

INSTITUTE OF GEOLOGICAL SCIENCES
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Cruise Report 80/FE/09

"FERDER" DRILLING LEG 1

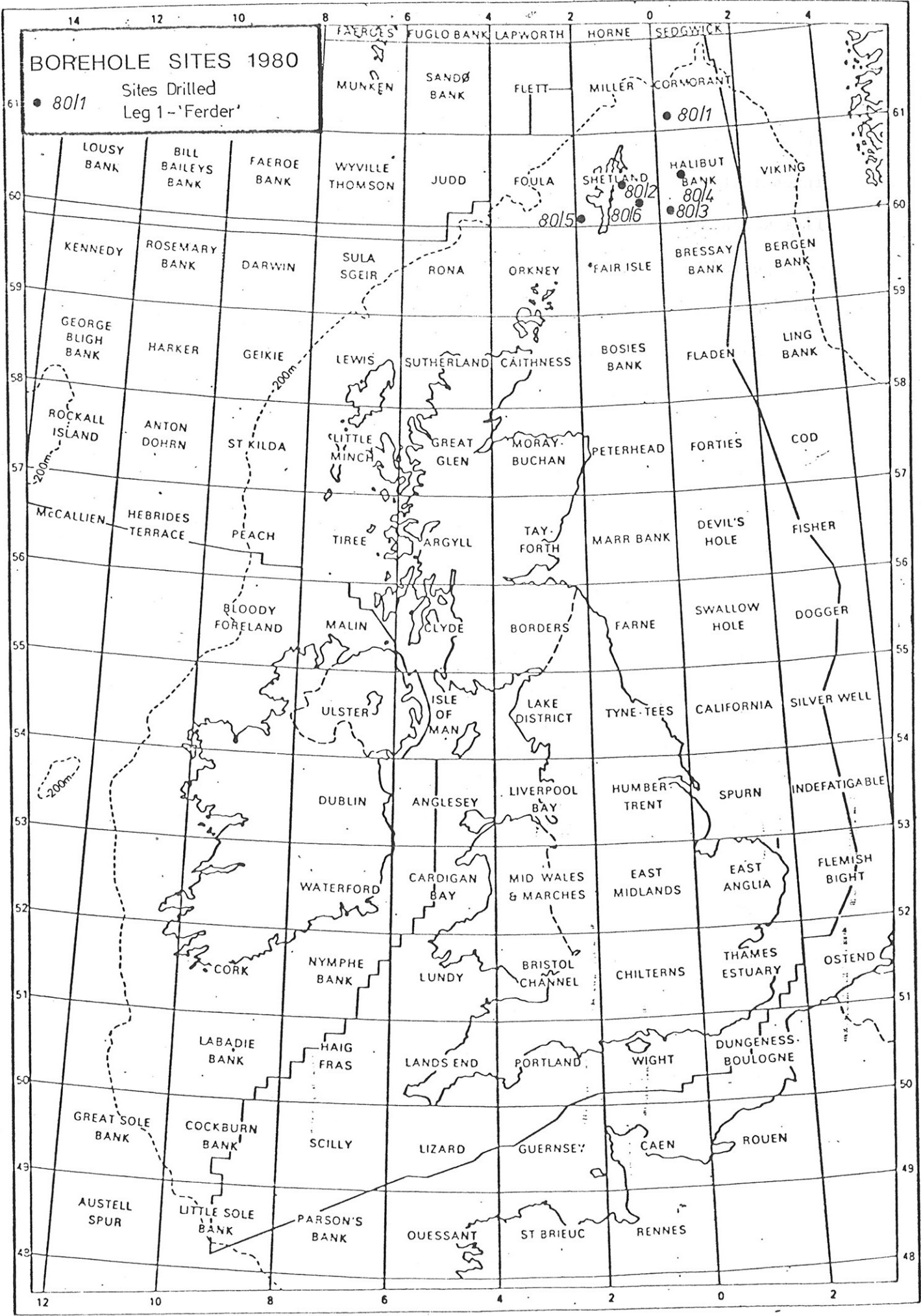
13.8.80 - 4.9.80

by

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CONTENTS

	<u>Page</u>
BOREHOLE SITES 1980 (MAP)	1
INTRODUCTION	2
PERSONNEL	2
EQUIPMENT	2
SHIP PERFORMANCE	3
RESULTS	4
CONCLUSIONS	5
RECOMMENDATIONS	6
APPENDIX I - TABLE OF BOREHOLE DATA	8
APPENDIX II - TIME ANALYSIS	10
APPENDIX III - CAPTAIN'S LOG	14



INTRODUCTION

The MV "Ferder", a Norwegian registered and owned shallow drilling/site investigation vessel, became available to IGS for a period of approximately five weeks, commencing mid-August. This report covers Leg 1, a three week period from 13th August to 4th September inclusive. Throughout the cruise the weather was generally poor and sometimes extremely bad. Equipment malfunction led to further downtime but a total of six boreholes were attempted and five can be considered as successful.

PERSONNEL

A C Skinner	IGS (MGLU)	Senior Scientist
R Owens	IGS (MGLU)	Geologist
J M Dean	IGS (HCU)	Geologist
I Moore	IGS (EGU)	Engineering Geologist
R Sutherland	IGS (HCU)	Assistant
N Campbell	IGS (MGLU)	Assistant

In addition Mr Ken Armstrong, drilling manager, Cluff Oil Ltd. visited the ship prior to sailing to advise and discuss various details of the drilling programme.

EQUIPMENT

A) Ship's Equipment

Ship specification and equipment are described in MGLU internal report 80/16. Compared to previous experiences with "Ferder" this year did not compare at all well. Numerous minor stoppages and two major breakdowns of equipment led to disruption of the available drilling time. The equipment was considered to be suffering from lack of maintenance consequent on an extremely long period of steady work. Accommodation was up to the previous high standards.

b) IGS Equipment

This equipment is also described in MGLU Internal Report 80/16. Initial latching problems with the Christensen core barrel were rapidly cured and it must now become standard that each set of equipment be modified, according to instructions on board, then tested prior to initial deployment. When matched sets of equipment are obtained by this method the running is virtually routine and trouble-free. Core recovery is still a problem but can now be more closely linked to drilling parameters.

SHIP PERFORMANCE

This is dealt with in detail in MGLU Internal Report 80/16 and in the report by J.H. W-Wilson who acted as drilling consultant on the second leg.

The ship behaves well in adverse weather conditions and under the supervision of Captain Jacobsen drilled successfully in marginal weather conditions on a number of holes. Only four anchors were laid at any location and there was considerable ship movement at some stations. Five or possibly six anchors would possibly improve the station keeping as would a little more tension on the anchor wires. The seabed template used was the McClelland Stingray in static mode and no problems were associated with its use, other than re-entry being thwarted by the ship moving position.

Pipe handling was systematic and well organised, the deck being kept neat and tidy at all times. Drilling was somewhat erratic with a definite lack of understanding of coring procedures being evident. In many cases this was corrected by constant supervision by IGS and direct requests to the driller but this was not always possible. In

addition, there was a marked difference in the drill capability on the two shifts. The helpfulness of the crew at all times cannot be over-emphasised.

The engineering capability on the ship was excellent and kept the downtime to a minimum. However the state of repair of the power swivel was such that numerous minor stoppages and two major breakdowns occurred.

The laboratory facilities were adequate providing coring was not too rapid - otherwise the system became cluttered up owing to lack of unexamined core space. It is also difficult to find somewhere suitable to sit down! Messing and accommodation were of a high standard. Laundry facilities were excellent and did much to alleviate the poor deck conditions such as raining mud from a constantly leaking power swivel.

RESULTS

Bad weather and equipment problems resulted in a considerable loss of drilling time. A total of six boreholes were attempted. Of these only one was entirely unsuccessful and consequently much useful geological information was obtained despite the various hindrances encountered. Core recovery varied from a few percent to over 90% in the core runs and the variation is attributable to various combinations of weather, bit types, bit weight, mud volumes and the experience of the driller. Appendix 1 displays the results of each borehole attempted, and MGLU Internal Report 80/17 gives a more detailed account of the geology.

CONCLUSIONS

Despite weather and equipment problems a total of six boreholes attempted gave successful geological results on five of these boreholes. The difficulties of trying out drilling equipment in harbour prior to charter commencement leaves the charterer at a disadvantage in assessing the capability of such equipment. Appearances, either good or bad, cannot be relied upon and in this charter period with "Ferder" some items of equipment, notably the power swivel were "kept going" long after all the warning indications of major trouble ahead, had passed. While in port the anchor fairleads and derrick sheaves were re-bushed as being of a higher priority repair than the swivel although the lower clamp ring was sent ashore for refurbishing. Two power swivel breakdowns on the swivel caused premature termination of one borehole and re-commencement of another that had already reached 55m below seabed (See Report 80/16). It is the opinion of the IGS personnel on board that a more satisfactory cruise would have been had by both IGS and Contractor had a little more time been spent on maintenance or repair prior to charter commencement as only the skill of the engineering staff on board kept downtime to a minimum. The use of deck officers as drillers is acceptable provided they have coring experience. While the shifts were obviously competent to carry out normal site investigation drilling they did not have the necessary experience or understanding for coring without supervision. Much of this supervision could have been provided by the Captain and Chief Officer who had previous experience of IGS operations but, in general, they only appeared when problems were encountered.

The performance of the Christensen core barrel now appears to be reliable

and the other controllable factors such as bit type, bit weight, R.P.M. and mud S.P.M. should be monitored closely to obtain the best coring parameters. Consequently careful study will have to be made of all the IGS drilling records obtained throughout this and previous years. They will have to be kept up, and possibly extended in scope, in future years, before core recovery can be optimised by using the correct coring parameters for different lithologies encountered using past experiences as a guideline.

The lack of a drilling consultant on this leg was not a disadvantage. "Ferder" is a tried and proven ship and most of the IGS personnel on board had previous experience on her. It is also questionable how much a consultant can influence the overall drilling unless the driller understands the principles behind what is being asked of him. The consultant can, and does, initiate the procedures being used. One of the reasons for this operation progressing successfully was the adherence to a set of guidelines determined by Mr Ken Armstrong of Cluff Oil who had operated with IGS on board "Ferder" in previous years and who visited the ship in Aberdeen to check and advise on various details before the commencement of this charter.

RECOMMENDATIONS

The present system of using a site investigation vessel with IGS coring equipment is a good arrangement which can be improved with experienced drillers on the deck. The main requirements are a set of procedures to be followed and adherence to drilling parameters regulated by past experience based on records kept.

The IGS borehole site data sheets must be improved. They must give more idea of the geology and whether it is permissible to move a site in any

direction and by how much. They must also give a better idea of ground conditions at each site and whether it has been attempted before. This year a number of sites were attempted where bad or impossible ground conditions had been encountered previously - no mention was made of this or the drilling techniques used in previous attempts.

Where hard rock drilling is involved minimum penetration (& recovery) necessary for successful geological interpretation should be indicated as this is a time consuming and (more) costly exercise. Perhaps two shallower boreholes may be more cost effective and productive if the geology permits.

In view of difficulties encountered with poorly maintained equipment it may be advisable for the Senior Scientist to put in writing to the captain notice of any defects which he feels may give rise to predictable and thus unnecessary downtime at a later date in the contract.

APPENDIX I - Table of Borehole Data

Site No.	Borehole No.	Date	Depth	Core	Log	Geology	Comments
111	80/1	16.8.80 to 18.8.80	128.0m	35.23m (27.5%)	Yes	Quaternary sands, silts and clays with possible Tertiary at base of hole	Hole terminated prematurely owing to failure of power swivel motor.
86	80/2	23.8.80 to 24.8.80	23.5m	7.5m (32%)	No	Quaternary sands, silts clays to 12.0m then Permo-Trias sandstone	Hole cored to 17.5m with TC bit then string tripped and re-run with rock roller bit. Re-entry not possible and new hole run with rock roller to 20.5m when string tripped and run with coring bit to 23.5m T.D. after new motor fitted to power swivel.
104	80/3 & 80/3A	25.8.80 to 30.8.80	55.0m 163.0m	13.46m (24.5%) 4.23m 7.7% to 55m 17.71m (16.4%) rest of hole	Yes Yes	Quaternary sands and silty clays to 20m then Tertiary glauconitic sands and sandstone with clays and carbonaceous beds to base.	Hole cored to 55m depth when power swivel breakdown occur- red and string had to be pulled. Unable to re-enter hole on repair-new hole drilled with high mud pressure to 55m depth. String pulled for change to diamond bit at 152m.
28	80/4	31.8.80	47.0m	2.55m (5.4%)	No	Quaternary sands and some silty clay	Poor recovery and poor hole conditions. Hole finally collapsed and abandoned. Main problem not able to stabilise coarse shell sand.
107	80/5	1.9.80 2.9.80	4.0m	1.65m (41.3%)	No	Recent sand and gravel over Permo Trias sand- stone and salts	Hole abandoned because of bad weather but rockhead reached and identified.

Table of Borehole Data (Cont'd)

Site No.	Borehole No.	Date	Depth	Core	Log	Geology	Comments
61	80/6	2.9.80 3.9.80	35.5m	5.4m (15.2%)	Yes	Recent/Quaternary gravel sands and clays to 22m then Permo Trias sandstone.	No core recovery to rockhead as diamond bit used from the seabed to avoid a string trip. Objective was rockhead type and if recovery gauged from rockhead to T.D. it becomes 40.8%.

TABLE I TIME UTILISATION ANALYSIS

DATE	IN PORT	ON PASSAGE	BETWEEN STATIONS	ANCHORING	DRILLING WORK (& LOGGING)	DOWNTIME			NO. V/E STATIONS	NO. GS/CS STATIONS	REMARKS
						WEATHER	EQUIP'T	SHIP			
13.8.80	3.6								Not Applicable	Not Applicable	Ship in Aberdeen
14.8.80	20.4	3.6									Mobilisation starts 1300 hours
15.8.80		24.0									
16.8.80		6.5		1.5	10.5	3.0	2.5				Adjusting inner barrel latches
17.8.80					24.0						
18.8.80			2.25	2.0	16.5 (3.25)						Power swivel break-down stopped hole.
19.8.80			2.75			21.25					
TOTAL %											Cont'd ...

TABLE I TIME UTILISATION ANALYSIS

DATE	IN PORT	ON PASSAGE	BETWEEN STATIONS	ANCHORING	DRILLING WORK (& LOGGING)	DOWNTIME			NO. V/E STATIONS	NO. GS/CS STATIONS	REMARKS
						WEATHER	EQUIP'T	SHIP			
20.8. 80						24.0			Not Applicable	Not Applicable	
21.8. 80						24.0					
22.8. 80						24.0					
23.8. 80		0.25		1.0	16.0	6.75					
24.8. 80					22.8			1.2			Replace motor on Power swivel
25.8. 80		9.3		2.35	11.6			0.75			Power swivel repair
26.8. 80					9.5 (2.5)			12.0			Power swivel oil change and breakdown
TOTAL %											Cont'd ...

TABLE I TIME UTILISATION ANALYSIS

DATE	IN PORT	ON PASSAGE	BETWEEN STATIONS	ANCHORING	DRILLING WORK (& LOGGING)	DOWNTIME			NO. V/E STATIONS	NO. GS/CS STATIONS	REMARKS
						WEATHER	EQUIP'T	SHIP			
27.8.80					12.5			11.5	Not Applicable	Not Applicable	Repair complete but drilling to break-down position until 0650 hours on 27.8.80
28.8.80					23.5			0.5			
29.8.80					23.25			0.75			Power swivel oil change
30.8.80					21.75 (1.75)			0.5			Power swivel oil change
31.8.80			4.0	2.5	17.0			0.5			Mud pump repair
1.9.80			11.0	2.6	10.4						
2.9.80			8.8	2.1	13.1			2.0			
TOTAL %											

TABLE I TIME UTILISATION ANALYSIS

DATE	IN PORT	ON PASSAGE	BETWEEN STATIONS	ANCHORING	DRILLING WORK (& LOGGING)	DOWNTIME			NO. V/E STATIONS	NO. GS/CS STATIONS	REMARKS
						WEATHER	EQUIP'T	SHIP			
3.9.80	1.0	5.25		3.0	10.25 (2.5)			2.0	Not Applicable	Not Applicable	Anchor winches malfunctioning Sail to Lerwick
4.9.80	12.0										to 1200 hours in port
TOTAL	37.0	39.35	38.35	17.05	242.65(10.)	103	2.5	29.7			519.6 total hrs.
%	7.1	7.6	7.4	3.4	46.7 (1.9)	19.8	0.5	5.7			100%

