

In Confidence - Not to be quoted without reference to the Laboratory

FRV "EXPLORER"

CRUISE 7/83

REPORT - 15 - 27 JULY 1983

Objectives

1. To investigate the distribution of trace metals and nutrients in the coastal zone and major estuaries of eastern Scotland and northern England.
2. To work hydrographic stations in the Firth of Forth.
3. To collect radio caesium samples for MAFF, Lowestoft.

Narrative

"Explorer" sailed from Aberdeen at 1300 hrs on 15 July and proceeded north until off Peterhead. The ship then steamed slowly south as close to the shore as possible arriving off Great Yarmouth on the afternoon of 18 July. Water samples were taken routinely every half hour from the 'non-toxic' supply after leaving Peterhead until arrival in the Firth of Forth on the evening of 24 July.

After Great Yarmouth an offshore course was followed to Flamborough Head before working up the Humber to Immingham on 20 July. An offshore leg returning to the coast north of Flamborough Head was followed by a series of offshore-onshore transects arriving off St Abbs Head on the evening of 25 July. Overnight 24 hydrographic stations were worked in the Firth of Forth before returning to Aberdeen (radio caesium sampled at Arbroath) at 1730 on 26 July.

Results

With the exception of a few outstanding samples all analysis were carried out on board ship. A total of 477 surface water samples were analysed for nitrate, phosphate, silicate and salinity. In addition 450 of these samples were analysed for chlorophyll and 130 for dissolved cadmium, lead and copper.

Trace Metals

Copper levels increased in proceeding south from ca 0.18  $\mu\text{g dm}^{-3}$  off southern Scotland to ca 0.5  $\mu\text{g dm}^{-3}$  off East Anglia. This increase showed a strong correlation with the salinity decrease in the southern North Sea. Levels up to 3.3  $\mu\text{g dm}^{-3}$  were observed in the Humber estuary. A slight but consistent increase in copper concentrations was observed on moving inshore during transects.

Cadmium showed no clear trends, levels were generally between 0.02 and 0.04  $\mu\text{g dm}^{-3}$ , there was however a tendency towards increased levels in the south. Enhanced levels were only observed in the Humber up to 0.4  $\mu\text{g dm}^{-3}$ .

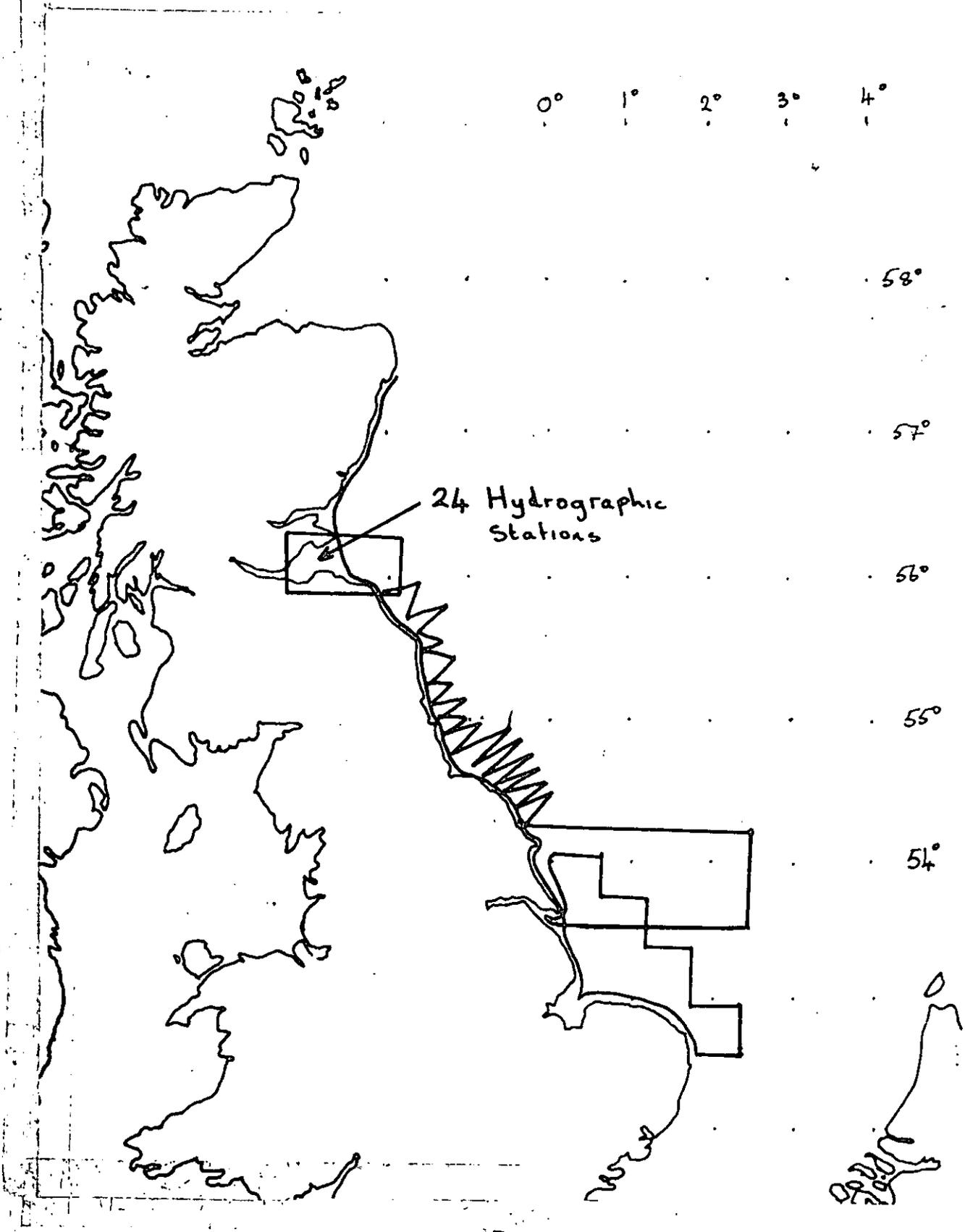
Lead levels were generally less than 0.1  $\mu\text{g dm}^{-3}$ , concentrations appear to be significantly lower off Scotland and East Anglia than off northern England. The lead data must be viewed with caution however because of possible contamination of the pumped supply. Unlike copper and cadmium, lead showed a decreased concentration in the Humber, this is attributed to scavenging by the high particulate loading in the estuary.

## Nutrients and Chlorophyll

The summer nutrient distribution showed very low offshore levels with typically  $<0.1 \mu\text{g at dm}^{-3} \text{NO}_3\text{-N}$ ,  $<0.1 \mu\text{g at dm}^{-3} \text{Si(OH)}_4\text{-Si}$  and  $<0.05 \mu\text{g at dm}^{-3} \text{PO}_4^{3-}\text{-P}$ . Higher levels were only observed within a narrow strip close to the coast (2 - 3 miles wide) where chlorophyll levels typically  $<1 \mu\text{g dm}^{-3}$  offshore rose to up to  $15 \mu\text{g dm}^{-3}$ .

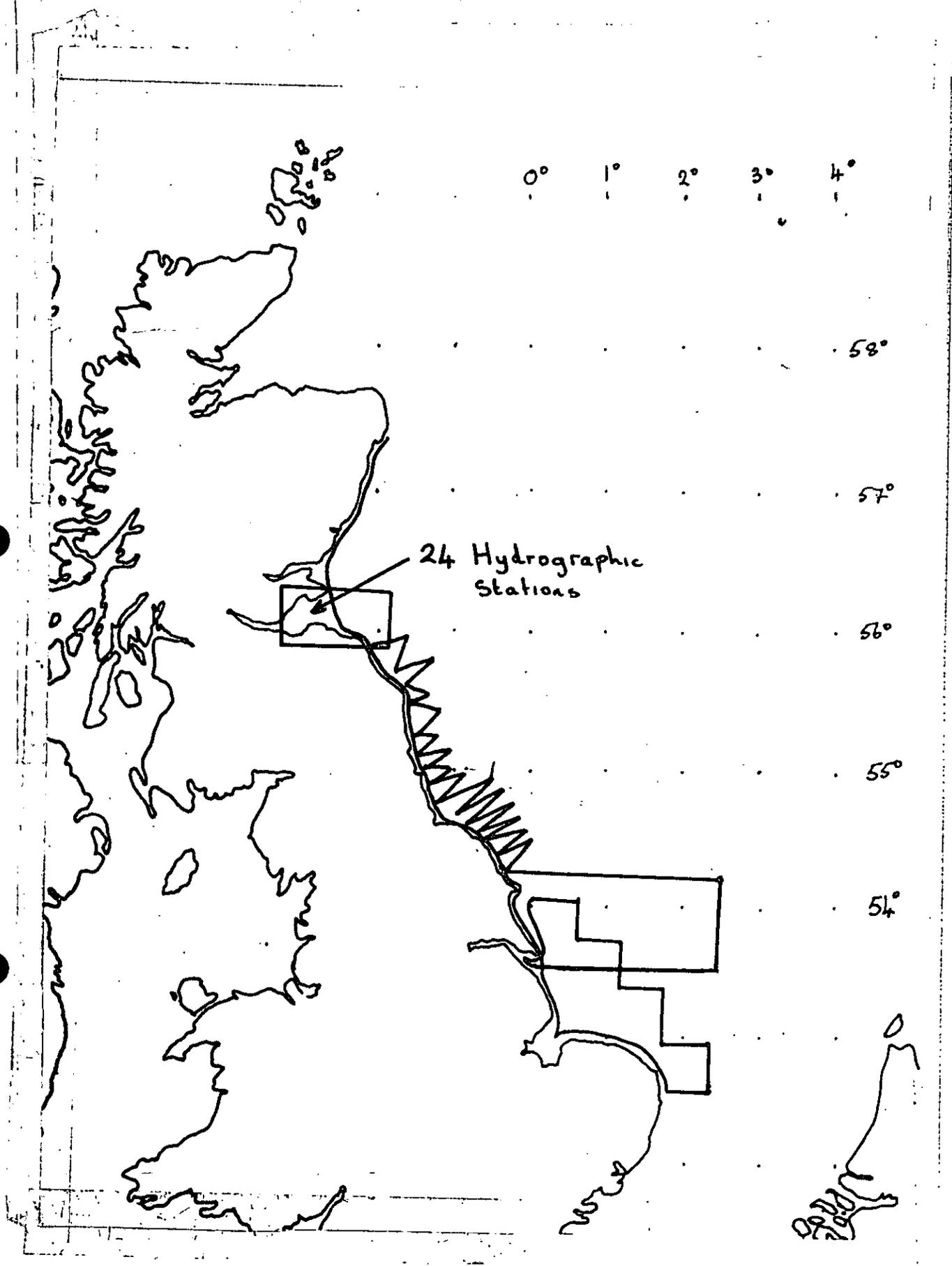
P W Balls

1 August 1983



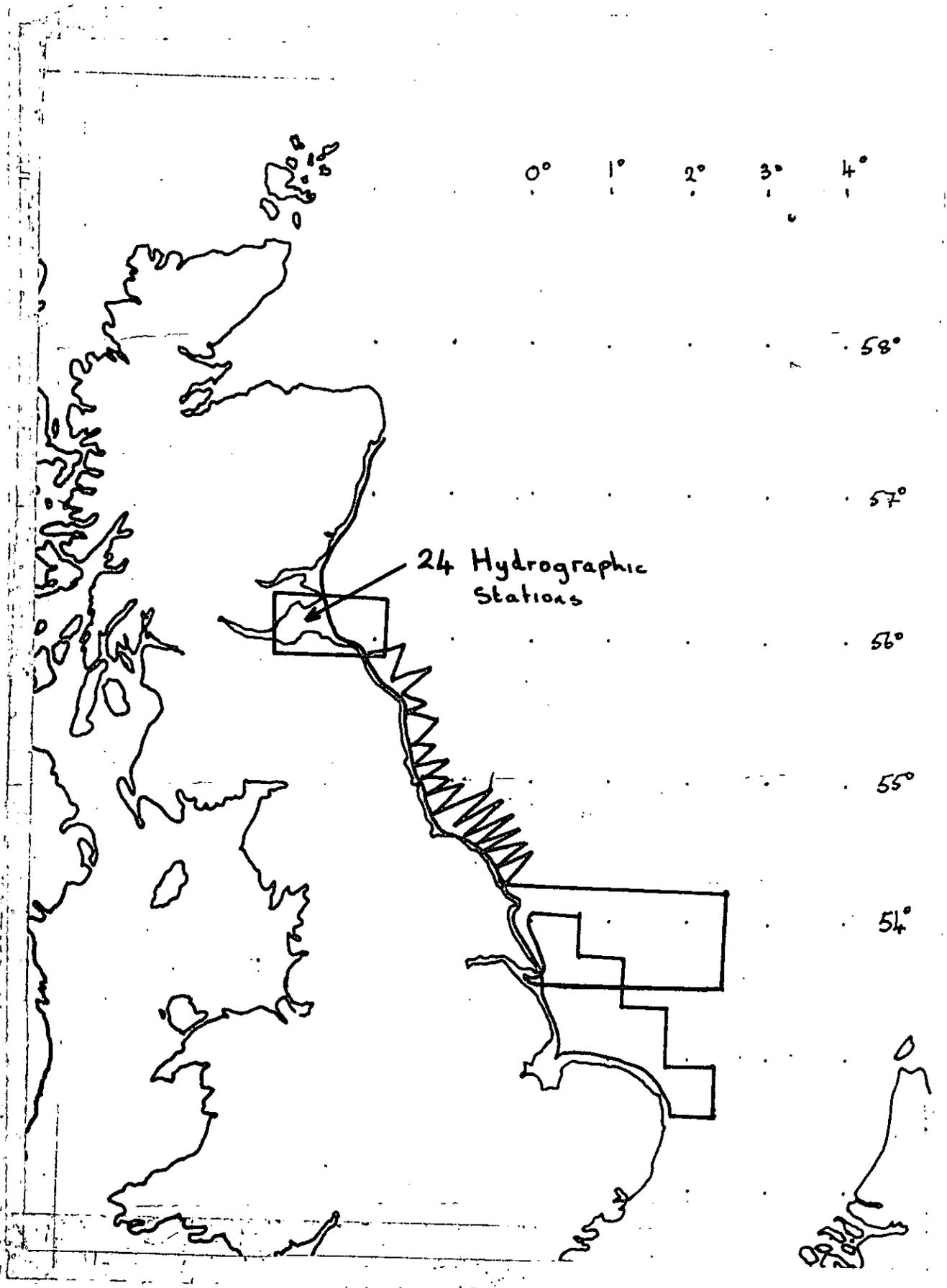
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