of 4 June when the vessel commenced passage towards Hatton Bank, slowing for five hours in the evening to run a short airgun line over a reported gravity high en route. On completion the vessel resumed full speed passage overnight. The following morning, 5 June, the vessel slowed for three hours to investigate a shallow bright spot observed on Danish seismic data. Full speed passage was resumed shortly after midday and continued for the remainder of the day in steadily deteriorating conditions.

The vessel arrived at Site 401, on Hatton Bank, in the early hours of 6 June, by which time sea conditions were too poor to conduct site survey operations with the sparker. A regional survey line was run, using airgun only in marginal conditions, until a compressor failure halted operations just before midnight. It took some six hours to effect running repairs to the compressor and airgun operations recommenced in the morning of 7 June continuing to run regional lines. Sea conditions deteriorated again in the evening and all gear was recovered with the vessel hove to shortly before midnight.

The following two days, 8 and 9 June, were spent hove to in almost continuous gale conditions before the weather began to moderate overnight 9/10 June. Airgun operations restarted during the morning of 10 June and, with the conditions steadily improving, sparker

operations became possible during the afternoon and the site survey grid was commenced in the evening. The site survey seismic operations were completed the following evening without interruption in steadily improving conditions and the coring operations were completed shortly before midnight. This marked the completion of all site survey operations.

Regional survey operations, running airgun and sparker, commenced in the early hours of 12 June and ran in good conditions without significant disruption for the following 72 hours. This completed available time and all equipment was recovered in the early hours of 15 June and the vessel headed for Galway, docking on the morning of 17 June.

3. Equipment Used

1. Sparker System

The source consisted of an EG&G nine candle sparkarray fitted with multi-tip candles arranged in groups of three, with an energy of 500J available through each group. For shallower sites 1000J firing through six candles was used, increasing to 1500J through nine candles for deeper sites. Firing rates varied with water depth to obtain the optimum configuration of airgun/sparker at any particular site, the sparker being given priority over the airgun for the site surveys. This priority was reversed for the regional survey over Hatton Bank.

The hydrophone was a 10m, 7 channel Teledyne with a number of channels (normally six) summed to give optimum output.

Analogue processing comprised band pass filter (normally 260-800Hz), TVG (TSS 307), swell filter (TSS 305) and display on a Waverley 3710 thermal printer.

2. Airgun System

The source was a cluster array of four, 40 cu in Bolt 600B guns with wave shape kits, towed at a depth of 2m. The guns were configured such that any number could be fired. The number used varied from one at the shallowest site, to three at the deepest site. For the majority of the time, including all but one line of the regional survey, two guns were used.

The hydrophone was a 30m, two channel Geomechanique, with both channels summed to give a single output.

Analogue processing was as for the sparker above.

3. Digital Recording/Processing

Both sparker and airgun were recorded digitally on a CODA DA200 system on exabyte cartridge. The DA200 also produced an on-line processed hardcopy output to a Waverley 3710 thermal printer. The processes applied included TVG and TVF. Additional hardcopy output was produced between sites to the geologist's specification. Navigation data was also recorded on the DA200 on a shot by shot basis.

4. Positioning

A VERIPOS DGPS system, supplied by SubSea Offshore was used. The system comprised two Sercel NR103 DGPS receivers with corrections from either an HF radio link or via satellite using a link into the vessel's satcom aerial.

Output from the NR103 receivers was processed and logged by a Qubit TRAC IV navigation processor/logger. This provided fix mark outputs to analogue recorders, a vessel steering

display and logged position data to tape at one minute intervals. Water depth, derived from the airgun or sparker return was also logged. Navigation data was also output from the NR103 directly to the CODA DA200 system.

5. Echo Sounder

This vessel installed Simrad EA500, with colour printer output. It was not possible to log this system on the Qubit and logged depth data was derived from digitising the sparker or airgun return.

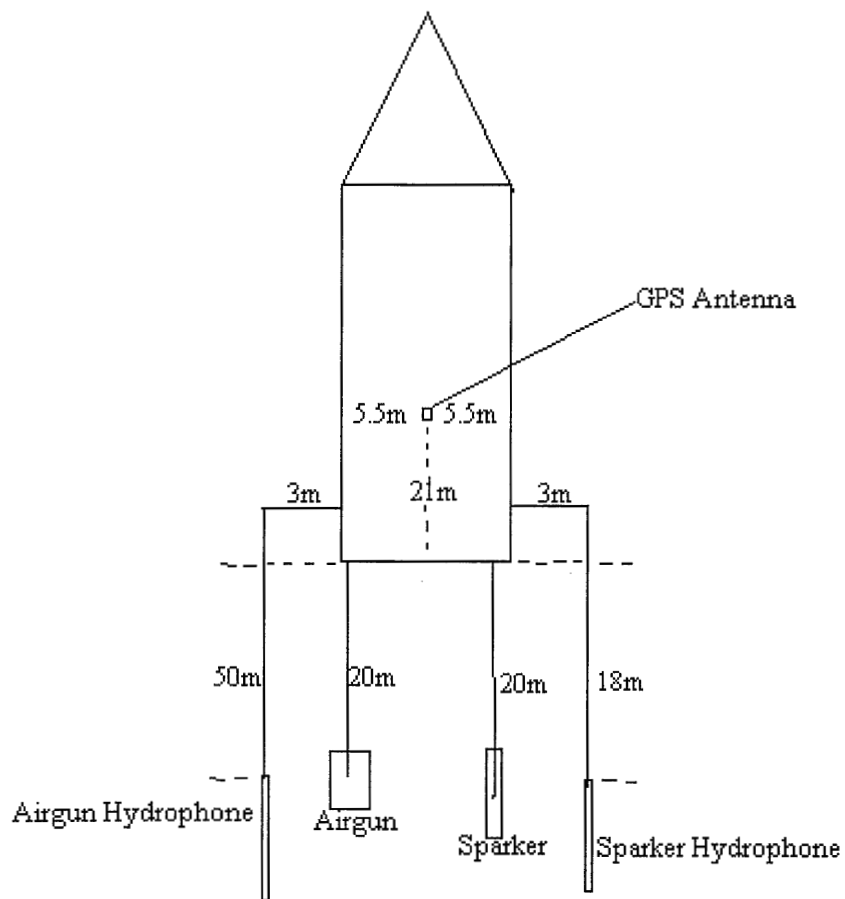
6. Gravity Corer

A 3m corer with 1 ton weight was used , deployed over the stern using the vessel's main winch.

4. Personnel

C P Brett	Geophysicist	Party Chief	}	
J Bulat	Geophysicist)	
N Campbell	Mechanical Engineer		}	
J Derrick	Mechanical Engineer		}	Petroleum and Marine Geology Group
A Fyfe	Geologist		}	British Geological Survey
K Hitchen	Geologist		}	
D Smith	Electronics Engineer		}	
D Wallis	Electronics Engineer		}	
G Stephen	Fisheries liaison/cetacean observer			Scottish Fishermen's Federation

RRS Challenger Layback Diagram



Project 98/01 Daily Summary

Date: 28 May 1998

Time

0745 Vessel left berth

0905 Dropped pilot - on passage to survey area

Time Summary

	Today Hours	Total Hours
On site operations:		
Steaming:	16	16
Weather d/time:		
Equipment d/time:		
Vessel d/time:		

Project 98/01 Daily Summary

Date: 29 May 1998

Time

0000 On passage to survey area

1835 Slowed to deploy gear at site 380

1905 All gear deployed - setting up and conducting tow trials

2330 Heading for start of first line

Time Summary

	Today	Total
	Hours	Hours
On site operations:	5.5	5.5
Steaming:	18.5	34.5
Weather d/time:		
Equipment d/time:		
Vessel d/time:		

Project 98/01 Daily Summary

Date: 30 May 1998

Time

0015 SOL 1
0310 Approach to line 4 interrupted by vessel Charles Darwin on line sampling
Negotiations with Charles Darwin over vessel operations
0750 Sparker failed - safety emergency stop cut out
0850 SOL 7 sparker operational
0905 EOL 7 - end of seismic
0925 All gear recovered - heading for sample site
1000 Corer deployed
1018 Corer on seabed
1030 Corer on deck
1045 Vessel steaming to Site 394
1735 Slowed to deploy gear
1805 All gear deployed
1850 SOL 8
2045 Noise on sparker record - thought to be interference from activity at Foinavon
2400 EOL 12

Time Summary

	Today	Total
	Hours	Hours
On site operations:	16.2	21.7
Steaming:	6.8	41.3
Weather d/time:		
Equipment d/time:	1.0	1.0
Vessel d/time:		

Project 98/01 Daily Summary

Date: 31 May 1998

Time

0020 SOL 13
0105 EOL 13 -end of seismic
0130 All gear recovered - heading for sample site
0225 Corer on seabed
0250 Corer on deck - site completed
0310 Heading for Site 395
0550 Seismic gear deployed
0630 Unable to start due to excessive noise - both acoustic and 50hz.
Investigating sources of noise in deteriorating weather conditions.
1300 Acoustic interference on sparker hydrophone identified as vibration of airgun hoses
1400 Source of 50hz noise isolated to hydrophone amplifier -replaced by spare
1445 Running through survey area to test data quality - weather now Force 6
1615 Data unacceptable in any direction
1630 All gear recovered - Waiting on weather

Time Summary

	Today	Total
	Hours	Hours
On site operations:	3.2	24.9
Steaming:	2.7	44.0
Weather d/time:	10.0	10.0
Equipment d/time:	8.1	9.1
Vessel d/time:		

Project 98/01 Daily Summary

Date: 1 June 1998

Time

0000 Waiting on weather
0600 Equipment deployed
0615 Running test data - not acceptable
0835 SOL 14 - data not accepted
1000 SOL 15 - OK
Running seismic
1545 EOL 20 - end of seismic
1605 All gear recovered
1620 Corer deployed
1746 Corer on seabed
1805 Corer on deck - no recovery
1902 Corer on seabed - second attempt
1926 Corer on deck - 2.2m recovery - Site completed
1930 Heading for Site 392
2330 Slowed to deploy seismic gear
2350 All gear deployed

Time Summary

	Today	Total
	Hours	Hours
On site operations:	10.0	34.9
Steaming:	4.0	48.0
Weather d/time:	10.0	20.0
Equipment d/time:		9.1
Vessel d/time:		

Project 98/01 Daily Summary

Date: 2 June 1998

Time

0050 SOL 21 - first line at Site 392
0850 EOL 26 - end of seismic
0905 All gear recovered
1015 Corer deployed
1032 Corer on seabed
1045 Corer on deck - successful
1050 Heading for Site 381
1210 Slowing to deploy gear
1220 All seismic gear deployed
1300 SOL 27 - first line at Site 381
1810 Line 32 aborted due to Qubit problem
1903 SOL 33
1942 EOL 43 - end of seismic
2000 All gear inboard
2040 Corer deployed
2115 Corer on seabed
2125 Corer on deck - poor recovery
2155 Corer on seabed -second attempt
2205 Corer on deck - site completed
2220 Heading for Site 389

Time Summary

	Today	Total
	Hours	Hours
On site operations:	20.1	55.0
Steaming:	3.0	51.0
Weather d/time:		20.0
Equipment d/time:	0.9	10.0

Vessel d/time:

Project 98/01 Daily Summary

Date: 3 June 1998

Time

0000 Heading for Site 389
0700 Gear deployed
0735 SOL 34 - first line at Site 389
1311 EOL 39 - end of seismic
1325 All gear recovered, heading for core site
1354 Corer deployed
1405 Corer on seabed
1410 Corer on deck - no recovery
1421 Corer on seabed - second attempt
1426 Corer on deck - site 389 completed
1435 Heading for Site 393
2045 Slowed to deploy gear at Site 393
2100 All gear deployed
2123 SOL 40 - first line at Site 393
2400 EOL 42

Time Summary

	Today	Total
	Hours	Hours
On site operations:	10.9	65.9
Steaming:	13.1	64.1
Weather d/time:		20.0
Equipment d/time:		10.0
Vessel d/time:		

Project 98/01 Daily Summary

Date: 4 June 1998

Time

0034 SOL 43
0244 EOL 45 - end of seismic
0300 All gear recovered
0420 Corer deployed
0441 Corer on seabed
0500 Corer on deck - barrel broken, no recovery
0522 Corer deployed
0614 Corer on seabed
0634 Corer on deck - 0.6m recovery
0655 Heading to next site
1500 Slowed to deploy airgun for line over gravity high/volcano?
1530 SOL 46 - airgun only
2000 EOL 46
2015 All gear recovered - heading for next site

Time Summary

	Today	Total
	Hours	Hours
On site operations:	12.0	77.9
Steaming:	12.0	76.1
Weather d/time:		20.0
Equipment d/time:		10.0
Vessel d/time:		

Project 98/01 Daily Summary

Date: 5 June 1998

Time

0000 On passage to next site
0850 Deploying seismic gear - sparker only
0921 SOL 47 - sparker over shallow bright spot
1005 EOL 47
1015 Gear inboard
1100 Corer deployed
1105 Winch problem - wire jumped sheave in winch room.
1135 Winch OK
1159 Corer on seabed
1210 Corer on deck - no recovery
1213 Corer deployed
1223 Corer on seabed
1233 Corer on deck - again no recovery
1236 Heading for Sites 401 etc. on Hatton Bank
2200 On passage - weather conditions deteriorating

Time Summary

	Today	Total
	Hours	Hours
On site operations:	3.0	80.9
Steaming:	20.5	96.6
Weather d/time:		20.0
Equipment d/time:		10.0
Vessel d/time:	0.5	0.5

Project 98/01 Daily Summary

Date: 6 June 1998

Time

0000 On passage to Hatton Bank sites in deteriorating conditions.
0130 At Site 401 - waiting on weather - Force 6-7
1440 Airgun deployed - data marginal - weather too poor for site surveys with sparker
1530 SOL 48 - regional line using airgun only
2110 EOL 48
2345 SOL 49
2355 Compressor failed
2359 EOL 49 - aborted due to compressor failure

Time Summary

	Today Hours	Total Hours
On site operations:		80.9
Regional survey:	9.3	9.3
Steaming:	1.5	98.1
Weather d/time:	13.2	33.2
Equipment d/time:		10.0
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 7 June 1998

Time

0000 Operations suspended due to airgun compressor failure
0328 Airguns recovered
0630 Compressor now running and heading for line
0910 Airguns deployed
0945 SOL 50 - airgun only - regional survey
1420 EOL 50
1550 SOL 51
1940 EOL 51
2140 SOL 52 - conditions deteriorating again
2319 EOL 52 - abandoned due to deteriorating sea conditions, Force 6-7
2330 All gear inboard - waiting on weather

Time Summary

	Today Hours	Total Hours
On site operations:		80.9
Regional survey	13.8	23.1
Steaming:		98.1
Weather d/time:	0.5	33.7
Equipment d/time:	9.7	19.7
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 8 June 1998

Time

0000-2400 Waiting on weather Force 7, large swell building

Time Summary

	Today Hours	Total Hours
On site operations:		80.9
Regional survey:		23.1
Steaming:		98.1
Weather d/time:	24.0	57.7
Equipment d/time:		19.7
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 9 June 1998

Time

0000 - 2400 Waiting on weather. Gale 8 swell building to maximum of 9m.

Time Summary

	Today Hours	Total Hours
On site operations:		80.9
Regional survey:		23.1
Steaming:		98.1
Weather d/time:	24.0	81.7
Equipment d/time:		19.7
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 10 June 1998

Time

0000 Waiting on weather
0700 Deployed airgun to test conditions
0730 Heading towards start of next line
0830 SOL 53 - regional survey airgun only
1250 EOL 53
1330 Sparker deployed in improving conditions
1450 SOL 54 - regional survey airgun and sparker
1910 EOL 54 heading towards grid survey
2003 SOL 55 - first line of grid survey
2015 EOL 55 - records poor, incorrect set-up, circling to reshoot
2055 Qubit TRAC IV hung up
2325 SOL 56 -grid survey

Time Summary

	Today	Total
	Hours	Hours
On site operations:	1.7	82.6
Regional survey:	11.6	34.7
Steaming:		98.1
Weather d/time:	7.5	89.2
Equipment d/time:	3.2	22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 11 June 1998

Time

0000 Running seismic over Hatton Bank sites.
1900 EOL 69 completion of seismic - lines 56-69 run without interruption
1915 All gear recovered - heading for first sample site
2000 Corer deployed
2009 Corer on seabed
2023 Corer on deck - poor recovery
2036 Corer deployed
2105 Corer on seabed
2120 Corer on deck - badly bent barrel - better recovery
2130 Heading for next sample site
2140 Corer deployed
2158 Corer on seabed
2215 Corer on deck - another bent barrel, sample recovered
2220 Underway to next sample position
2246 Corer deployed
2318 Corer on seabed
2334 Corer on deck - sample recovered -operations on Hatton Bank drill sites completed.
2340 Heading for start of next regional survey line.

Time Summary

	Today	Total
	Hours	Hours
On site operations:	23.6	106.2
Regional survey:	0.4	35.1
Steaming:		98.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 12 June 1998

Time

0115 Seismic gear deployed - airgun and sparker
0205 SOL 70 - regional survey
0206 TRAC IV tape hung - reloaded first two fixes not logged on tape
1128 Differential corrections dropping out - both HF and satcom
1300 EOL 70
1325 Differential HF aerial re-sited
1335 Sparker recovered for maintenance and redeployed
1420 SOL 71
2125 One DGPS receiver hung - using other
2230 EOL 71
2310 SOL 72

Time Summary

	Today Hours	Total Hours
On site operations:		106.2
Regional survey:	24.0	59.1
Steaming:		98.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 13 June 1998

Time

0000 Running Line 72
0120 Ships steering gear problem caused deviation from the line for approx. 5 mins
0230 EOL 72
0350 SOL 73
0750 EOL 73
0930 SOL 74
1150 Airgun hose leaking badly - closed off air for that gun pair.
1457 EOL 74 - Qubit hung up 3 minutes before scheduled end of line. Tape drive controller as usual. Rebooted system between lines - no time lost
1500 Guns recovered for repair between lines - no time lost
1547 Guns redeployed
1650 SOL 75
2140 EOL 75
2310 SOL 76

Time Summary

	Today Hours	Total Hours
On site operations:		106.2
Regional survey:	24.0	83.1
Steaming:		98.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 14 June 198

Time

0000 Running Line 76
0440 EOL 76
0535 SOL 77
1010 EOL 77
1140 SOL 78
1420 One NR103 DGPS receiver failed
1620 EOL 78
1910 SOL 79

Time Summary

	Today	Total
	Hours	Hours
On site operations:		106.2
Regional survey:	24.0	107.1
Steaming:		98.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 15 June 1998

Time

0000 Running Line 79
0240 EOL 79
0255 All gear recovered - end of survey
0300 On passage to Galway

Time Summary

	Today Hours	Total Hours
On site operations:		106.2
Regional survey:	3.0	110.1
Steaming:	21.0	119.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 16 June 1998

Time

0000 On passage to Galway

Time Summary

	Today Hours	Total Hours
On site operations:		106.2
Regional survey:		110.1
Steaming:	24.0	143.1
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

Project 98/01 Daily Summary

Date: 17 June 1998

Time

0000 On passage to Galway
1030 Docked Galway

Time Summary

	Today Hours	Total Hours
On site operations:		106.2
Regional survey:		110.1
Steaming:	10.5	153.6
Weather d/time:		89.2
Equipment d/time:		22.9
Vessel d/time:		0.5

BGS Marine Operations

Line Summary Sheet

Project: 98/01

Vessel: RRS Challenger

Area: West of Shetland to Hatton Bank

Line Number	Start Day/Time	End Day/Time	Last Fix	Line Length km	Equipment Run	Quality	Comments
1	30 May / 0015	30 May / 0045	7	5.5	Sparker / Airgun	adequate	
2	30 May / 0100	30 May / 0200	13	6	Sparker / Airgun	good	
3	30 May / 0212	30 May / 0245	8	5.2	Sparker / Airgun	good	
4	30 May / 0350	30 May / 0435	10	6	Sparker / Airgun	good	
5	30 May / 0620	30 May / 0700	9	6	Sparker / Airgun	good	
6	30 May / 0715	30 May / 0800	10	6.8	Sparker / Airgun	good	Sparker 8 fixes only
7	30 May / 0850	30 May / 0905	4	2.3	Sparker / Airgun	good	
8	30 May / 1850	30 May / 1930	10	6	Sparker / Airgun	good	No analogue sparker from fix 8
9	30 May / 1950	30 May / 2025	8	4.9	Sparker / Airgun	good	
10	30 May / 2035	30 May / 2110	8	5.1	Sparker / Airgun	good	
11	30 May / 2155	30 May / 2240	10	5.5	Sparker / Airgun	good	
12	30 May / 2320	31 May / 0000	9	6.3	Sparker / Airgun	good	
13	31 May / 0020	31 May / 0105	10	5.9	Sparker / Airgun	good	
14	1 Jun / 0835	1 Jun / 0915	9	5.4	Sparker / Airgun	adequate	poor weather
15	1 Jun / 1000	1 Jun / 1050	11	8	Sparker / Airgun	good	poor weather
16	1 Jun / 1122	1 Jun / 1155	8	5.4	Sparker / Airgun	adequate	poor weather
17	1 Jun / 1211	1 Jun / 1245	8	4.9	Sparker / Airgun	adequate	poor weather
18	1 Jun / 1325	1 Jun / 1400	8	5.3	Sparker / Airgun	poor	poor weather
19	1 Jun / 1415	1 Jun / 1450	9	5.6	Sparker / Airgun	good	poor weather
20	1 Jun / 1505	1 Jun / 1545	9	5.4	Sparker / Airgun	adequate	poor weather

BGS Marine Operations

Line Summary Sheet

Project: 98/01 **Vessel:** RRS Challenger **Area:** West of Shetland to Hatton Bank

Line Number	Start Day/Time	End Day/Time	Last Fix	Line Length km	Equipment Run	Quality	Comments
21	2 Jun / 0155	2 Jun / 0240	11	6.4	Sparker / Airgun	adequate	First attempt line 21 abandoned
22	2 Jun / 0300	2 Jun / 0345	10	6.4	Sparker / Airgun	adequate	
23	2 Jun / 0400	2 Jun / 0445	10	6.6	Sparker / Airgun	adequate	
24	2 Jun / 0545	2 Jun / 0625	9	6.7	Sparker / Airgun	adequate	
25	2 Jun / 0700	2 Jun / 0750	12	7.7	Sparker / Airgun	good	
26	2 Jun / 0805	2 Jun / 0850	10	6.8	Sparker / Airgun	adequate	
27	2 Jun / 1300	2 Jun / 1345	10	5.1	Sparker / Airgun	adequate	
28	2 Jun / 1400	2 Jun / 1430	8	5.4	Sparker / Airgun	good	
29	2 Jun / 1445	2 Jun / 1530	10	5.1	Sparker / Airgun	adequate	
30	2 Jun / 1615	2 Jun / 1650	8	5.4	Sparker / Airgun	adequate	
31	2 Jun / 1713	2 Jun / 1750	9	5.2	Sparker / Airgun	poor	
32	2 Jun / 1821	2 Jun / 1825	4	2.3	Sparker / Airgun	good	Line abandoned: Qubit problem
33	2 Jun / 1903	2 Jun / 1941	10	5.4	Sparker / Airgun	adequate	
34	3 Jun / 0735	3 Jun / 0822	11	6.3	Sparker / Airgun	good	
35	3 Jun / 0836	3 Jun / 0916	10	5.4	Sparker / Airgun	adequate	
36	3 Jun / 0936	3 Jun / 1018	10	6.2	Sparker / Airgun	adequate	
37	3 Jun / 1105	3 Jun / 1142	9	5.2	Sparker / Airgun	good	
38	3 Jun / 1154	3 Jun / 1228	9	5.6	Sparker / Airgun	good	
39	3 Jun / 1240	3 Jun / 1311	8	5.4	Sparker / Airgun	good	
40	3 Jun / 2123	3 Jun / 2204	10	5.5	Sparker / Airgun	good	

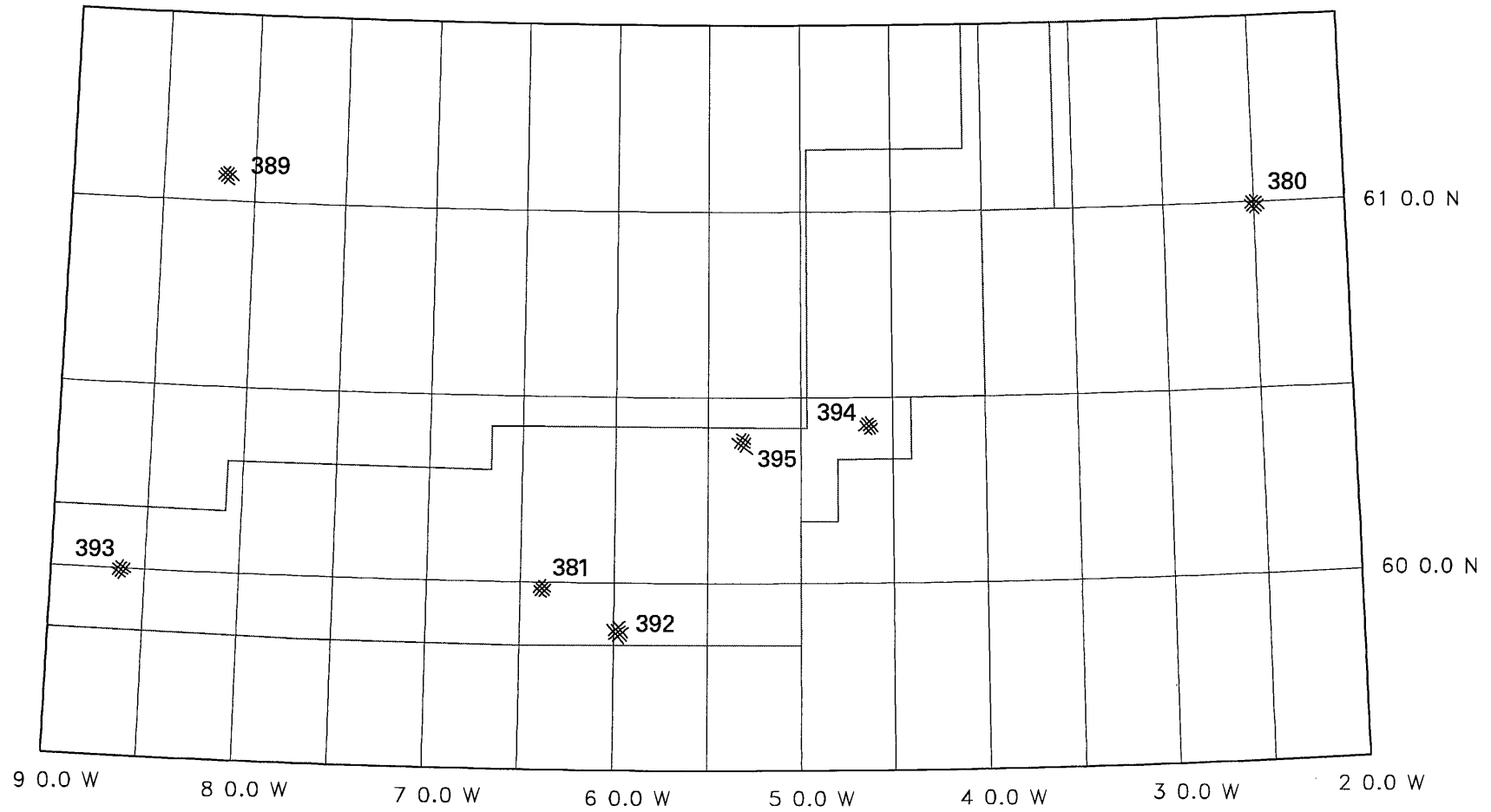
BGS Marine Operations

Line Summary Sheet

Project: 98/01 **Vessel:** RRS Challenger **Area:** West of Shetland to Hatton Bank

Line Number	Start Day/Time	End Day/Time	Last Fix	Line Length km	Equipment Run	Quality	Comments
41	3 Jun / 2221	3 Jun / 2310	11	5.5	Sparker / Airgun	good	
42	3 Jun / 2321	3 Jun / 2359	9	5.7	Sparker / Airgun	good	
43	4 Jun / 0034	4 Jun / 0106	9	5.2	Sparker / Airgun	good	
44	4 Jun / 0117	4 Jun / 0154	9	5.6	Sparker / Airgun	good	
45	4 Jun / 0206	4 Jun / 0244	9	5.5	Sparker / Airgun	good	
46	4 Jun / 1530	4 Jun / 2000	55	38.5	Airgun	good	
47	5 Jun / 0921	5 Jun / 1005	10	6.1	Sparker	good	
48	6 Jun / 1530	6 Jun / 2110	35	44.1	Airgun	good	
49	6 Jun / 2345	6 Jun / 2359	3	2	Airgun	poor	line re-shot
50	7 Jun / 0945	7 Jun / 1420	29	37.1	Airgun	good	
51	7 Jun / 1550	7 Jun / 1940	24	40.6	Airgun	good	
52	7 Jun / 2140	7 Jun / 2319	11	10.2	Airgun	good	
53	10 Jun / 0830	10 Jun / 1250	27	36.6	Airgun	adequate	
54	10 Jun / 1450	10 Jun / 1910	27	38.5	Sparker / Airgun	adequate	
55	10 Jun / 2003	10 Jun / 2015	5	1.6	Sparker + Airgun	poor	line re-shot
56	10 Jun / 2325	11 Jun / 0115	24	14.9	Sparker / Airgun	adequate	
57	11 Jun / 0130	11 Jun / 0235	14	10.2	Sparker / Airgun	poor	line re-shot
58	11 Jun / 0305	11 Jun / 0440	20	12.5	Sparker / Airgun	good	
59	11 Jun / 0500	11 Jun / 0640	21	15.6	Sparker / Airgun	adequate	
60	11 Jun / 0735	11 Jun / 0825	11	6.4	Sparker / Airgun	good	

WEST SHETLAND SITE SURVEYS



HATTON BANK SITE SURVEYS
AND REGIONAL GRID

