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MINISTRY OF AGRICULTURE, FISHERIES AND FOOD
CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE

1998 RESEARCH VESSEL PROGRAMME

REPORT: RV *CIROLANA*: CRUISE 3a

STAFF:

H L Rees (SIC)
C Allchin
D S Limpenny
S Boyd
P Hudson
M Pendle
R Hamer
S Cliffe
W Meadows (p/t)
J Read (p/t)
G Ryan (WS Oceans Ltd, p/t)

DURATION:

Sailed Lowestoft 2355h 30 May, docked Swansea 1400h 17 June

LOCALITY:

North Sea/English Channel/Celtic Sea

AIMS:

1. To conduct further scientific sampling at an experimentally dredged area off the Norfolk coast, using grab and side-scan sonar in order to establish the time required for recovery of the sea bed fauna.

2. To sample horse-mussels from the Humber/Wash area for later analyses of contaminants in flesh.

3. To sample representative offshore NMP locations using grab, core and trawl, and to collect core samples for PCB and PAH analysis.

4. To sample representative offshore NMP locations for nutrients and chlorophyll.

5. To sample the sediments and benthos off the Tyne for time-series studies using grab, core and beam trawl, including extra sampling at the sewage-sludge disposal site.

6. To survey dredged material disposal sites at Roughs Tower (outer Thames estuary: including a proposed new site nearby), Tyne , Tees and Nab Tower (Isle of Wight) using grab, underwater camera and acoustic methods.

7. To collect sediment samples at the Tyne and Tees maintenance dredgings sites for TBT analysis.

8. To collect sediments and fish from Tees Bay and elsewhere for flame-retardant chemicals.

9. To conduct surveys at aggregate extraction sites off Lowestoft and the Isle of Wight using grab, beam trawl, dredge and acoustic techniques.

10. To conduct a survey of the benthos and sediments at the Thames sewage-sludge disposal site.

11. To service moorings for smart biophysical sensors in the Thames.

12. To sample a grid of stations in the vicinity of the dredgings disposal site in Swansea Bay for PCBs in sediments.

13. To obtain meiofauna samples at inshore muddy sites near to major estuaries.

14. To collect sediment, water and fish samples for nonylphenols at various disposal and NMP sites.

NARRATIVE:

A cruise track is given in Figure 1.

On 30 May, samples of horse-mussels were collected off Cromer (aim 2) on the way to a location which was experimentally dredged in 1992, where five Hamon grabs were collected there and at a nearby reference site (aim 1). A side-scan survey of the dredged area was conducted before sailing to NMP 345 (off Humber) where Day grabs were taken for trace contaminants and the benthic fauna (aim 3). Meiofauna samples were also collected using a multi-corer, followed by water samples for nutrients/chlorophyll (aim 4) and trace contaminants (aim 14). After collection of an epifauna sample using a 2 m beam trawl, *Cirolana* sailed to NMP 245 (off Tyne), where the same sampling procedures were followed (aims 3,4,14).

Two long-term monitoring sites were then worked at and to the south of the Tyne sewage-sludge disposal site (aims 5,14). On 2 June, a transect of stations through the Souter Point dredged material disposal site was sampled by Day grab for later analysis of TBT in sediments (aim 7), followed by the collection of four meiofauna cores in Marsden Bay (aim 13). Additional stations were then sampled for the benthic fauna and sediments near to the sewage-sludge disposal site, and at a reference site to the north (aims 5,14). During the

day, the ship participated in a short training exercise involving the winching on board of RAF personnel from a rescue helicopter.

On 3 June, sediment samples were collected by Day grab along a transect through the Tees dredgings disposal site for later analysis of TBT and other trace contaminants, followed by fish sampling using a 3 m beam trawl (aims 7,8,14). Water sampling in the Tees estuary was then carried out from the sea-rider (aims 8,14) which also picked up a 4th engineer before return. Following further 3 m beam trawl sampling (aim 8), *Cirolana* sailed to the Humber area, where horse-mussels were collected at the sewage-sludge disposal site on 4 June (aim 2).

The inshore part of a large grid of gravelly stations around the Cross Sands aggregate dredging area was completed by the afternoon of 5 June (aim 9). A short side-scan sonar and bathymetric survey was then conducted across a dredged area. A reference station to the east of Cross Sands was worked on 6 June for the benthic fauna, and for fish for stomach content analysis (aim 9). After further fishing at and to the south of Cross Sands, the ship sailed to Roughs Tower (outer Thames estuary) for sampling of the benthic fauna with a Hamon grab, and for a side-scan sonar and bathymetric survey of the existing dredgings disposal site (aim 6).

On 8 June, a series of Hamon and Shipek grab samples were collected around a proposed new maintenance dredgings disposal site to the east of Roughs Tower (aims 6,8,14), followed by completion of the side-scan sonar/bathymetry survey at the existing disposal site. A vertical image of sediments was also obtained along a line run with an EG and G sub-bottom profiler. A transect of Day grab samples was worked for the benthic fauna and sediments through the Barrow Deep sewage-sludge disposal site on 9 June (aims 8,10,14) followed by trawl sampling for fish in the Kings Channel (aims 8,14).

J Read and G Ryan then came aboard *via* a Harwich pilot vessel for servicing of moored sensors the following day (aim 11). On completion, they returned to shore by pilot vessel along with W Meadows, and *Cirolana* sailed overnight to the Isle of Wight area, commencing Hamon grab sampling for the benthic fauna on a grid of stations (aim 9) on 11 June. On completion, 2 m and 3 m beam trawls were deployed at selected stations on 13 June to obtain samples of the epifauna and fish (aim 9). The following day, a side-scan sonar and bathymetric survey of the Nab Tower dredgings disposal site was conducted (aim 6), and a 'drop' camera frame was then deployed here and at a nearby aggregate extraction area. *Cirolana* then sailed to Lyme Bay overnight, for sampling at a new NMP station to meet various objectives (aims 3,4,14). On 16 June, NMP 605 (Celtic Deep) was sampled in the same way.

Samples of the benthic fauna and sediments for later contaminant analysis were collected at a proposed new dredgings disposal site off Milford Haven (extra aim). The ship then sailed to Carmarthen Bay where a meiofauna station was worked as a follow-up to earlier sampling in the immediate aftermath of the *Sea Empress* oil spill (extra aim). On 17 June, a transect of stations through the Swansea Bay dredgings disposal site was sampled for trace organic contaminants, including PCBs and nonylphenols, in sediments (aims 12, 14). After collection of meiofauna cores at an inshore muddy station (aim 13), *Cirolana* docked at Swansea at 1400h.

RESULTS:

Nine aims, together with two additions, were fully achieved, while a further 5 were achieved in part. Core samples for PCB/PAH analysis (aim 3) were, in the event, not required from this survey. Meiofauna cores were not collected at NMP 245 (aim 3) or as part of aim 5, due to adverse weather. Sea state also precluded the conduct of an acoustic survey at a Tyne dredgings disposal site (aim 6), and underwater camera work was confined to the Nab Tower disposal site. Inadequate numbers of fish for later stomach content analysis were collected at one station in the vicinity of Cross Sands and at three in the eastern Isle of Wight (aim 9), while only 2 of 4 meiofauna samples were collected from a station in Swansea Bay (aim 12). It is expected that a number of these aims will be completed during part b of the cruise.

Full results from most of the survey work conducted must await laboratory analysis of samples.

Side-scan sonar images at an experimentally dredged site off Norfolk (aim 1) confirmed that no physical evidence remains of the earlier (1992) activity. Figure 2 depicts the outcome of a bathymetric transect running from north to south across the western tip of a licensed aggregate extraction site (361) at Cross Sands. The lower graph shows the unprocessed bathymetry of the eastern line (where south is to the left) : the lowered segment about a third of the way along correlates with soundings taken within the licensed area, suggesting that this may be a consequence of intensive dredging activity. The survey was run with an Elac LAZ4100 bathymetric sounder, heave corrected with a TSS320 compensation system. The data were logged and plotted using a Geographix survey package with positioning input from gyrocompass and Sercel/Veripos DGPS.

A summary of the outcome of bathymetric work at the Roughs Tower dredgings disposal site (Figure 3) shows natural shoaling to the west, and a central shallower zone associated with ongoing disposal activity. Grab samples identified a variety of material at the site which could be related to known variability in the composition of dredged material currently deposited there. Further post-processing of the bathymetric data, along with side-scan records and other environmental data collected in the vicinity, will provide a clear picture of the status of this site prior to the planned disposal of several million tonnes of capital dredgings in the coming months.

Good quality images were obtained with the hired EG and G DF1000 digital fish from all locations surveyed, and the closely-spaced lines run at dredgings disposal sites will allow mosaicing using recently-acquired Triton Elics software.

A grid of 41 stations in the vicinity of the block of Cross Sands aggregate extraction licenses was successfully sampled using a 0.1m^2 Hamon grab for macrofauna and sediments (aim 9). Several grabs taken from stations north of the extraction block were found to contain a variety of macrofaunal taxa associated with living *Sabellaria* reef (Ross worm). In general however, very few encrusting organisms were encountered and this probably reflects the high-energy environment of the area. A station to the east of Cross Sands was identified as having a similar substratum to stations located within the dredging site. This eastern station will be used in future monitoring programmes as a reference site. Fish (mainly Dover sole

and whiting) were also collected from tows using a 3 m beam trawl. The stomach contents from sampled fish will be analysed to compare the feeding preferences of fish collected in an area known to be actively dredged with those caught 11km to the south of the licensed area. Samples taken from this survey will be analysed on return to the laboratory to investigate whether there are any cumulative environmental impacts of aggregate extraction in this area.

Fifty-eight stations were also sampled using a Hamon grab in an area to the SE of the Isle of Wight (aim 9). A wide range of both epifaunal and infaunal taxa were observed from grab samples at most stations, with several samples taken off Selsey Bill containing appreciable numbers of mussels (*Mytilus edulis*). However, grab samples taken from stations within the dredging licenses were notably less diverse than those collected nearby.

Sediment sampling in the vicinity of a proposed new location for the disposal of maintenance dredgings east of the Roughs Tower site (aim 6) revealed muddy coarse deposits typical of this region of the estuary.

Two moorings for biophysical sensors in the outer Thames estuary were successfully recovered, serviced and re-deployed (aim 11).

A sub-set of muddy NMP stations in areas of relative stability was successfully sampled for the second year (aim 3). .These are intended to contribute to a time-series of information on environmental quality status around the England and Wales coastline.

Additional sampling of the benthic fauna and sediments at the Tyne and Thames sewage-sludge disposal sites (aims 5, 10) was carried out in order to provide recent information on contaminant and biological status, for future comparison with conditions following cessation of disposal activity by the end of 1998.

H L Rees
18 June 1998

SEEN IN DRAFT: R Williams (Master)

R Graham (Senior Fishing Mate)

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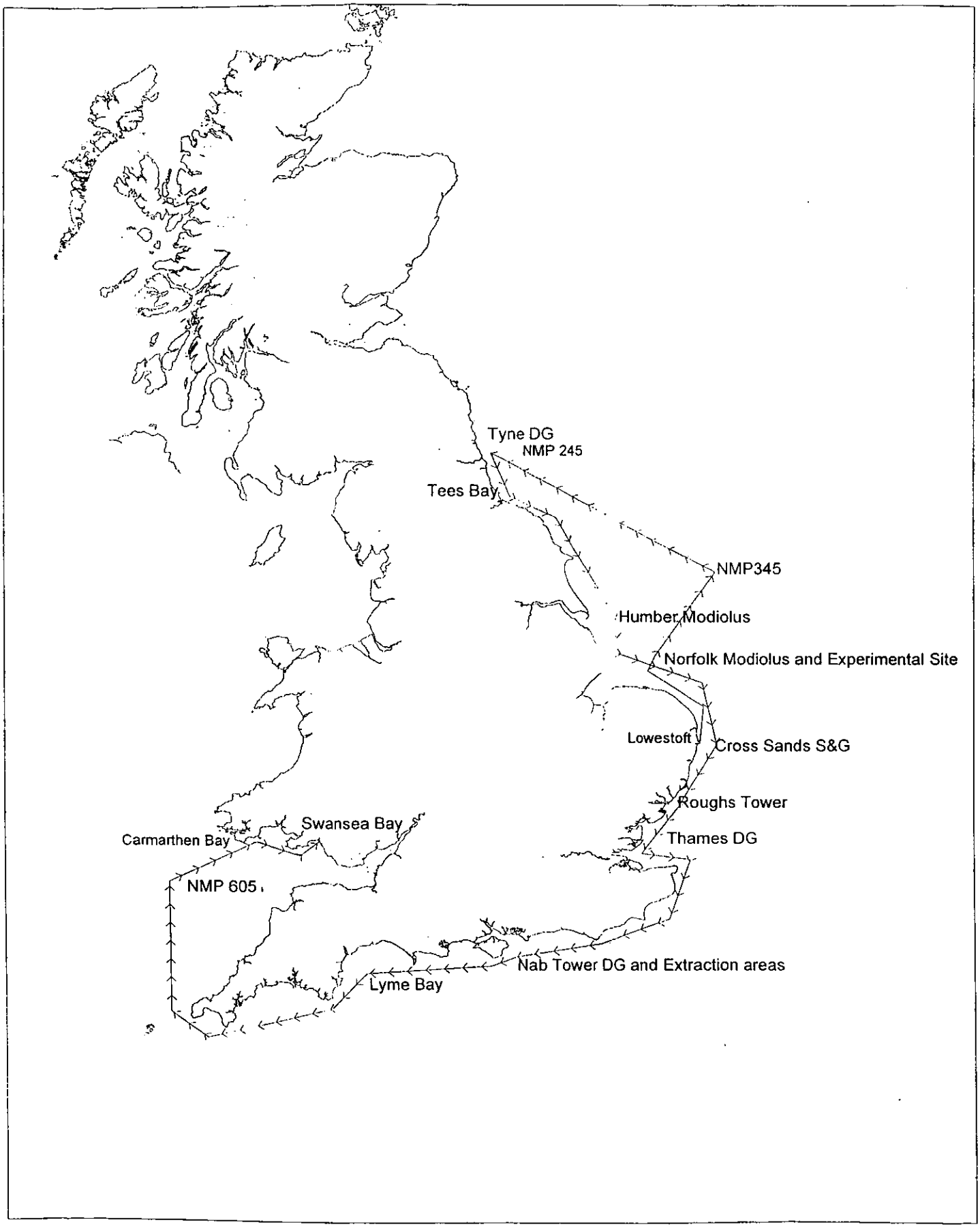
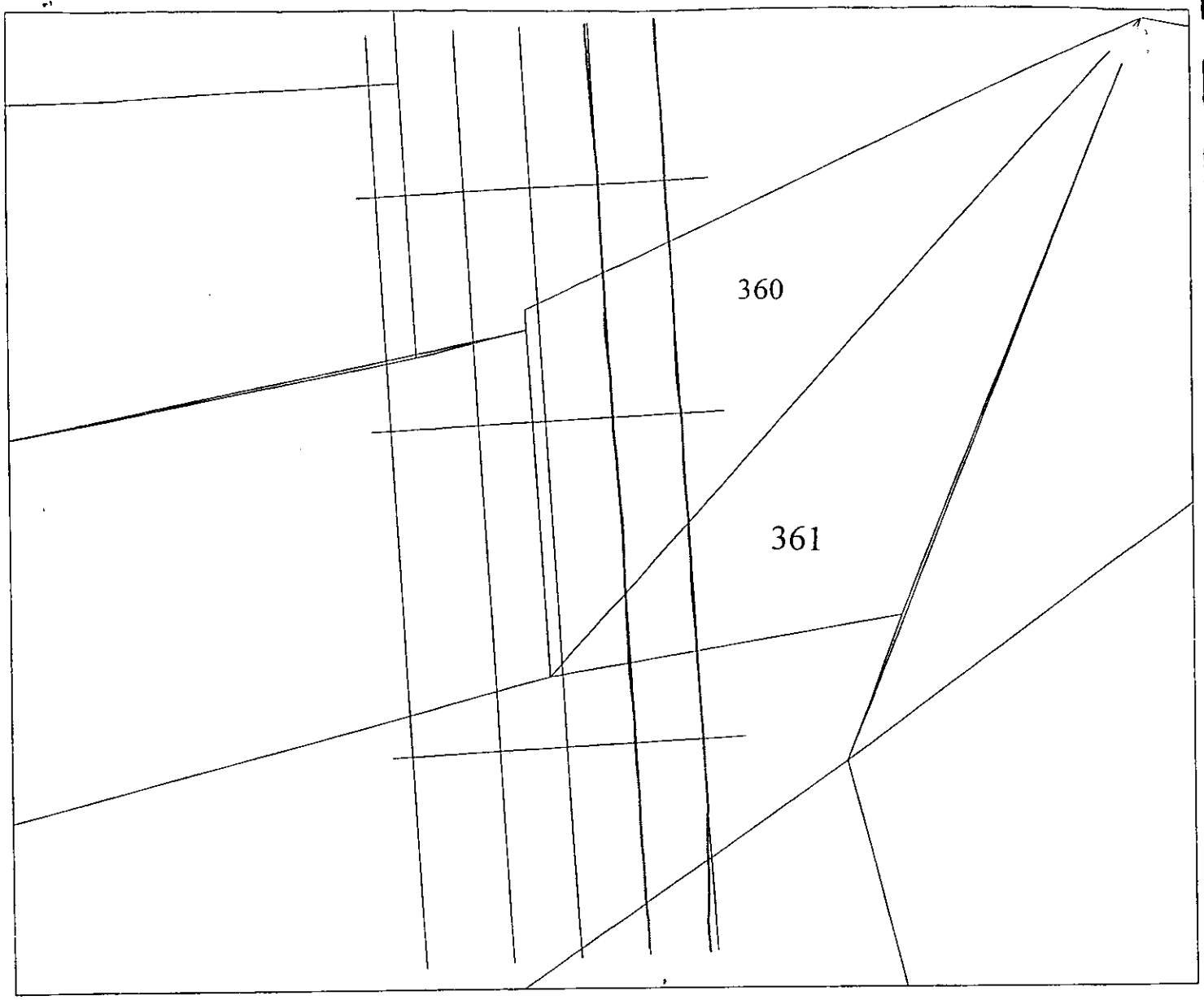
M Pendle
R Hamer
S Cliffe
W Meadows
J Read
A J Murray (Crown Estates Commission)

Figure 1: Cruise track of Cirolana 3a/98





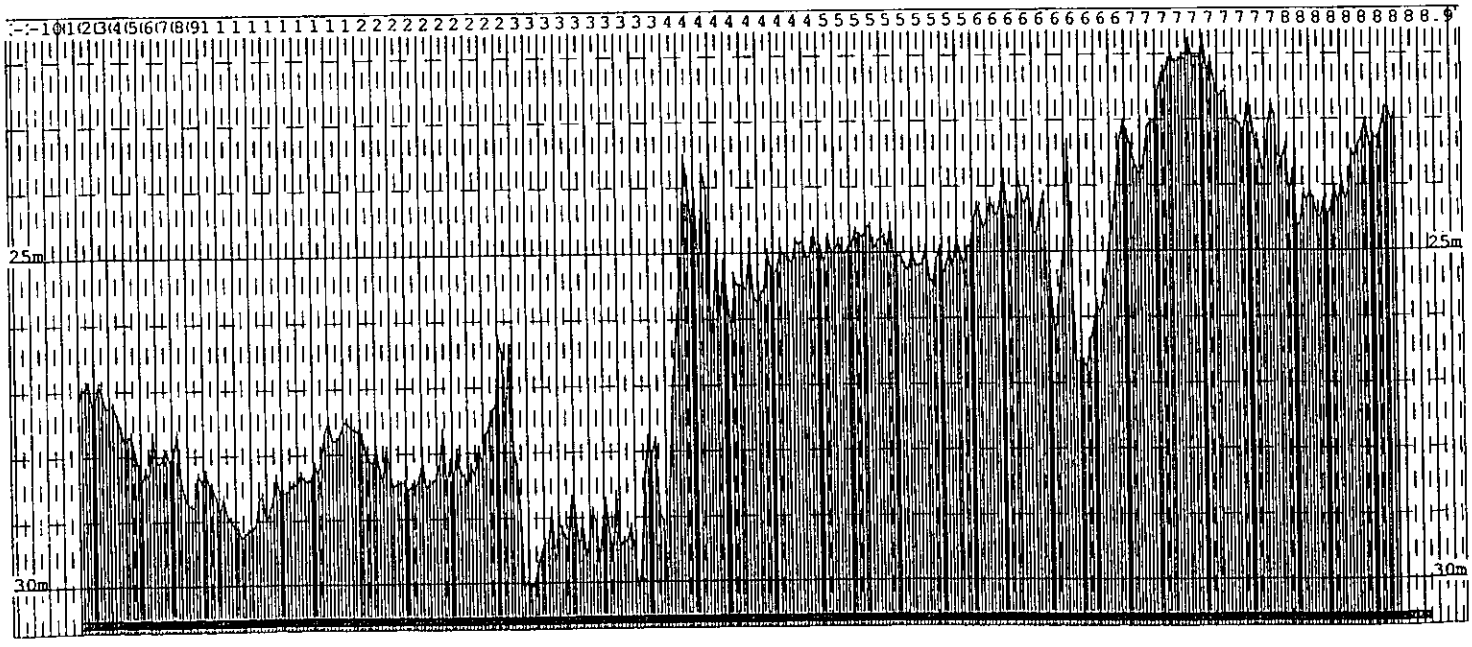
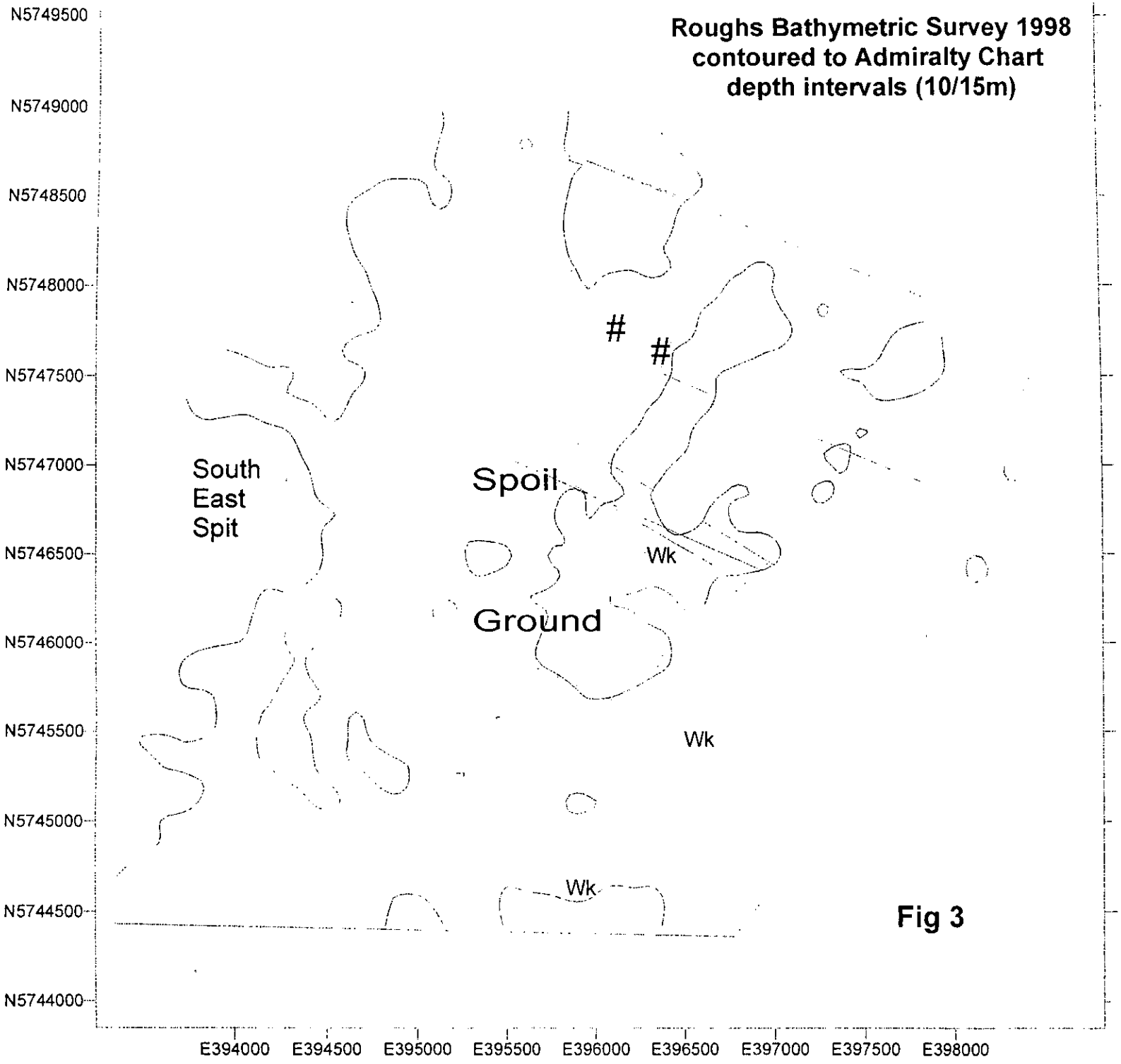


Figure 2		*Date:*	*6-Jun-98*
Port 1 Scale:	*55845*	*Cross Sand extraction site*	
Port 2 Scale:	*1000 H 21321045 V*	*Bathymetric transect*	


Roughs Bathymetric Survey 1998
contoured to Admiralty Chart
depth intervals (10/15m)
N5749500
N5749000
N5748500
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N5746500
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E394000
E394500
E395000
E395500
E396000
E396500
E397000
E397500
E398000
South
East
Spit
Spoil
Ground
Wk
Wk
Wk
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Fig 3