NATURAL ENVIRONMENT RESEARCH COUNCIL

INSTITUTE OF GEOLOGICAL SCIENCES

CONTINENTAL SHELF DIVISION MGU.

Report No. 104

Cruise report on Project 80/02
A Geophysical Survey in the
eastern English Channel

Edited by

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December 1980

CONTENTS

PREFACE

1980 Geophysical survey - overall cruise summary

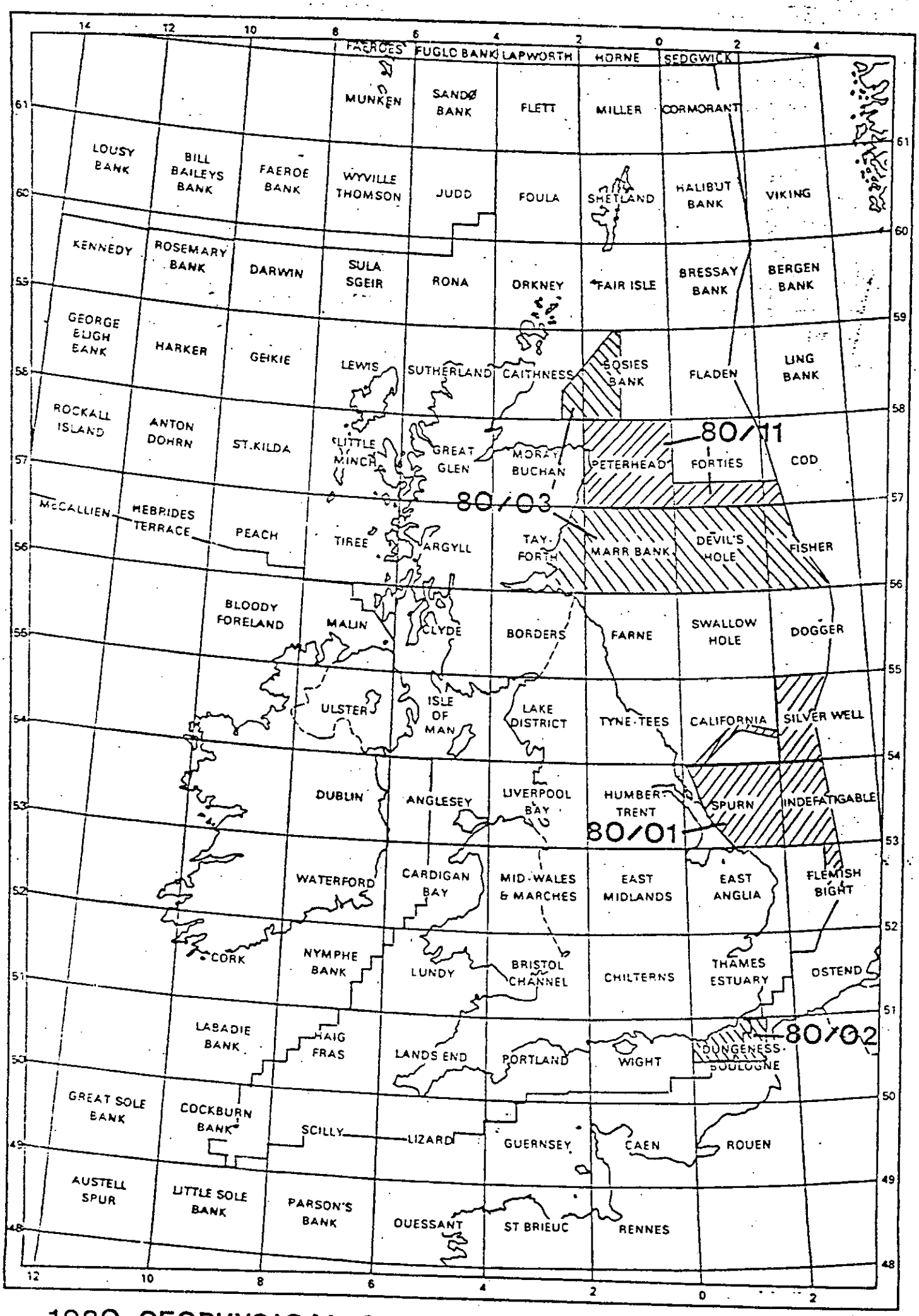
The 1980 geophysical survey programme was divided into eleven legs, comprising four projects, as follows:

	Dates	Project No.	Area	Port
Mobilisation	9 Apr-20 Apr	-	-	South Shields
Leg 1 (80/01 PART 1)	21 Apr-6 May	80/01	S North Sea	Hull
Leg 2 (80/01 PART 1)	7 May-20 May	80/01	S. North Sea	Gt Yarmouth
Leg 3 (80/01 PART 1)	22 May-4 June	80/01	S. North Sea	Gt Yarmouth
Leg 4 80/02	6 June-17 June	80/02	English Channel	Gt Yarmouth
Leg 5 80/01 PART 2	19 June-30 June	80/01	S. North Sea	Sunderland
Maintenance period	30 June-4 July	-	-	Sunderland
Leg 6 (80/03)	5 July-16 July	80/03	N. North Sea	Dundee
Leg 7 (80/03)	19 July-30 July	80/03	N. North Sea	Dundee
Leg 8 (80/03)	31 July-13 Aug	80/03	N. North Sea	Dundee
Leg 9 (80/03)	15 Aug-26 Aug	80/03	N. North Sea	Dundee
Leg 10 (80/03)	28 Aug-8 Sept	80/03	N. North Sea	Dundee
Leg 11 80/11	10 Sept-22 Sept	80/11	N. North Sea	South Shields

Projects 80/01, 80/02 and 80/03 were full regional surveys utilising multi-system seismics together with gravity and magnetics. Project 80/11 consisted only of gravity and magnetic surveying.

Reports in this series covering the other projects of the 1980 field season are listed below:

Project 80/01	Report No. 103
Project 80/03	Report No. 105
Project 80/11	Report No. 106



1980 GEOPHYSICAL SURVEY AREAS

INTRODUCTION

This report covers the operation of Project 80/02, a regional geophysical survey in the eastern English Channel.

The main objectives were to delineate the area of Jurassic rocks and other major boundaries to enable them to be tied into previous surveys made for a cross-Channel power cable from Dungeness to Equihen. The survey also formed a basis for the Dungeness-Boulogne sheet of the IGS 1:250,000 map series and the data used to help determine a bottom sampling programme to be carried out by the Institute of Geological Sciences (IGS), Marine Geology Unit later in the season.

The vessel used was the NERC research ship, RRS Shackleton which has an overall length of 61m, beam of 11m, draught of 4.4m and displacement of 1658 tons.

Geophysical methods employed were shallow seismic (sparker and airgun), high resolution seismic (pinger), side-scan sonar, gravity and magnetics.

The senior scientist, geophysical, geological, navigation and technical reports produced for the survey, summary lists and log sheets on which this report is based, are held on open file in the Marine Geophysics Unit, Institute of Geological Sciences, Murchison House, West Mains Road, Edinburgh. The authors of the reports are given in Table 1.

The survey was carried out in one of the world's busiest shipping areas and excellent co-operation was received from both the French and British Coastguards, the Master, Officers and Crew of Shackleton. In the 12 days dedicated to this project a total of 1100km were surveyed.

NARRATIVE

The vessel sailed from Great Yarmouth on 6 June and initially carried out three short gravity transit lines on passage to the main survey area. Twenty-eight lines were shot in the main area but due to the prevailing weather conditions only half of these were carried out with a full complement of towed systems. In conditions of poor visibility the number of towed systems had to be reduced, priority being given to the 1kj multielectrode sparker. Survey operations were suspended completely on several occasions by extended periods of very poor visibility. Towards the end of the leg operations were suspended for 24 hours on 14-15 June because of a S-W gale, the vessel taking shelter in Boulogne.

Due to the continuing poor performance of the Huntec boomer (see Report No. 103) and with the pinger continuing to provide good records, the side-scan sonar was used as a routine survey tool at the expense of the boomer since both could not be towed together. The programmer of the boomer EPC4100 recorder was used to inhibit transmission of the side-scan on the sparker firing sweep thus removing sparker interference from the side-scan record. The $5in^3$ airgun was towed shallow, suspended from a catamaran, thereby reducing the bubble pulse.

Satellite coverage was generally good with commonly 1-1½ hours between updated fixes. However, an intermittent fault in the system which had occurred on two occasions earlier in the season recurred with increasing regularity, seriously affecting the accuracy of navigation for the periods when the fault situation was operative. The lines affected are numbers 7, 8, 10, 11, 12, 19, 20, 22, 27, 28, 29 and 30, and, whilst the accuracy has been improved in post-survey processing, navigation on these lines must be treated with some degree of caution. On the remainder of the lines the navigational accuracy is estimated to be within 200m.

Gravity results were good with a mean mistie of 1.1mGal. This value should be reduced after the navigation data has been processed reducing the effects of the poor on-line operation of the navigation system. Agreement with the scant existing gravity data in the area appeared to be good.

The two long lines to longitude 0° enabled the bases of the Jurassic, Lower Cretaceous, Chalk and Palaeogene to be delineated. The Chalk with its 'transparent' character on sparker records was clearly identified. The Lower Cretaceous 'Wealden' between Dungeness and Hastings produced poor, though characteristic, discontinuous reflectors because of its varied clayey and sandy lithologies. The Jurassic rocks were distinctive with high dips, numerous faults and folds, the latter trending mainly WNW-ESE.

EQUIPMENT PERFORMANCE SUMMARY

The gravity meter, magnetometer, echo sounder, data logging systems, MS47 transit sonar, sparker and airgun system all operated without significant problems.

Satellite navigation system

Due to its intermittent nature the fault which occurred repeatedly on this leg was difficult to locate, often clearing itself. The symptoms of the problem were:

(a) if on-line the SHOT ENBL light usually but not always, went out and at the same time a jump in position of 200m or more occurred, and

(b) spuriously large and/or very variable cross-course and/or along course speeds were seen, accompanied by spurious doppler sonar received frequencies.

The problem was finally traced to a poor connection in plug EXT2 of the MX200 interface unit as moving this plug always cleared the fault. This connection was rewired successfully during the port call at the end of the leg.

Side-scan sonar

The side-scan sonar operated well throughout but on two occasions the winch failed to start when attempting to pull in the fish. This was thought to be caused by a sticking valve spool in the Moog Controller and was overcome by operating the manual overide on the Moog unit.

Edo Western pinger

The pinger operated well until the penultimate line when the record suddenly deteriorated and was then lost altogether. On recovery of the fish it was found that the tow cable was badly frayed at the tow point and by the time the fish was landed on deck only six strands of the cable armouring remained intact.

TABLE 1

Project 80/02 - Personnel

Leg 4
6-17 June: Gt Yarmouth-Gt Yarmouth

		Leg Report
M C Tully)		Senior Scientist
E J Armstrong)	IGS MGU	Geophysical
J R Walker)		Navigation
H Stanley)		
D K Smythe)	IGS HCU	
S Beamish)		
R W Powell)		
M Gallon)	RVS Barry	
J Taylor)		
M W Garratt	Emoos Ltd	Technical
B N Fletcher	IGS MGLU	Geological
S Lallier	BRGM, France	

LINE NO.	LAST FIX	START Day Time	END Day Time	LINE LENGTH KM	NAVIGATION			BATHYMETRY	GRAVITY	MAGNETICS	DATA LOGGING		SONAR			SEISMIC					
					DOPPLER SONAR	SATNAV	OTHER	ATLAS DESO 10 EDIG 10	LACOSTE & ROMBERG S75	BARRINGER	DECCA-IGS	MONITOR LABS 9400	KELVIN HUGHES MS 47	UDI AS350 DUAL CHN. SIDE SCAN	WESTERN EDO PINGER	DEEP-TOW BOOMER HUNTEC	SPARKER EG&G	AIRGUN BOLT 600B	WATERGUN SODERA MICA-T	
1	20	158 1950	158 2300	26	✓			✓	✓		✓	✓									
2	20	159 0026	159 0336	29	✓			✓	✓		✓	✓									
3	18	159 0420	159 0710	24	✓			✓	✓		✓	✓									
4	55	159 1140	159 2040	96	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ 1KJ	✓ $5IN^3$			
5	52	159 2150	160 0620	95	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ PART			
6	25	160 1000	160 1400	43	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
7	7	160 1452	160 1552	16	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
8	6	160 1912	160 2002	14	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
9	8	160 2020	160 2130	13	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
10	19	161 0050	161 0350	36	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
11	20	161 0506	161 0816	38	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
12	22	161 1310	161 1640	36	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
13	18	161 1716	161 2006	37	✓			✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "			
14	21	163 1310	163 1630	38	✓			✓	✓		✓	✓	✓				✓ "				
15	20	163 1750	163 2100	39	✓			✓	✓		✓	✓	✓				✓ "				
16	22	163 2230	164 0200	38	✓			✓	✓		✓	✓	✓				✓ "				
17	15	164 0300	164 0520	27	✓			✓	✓		✓	✓	✓				✓ "				
18	22	164 1210	164 1540	26	✓			✓	✓		✓	✓	✓				✓ "				
19	22	164 1558	164 1928	25	✓			✓	✓		✓	✓	✓				✓ "				
20	15	164 2012	164 2232	26	✓			✓	✓		✓	✓	✓				✓ "				

LINE SUMMARY

TABLE 2

LINE NO.	LAST FIX	START Day Time	END Day Time	LINE LENGTH KM.	NAVIGATION		BATHYMETRY ATLAS DESO 10 EDIG 10	GRAVITY LACOSTE & ROMBERG S75	MAGNETICS BARRINGER	DATA LOGGING		SONAR		SEISMIC				
					SATNAV-DOPPLER SONAR	OTHER				DECCA-IGS	MONITOR LABS 9400	KELVIN HUGHES MS47	UDI AS350 DUAL CHN. SIDE SCAN	WESTERN EDO PINGER	HUNTEC DEEP-TOW BOOMER	SPARKER EG&G	AIRGUN BOLT 600B	WATERGUN SODERA MICA-T
21	16	165 0626	165 0656	27	✓		✓	✓		✓	✓	✓				✓ 1KJ		
22	13	165 0740	165 0940	29	✓		✓	✓		✓	✓	✓				✓ "		
23	25	165 1304	165 1704	49	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ 5 IN³	
24	38	165 1930	166 0140	54	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "	
25	30	166 0770	166 1210	47	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "	
26	8	166 1420	166 1530	13	✓		✓	✓	✓	✓	✓	✓	✓	✓		✓ "	✓ "	
27	17	167 1530	167 1810	21	✓		✓	✓		✓	✓	✓		✓		✓ "		
28	29	167 1900	167 2340	46	✓		✓	✓		✓	✓	✓		✓		✓ "		
29	20	168 0400	168 0710	33	✓		✓	✓		✓	✓	✓		✓		✓ "		
30	26	168 0930	168 1340	43	✓		✓	✓		✓	✓	✓		✓		✓ "		
31	13	168 1702	168 1902	25	✓		✓	✓		✓	✓	✓				✓ "		

LINE SUMMARY

TABLE 2

TABLE 3

Corrected Gravity Base Ties

Date Day Time GMT	Place & Berth	g at main base mGal	g at base corrected for tidal effects mGal	Meter reading corrected for tidal effects meter divs.	Drift mGal
4.6.80 156 1515	Gt. Yarmouth South Quay	981301.5	981302.6	12093.2	
					+0.7
6.6.80 158 1245	Gt Yarmouth South Quay	981301.5	981302.6	12093.9	
					+0.7
18.6.80 170 0700	Gt Yarmouth South Quay	981301.5	981303.0	12095.0	

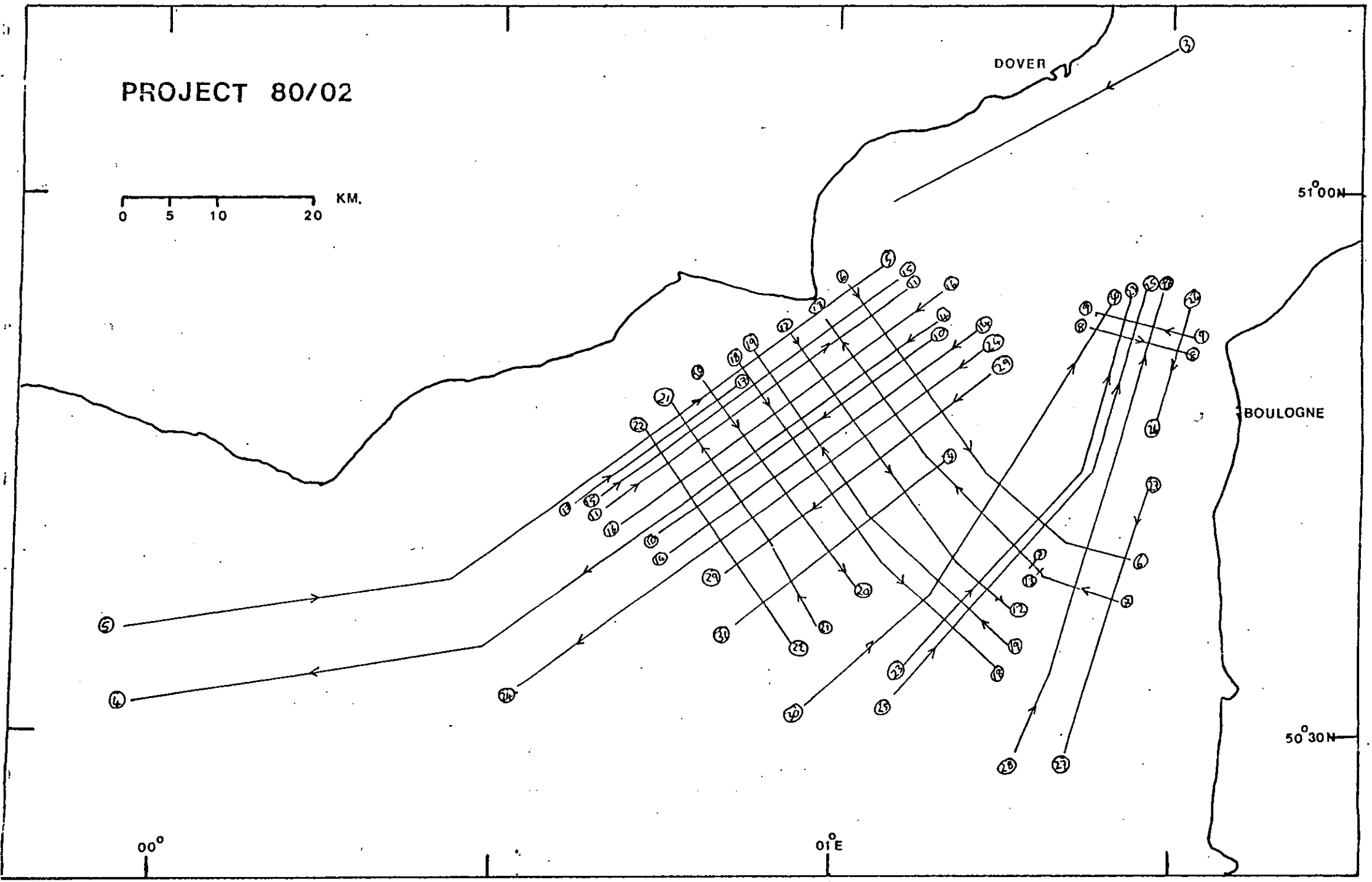


Figure 1

APPENDIX 1

Equipment Carried

Navigation

1. Magnavox satellite navigation system integrated with MX610/MX600 doppler sonar and Arma Brown Mk I Mod 5 gyro compass.

2. Decca Mk 21 main chain receiver - optional integration with above.

Gravity

LaCoste and Romberg S75 air-sea gravity meter. World Wide land gravity meter for base ties.

Magnetics

Barringer proton magnetometer - two tow cable/sensor assemblies.

Bathymetry

Atlas Deso 10 echo sounder with hull mounted transducers (33 and 210KHz) and Edig 10 digitiser unit.

Data logging

1. Decca/IGS data logger.

2. Monitor Labs 9400 data logger.

Sonar

1. Kelvin Hughes MS47 transit sonar - hull mounted, port scanning.

2. UDI AS350 dual channel side scan system with catamaran tow fish, 2500' tow cable and remote controlled winch. Recording on an EPC 3200 graphic recorder.

Seismic

1. Edo Western 248 pinger, 3.5KHz, 10KW transducer in tow fish assembly. Used with TSS Model 302 swell filter, recording on EPC 4600 graphic recorder.

2. Huntec deep tow boomer system with remote controlled winch, two Krohn-hite bandpass filters, recording on an EPC 4100 graphic recorder.

3. EG & G sparker system - up to 5KJ capability, one three element and one nine element spark array, Krohn-hite band-pass filter, TSS Model 307 TVG amplifier, recording on an EPC 4600 graphic recorder.

4. Air gun system:- Bolt 600B, two guns with standard ($1-40in^3$) range of chamber sizes, Krohn-hite bandpass filter, TSS Model 307 TVG amplifier and recording on an EPC 4600 graphic recorder.

5. Sodera Mica-T $80in^3$ water gun recording as for air gun system.

6. Analogue tape and seismic control system (IGS) incorporating a Racal Store 4 tape deck.

7. Hydrophones

   (a) Huntec ST2.

   (b) EG & G 265.

   (c) EG & G 263C, 2 off - used with sparker.

(d) Teledyne 7 channel (10m) - used with sparker latter half of season.

(e) Geomecanique 30m used with air gun.

(f) Geomecanique 50m 3 section - used with air gun/water-gun.

8. Seismic amplifiers - Bell and Howell, 10 off.

9. Additional EPC 3200 recorder - normally used for additional display of air gun or simultaneous display of air gun and sparker.

10. Spare EPC 4600 recorder.

11. Spare Racal Store 4 tape deck.

Miscellaneous

1. Two UDI closed circuit television systems for monitoring remote winches.

2. Hewlett Packard 9810 desk top calculator with 9862A graph plotter.