INSTITUTE OF GEOLOGICAL SCIENCES
CSU II Report 74/10

IGS CONTINENTAL SHELF UNIT II

SOUTH FORTIES AREA
GEOTECHNICAL PILOT PROJECT

Cruise Report M. V. Whitethorn
12th-28th May 1974

Cruise 74/WH/12

by

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INTRODUCTION

The object of the cruise was to closely sample a small area and to compare methods of geophysical profiling and geotechnical testing. To do this three sampling grids were planned with a station seperation ranging from 3 to 10 km from the smallest to the largest grid. In the event only the close grid was completed and part of the largest grid was also sampled. Fifty seven stations were sampled all together and approximately 520 km of geophysics line traversed. Four samples were also taken across one anchor spread (430 m) to test for variation within the 3 km grid. The programme was a collaborative venture involving staff from Continental Shelf Unit II, Marine Geophysics Unit and Engineering Geology Unit.

WORK AREA (See Location Map Fig 2)

The sampling was carried out in the South Forties sea area around 57° 15'N and 0° 30'E (Fig 1). This is about 40 km south of the BP Forties Platform area. The area was chosen because at least three different sediment types could be sampled within a closely spread grid measuring 15 x 18 km.

NAVIGATION

Decca Main Chain (6c) was the navigation system used. Accuracy in this area is fairly good but it is realized that for this sort of exercise either hifix or satellite navigation with doppler sonar are the best methods. Neither were available but it was decided that for this particular pilot programme the internal relativity given within the sampling grid was sufficiently accurate to allow the necessary comparisons to be made. The data was recorded on a 1:100,000 summary sheet (57° 00'N / 00° W) and on four specially prepared 1:20,000 sheets

57° 14'N / 0° 17'E

57° 14'N / 0° 29'E

57° 08'N / 0° 17'E

57° 08'N / 0° 29'E

SAMPLING

The main sampling effort of the cruise was to obtain vibrocore and gravity core samples. However at each station Shipek grab samples, usually with

an accompanying photograph, were also obtained (using a Shipek grab with a camera attached, specially developed by IGS) and dredge samples were collected using a small shell dredge. Vibrocores up to 6 m in length were recovered from every station except one but only a few short gravity cores were recovered though several attempts were made at each station. This was mainly because the thin sand cover over most of the area prevented the gravity corer from penetrating into the underlying mud. Great care was taken when handling the cores and they were stored upright throughout the cruise. To compare the effects of storage and handling on the cores as much testing as possible was done on board ship. These tests will be repeated ashore to see if there is any consistent difference from the results obtained immediately after the cores were taken.

SAMPLE TESTING

The work programme on each vibrocore depended on the type of sediment cored. If the core was sandy then, after being allowed to stand for 1-2 hours it was cut into one metre lengths, acoustically scanned and a visual geological description made. However if the core was composed of a clay material the following additional work was done,

1. Hand vane and pocket penetrometer tests to measure the approximate unconfined sheer strength and unconfined compressive strength of the material at the top of each metre length.
2. A motorised laboratory sheer vane was used to give accurate values of the peak sheer strength and remoulded sheer strength at one three and five metre depths.
3. Bulk density was measured at one metre depth.
4. Moisture content was measured at one, three and five metre depths.
5. Waxed smaples, were taken at 2 m depth for bulk density and moisture content measurement ashore.
6. Occasional larger waxed samples were taken for triaxial testing ashore.

GEOPHYSICAL PROFILING

The object of the geophysical programme was to produce records with sufficiently good resolution in the top 10 m of the soft sediment layer to permit correlation between the cores recovered and the geophysical profiles. It is extremely difficult to obtain good records from the top 10 m of the seabed and with some equipment the pulse width may mark the top 5 m. Also the damping effect of the thin mobile sand layer which covers the seabed in this area made the task even more difficult.

A north-south and east-west grid with a three kilometre line spacing was run over the test area and then intermediate lines at a one kilometre spacing were run where appropriate.

The equipment used was the Atlas Deso echo sounder, the ORE pinger, EG &G sparker, and the EG & G Uniboom. Gifft recorders were used with the pinger, sparker and boomer systems. The programme was moderately successful and the best results were obtained from the ORE pinger. However the damping effect of the mobile sand layer greatly reduced penetration and correlation between lines even at a 1 km spacing was difficult. Useful results were obtained from the sparker but as expected the pulse width of the signal blanked out most of the area of interest for this particular exercise. The boomer was only at trials stage for this cruise, but potentially it will be a very useful tool, given suitable weather conditions.

From the experience gained on this trip it seems likely that the best results for future shallow geotechnical work will be from a combination of the pinger and a deep tow boomer.

WHITETHORN SUMMARY LOG 74/WH/12

Sun	12.5.74	
	0700 - 2230	Geophysics trials with UDI technician
	2230 - 2400	Anchor for night
Mon	13.5.74	
	0700 - 0845	Vibrocorer trials
	0845 - 1900	Geophysics trials
	2000 - 2130	Put UDI technician and IGS photographer ashore by pilot cutter
	2130 -	Steam towards working area 57°N 0°E
Tue	14.5.74	
	0730 - 2400	Sampling using vibrocorer shipek and shell dredge
Wed	15.5.74	
	0000 - 0045	Sampling
	0045 - 0840	Geophysics traversing
	0840 - 2200	Sampling
	2200 - 2400	Geophysics
Thur	16.5.74	
	0000 - 0800	Geophysics
	0800 - 1500	Sampling - shackle lost from vibrocorer and electric cable cut. Vibrocorer recovered by trawling with anchor using the foot as a messenger
	1500 - 2330	Recovering and repairing vibrocorer
Fri	17.5.74	
	0000 - 0800	Geophysics
	0800 - 2100	Sampling
	2100 - 2400	Geophysics
Sat	18.5.74	
	0000 - 0800	Geophysics
	0800 - 2100	Sampling
	2100 - 2400	Geophysics
Sun	19.5.74	
	0000 - 0700	Geophysics
	0700 - 1530	Sampling - cable cut at Kellens grip
	1530 - 2130	Checking and repairing cable
	2130 - 2400	Geophysics
Mon	20.5.74	
	0000 - 0730	Geophysics
	0700 - 2200	Sampling and changing and repairing cable
	2200 - 2400	Geophysics
Tue	21.5.74	
	0000 - 0700	Geophysics
	0700 - 2100	Sampling
	2100 - 2400	Geophysics
Wed	22.5.74	
	0000 - 0930	Steaming to Aberdeen to put Wimpey Foreman ashore
	0930 - 1830	Waiting for replacement Foreman
	1830 - 1200	Steaming towards work area

Thur 23.5.74

0000 - 0700	Steaming towards work area
0700 - 2130	Sampling
2130 - 2400	Geophysics

Fri 24.5.74

0000 - 0530	Geophysics
0600 - 1300	Sampling - runner guide in vibrocorer lost
1300 - 2400	Fabricating new part for vibrocorer. Ship standing by in heavy swell

Sat 25.5.74

0000 - 1600	Ship standing by in heavy swell
1600 - 2200	Sampling
2230 - 2400	Geophysics

Sun 26.5.74

0000 - 0600	Geophysics
0600 - 2030	Sampling
2030 - 2400	Geophysics

Mon 27.5.74

0000 - 0430	Geophysics
0430 - 0530	Steaming towards sampling position
0530 - 2130	Sampling
2130 - 2215	Boomer trials
2215 - 2400	Steaming towards Leith

Tue 28.5.74

0000 - 1400	Steaming to Leith
1430 -	Alongside in Leith for port call.

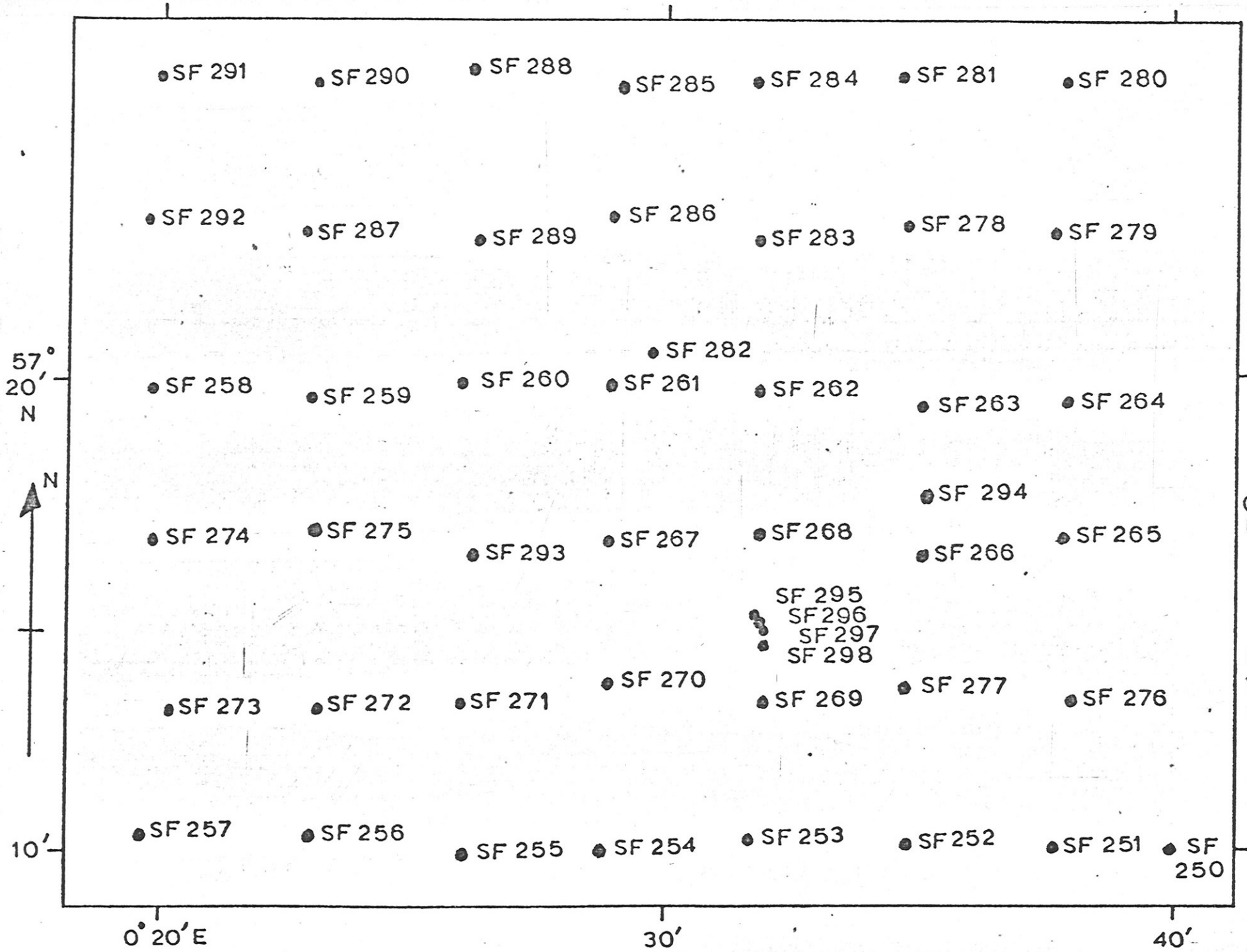

FIG. 1

Sample Stations

For location see fig 2.

SCALE

0 Km. 3

1:100,000

U.T.M. Projection.

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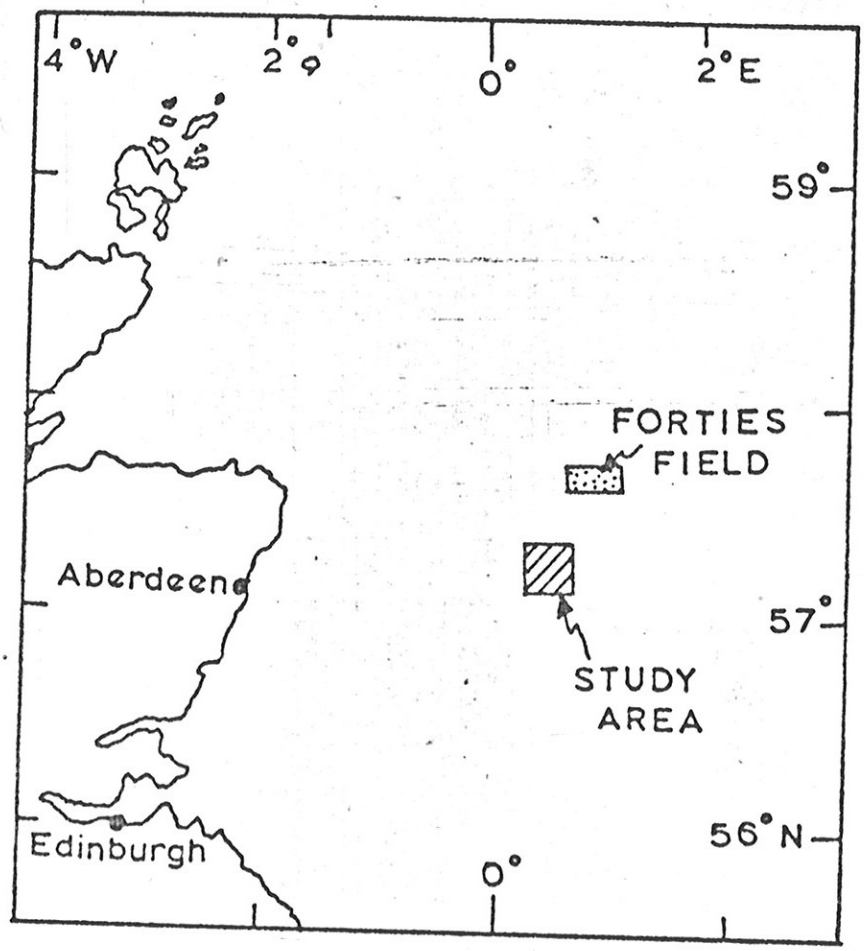
FIG 2. LOCATION OF THE PILOT STUDY AREA.



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