

COAST3D Data Report - 3D Experiment, Teignmouth, UK

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**Report TR 119
April 2001**



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Summary

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This report (Whitehouse, R.J.S and J. Sutherland, 2001. COAST3D data report - 3D experiment, Teignmouth, UK. HR Wallingford Report TR119) describes the measurements made as part of the COAST3D experiment at Teignmouth, South Devon, UK. As part of the core COAST3D activities the following survey activities were undertaken:

- Beach transect surveys, 6-monthly between 1995-1999
- Baseline site investigations, June 1998
- The COAST3D Pilot Study, 9 to 24 March 1999
- The COAST3D Main Study, 18 October to 26 November 1999
- Continuous monitoring of water levels, waves and currents, December 1998 through November 1999

The measurements made by the COAST3D field research team covered the following activities:

- Fluvial flow – gauging station results for fluvial inflow (provided by the Environment Agency)
- Meteorology – local meteorological conditions and UK Met. Office data
- Waves – wave parameters offshore and inshore
- Water levels – water levels at offshore, inshore and fixed stations
- Currents – mean currents and wave-orbital velocities
- Water properties – salinity and temperature
- Sediment properties – grain size distributions, USP RoxAnn sediment type,
- Sediment transport – OBS (Optical Backscatter Sensor), ABS (Acoustic Backscatter Sensor), pumped sampling, sandwave migration, bedload trap, fluorescent tracer
- Morphology – subtidal and intertidal bed levels, bed texture (Side Scan Sonar), small scale bedforms (ASRP; Autonomous Sand Ripple Profiler), LIDAR

More details of the COAST3D project are available at
<http://www.hrwallingford.co.uk/projects/COAST3D>

The data is all included in the COAST3D Teignmouth database available from HR Wallingford. The contents of the database is described.

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Contents

Title page	i
Contract - Research	iii
Summary	v
Field Partners	vii
Contents	ix

1.	General Introduction	1
1.1	Aim of the report.....	1
1.2	Site description	1
1.3	Activities and partners	2
1.4	Available equipment	3
1.4.1	Morphology	3
1.4.2	Process and sediment transport instruments	3
1.4.3	Other measurements	4
1.4.4	Sediment sampling.....	4
1.4.5	Time base.....	4
1.4.6	Data availability	4
2.	Baseline Study	5
2.1	Morphology	5
2.1.1	Subtidal zone	5
2.1.2	Intertidal zone	5
2.2	Process measurements	5
2.3	Other activities	6
2.3.1	Grab samples	6
2.3.2	Sediment type	6
2.3.3	Water samples.....	6
3.	Pilot Study.....	6
3.1	Boundary conditions	7
3.2	Morphology	7
3.2.1	Subtidal zone	7
3.2.2	Intertidal zone	8
3.2.3	Argus.....	8
3.3	Process measurements	8
3.3.1	Subtidal nearshore.....	8
3.3.2	Bottom mounted ADP	9
3.3.3	Other current measurements	9
3.3.4	Intertidal zone	9
3.4	Other activities	10
3.4.1	Grab samples	10
3.4.2	Vessel Mounted ADP	10
4.	Main Study.....	10
4.1	Boundary conditions	10
4.2	Morphology	11
4.2.1	Subtidal zone	11
4.2.2	Intertidal zone	12
4.2.3	Argus.....	12
4.3	Process measurements	12

Contents continued

4.3.1	Subtidal nearshore	12
4.3.2	Bottom mounted ADP	13
4.3.3	Intertidal zone	13
4.4	Other activities.....	13
4.4.1	Bed sampling	13
4.4.2	Side scan sonar	13
4.4.3	Drogue tracking	13
4.4.4	Vessel Mounted ADP	14
4.4.5	Pump sampling results.....	14
4.4.6	Scour monitors.....	14
4.5	Summary of available data	14
5.	Continuous Monitoring.....	14
5.1	Water levels, waves and currents.....	14
5.2	Beach profiles	15
5.3	Fluvial inflow	15
6.	Data Availability.....	15
7.	Acknowledgements.....	15
8.	References	16

Tables

Table 1	Teignmouth pilot study measurements
Table 2	Teignmouth main study measurements
Table 3	Bar chart of activities in the main study

Figures

Figure 2.1	Bathymetric survey 3-7 June 1998 (HR1 06/98) with locations of long-term beach monitoring profiles (N, C, S)
Figure 2.2	Beach profiles during June 1998 (locations on Figure 2.1)
Figure 3.1	COAST3D Teignmouth - layout of equipment during the pilot study (March 1999)
Figure 3.2	Pilot study time series of meteorology (item 34), water levels (items 8, 11) and river inflow (item 31) - provided by the Environment Agency
Figure 3.3	Pilot study time series of wind speed and direction (item 34), water level (item 8), and wave height and period (item 26)
Figure 3.4	Pilot study time series of easterly and northerly components of current U-V at the boundaries of the study box (items 6, 32 and 33)
Figure 3.5	Pilot study bathymetric survey no. 1, 12-13 March 1999 (HR2 03/99)
Figure 3.6	Pilot study bathymetric survey no. 2, 24 March 1999 (HR3 03/99)

Contents continued

- Figure 3.7 Evolution of the beach topography from the Pilot Study (22-24 March 1999) to the end of the Main Study (23-25 November 1999). Figure supplied by Dr F. Levoy, University of Caen
- Figure 3.8 Pilot study example beach profiles, 12 March (compare Figure 2.2)
- Figure 3.9 Pilot study time series currents U-V (items 25, 18A, 21A)
- Figure 3.10 Pilot study time series water depth, wave height, currents U-V and sediment fluxes both in the wave direction and perpendicular to the wave direction (item 18A)
- Figure 3.11 Pilot study time series wave height and significant orbital velocities under wave crest and wave trough (items 25, 18A, 21A)
- Figure 4.1 COAST 3D Teignmouth – layout of equipment during the main study (October/November 1999)
- Figure 4.2 Main study meteorology (item 34 - with data supplied by the UK Met. Office), water levels (items 8, 11) and river inflow (item 31) - provided by the Environment Agency
- Figure 4.3 Main study time series of wind speed and direction (data supplied by the Met. Office), water levels (item 8, 11), wave height, period and direction (item 7)
- Figure 4.4 Main study time series currents U-V at items 4, 6, 32, 33, and 29
- Figure 4.5 Main study bathymetric survey no. 1, 27-28 October 1999 (HR4 10/99)
- Figure 4.6 Main study bathymetric survey no. 2, 6-8 November 1999 (HR5 11/99)
- Figure 4.7 Main study bathymetric survey no. 3, 16-17 & 19 November 1999 (HR 6 11/99)
- Figure 4.8 Main study bathymetric survey no. 4, 24-25 November 1999 (HR 7 11/99)
- Figure 4.9 Evolution of the beach topography during the Main Study (from 25-27 October 1999 to 23-25 November 1999). Figure supplied by Dr F. Levoy, University of Caen
- Figure 4.10 Main study example beach profiles (compare Figures 2.2, 3.8)
- Figure 4.11 Main study time series currents U-V (items 3A, 23, 27)
- Figure 4.12 Main study time series water depth, wave height, currents U-V and sediment fluxes both in the wave direction and perpendicular to the wave direction (item 18A)
- Figure 4.13 Main study time series wave height and period and significant orbital velocities under the wave crest and wave trough (items 3A, 18A, 21A)
- Figure 4.14 Main study time series wave height and significant orbital velocities under the wave crest and wave trough (items 9, 2, 20A)
- Figure 4.15 Main study map showing distribution of bedforms (figure provided by Prof. J. Lanckneus/Dr V. van Lancker, Magelas)
- Figure 4.16 Main study drogue tracks for ebbing spring tide, 29 October 1999 (HW+0:22 hrs to HW+1:22 hrs)
- Figure 4.17 Main study drogue tracks for ebbing spring tide (HW +1:28 hrs to HW+2:16 hrs)
- Figure 4.18 Main study drogue tracks for ebbing spring tide (HW+2:26 hrs to HW +2:59 hrs)
- Figure 4.19 Main study transects for Vessel Mounted ADP surveys

Contents continued

Figure 4.20 Main study locations at which water depths were measured
(bathymetry from Figure 4.5)

Figure 4.21 Main study locations at which wave parameters were measured

Figure 4.22 Main study locations at which time-averaged currents were
measured

Figure 4.23 Main study locations at which wave orbital velocities were
measured

Figure 4.24 Main study locations at which sediment concentration parameters
were measured

Figure 5.1 Time series water levels, wave height, RMS orbital velocity,
current speed, water temperature (item 15) and river inflow (item
31 - provided by the Environment Agency)

Figure 5.2 Time series beach levels (profile locations Figure 2.2)

Plates

- Plate 1 The Teign Estuary and nearshore looking north east. Photograph
taken 14 June 1999. Copyright South West Water
- Plate 2 Teignmouth during the pilot study; the nearshore banks at low tide on
3 March 1999 (top) and the beach on 16 March 1999 (bottom)
- Plate 3 Teignmouth during the main study; the nearshore viewed from the
north on 15 November 1999 (top) and the beach and nearshore banks
at low tide on 24 November 1999 (bottom)

Appendices

- Appendix 1 Bathymetric survey
- Appendix 2 Log of activities in pilot study
- Appendix 3 Log of activities in main study
- Appendix 4 Contents of Teignmouth pilot study database
- Appendix 5 Contents of Teignmouth main study database

1. GENERAL INTRODUCTION

Teignmouth, on the south coast of Devon, UK was chosen by the COAST3D project as a complex 3-dimensional coastal site at which to undertake measurements of morphological change and the associated coastal processes (Soulsby, 1998a, 1998b).

After a review of existing information, and performing monthly beach surveys over a 6-month winter period at a number of candidate sites, Teignmouth was found to exhibit both the greatest 3-dimensionality and the greatest morphodynamic variation of the sites considered. It also had good access and logistical considerations.

As part of the core COAST3D activities the following survey activities were undertaken:

- Beach transect surveys, 6-monthly between 1995-1999 (partner: UPI)
- Baseline site investigations, June 1998 (partner: HRW)
- The COAST3D Pilot Study, 9 to 24 March 1999
- The COAST3D Main Study, 18 October to 26 November 1999
- Continuous monitoring of water levels, waves and currents, December 1998 through November 1999 (partner: HRW)

The Teignmouth study operated over the area between Shaldon Bridge, which crosses the estuary about 1 km from the mouth (Plate 1), and a distance 1 km offshore of the beach (about –6 m below Chart Datum). The experimental box was about 1.5 km long with its offshore boundary running more or less parallel to the coastline.

1.1 Aim of the report

The aim of this report is:

- (a) to provide a summary of the COAST3D work done at Teignmouth,
- (b) to describe the validation, calibration and basic analysis of the data,
- (c) to present examples of the calibrated and validated data, and
- (d) to indicate how the data can be obtained for third party use.

More details of the data interpretation can be found in the report COAST3D (2001)

1.2 Site description

The town of Teignmouth is situated on the north side of the mouth of the Teign Estuary (Figure 2.1; Plate 1). Plate 1 shows the site in June 1999, i.e. between the Pilot and Main Studies.

Teignmouth has a busy commercial port and local fishing fleet and is a popular location both for beach users and watersports users (surfing, sailing, powerboats, and jetskis). The shoreline is irregular with a 2km long beach. The beach is groyned and backed by sea defences, the present seawall dates from 1977. There is a 100-year old leisure pier situated mid-way along the beach in front of the town. The orientation of the site to the prevailing wind means that infrequent winds from the north-east quadrant are responsible for generating storm waves ($H_{m0,hr}$) of at least 1.5 m height and period ($T_{0,2hr}$) around 5 to 6 seconds. The rest of the time there can be low swell wave activity at the site.

The mean tidal range is 1.7 m on neaps and 4.2 m on springs. Tidal currents at about 0.4 km and 1 km offshore generally do not exceed 0.3 ms^{-1} , except where the estuary outflow through the nearshore banks results in locally enhanced values in excess of 0.5 ms^{-1} 1 km from the shore (Whitehouse et al, 2000).

The mouth of the Teign Estuary is situated at the southern end of the beach; the River Teign provides the main fluvial input into the estuary. The estuary channel is sinuous in the lower 1 km as it passes to the north of a large intertidal area ("The Salty"). The exchange of water through the narrow estuary mouth, approximately 130 m wide at mid-tide, results in locally high spring tide near-bed current speeds of at least 1.5 ms^{-1} which are sufficient to maintain a deep scoured channel floored by a mixture of stones and gravel interspersed with some fine sand. On its southern side, the channel outside the estuary mouth is constrained by a training wall and a rocky headland ("The Ness"). On the north side of the estuary mouth there is a sand spit ("Denn Point") and situated outside the estuary there is a cobble pavement overlain by "Spratt Sand", a persistent deposit of sand, which is morphologically active and covered by sandwaves.

The channel cutting through the ebb shoal extends to about 1 km from the estuary mouth and has a sand bar at its seaward extent. The ebb shoal, the bar and associated nearshore banks ("Poles") are morphologically active. The nearshore banks circulate in an anti-clockwise direction with a cycle time of between 3 and 5 years, maximum 7 years (Robinson, 1975). The presence of the nearshore banks and their mobile nature present a hazard to navigation. For this reason the ebb tidal shoal formed outside the estuary is dredged more or less daily with a small plough dredge operated from a tug to maintain navigability (visible in Plate 1). Despite this the sands can be treacherous and ships occasionally run aground on the ebb shoal requiring assistance, as happened for example in December 1998 and April 1999.

The beach and nearshore bank system comprises mixed sediments (sand and gravel) and the sediment offshore is fine sand. Photographs of the site during the pilot study are shown in Plate 2 and during the main study in Plate 3.

From the British Geological Survey Seabed Sediments Chart (1:250,000 scale) for Portland (publ. 1983) there is some information about sediment thickness. There are no samples close in to Teignmouth (the closest is at the 15 m isobath). The sediment thickness given on a 1:1,000,000 inset map is shown as lying in a band of 1 to 5 m along the whole frontage of Teignmouth. There is also given (imprecisely at this scale) a submerged cliff line running parallel to the coast (within 1 km of the coast) both north and south of the location of the estuary ebb shoal. No evidence for this feature was encountered within the COAST3D survey.

1.3 Activities and partners

The activities during the pilot and main studies included:

- Repeat surveys of the beach and nearshore morphology ranging from the broad scale, through to individual beach profiles, intertidal bedforms to swash morphology
- Measurements of sediment transporting processes on the beach and offshore
- Measurements of wave conditions, currents and water levels, and the beach water table level
- Measurements of meteorological conditions
- As well as sediment sampling, sediment trapping and pump sampling, high frequency acoustic measurements of suspended sediment, tracer experiments, bedform mapping, sediment classification, autonomous bed level and ripple sensors, and video and radar imaging of the nearshore region

During the baseline survey the morphology of the local offshore and nearshore area, including the estuary mouth, was mapped and the seabed sediments were classified. Continuous monitoring was also carried out comprising repeat beach profiling and waves, currents, water levels, temperature and turbidity. The discharge of the River Teign, the main tributary for the estuary, was provided by the Environment Agency from their gauging station inland.

The field partners for the 3D Teignmouth study are listed below:

No	Code	Name	Nationality
1	HRW	HR Wallingford	UK
2	UU	Utrecht University	NL
3	UPI	University of Plymouth*	UK
4	POL	Proudman Oceanographic Laboratory	UK
5	Uca	University of Caen	FR
6	Mag	Magelas BV	BE
		*Institute of Marine Studies IMS and Department of Civil and Environmental Engineering CE	

1.4 Available equipment

1.4.1 Morphology

The HRW survey vessel mv “Sir Claude Inglis” (15.7m LOA x 4.3m beam x 1.4m draft) was used for all the data collection and deployment of most instrumentation in subtidal locations. The Master of the vessel, given good sea conditions, took the vessel into 1.5 to 2m water depths in sandy areas.

The main bathymetry area was surveyed at 25m intervals generally normal to the coastline, totalling 61 NW to SE lines (T1-T61). The size of the study area was approximately 1.5 x 1.0 km with the long side parallel to the coastline. The study area was centred on “The Bar” which is the seaward entrance to Teignmouth Harbour. There were 3 cross check lines equi-spaced through the area at 250m intervals, as well as random “zigzag” lines in the main channels both in and outside the estuary. The detailed configuration for each survey is discussed in Whitehouse et al (2000).

Intertidal data were collected using a variety of conventional land surveying techniques (e.g. Geodimeter 440 Total Station, optical level etc) by UPI IMS, UU, HRW. In addition repeat surveys of the intertidal area were made using a DGPS system by UC – manually deployed for spot heights or on a 4-wheeled Quad bike.

All topographic and bathymetric data was tied into known reference points (OSGB) and Admiralty Chart Datum (ACD for Teignmouth approaches = 2.65 m below Ordnance Datum Newlyn), approximately the local level for the Lowest Astronomical Tide. True North is the standard northpoint for the Teignmouth study unless otherwise stated. Details of the corrections between northpoints at the time of the study were presented in Appendix 2 of Whitehouse et al (2000) also repeated here in Appendix 3.

In addition (hourly) remote sensing of the nearshore area showing the morphology clearly at low tide in daylight hours was provided by the ARGUS video imaging system developed by Oregon State University (<http://cil-www.oce.orst.edu:8080/>) and set up at Teignmouth in conjunction with UPI IMS.

1.4.2 Process and sediment transport instruments

Process and sediment transport time series were obtained using the following equipment types deployed in varying combinations on bed mounted frames. Most of the data stored as time averaged quantities has one value per hour, time series data has more than one value per hour depending on the sampling frequency and sampling regime.

ABS	Acoustic Backscatter Sensor	Time series sediment suspension
ADP	Acoustic Doppler Profiler	Time averaged current profiles
ADV	Acoustic Doppler Velocimeter	Time series wave and current velocities

ASRP	Autonomous Sand Ripple Profiler	Time series bed level profiles
BWT	Beach WaterTable *	Time series (* pipes inserted in beach)
EMF	ElectroMagnetic Flowmeter	Time series wave and current velocities
OBS	Optical Backscatter Sensor	Time averaged sediment concentration
PT	Pressure Transducer	Time series pressure (water depth)
TT	Tell-Tail scour monitor	Time series bed level

Generally the analysis of all process time series followed the standard procedure adopted in the COAST3D project, into high frequency (0.05 to 0.33 Hz) and low frequency (0.004 to 0.05 Hz) bands.

1.4.3 Other measurements

Other measurements were taken to characterise the wave and current conditions in the survey area. Two of the pressure transducers were installed on fixed structures to allow for accurate determination of water levels.

ARG	ARGUS	Time averaged daylight video images
CAP	CAPacitance wire wave probe	Time averaged
MET	METeorological conditions	Time averaged
PT	Pressure Transducer	Time series pressure (water depth)
RGS	River Gauging Station	Time series river discharge
WRB	Waverider buoy	Time averaged wave parameters (hourly)
XB	X-Band radar	Time averaged synoptic wave field

It should be noted that the WRB has standard settings for filtering the data of 0.033 and 0.60 Hz which differs from the COAST3D procedure adopted above (Section 1.4.2). The influence of this is discussed with reference to data obtained in the main study (Section 4.1).

1.4.4 Sediment sampling

Bed sediment samples were taken using a 2 litre Van Veen grab, or manually in the intertidal zone. High definition digital sidescan sonar (dual frequency GeoAcoustics system with 410 kHz used) provided information on bed texture (bedforms) and the USP RoxAnn sediment classification system was operated from a Koden CVS106 colour 120kHz echo sounder.

1.4.5 Time base

The time base for the survey work was GMT (Greenwich Mean Time). The time series data is stamped with the COAST3D “burst number”. Burst number 1 corresponds to 01:00 hrs GMT on 1 October 1997. All hours have been numbered consecutively and some relevant numbers are tabulated below. Data presented at a greater frequency than once per hour are designated with a sub-burst number (decimal).

COAST3D burst numbers

Date	Time	Burst number	Comment
01/10/97	01:00	1	Day 1 of COAST3D project
01/12/98	12:00	10236	Start of continuous monitoring data
09/03/99	12:00	12588	Start Teignmouth Pilot Study
24/03/99	12:00	12948	End Teignmouth Pilot Study
18/10/99	12:00	17940	Start Teignmouth Main Study
26/11/99	12:00	18876	End Teignmouth Main Study

1.4.6 Data availability

The data obtained from these instruments and further information on the techniques are available in the COAST3D Teignmouth database (see Section 6), in other COAST3D publications (e.g. COAST3D, 2001) and from the field partners. The ARGUS data is available from OSU (see Section 1.4.1).

2. BASELINE STUDY

The baseline survey provided detailed information of the nearshore morphology to assist in planning the subsequent experimental work.

2.1 Morphology

2.1.1 Subtidal zone

Survey id	Dates	Survey	Comment	Partner
HR1	3-7 June 1998	Baseline survey	Complete survey	HRW

A full bathymetric survey of the study area was completed (Section 1.4.1 and Appendix 1).

Positioning was achieved with a Trimble 4000RL/4000DL mobile DGPS survey navigation system, fitted with Everest Option multi-path rejection firmware, was used on the survey vessel for the calculation of all positions at sea. Data was logged at 1 Hz and the system was used in Lat/Long/Height mode.

A Trimble 4000RL receiver was located at a reference station (DGPS 1) on the Denn Point Car Park adjacent to the seafront at Teignmouth. This provided the GPS differential corrections for the mobile unit on the vessel. The position accuracy was generally better than 2m (Whitehouse et al, 2000).

This survey provided baseline information for planning the work scheduled to take place in 1999. The chart produced (Figure 2.1) showed the structure of the ebb tidal shoal and associated nearshore bathymetry. The estuary channel is prominent and the bank features Spratt Sand, East Pole Sand and Pole Sand, at the offshore edge of the ebb shoal, are evident. Outside the influence of the ebb tidal shoal the surrounding seabed has a gentle slope with relatively parallel contours.

2.1.2 Intertidal zone

Survey id	Dates	Survey	Comment	Partner
HR1	3-7 June 1998	Baseline	Topographic survey	HRW
13/05/98	13 May 1998	Baseline	Beach profiles N, C, S	UPI IMS
12/06/98	12 June 1998	Baseline	Beach profiles N, C, S	UPI IMP

Some additional topographic data was collected from East Pole Sand and the beach to the east, south and southwest of the car park at the Point. These data have been patched into Figure 2.1.

UPI IMS also carried out beach profiling along the transects marked N(orthern), C(entral) and S(outhern) on Figure 2.1. The data for June 1998 are plotted in Figure 2.2. The profiles clearly show the steep upper beach (slope around 1:10) and the lower gradient low tide terrace. The central transect shows the presence of the nearshore bank East Pole Sand and that it is migrating onshore.

2.2 Process measurements

The only process monitoring undertaken during this survey was of the tidal levels (instrument items 8 and 11, Figure 3.1), on Teignmouth Pier and in the estuary at New Quay. The typical resolution was 1 or 2mm, providing accuracies of around 5mm or better. The New Quay unit averaged over 20 seconds, and The Pier averaged over 180 seconds. The longer averaging period was more effective at removing swell and waves, and all averages were corrected and time stamped at the centre time of the average.

Both automatic systems were installed near to a standard HRW tide board. The board at Teignmouth Pier was fitted with a stilling tube to damp out waves and swell. Both boards were levelled by land survey closed loop traverse to the same two nearby OSBM's. These OSBM's were also the source for the beach survey heights, and co-ordinated control points installed along the promenade close to the sea wall edge.

Full details of the OSBM's used are given in Appendix 3. At both sites tide board readings were taken from LW to HW to calibrate the Hydrotides for local seawater density difference, with additional twice-daily readings when possible to monitor each unit's performance.

It is estimated that in calm weather the water levels were recorded to an accuracy of 0.03m or better.

2.3 Other activities

2.3.1 Grab samples

Fifty seabed grab samples were collected for visual analysis and to aid calibration of the RoxAnn system. A 2 litre Van Veen galvanised grab, lowered by hand to the seabed, was used to recover seabed samples comprising mainly sand. Some stones were recovered near to the channel entrance bar. Visual descriptions were made of all samples and sieve analysis carried out on twenty-five selected samples. The data is presented in Whitehouse et al (2000).

2.3.2 Sediment type

USP RoxAnn data in the form of "E1" roughness and "E2" hardness, from a Koden CVS106 colour 120kHz echo sounder, was recorded at 0.33 Hz (max depth 80m, range scale 0-160m, gain 13). The transducer from the Koden was mounted through the hull on the port side of the vessel amidships. The "E1" and "E2" data were calibrated by visual identification of the seabed grab samples taken in the survey area.

The sediment was classified as one of:

- Fine sand - FS
- Medium sand - MS
- Coarse sand - CS
- Stones - ST
- Sand and stones - SST
- Rock - R

The survey provided a good determination of the sediment characteristics over the study area, confirming the broad occurrence of fine sand offshore. The results (presented in Whitehouse et al, 2000) showed there was a coarsening of the bed material in the area of the shallow intertidal banks and inshore from about -1 m depth contour at the beach to the north of the pier.

2.3.3 Water samples

Some water (bottle) samples were taken in the water column but these showed negligible sediment concentration in and around the ebb tidal shoal and in the wake of the tug dredger.

3. PILOT STUDY

Planning for the Pilot Study was completed in the period between October 1998 and February 1999. The trial version of the work programme was issued in 26 February 1999. The experiment was set up on the basis of three main transects to facilitate examination of the cross-shore and long-shore processes, and gradients in processes, and to provide data for the validation of computational models. Because of the complexity of the area, the two cross-shore transects (North and South) were selected as the basis of two contrasting linear arrays, one in the relatively open coast to the north and the second in the area where the 3-d effects were expected to be greatest. The shore-parallel East transect was added to provide information in the alongshore direction. Other measurements were made at discrete beach and nearshore locations. The transects and instrument coverage are shown in Figure 3.1.

The pilot study at Teignmouth was designed to test the design of the measuring concept and check a subset of the instruments and procedures under realistic field conditions. The complete inventory of equipment and parameters measured are listed in Table 1.

3.1 Boundary conditions

Boundary conditions measured were as follows:

- Local meteorological conditions (item 34). The meteorological station was operational between 4 March and 26 March 1999 in an exposed position at the offshore (SE) end of Teignmouth Pier (OSGB grid reference 294371mE, 72642mN), at a height of 7.8m above mean sea level or 10.55m ACD. This unit returned data values every 15 minutes (Figure 3.2).
- Fluvial flow (item 31) – gauging station results for fluvial inflow of the River Teign (provided by the Environment Agency), Figure 3.2.
- Water levels (items 8 and 11) – the fixed station water levels were measured in the same fashion as described in Section 2.2. The data for the period of the pilot study are plotted in Figure 3.2. Water depths were also measured with pressure sensors at stations 4, 6, 32, 33.
- Waves (item 26) - a non-directional Waverider buoy was deployed and the data recorded through the receiver unit and a desk-top computer for logging the data installed in the site office near Teignmouth pier. Wave parameters were determined hourly from 4096 data points recorded at 2Hz. The processed wave height and period are plotted in Figure 3.3. The following parameters were also determined for stations 4, 6, 32, 33 from pressure sensor records:
 - average of the highest 1/10th of high frequency wave heights (m)
 - average of the highest 1/3rd of high frequency wave heights (m)
 - root-mean-square high frequency wave height (m)
 - mean high frequency wave height (m)
 - average period of the highest 1/10th of the high frequency waves (s)
 - average period of the highest 1/3rd of the high frequency waves (s)
 - root-mean-square high frequency wave period (s)
 - mean high frequency wave period (s)
 - spectral high frequency significant wave height (m)
 - spectral peak period in high frequency range (s)
 - spectral average high frequency wave period (s) ($=m_0/m_1$)
 - spectral average high frequency wave period (s) ($=\sqrt{m_0 / m_2}$)
- Currents (items{instrument height, m} 6{1.97}, 32{0.71}, 33{1.97}) – burst averaged records of current speeds U and V were obtained at 10 minute intervals from S4 current meters where:
 - U – easterly component of velocity (+’ve for flow to east)
 - V – northerly component of velocity (+’ve for flow to north)The data are presented in Figure 3.4. No data was recovered from item 4.

3.2 Morphology

3.2.1 Subtidal zone

Survey id	Dates	Survey	Comment	Partner
HR2	12-13 Mach 1999	Pilot 1	Complete survey	HRW
HR3	24 March 1999	Pilot 2	Partial survey	HRW

Two surveys were planned for the pilot experiment, to provide evidence of any bathymetric change during the month long deployment of instruments. Information on the bathymetric survey techniques is provided in Appendix 1. For this survey the differential GPS corrections were provided by Trinity House station no 689 at Nash Point in the Bristol Channel. The positional accuracy was generally better than 2 m.

The results from the first survey made on 12-13 March are reliable (Figure 3.5). Some difficulties with positioning were experienced during the second survey on 24 March and hence the plan position of the spot depths used for the bathymetry in certain areas may not be known to better than 5 m. Owing to these difficulties with the positioning system the second survey suffered from periodic apparent shifts in the logged coordinates, this meant that the second survey (Figure 3.6) is not as reliable as the 12-13 March survey. There was also a gap in the coverage of the second survey.

3.2.2 Intertidal zone

Survey id	Dates	Survey	Comment	Partner
	8, 10, 12, 14, 16, 18, 20, 22, 24 and 26 March 1999	Pilot	Beach Profiles N, C, S	UPI
11/3/99	11 March 1999	Pilot	Topographic survey	UC
24/3/99	24 March 1999	Pilot	Topographic survey	UC
	10, 11, 12, 14, 16, 18 and 21 March 1999	Pilot	Beach profiles at "North transect"	UU

Intertidal topography was measured by UC, UPI IMS and UU. UC measured the whole area with the Quad bike mounted DGPS system and produced detailed topographic maps. These maps were then analysed for elevation changes, for example, the beach evolution map made by University of Caen for the period from the Pilot Study survey to the end of the Main Study is shown in Figure 3.7. Example data from transects N, C and S are plotted in Figure 3.8. UPI IMS measured the beach profiles (N, C, S) at the positions shown on Figure 2.1, and UU measured the beach profile to the north of the pier at around the location of the line marked North transect in Figure 3.1.

3.2.3 Argus

The Argus camera (Oregon State University/University of Plymouth) recorded hourly daylight images during this period. An animation of the images from the camera overlooking the central area of measurements was constructed by HRW.

3.3 Process measurements

3.3.1 Subtidal nearshore

- Waves – wave parameters offshore and inshore
- Water levels - the various measurements of water depth from bottom-mounted frames and fixed stations have been compared. The water level variations measured at each location are broadly consistent with one another but offsets between measurements are apparent. These offsets have not been removed from the data presented in this report. They arise from bed levels for bottom-mounted frames being accurate to 0.1m and possible minor settlement of these frames
- Currents – mean currents and wave-orbital velocities
- Water properties – temperature
- Sediment transport – OBS (Optical Backscatter Sensor), ABS (Acoustic Backscatter Sensor), Delft Nile bedload sampler. The Delft Nile bedload sampler was deployed over the stern of mv "Sir Claude Inglis" by HIAB crane during both sampling periods. Personnel from Delft Hydraulics (11 March)

- and Utrecht University (20 March) were responsible for this instrument. Measurements of flow, temperature and salinity were made (Section 3.3.3)
- Morphology – small scale bedforms (ASRP; Autonomous Sand Ripple Profiler)

The time series of currents U-V at items 25, 18A and 21A are shown in Figure 3.9. These illustrate how the magnitude of the current increases from offshore to the nearshore and how the banks are affecting the current direction near the shore. The current meter at item 25 records the periodic influence of eddies (velocity spikes) from the estuary outflow.

The sediment flux was determined for (e.g.) item 18A (velocity and OBS data) and is presented in Figure 3.10 with the corresponding hydrodynamic data.

Figure 3.11 shows the wave heights and corresponding significant wave orbital velocity under wave crest and trough for items 25, 18A, and 21A.

3.3.2 Bottom mounted ADP

A standalone 1500kHz upward looking (Nortek) ADP (Acoustic Doppler current Profiler) was installed on a bottom mounted frame at the offshore boundary of the experimental area (item 26, Figure 3.1). During the pilot study the ADP used a cell size of 0.25m and averaged over 300s every 30 minutes, with the lowest measurement at 1.27m above the bed. The data files were re-worked and analysed to give depth-averaged currents. These currents will be generally higher than measurements from frame mounted current meters which are located close to the seabed.

3.3.3 Other current measurements

Velocity profiles were measured from the “Sir Claude Inglis” using a Valeport BFM105 impeller current meter. Measurements were taken on 11 March 1999 and 20 March 1999. The speed and direction of the tidal stream was recorded over an averaging period of 100 seconds at heights of 0.5m, 1m, 2m, 3m (and 4 m) above the bed – depending on the water depth. Salinity and temperature were also measured.

On 20 March 8 profiles were measured at 4 locations outside the estuary. The wave conditions during this period were less than 0.15 m and the wind was 3 m/s from the SW. The flow was always to the East or South East due to the ebbing tide but was variable in time. Salinity values ranged from 33.8 to 30.9 through the measurements and temperature from 9.1 to 9.2°C. The positions for the measurements were as follows:

Sample time	Vessel position
11:48, 12:04, 12:16	294489mE, 72008mN
12:25	294491mE, 72008mN
12:48, 12:56	294385mE, 71945mN
13:09	294309mE, 71865mN

3.3.4 Intertidal zone

The parameters measured were:

- Waves
- Water depths
- Currents – mean currents and wave-orbital velocities
- Water properties – temperature
- Sediment transport – OBS (Optical Backscatter Sensor), ABS (Acoustic Backscatter Sensor), fluorescent tracer coarse sand
- Morphology – bed texture (Sector Scan Sonar)

An example of the mean currents data for item 21A in the intertidal zone were shown previously in Figure 3.9 and the associated wave height and bottom orbital velocity records are shown in Figure 3.11.

3.4 Other activities

3.4.1 Grab samples

Grab samples were taken during the deployment of bed frames on the 9th and 10th March and analysed for their particle size distribution.

3.4.2 Vessel Mounted ADP

A 1500kHz downward looking (Nortek) ADP was used to make a survey of the area on a spring tide (21 March 1999). Transects were run hourly across the narrow estuary mouth and around the 3 offshore edges of the survey box. The data were processed as 10 sec average for 0.5m bins which gave a precision (standard deviation) of 3.8cm/sec.

4. MAIN STUDY

The aim of the main study was to collect field data for evaluating numerical models and to gain a better understanding of morphological processes. The instrumentation and parameters measured are listed in Table 2 and the layout is shown in Figure 4.1. This was an extension to the layout used in the Pilot Study. The scheduling of the various types of measurement during the Main Study is illustrated in Table 3.

4.1 Boundary conditions

Boundary conditions were measured as follows:

- Meteorological conditions (item 34) - the meteorological station was set up on 20 October 1999 at the same location as that used in the Pilot survey but only provided a few days of data at the start of the project before it leaked in heavy rain during a gale. There was then a gap in data collection until 18 November. The data collection continued until the end of the study on 26 November. These data were supplemented with daily records of rainfall at the local meteorological station between the town and the beach. In order to provide meteorological information for the early part of the study data were obtained from the nearest coastal UK Meteorological Office coastal recording station at the Isle of Portland, some 75 km east of Teignmouth (OSGB grid reference 367700mE, 69200mN), at an exposed site 52 m above mean sea level. Over this short period there was good agreement of barometric pressure, wind direction (see Figure 4.2) and air temperature between the two sites. Wind speeds however were generally significantly higher at Isle of Portland.
- Fluvial flow (item 31) - gauging station results for fluvial inflow of the River Teign (provided by the Environment Agency) are shown in Figure 4.2.
- Water levels (items 8, 11, 34) – these were recorded in the same fashion as in the Pilot study. In addition a tide gauge was installed for part of the study at Shaldon Bridge in the estuary (item 34), up-estuary of item 11. This gauge was not levelled in to an absolute datum and had no in situ board reading calibration. However, the data can be used to determine the phase of HW and LW at this site. The data from items 8 and 11 are plotted in Figure 4.2. Water depths were also measured with pressure sensors at stations 4, 6, 32, 33.
- Waves (item 7) - a Datawell Directional Waverider buoy was deployed at the north-eastern corner of the study area. The buoy was operational during the period 28 October to 22 November 1999. The directional wave spectra were computed at hourly intervals and a summary of the wave parameters is included in Figure 4.3. Spectral analysis and counting analysis was undertaken on the data. The influence of the filtering of time series data in the COAST3D project (Sections 1.4.2 and 1.4.3) on the

Waverider records was examined (Whitehouse et al, 2000). The results showed that the Waverider output for wave height $H_{mo,hf}$ (spectral method) was between 7 and 10 % larger than that obtained with the COAST3D filter limits applied. Likewise for wave period, the mean wave period T_m from the Waverider was 20 % higher than the corresponding data $T_{0,2hf}$ with the COAST3D filter limits applied. The following wave parameters were also determined for stations 4, 6, 32, 33:

- average of the highest 1/10th of high frequency wave heights (m)
- average of the highest 1/3rd of high frequency wave heights (m)
- root-mean-square high frequency wave height (m)
- mean high frequency wave height (m)
- average period of the highest 1/10th of the high frequency waves (s)
- average period of the highest 1/3rd of the high frequency waves (s)
- root-mean-square high frequency wave period (s)
- mean high frequency wave period (s)
- spectral high frequency significant wave height (m)
- spectral peak period in high frequency range (s)
- spectral average high frequency wave period (s) ($=m_0/m_1$)
- spectral average high frequency wave period (s) ($=\sqrt{m_0 / m_2}$)
- Currents (items{instrument height, m} 4{1.00}, 6{1.00}), 32{1.00}), 33{1.00}), 29{1.21}) – instrumented frames were positioned at the boundaries of the survey box (4, 6, 32, 33) with S4 current meters and in the estuary mouth (29) with an EMF. Following recovery of the S4 current meters (items 4, 6, 32, 33) the data were downloaded and evaluated. It was immediately clear that the data were corrupted, possibly caused by a DC offset affecting the measurement transducers. The raw files were processed to remove all non-tidal current speeds and directions using a Doodson Tidal Filter. The filter removes all non tidal elements, so any regional residual affecting the area will also be lost in the filtering process. The results are presented in Figure 4.4 for:
 - U – easterly component of velocity (+’ve for flow to east)
 - V – northerly component of velocity (+’ve for flow to north)
- Water temperature was also measured at locations 4, 6, 32, 33, 29 and salinity at 4, 6, 32 and 33.

4.2 Morphology

4.2.1 Subtidal zone

Survey id	Dates	Period	Comment	Partner
HR4	27-28 October 1999	Main 1	Complete survey. 0.2 to 0.3m, 3 to 6 second waves	HRW
HR5	6-8 November 1999	Main 2	Complete survey. 0.1 to 0.4m, 3 to 10 second waves/swell	HRW
HR6	16-17 &19 November 1999	Main 3	Gaps on East Pole Sand as neap tide. 0.1 to 0.3m, 3 to 7 second waves	HRW
HR7	24-25 November 1999	Main 4	Gaps at PU pressure array as survey in darkness. 0.3 to 0.75m, 5 to 7 second waves	HRW

Four surveys were made during the main study. Coverage was out to the 6m ACD contour, and some of the 6.5 and 7m ACD contours. The surveys extended inshore to between the 0m ACD and the +1mACD level, and upriver to 250m above the port of Teignmouth.

Four surveys were undertaken in sea states varying from slight (0.1 to 0.2m) to moderate (0.5 to 0.75m). The influence of wave conditions on the accuracy of the results is presented in Appendix 3.

The bathymetric charts are plotted in Figures 4.5 to 4.8.

4.2.2 Intertidal zone

Survey id	Dates	Period	Comment	Partner
	25 through 27 October 1999	Main	RTK DGPS on Quad bike	UC
	8 through 10 November 1999	Main	RTK DGPS on Quad bike Includes measurements of the western part of "The Salty"	UC
	23 through 25 November 1999	Main	RTK DGPS on Quad bike	UC
	Main survey period: 24 and 29 October 1999, and 4, 8, 15 and 22 November 1999	Main	Beach profiles	UPI
	Beach profiles daily at 'North transect': 20 October to 13 November 1999, plus 15 November 1999	Main	Beach profiles	UU
	Bed profiles from 22 to 28 October 1999, 6 - 8, 10-15, and 22-23 November 1999	Main	Daily transects on Spratt Sand and Denn Point beach	UU

Intertidal topography was measured by UC, UPI IMS and UU. UC measured the whole area with the Quad bike mounted Real Time Kinematic (RTK) DGPS system, UPI IMS measured the beach profiles (N, C, S) at the positions shown on Figure 2.1, and UU measured the beach profile to the north of the pier around the location of the line marked North transect in Figure 4.1.

The beach evolution map made by University of Caen for the Main Study is shown in Figure 4.9. Example data from transects N, C and S are plotted in Figure 4.10.

4.2.3 Argus

The Argus camera (Oregon State University/University of Plymouth) recorded hourly daylight images during this period. An animation of the images from the camera overlooking the central area of measurements was constructed by HRW.

4.3 Process measurements

4.3.1 Subtidal nearshore

- Wave parameters
- Water levels. The various measurements of water depth from bottom-mounted frames and fixed stations have been compared. The water level variations measured at each location are broadly consistent with one another but offsets between measurements are apparent. These offsets have not been removed from the data presented in this report. They arise from bed levels for bottom-mounted frames being accurate to 0.1m and possible minor settlement of these frames
- Currents – mean currents and wave-orbital velocities
- Water properties – temperature and salinity
- Sediment transport – OBS (Optical Backscatter Sensors)

The time series of currents U-V at items 3A, 23 and 27 are shown in Figure 4.11. These indicate how the magnitude of the current increases from offshore to the nearshore and how the banks are affecting the current direction near the shore.

The sediment flux was determined for (e.g.) item 18A (velocity and OBS data) and is presented in Figure 4.12 with the corresponding hydrodynamic data.

Figure 4.13 shows the wave height and period data for item 3A and the orbital velocity data for items 3A, 18 and 21.

Figure 4.14. shows how the wave height varies from offshore to the beach at the North transect, items 9, 2 and 20A, as well as the variation in the magnitude of the wave orbital velocity.

4.3.2 Bottom mounted ADP

A standalone 1500kHz upward looking (Nortek) ADP was installed on a bottom mounted frame at the offshore boundary of the experimental area (item 26).

The ADP used a cell size of 0.5m and averaged over 40s every 10 minutes, with the lowest measurement at 1.56m above the bed. The data files were re-worked and analysed to give depth-averaged currents. Time series of the depth-averaged currents, temperature and water depth were produced. These currents will be generally higher than S4 frame values which are measured close to the seabed.

4.3.3 Intertidal zone

- Wave parameters – typical wave parameters are shown in Figure 4.14 (items 2 and 20A)
- Water depths
- Currents – mean currents and wave-orbital velocities
- Sediment transport – OBS (Optical Backscatter Sensor), ABS (Acoustic Backscatter Sensor) at item 25
- Morphology – small scale bedforms (ASRP; Autonomous Sand Ripple Profiler) at item 25. Also used to determine sediment transport by bedform migration method.

4.4 Other activities

4.4.1 Bed sampling

This was undertaken on the 4th and 6th November at a total of 54 sites throughout the project area. Fifty four grab samples were taken at selected sites for use by Magelas in interpretation of their side scan sonar records. Bed samples were collected at ten of the offshore frame locations and at each of the three beach scour monitoring locations (Section 4.4.6). The data showed that changes in the bed material characteristics had taken place between June 1998 and November 1999, particularly in the region of the nearshore banks.

4.4.2 Side scan sonar

The side scan sonar was run for two periods in the survey. A 410 kHz digital side scan system was used providing very high resolution data for the seabed texture and bedforms. The bedform map produced by Magelas is presented in Figure 4.15.

4.4.3 Drogue tracking

Drogue tracking was carried out on the 29th October from 09:32 to 12:09GMT, and on the 24th November between 07:39 and 07:59 GMT. HRW standard drogues (1x1m cruciform Terylene panels) were deployed at “The Narrows” on the ebb tide, sometimes in pairs. The centres of the cruciform were set at depths of 1 and 3m. The most reliable data was that obtained on the 29th October. The later drogue tracking was

abandoned soon after commencement as the sea conditions improved sufficiently to permit bathymetry to be started. The float tracks for 29th October on the ebbing tide are presented in Figures 4.16 to 4.18.

4.4.4 Vessel Mounted ADP

A 1500kHz downward looking (Nortek) ADP was used. VM-ADP measurements were undertaken on 2nd November for 13 hours in calm to slight sea-state, and again on the 9th November for 12.5 hours in a worsening sea state. The latter survey was considered to be of little value due to the excessive rolling of the vessel in the poor sea conditions.

Initially four transects encompassing the study boundaries, including The Narrows, were chosen for VM-ADP measurements, as had been used in the Pilot Study. This number was later increased to eight transects but was found to be too many for the time available and was decreased to six. The upriver transects were also among the small craft moorings which was a potentially hazardous area for the survey vessel. The transects used are shown in Figure 4.19. Typically a complete circuit of all 6 transects was completed in 45 minutes, followed by a CTD profile at The Narrows. Temperatures varied from 13.9 to 14.6°C, with near surface salinity between 29.8 and 35.6.

4.4.5 Pump sampling results

Suspended sediment samples from the southern flank of Spratt Sand, inshore of item 25, were collected by HRW staff from a 6 m Zodiac rigid-inflatable using a standard pumped sampling technique (Whitehouse et al, 2000). The sampling was undertaken during calm weather conditions on the flood tide of 25 November 1999 between high water –3.5 hours and high water –1.25 hours. The measured tidal range at New Quay was 4.86 m. The maximum concentration of sand in suspension was around 45 mg/l at 0.1 m above the bed and 20 mg/l at 0.5 m above the bed. The median grain size of the material in suspension varied approximately between 0.1 and 0.12 mm (very fine to fine sand). The bed material at this site was medium to coarse sand indicating the finer fractions are picked up and transported by the flow.

4.4.6 Scour monitors

Three HRW Scour Monitors were installed on the beach between 28 October 1999 and 26 November 1999 to obtain continuous measurements of beach level at three locations, for a mixed sand and gravel beach. The Scour Monitors were denoted SM1, SM2 and SM3 (items 35, 36, 37). The data showed how the bed level can change during tidal immersion (see Whitehouse et al, 2000).

4.5 Summary of available data

The data available for certain key parameters was listed in Table 2. The spatial distribution of this information has been presented graphically in Figures 4.20 to 4.24 for the main study:

Figure	Parameter measured
4.20	WL water levels
4.21	W waves and DW directional waves
4.22	C time-averaged currents
4.23	Osc C high frequency currents, e.g. wave-induced
4.24	Sed sediment concentration

5. CONTINUOUS MONITORING

5.1 Water levels, waves and currents

The data collection exercise for continuous monitoring of waves and currents can be summarised as follows:

HR Wallingford deployed two MicroSpec wave and current meters for a period of a year as part of the COAST3D project (items 15 and 29). The initial deployments were made at two locations (designated item 15 and item 29) in December 1998 and final recovery of the instruments took place at the end of the main study November 1999. Item 15 was positioned at 294597mE, 72398mN approximately 300m south-east of the end of Teignmouth pier on a flat sandy seabed. Item 29 was positioned at 293777mE, 72179mN in the mouth of the Teign estuary. Data recovery for the year from item 15 was high (83%) but the estuary mouth site presented a hostile location for item 29 and its frame, and here the data recovery was only 24%. The analysis method, and monthly time series of calibrated and validated data have been presented in Sutherland et al (2001). The overall statistics of the wave and current climate, and a discussion of the OBS records, are also given. Sutherland et al (2001) found a good comparison between data at item 15 and nearby instruments for the periods of the pilot and main studies.

The dataset for item 15 is summarised in Figure 5.1. Some of the current measurements from item 29 were presented in Figure 4.4.

5.2 Beach profiles

UPI IMS collected beach profile data between 1995 and 1999 at the locations N, C and S in Figure 2.1. This data has been analysed to show the variation in beach level at fixed chainages along each profile measured from the seawall. The results are presented in Figure 5.2.

5.3 Fluvial inflow

The River Teign provides the main inflow to the estuary but the other rivers such as the River Lemon also contribute some freshwater to the estuary. The fluvial flow was measured by the Environment Agency at their gauging station on the River Teign at Preston, upstream of Newton Abbott (Grid Ref: SX85567454) (item 31). The time series of discharge is shown in Figure 5.1 for the period November 1998 to end November 1999.

6. DATA AVAILABILITY

The data is contained in two databases, one for the pilot study and one for the main study. The contents of these are described in Appendices 4 and 5, and both databases are available on a single CD-ROM.

7. ACKNOWLEDGEMENTS

We wish to record the following contributions to the success of this field programme:

- the skill and commitment of the COAST3D field team and their colleagues in making, calibrating and validating the data referred to in this report
- the Exminster Office of the Environment Agency for the provision of the river flow data
- the UK Meteorological Office for the Portland met. data
- the excellent co-operation and support from many local organisations including - Teignbridge District Council, Teignmouth Harbour Commission, Teign Fishermen and Watermen's Association and The Teignmouth Quay Company
- the people of Teignmouth for their patience, interest, and friendly and co-operative attitude throughout the duration of the work

And finally, we recall the dedication of Klaas Houwman (1964 -2000), from Utrecht University, who contributed to the success of this programme.

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Tables

Table 1 Teignmouth pilot study measurements

WL = water level, W = wave parameters, DW = directional wave parameters, C = time averaged current, Osc C = wave orbital velocity, Sed = some form of sediment concentration measurement, Bed Lev = automatic measurement of bed level, Temp = water temperature, Sal = water salinity/conductivity

Item	Partner	Instrument	WL	W	DW	C	Osc C	Sed	Bed Lev	Temp	Sal
1	UU	MINI TRIPOD	*		*	*	*				
2	UU	MINI TRIPOD	*		*	*	*				
4	HRW	S4, MICROWAVE	*	*							
6	HRW	S4, MICROWAVE	*	*		*					
8	HRW	TIDE GAUGE	*								
11	HRW	TIDE GAUGE	*								
12A	UP	SLOT4	*		*	*	*	*			
13A	UP	SLOT5	*		*	*	*	*			
14	UC	S4 + TIDE	*			*					
15	HRW	MICROSPEC	*		*	*	*	*		*	
16A	UP	SLOT3	*		*	*	*	*			
18A	UC	3 CMS, OBS, PT	*		*	*	*	*			
21A	UP	SLOT1 + SONAR	*		*	*	*	*	*		
22A	UP	IWR	*	*							
22A	UP	SLOT2	*		*	*	*	*	*		
24A	UC	S4 + TIDE	*			*					
25	UU/POL	MAXI TRIPOD/ABS/ASRP	*		*	*	*	*	*		
26	HRW	NORTEK ADP	*			*					
26	HRW	WRB		*							
29	HRW	MICROSPEC	*		*	*	*	*		*	
30	UPL/OSU	ARGUS CAMERA									
31	EA	RIVER DISCHARGE									
32	HRW	S4, MICROWAVE	*	*		*					
33	HRW	S4, MICROWAVE	*	*		*					
34	HRW	MET STATION									
		Total in each category	21	6	11	17	11	9	3	2	0

Table 2 Teignmouth main study measurements

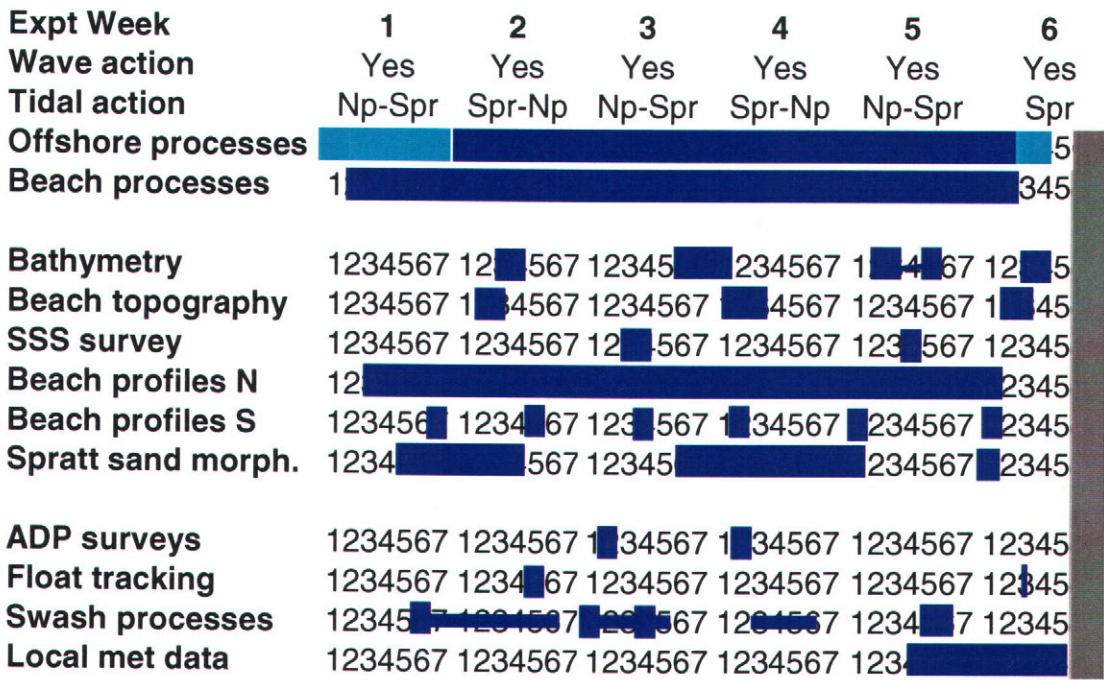
WL = water level, W = wave parameters, DW = directional wave parameters, C = time averaged current, Osc C = wave orbital velocity, Sed = some form of sediment concentration measurement, Bed Lev = automatic measurement of bed level, Temp = water temperature, Sal = water salinity/conductivity

Item	Partner	Instrument	WL	W	DW	C	Osc C	Sed	Bed Lev	Temp	Sal
1	UU	MINI TRIPOD	*		*	*	*	*			
2a	UU	MINI TRIPOD	*		*	*	*	*			
2b	UU	MINI TRIPOD	*		*	*	*	*			
2c	UU	MINI TRIPOD	*		*	*	*	*			
3A	UU	MAXI TRIPOD	*		*	*	*	*			
4	HRW	S4, MICROWAVE	*	*		*				*	*
5A,B	UC	S4				*					
6A	HRW	S4, MICROWAVE	*	*		*				*	*
7	HRW	DWR			*						
8	HRW	TIDE GAUGE	*								
9	UU	MAXI TRIPOD	*		*	*	*				
10	UP	WRS	*		*						
11	HRW	TIDE GAUGE	*								
12A	UP	SLOT2	*		*	*	*	*			
13A	UP	SLOT3	*		*	*	*	*			
14	UC	S4 + TIDE	*			*					
15	HRW	MICROSPEC	*		*	*	*	*		*	
16A,B	UP	VALEPORT 730D	*		*						
17	UP	SLOT1	*		*	*	*				
18A,B	UC	3 CMS, OBS, PT	*		*	*	*	*			
19A	UU	MINI TRIPOD	*		*	*	*	*			
20A	UU	MINI TRIPOD	*		*	*	*	*			
21A	UP	SLOT4	*		*	*	*	*	*		
22A	UP	IWR	*		*						
23	UC	S4 + TIDE	*			*					
24A	UC	S4 + TIDE	*			*					

Table 2 Teignmouth main study measurements (Continued)

Item	Partner	Instrument	WL	W	DW	C	Osc C	Sed	Bed Lev	Temp	Sal
25	UU/POL	MAXI TRIPOD /ABS/ASRP	*		*	*	*	*	*		
26	HRW	NORTEK ADP	*			*					
27	UC	S4				*					
28	UU	MAXI TRIPOD	*		*	*	*	*			
29	HRW	MICROSPEC	*		*	*	*	*	*		
30	UPL/OSU	ARGUS CAMERA									
31	EA	RIVER DISCHARGE									
32	HRW	S4, MICROWAVE	*	*		*				*	*
33	HRW	S4, MICROWAVE	*	*		*				*	*
34	HRW	TIDE GAUGE	*								
35	HRW	SCOUR MON 1							*		
36	HRW	SCOUR MON 2							*		
37	HRW	SCOUR MON 3							*		
38	HRW	MET STATION									
39	POL	X-BAND RADAR			*						
		Total in each category	31	4	22	27	17	14	5	6	4

Table 3 Bar chart of activities in the main study



Key
1234567 days of the week
 main monitoring activities
 background monitoring and X-band
 days outside experiment
Np/Spr neap and spring tide range

Figures



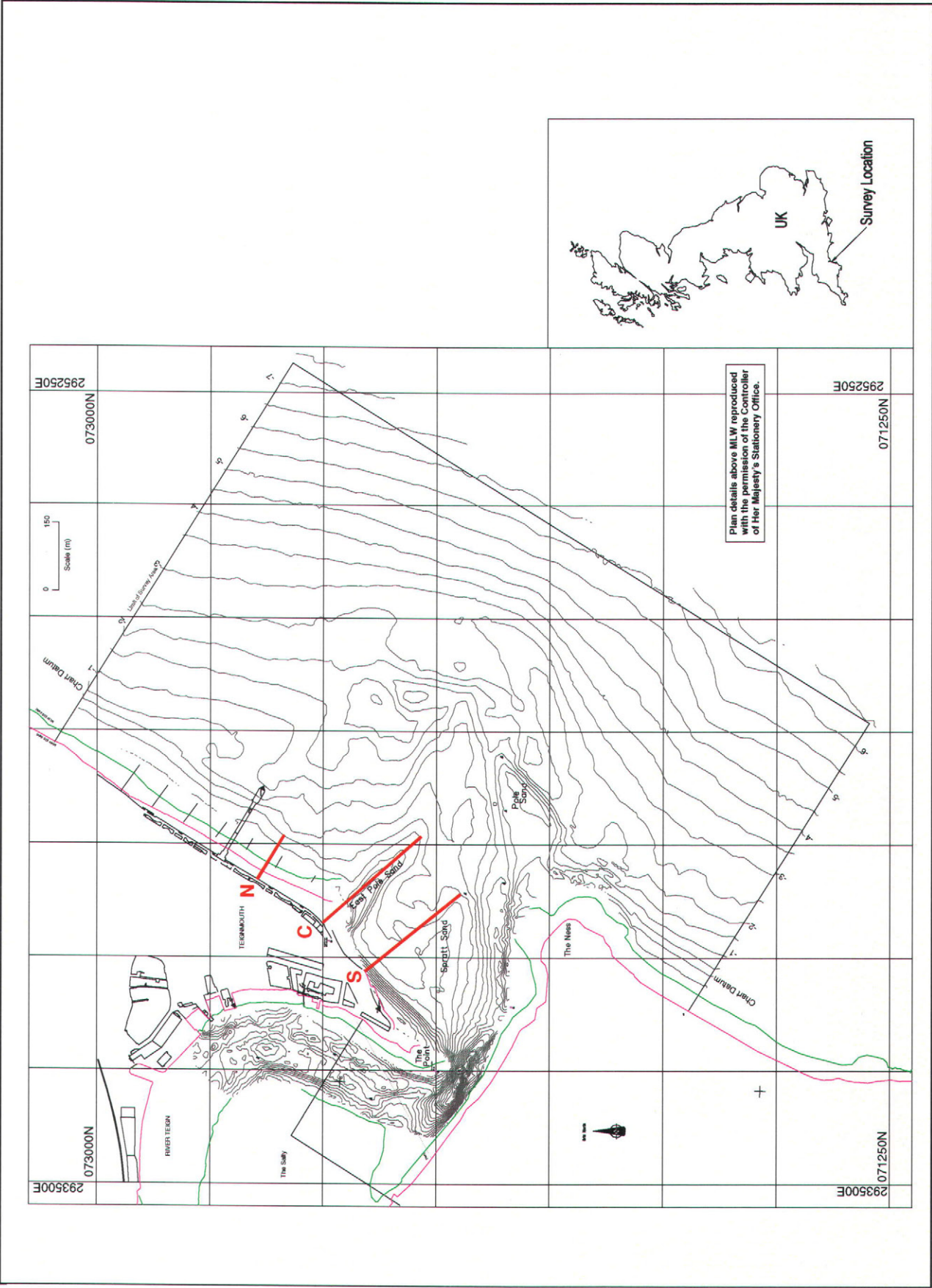


Figure 2.1 Bathymetric survey 3-7 June 1998 (HR1 06/98) with locations of long-term beach monitoring profiles (N, C, S)

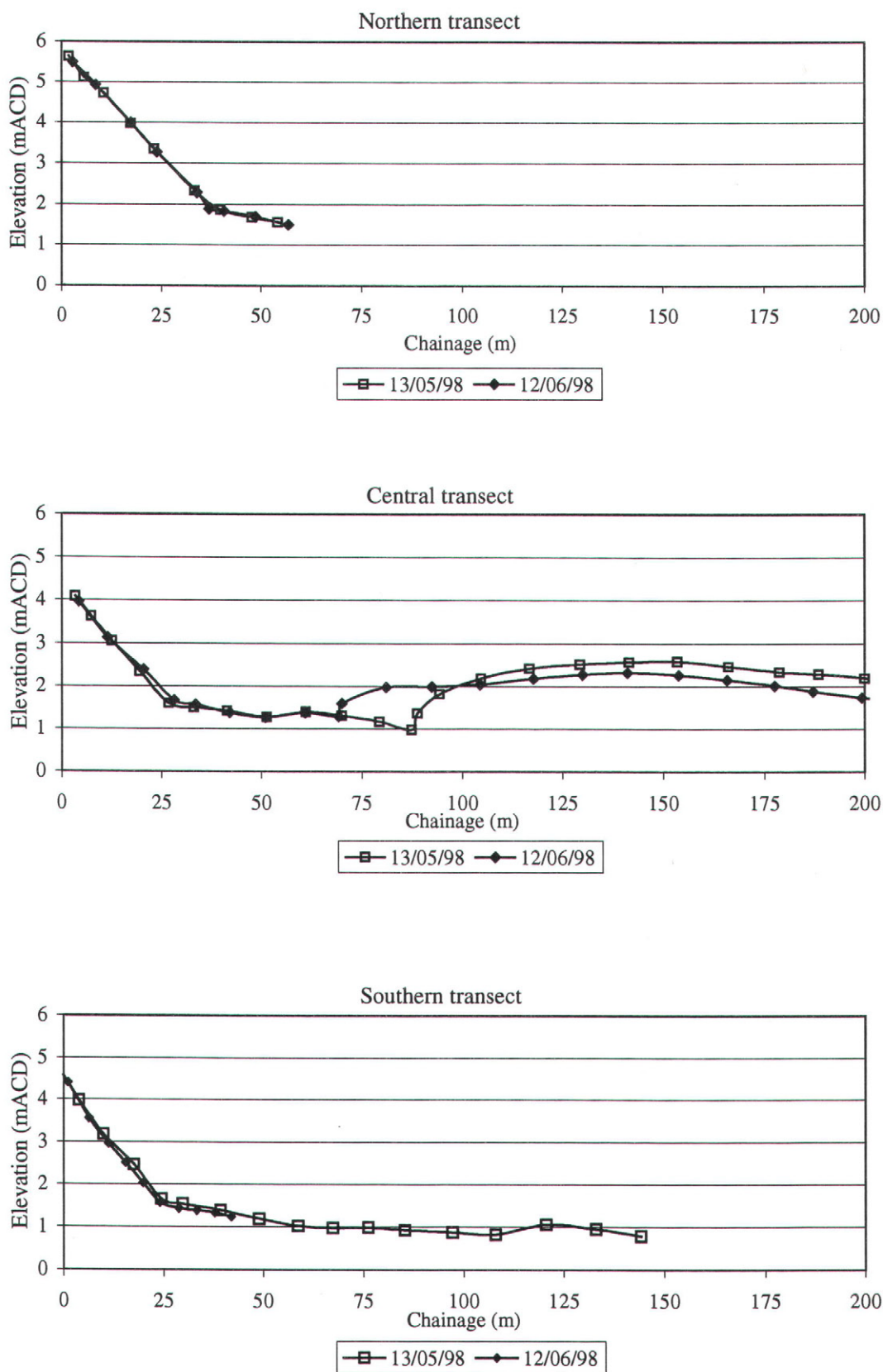


Figure 2.2 Beach profiles during June 1998 (locations on Figure 2.1)

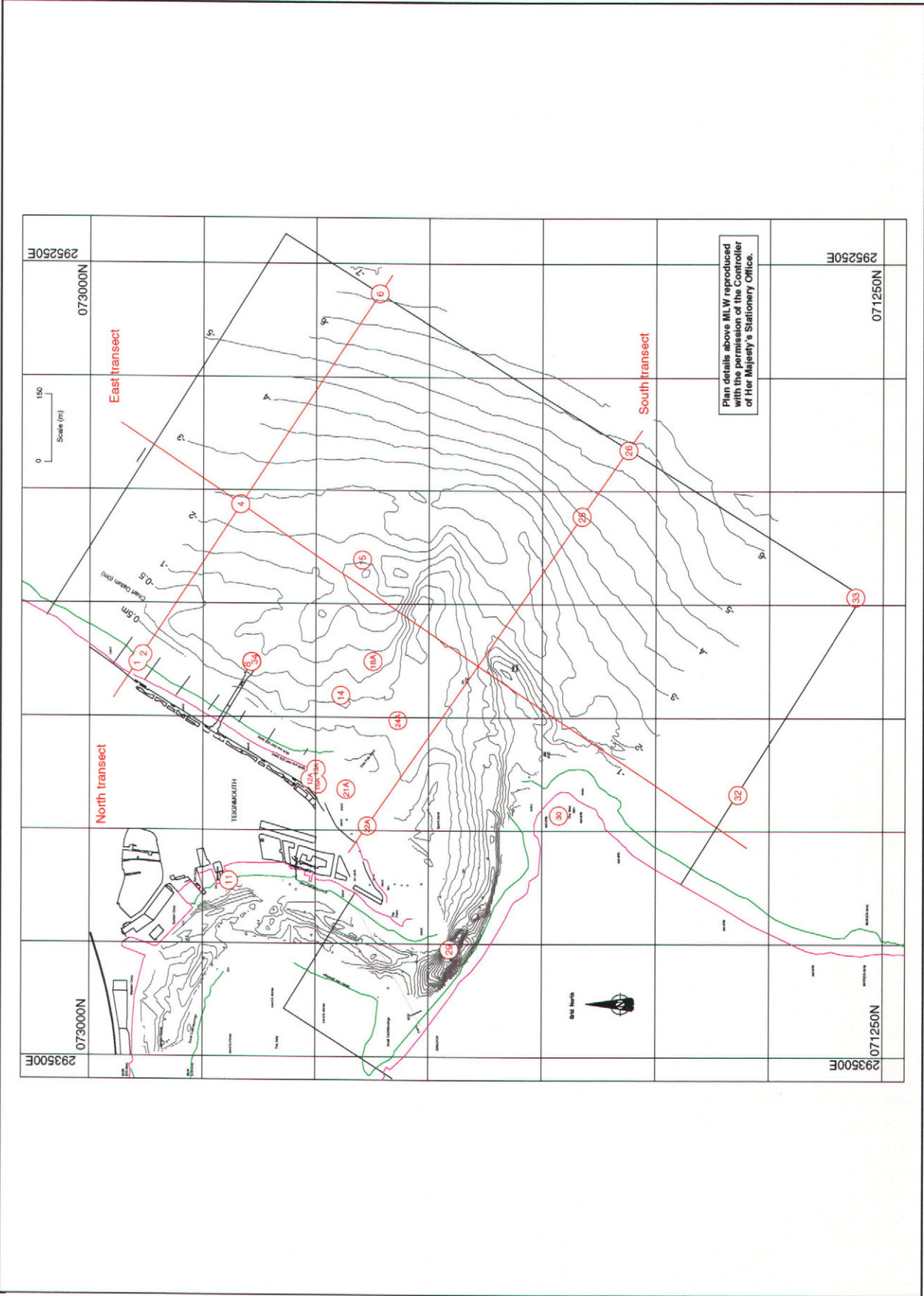


Figure 3.1 COAST3D Teignmouth - layout of equipment during the pilot study (March 1999)

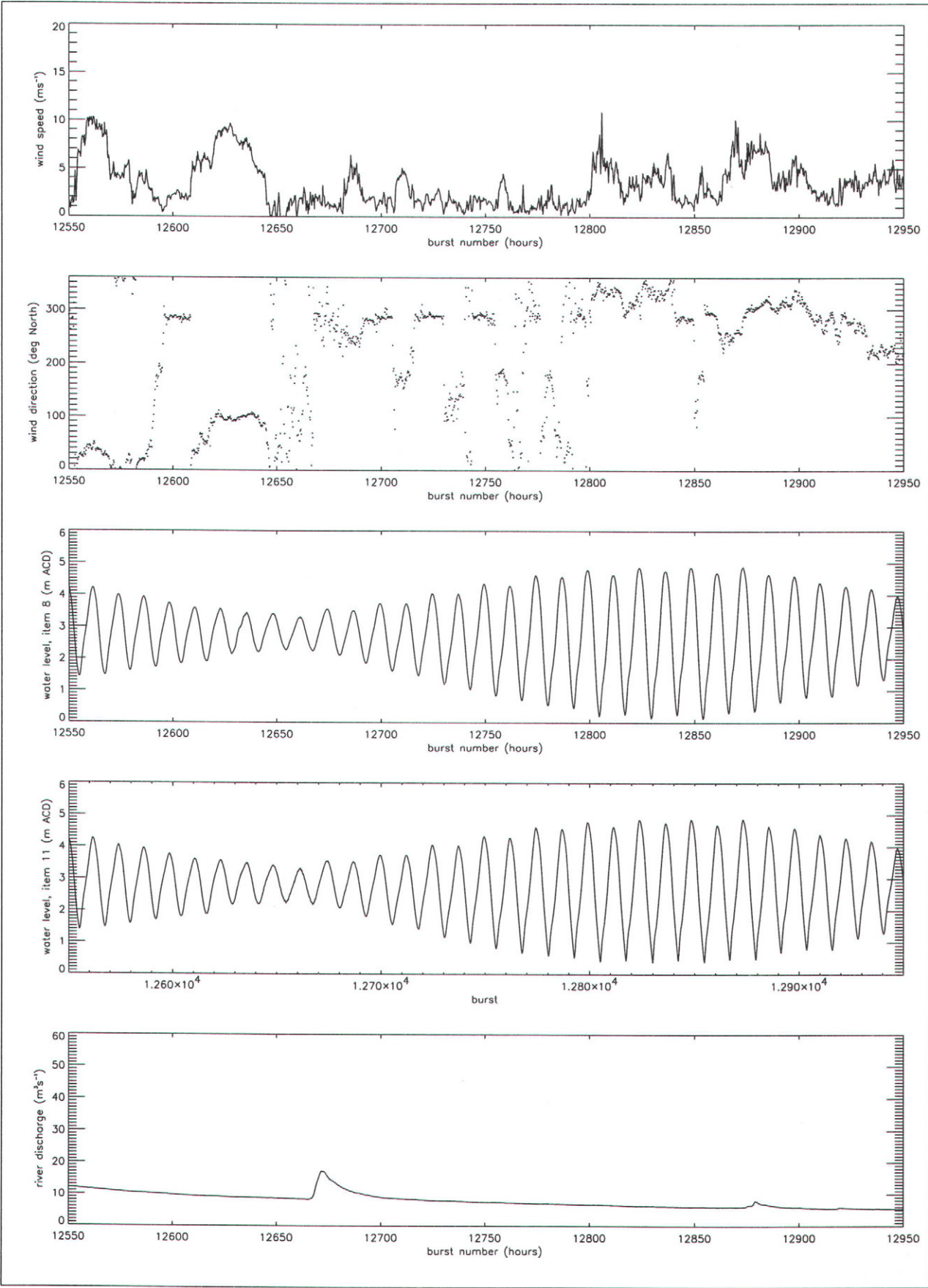


Figure 3.2 Pilot study time series of meteorology (item 34), water levels (items 8, 11) and river inflow (item 31) - provided by the Environment Agency

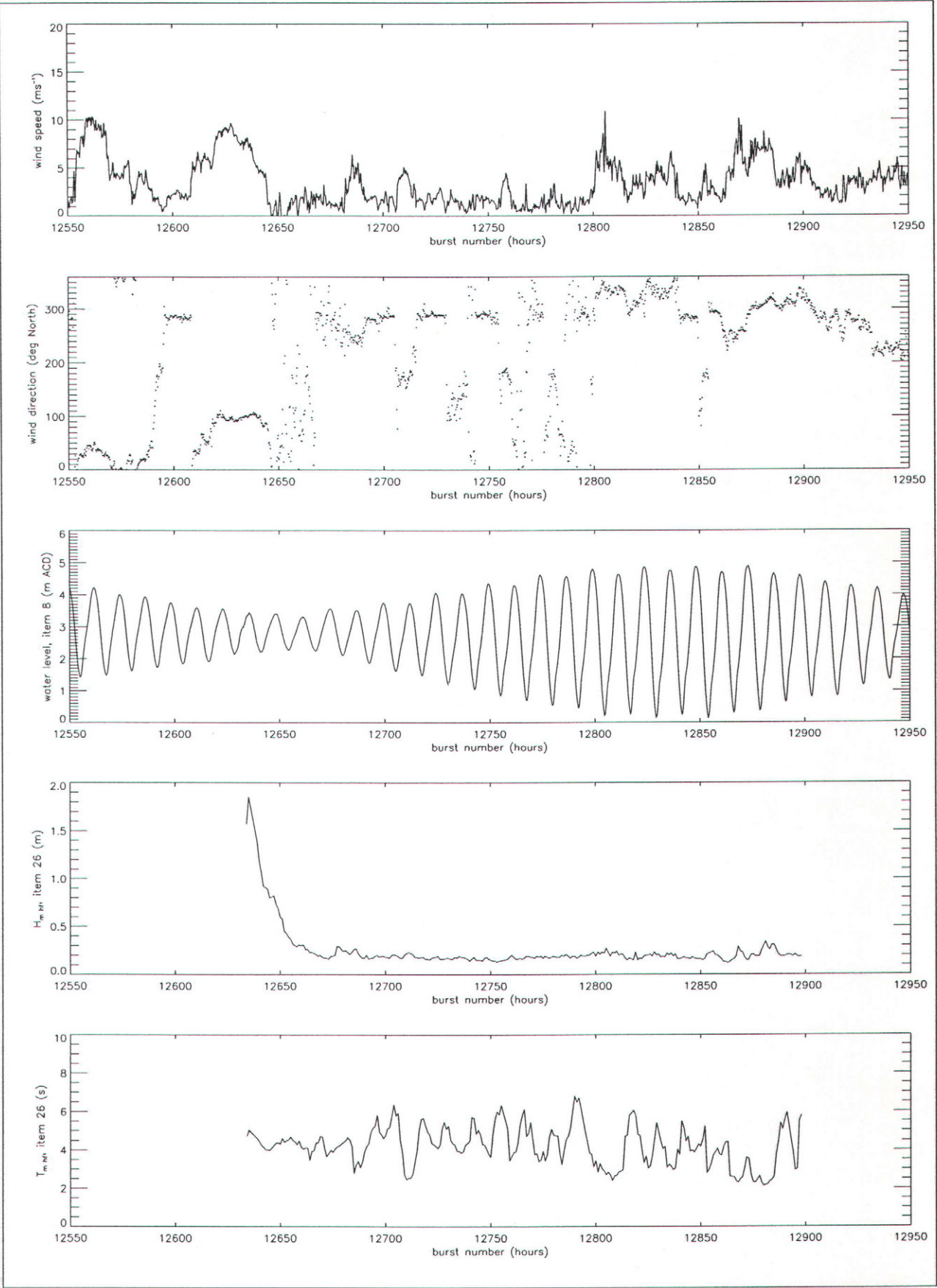


Figure 3.3 Pilot study time series of wind speed and direction (item 34), water level (item 8), and wave height and period (item 26)

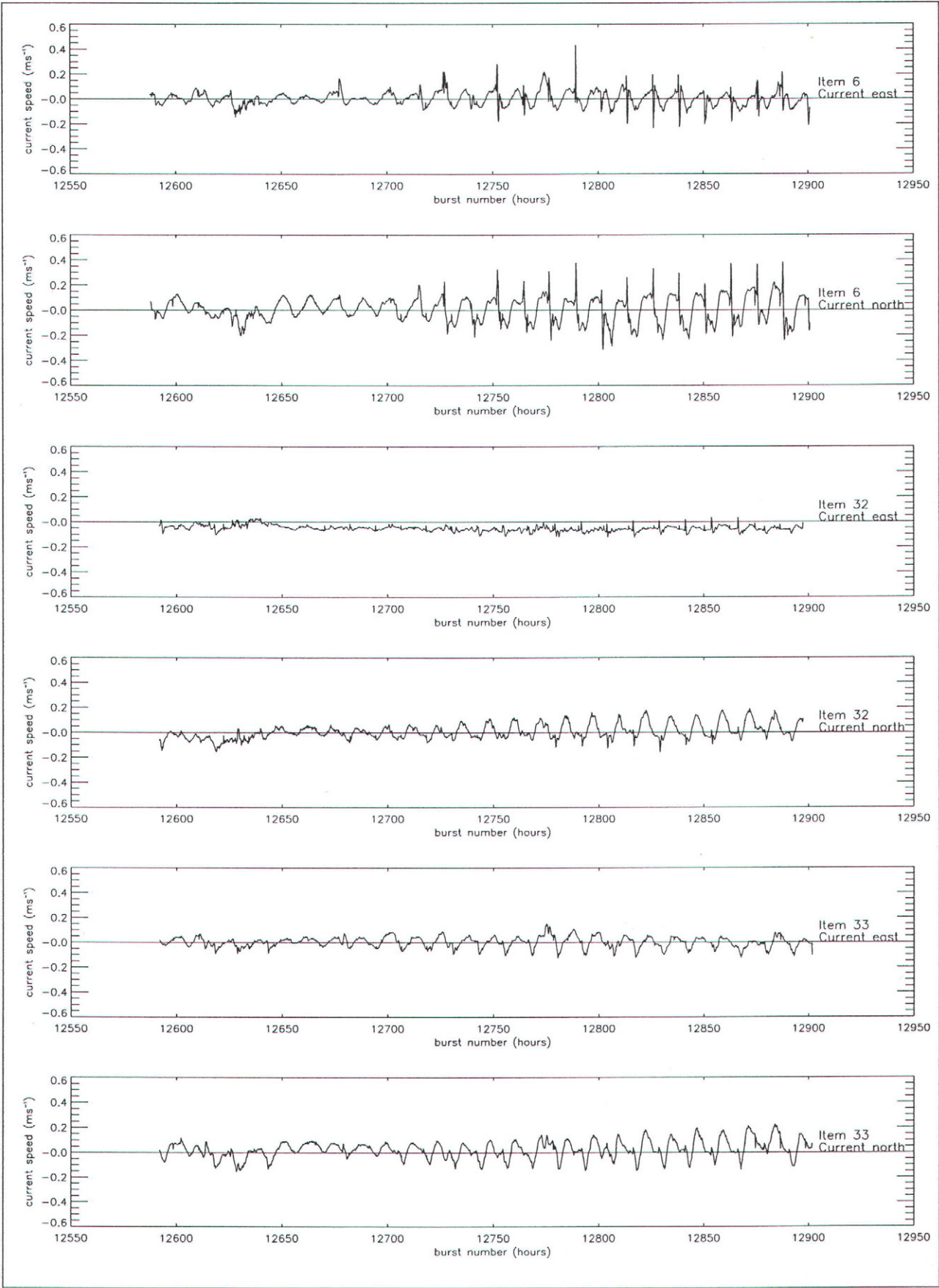


Figure 3.4 Pilot study time series of easterly and northerly components of current U-V at the boundaries of the study box (items 6, 32 and 33)

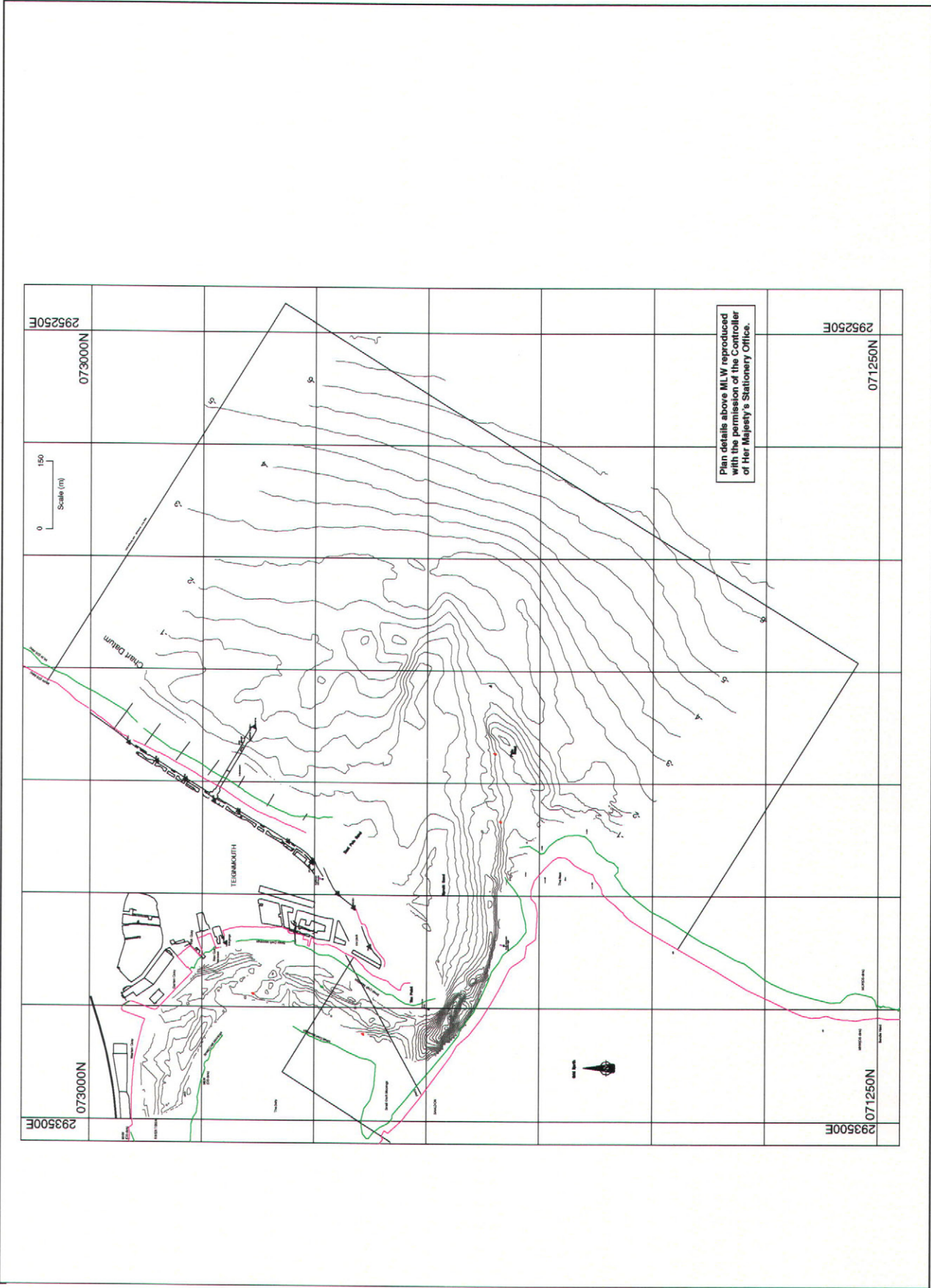


Figure 3.5 Pilot study bathymetric survey no. 1, 12-13 March 1999 (HR2 03/99)

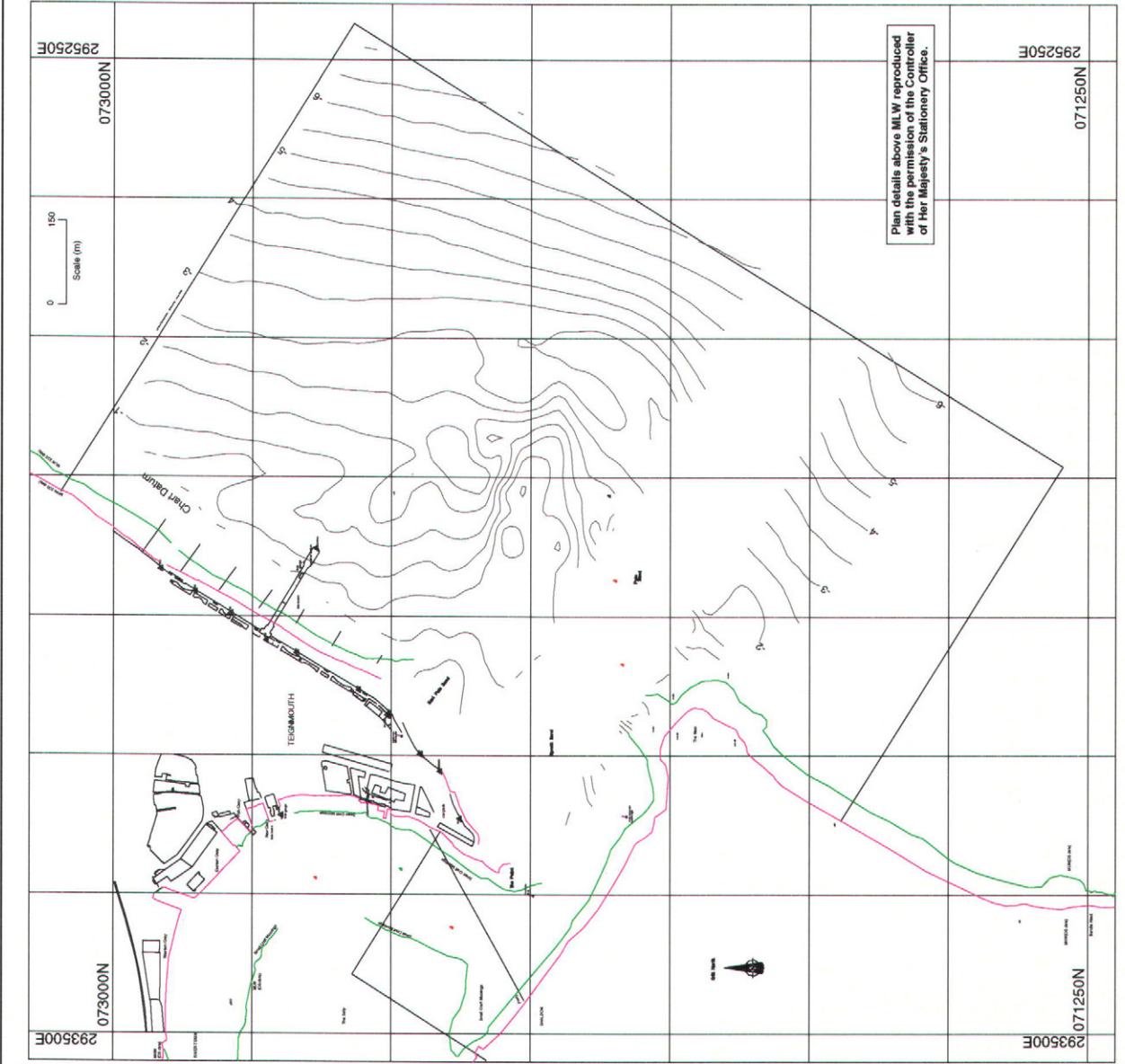


Figure 3.6 Pilot study bathymetric survey no. 2, 24 March 1999 (HR3 03/99)

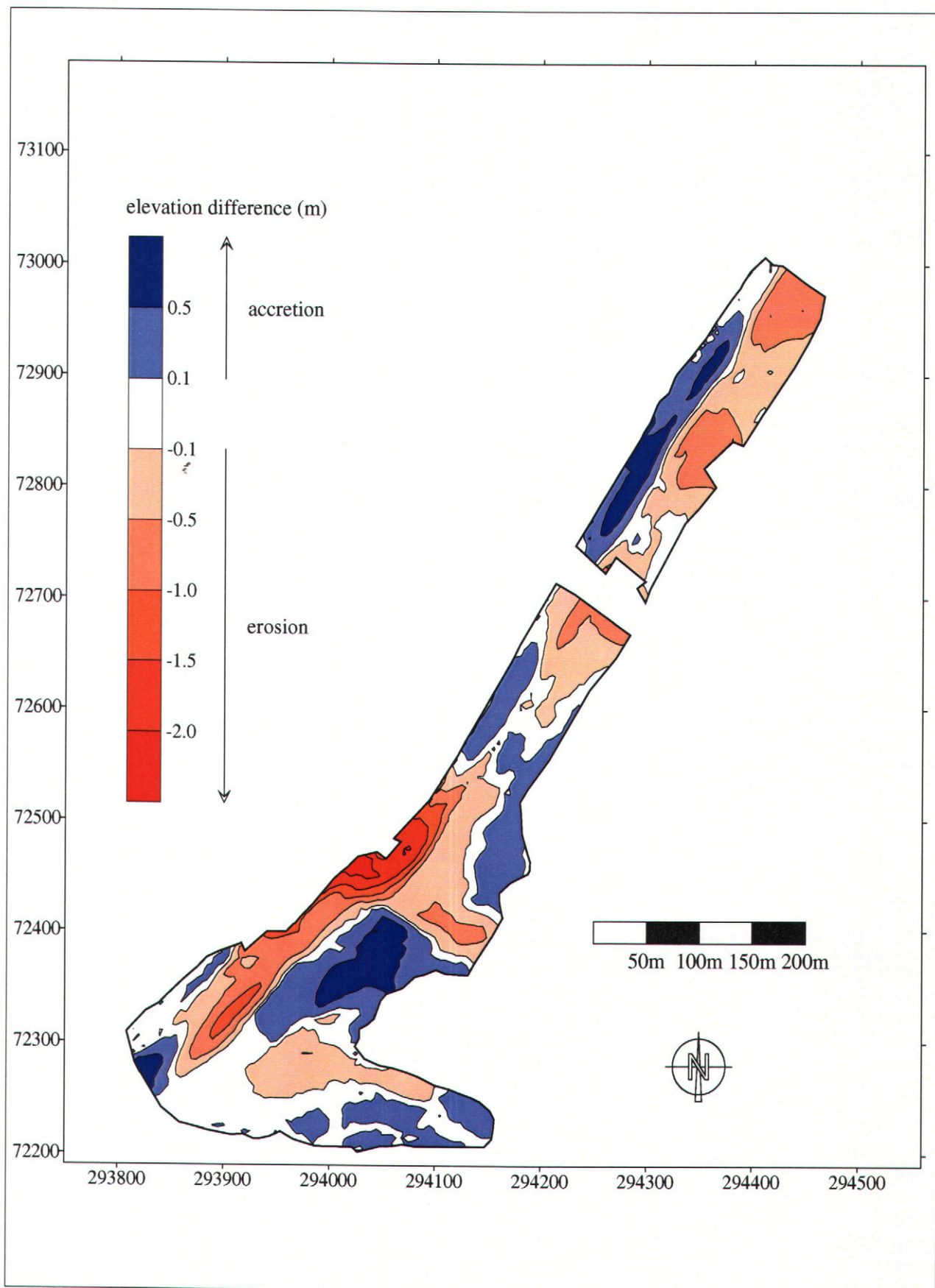


Figure 3.7 Evolution of the beach topography from the Pilot Study (22-24 March 1999) to the end of the Main Study (23-25 November 1999). Figure supplied by Dr F. Levoy, University of Caen

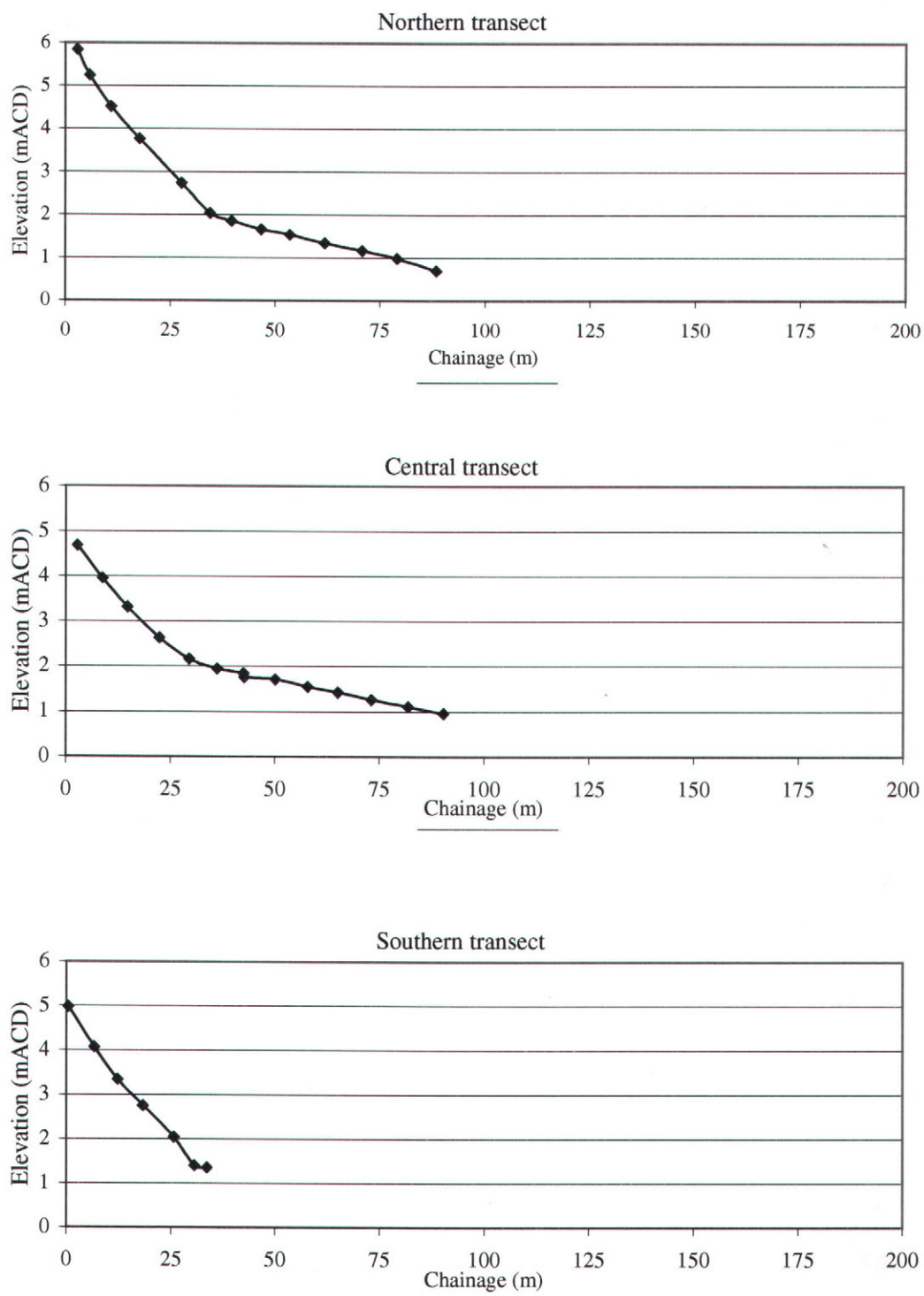


Figure 3.8 Pilot study example beach profiles, 12 March (compare Figure 2.2)

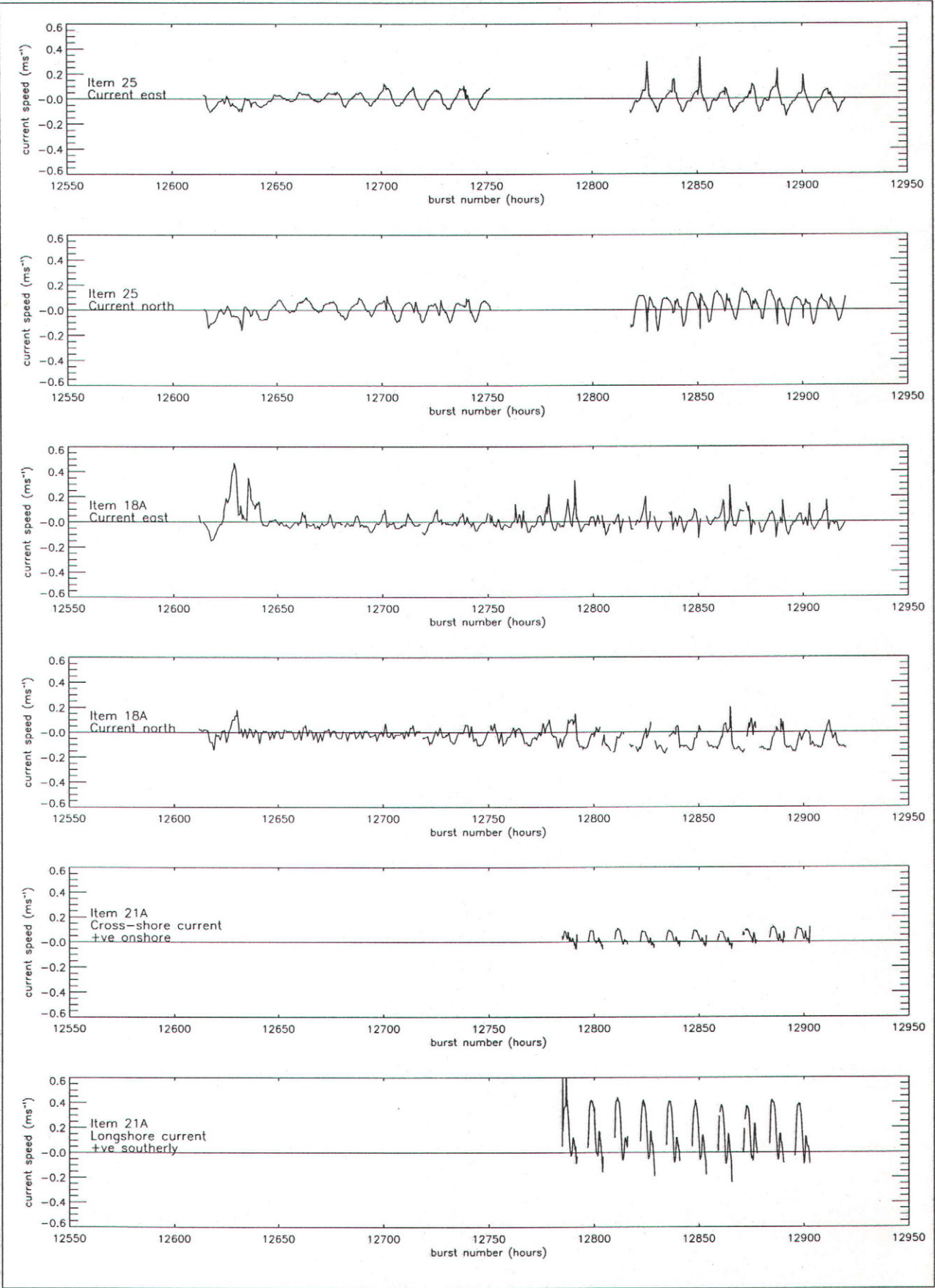


Figure 3.9 Pilot study time series currents U-V (items 25, 18A, 21A)

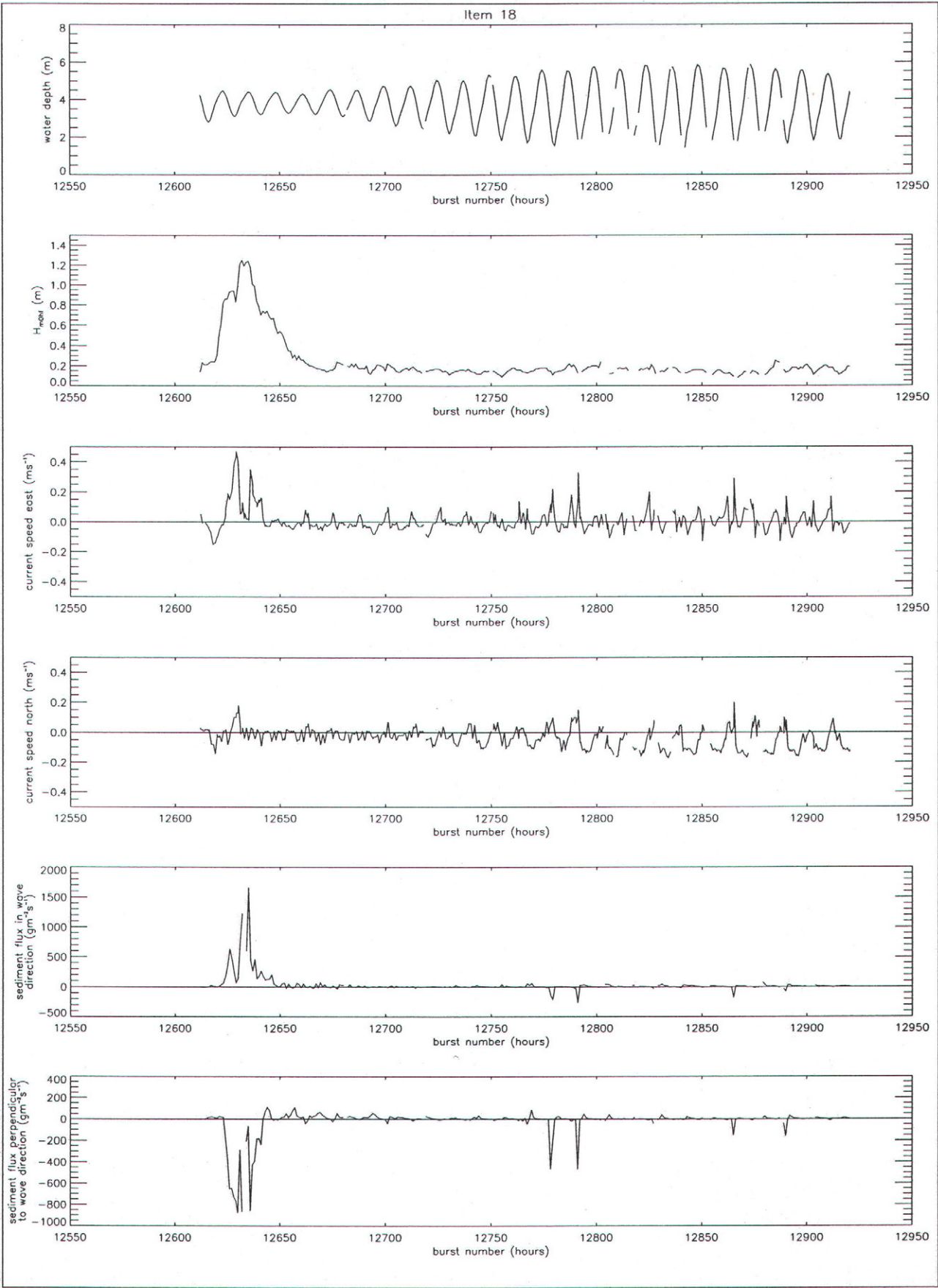


Figure 3.10 Pilot study time series water depth, wave height, currents U-V and sediment fluxes both in the wave direction and perpendicular to the wave direction (item 18A)

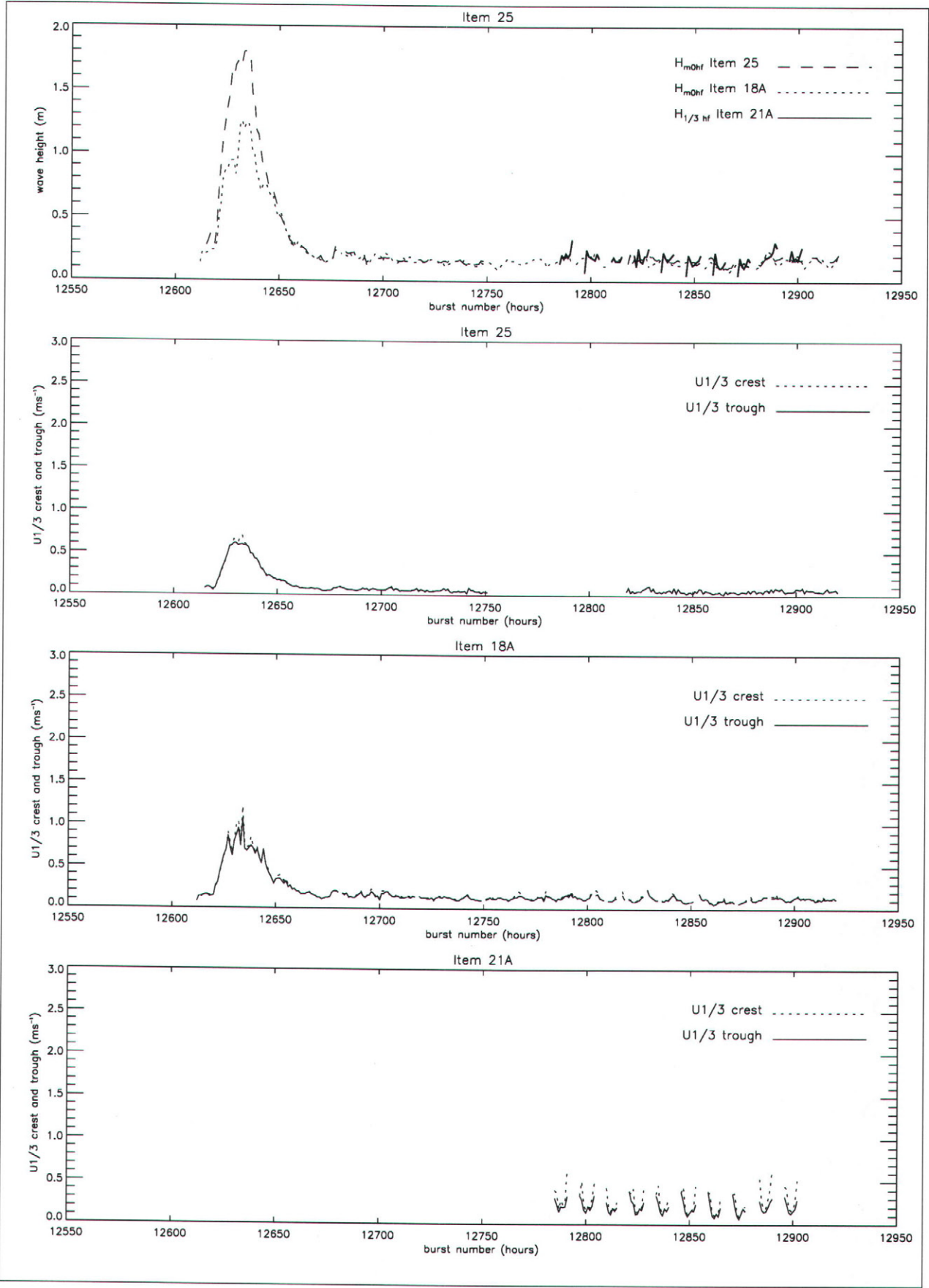


Figure 3.11 Pilot study time series wave height and significant orbital velocities under wave crest and wave trough (items 25, 18A, 21A)

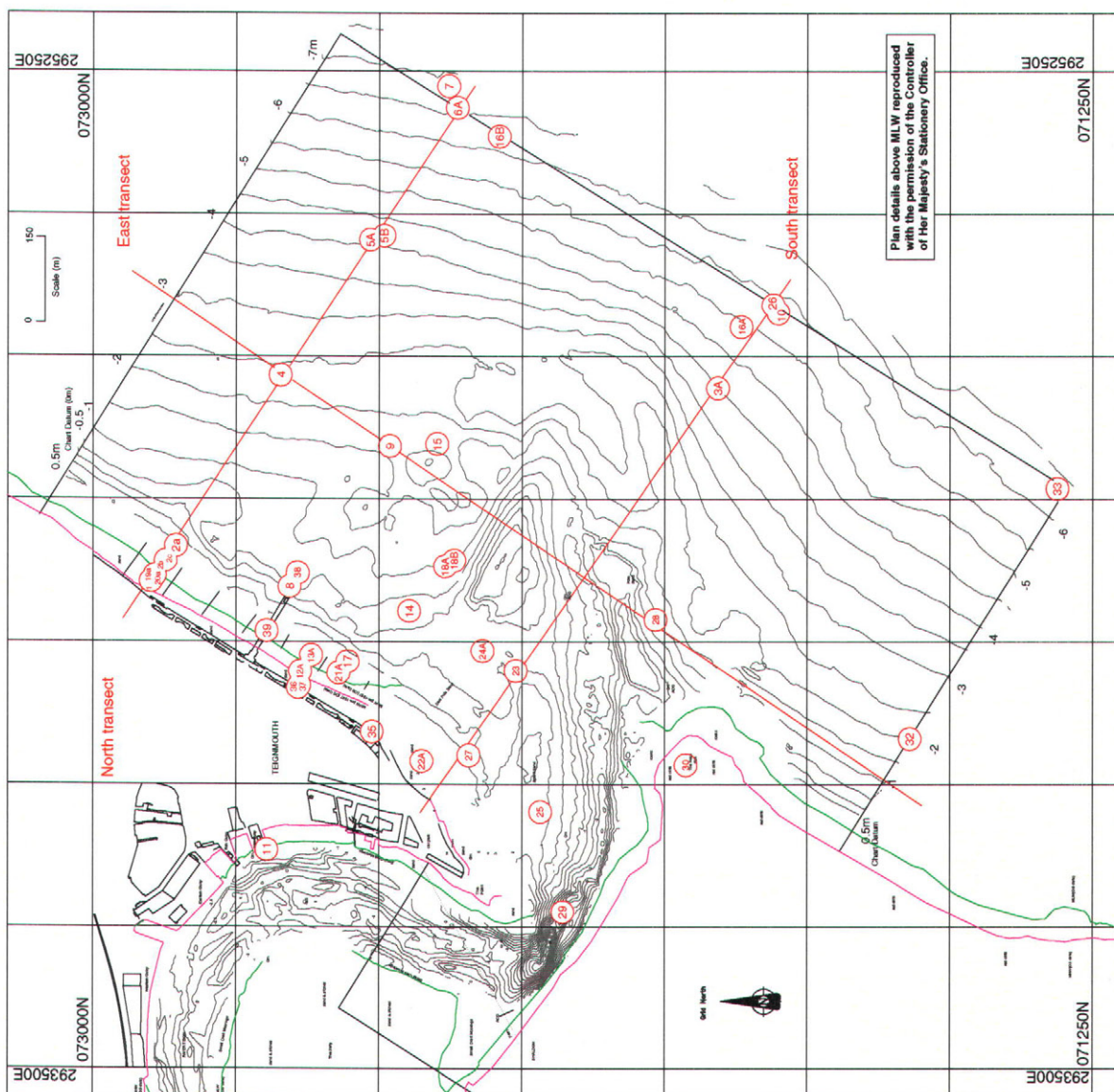


Figure 4.1 COAST 3D Teignmouth – layout of equipment during the main study (October/November 1999)

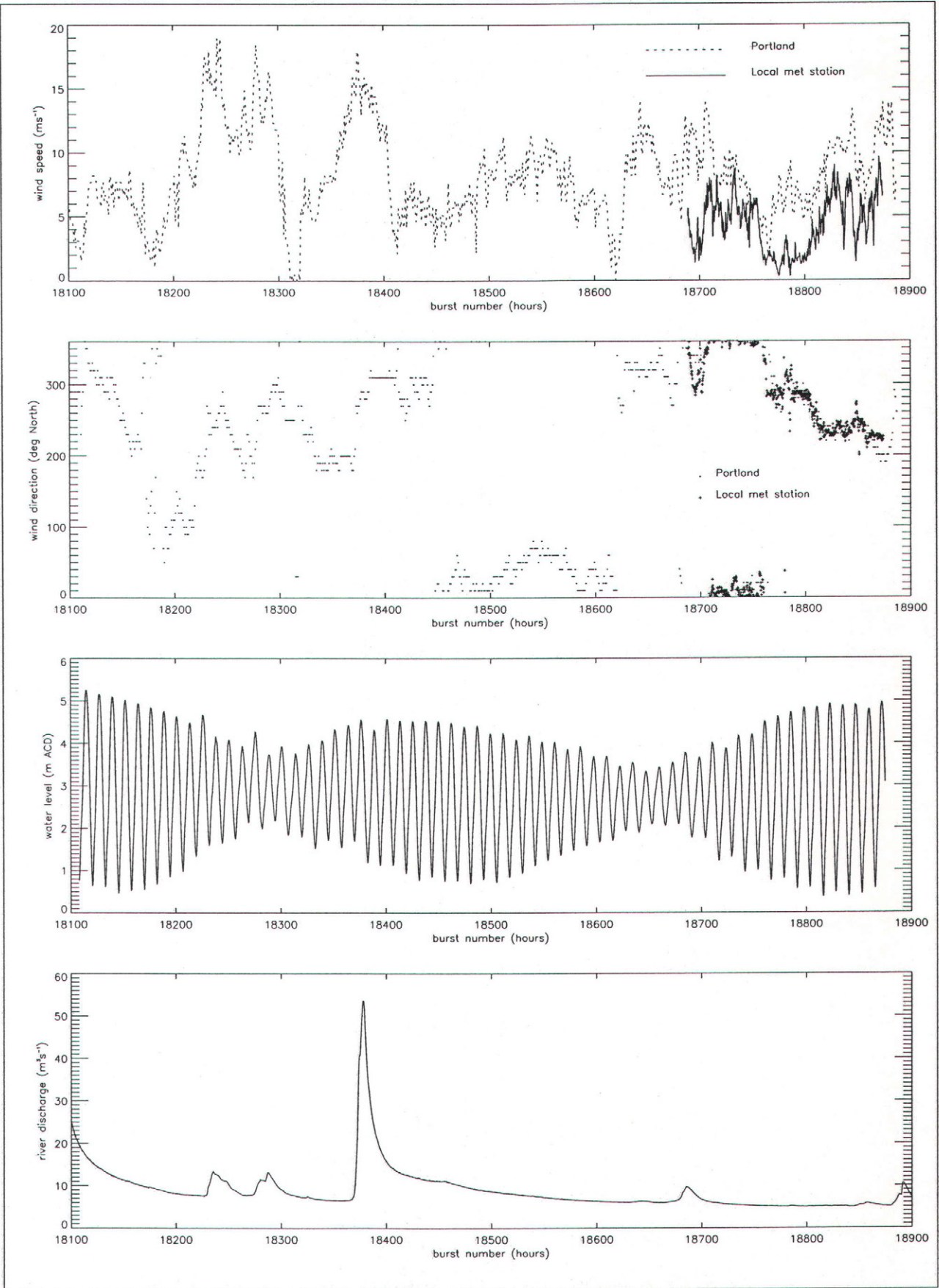


Figure 4.2 Main study meteorology (item 34 - with data supplied by the UK Met. Office), water levels (items 8 , 11) and river inflow (item 31) - provided by the Environment Agency

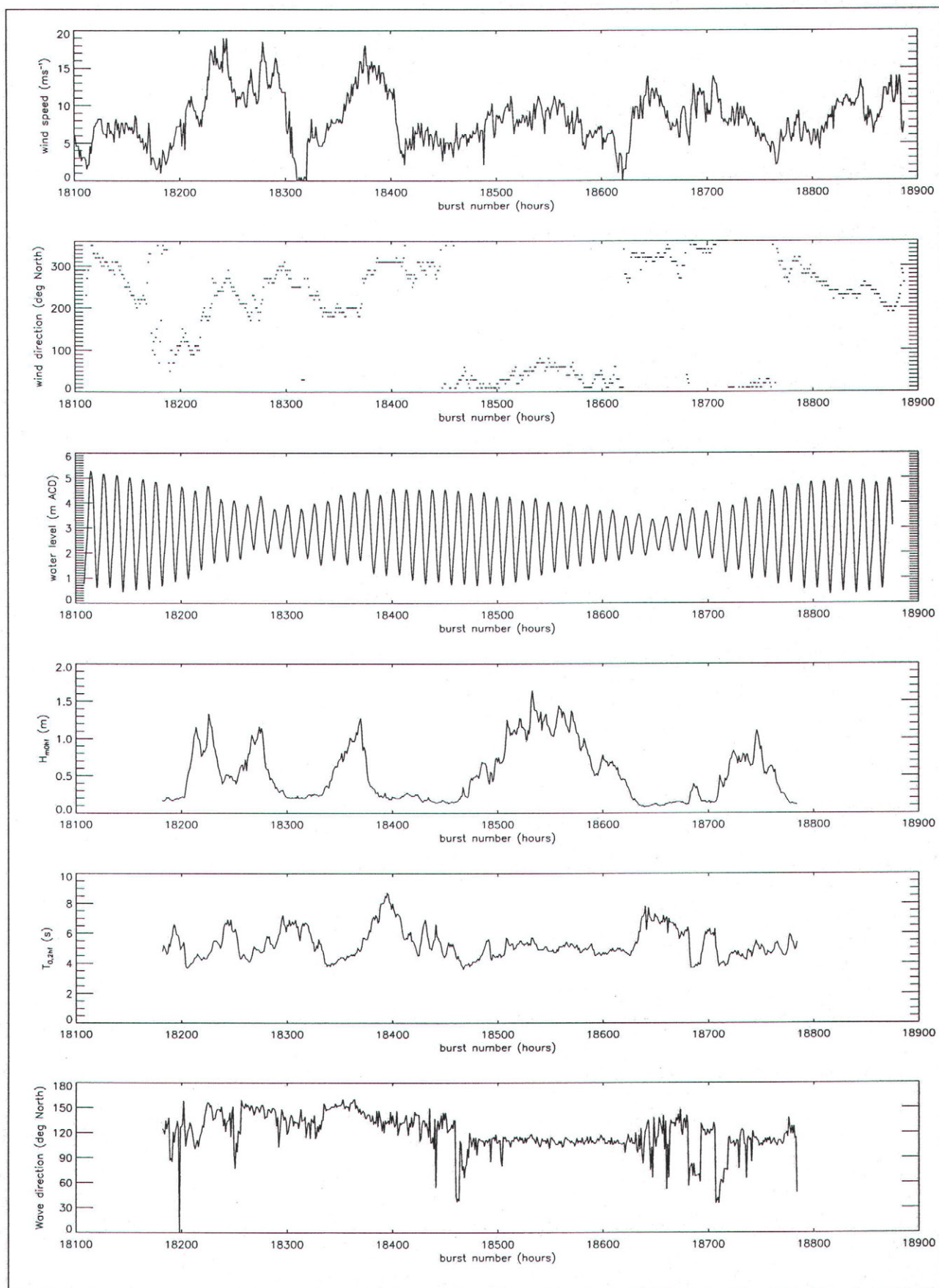


Figure 4.3 Main study time series of wind speed and direction (data supplied by the Met. Office), water levels (item 8, 11), wave height, period and direction (item 7)

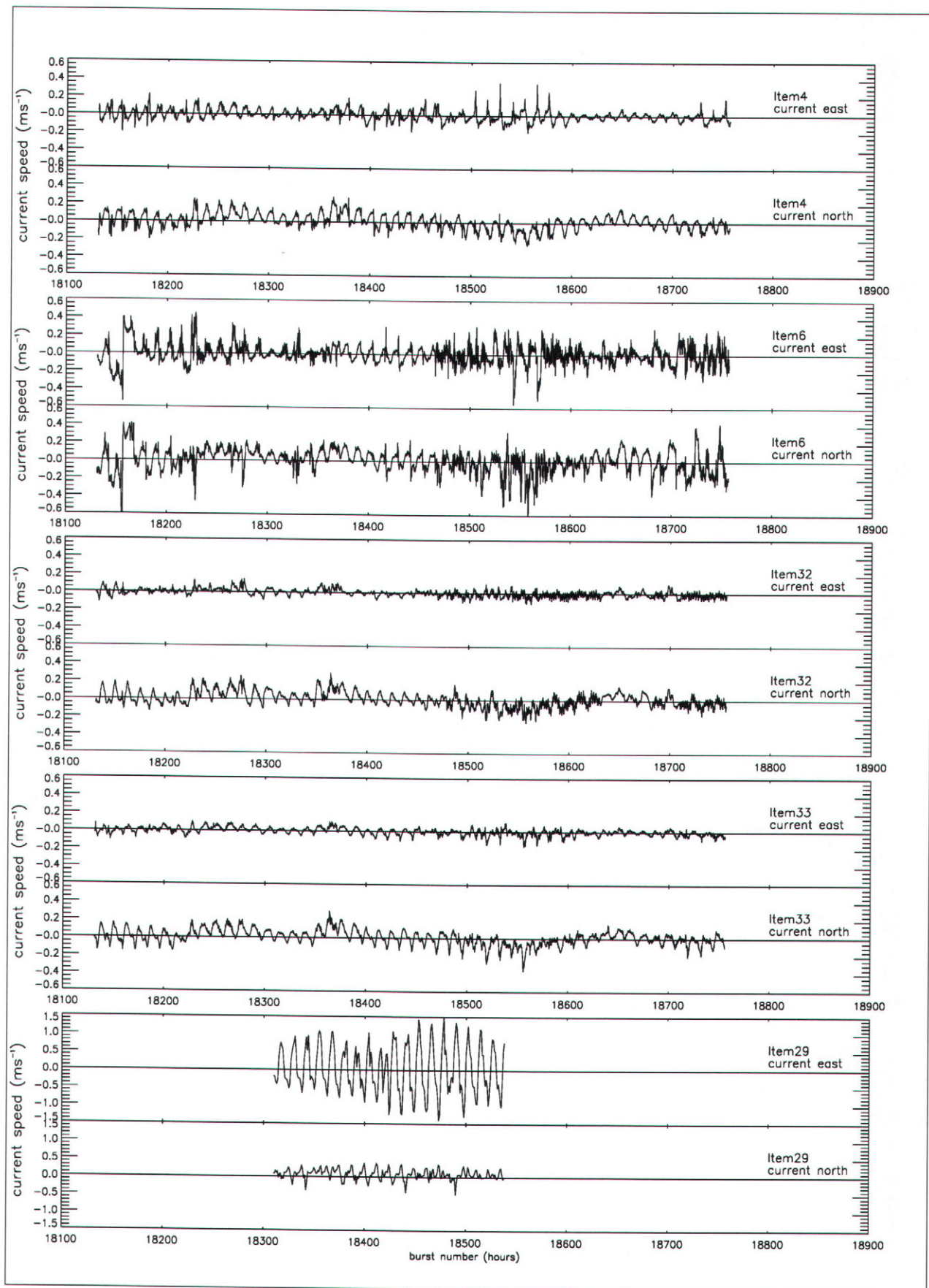


Figure 4.4 Main study time series currents U-V at items 4, 6, 32, 33, and 29

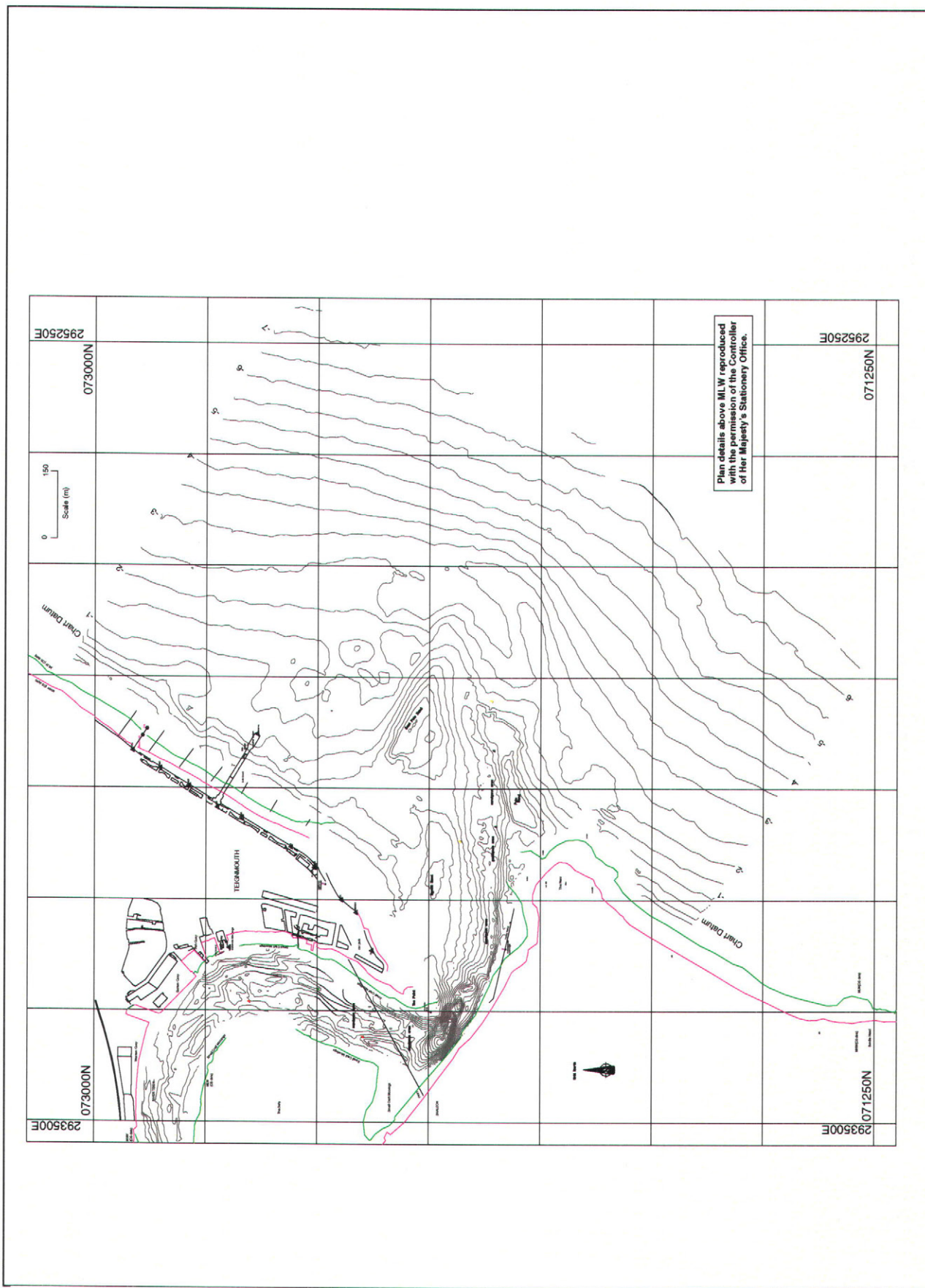


Figure 4.5 Main study bathymetric survey no. 1, 27-28 October 1999 (HR4 10/99)

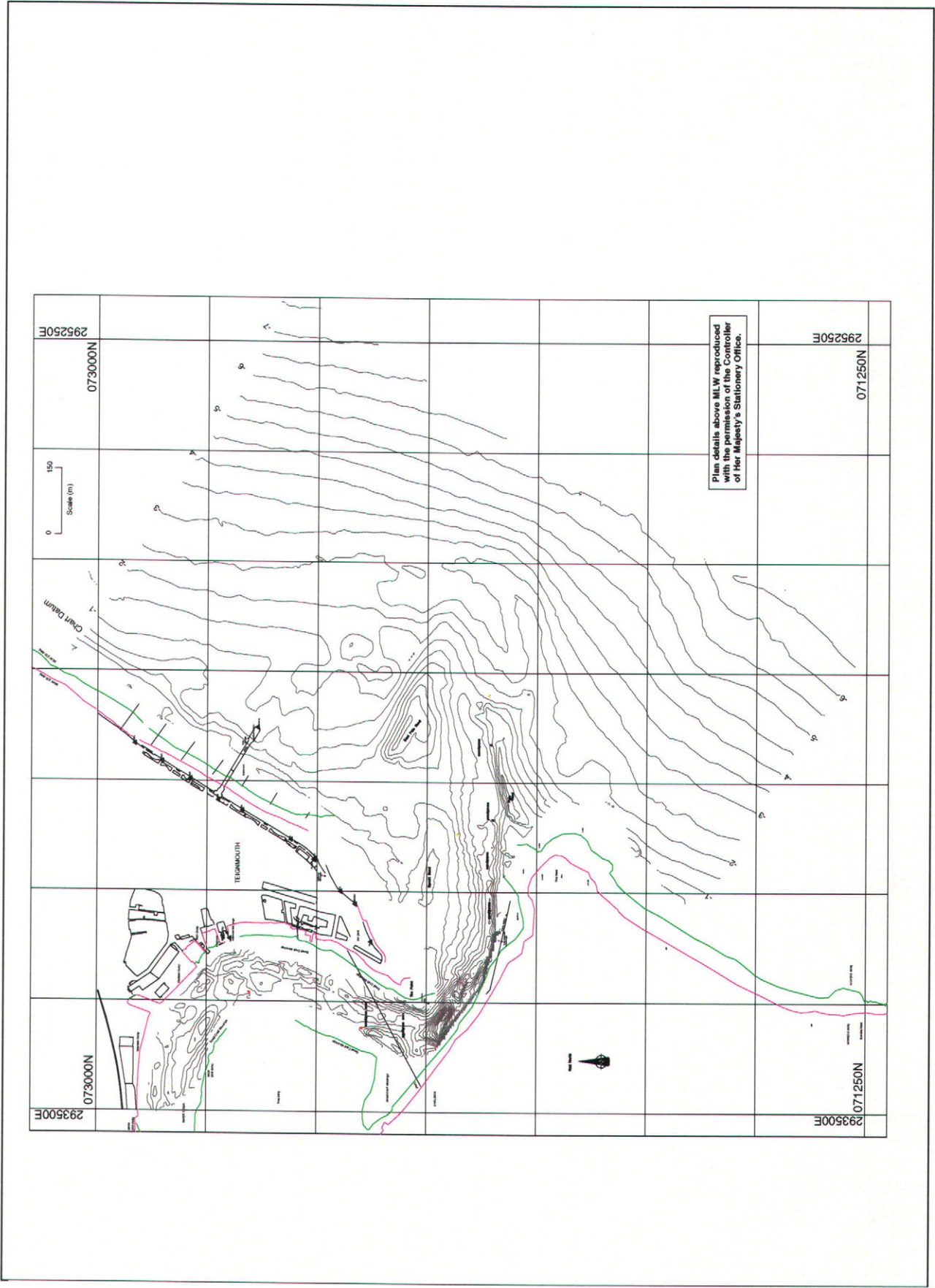


Figure 4.6 Main study bathymetric survey no. 2, 6-8 November 1999 (HR5 11/99)

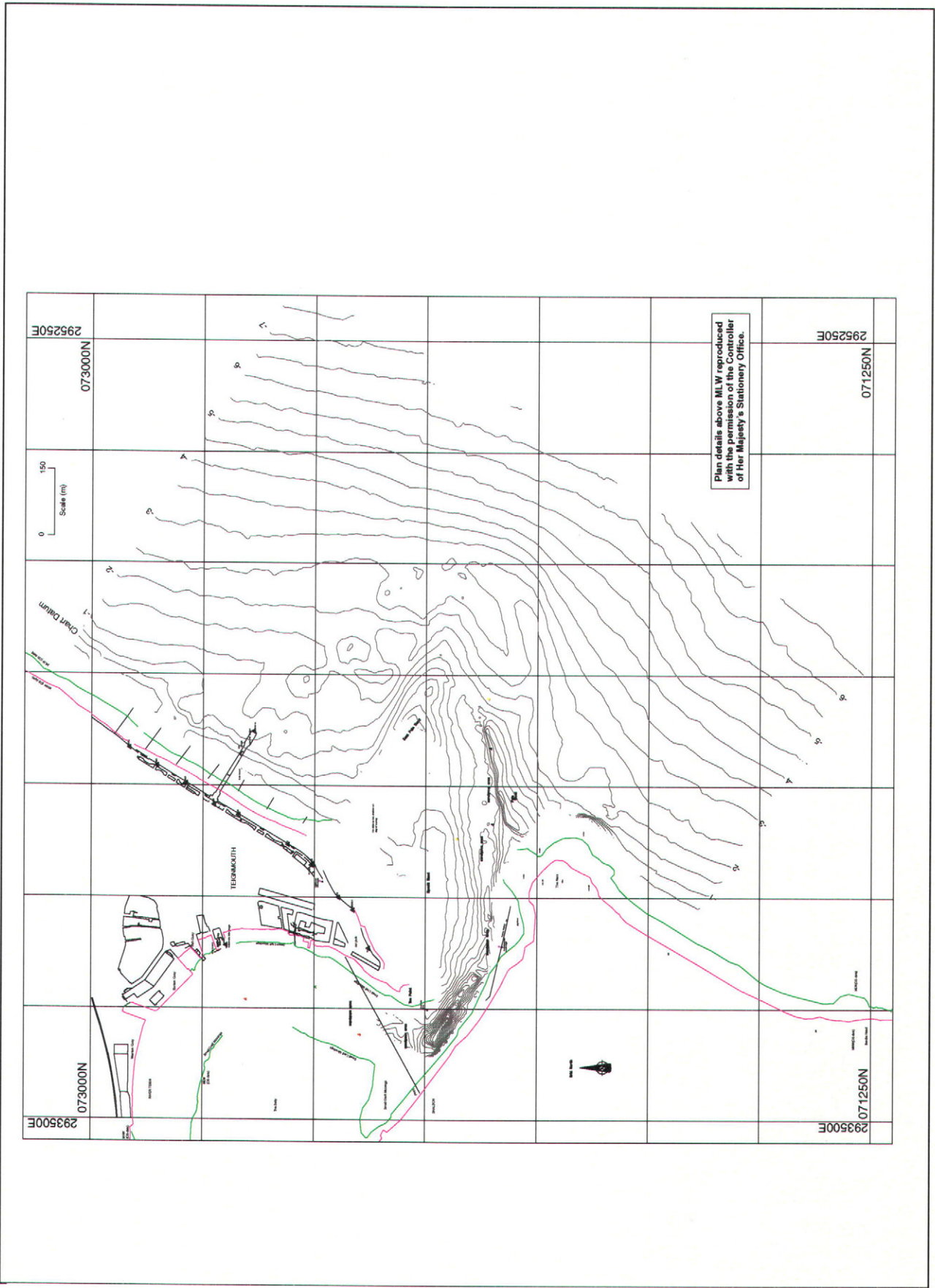


Figure 4.7 Main study bathymetric survey no. 3, 16-17 & 19 November 1999 (HR 6 11/99)



Figure 4.8 Main study bathymetric survey no. 4, 24-25 November 1999 (HR 7 11/99)

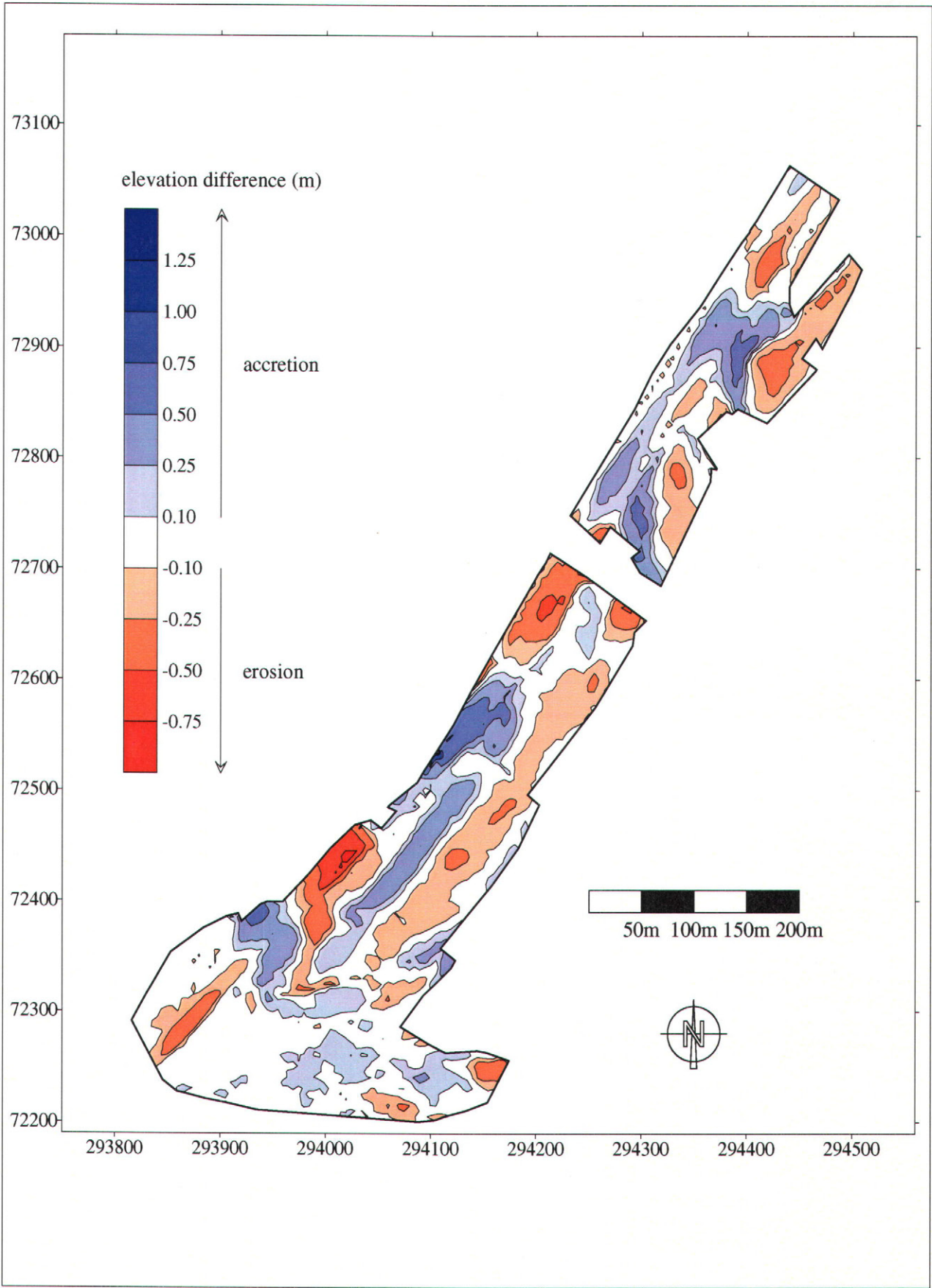


Figure 4.9 Evolution of the beach topography during the Main Study (from 25-27 October 1999 to 23-25 November 1999). Figure supplied by Dr F. Levoy, University of Caen

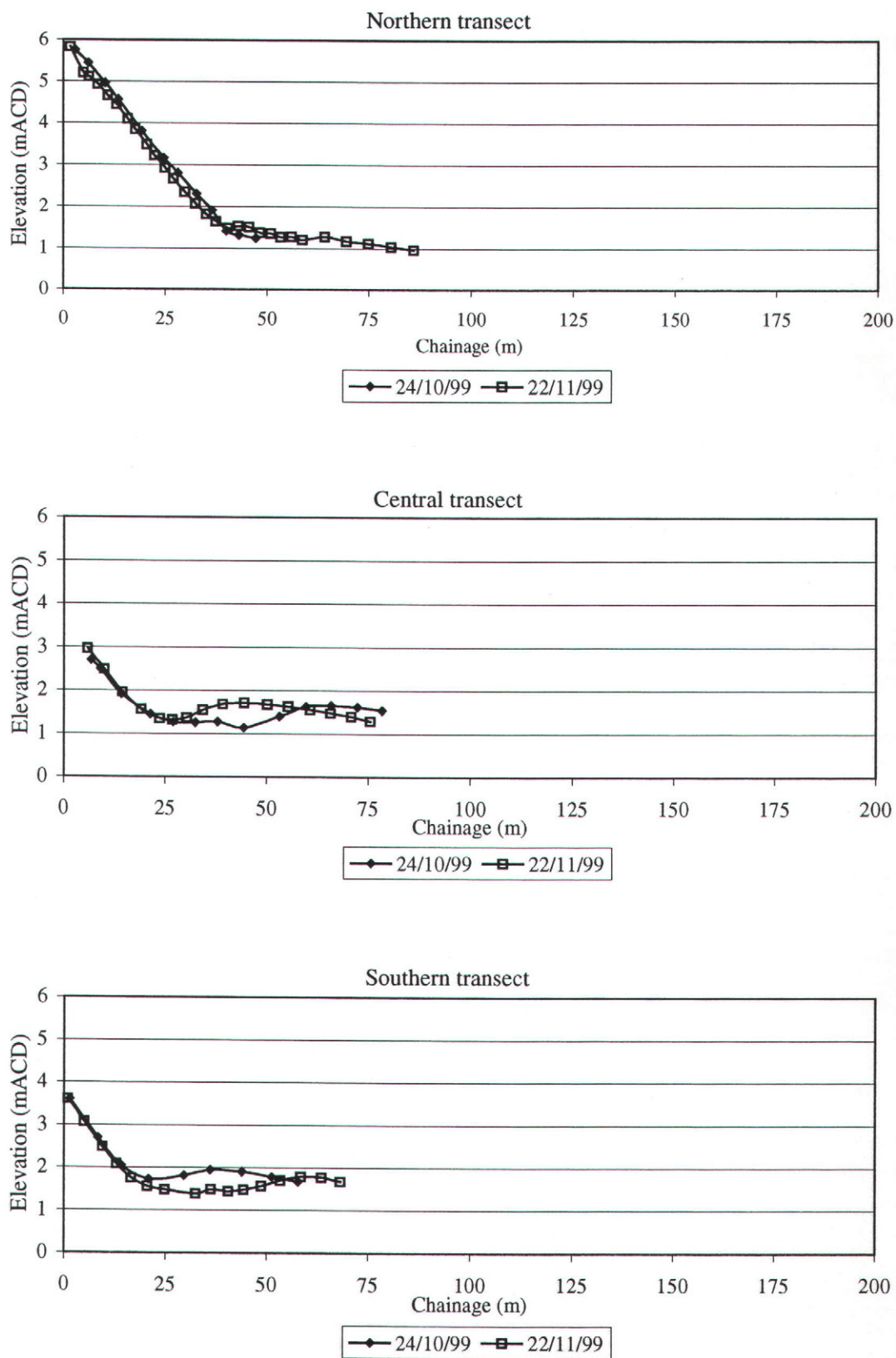


Figure 4.10 Main study example beach profiles (compare Figures 2.2, 3.8)

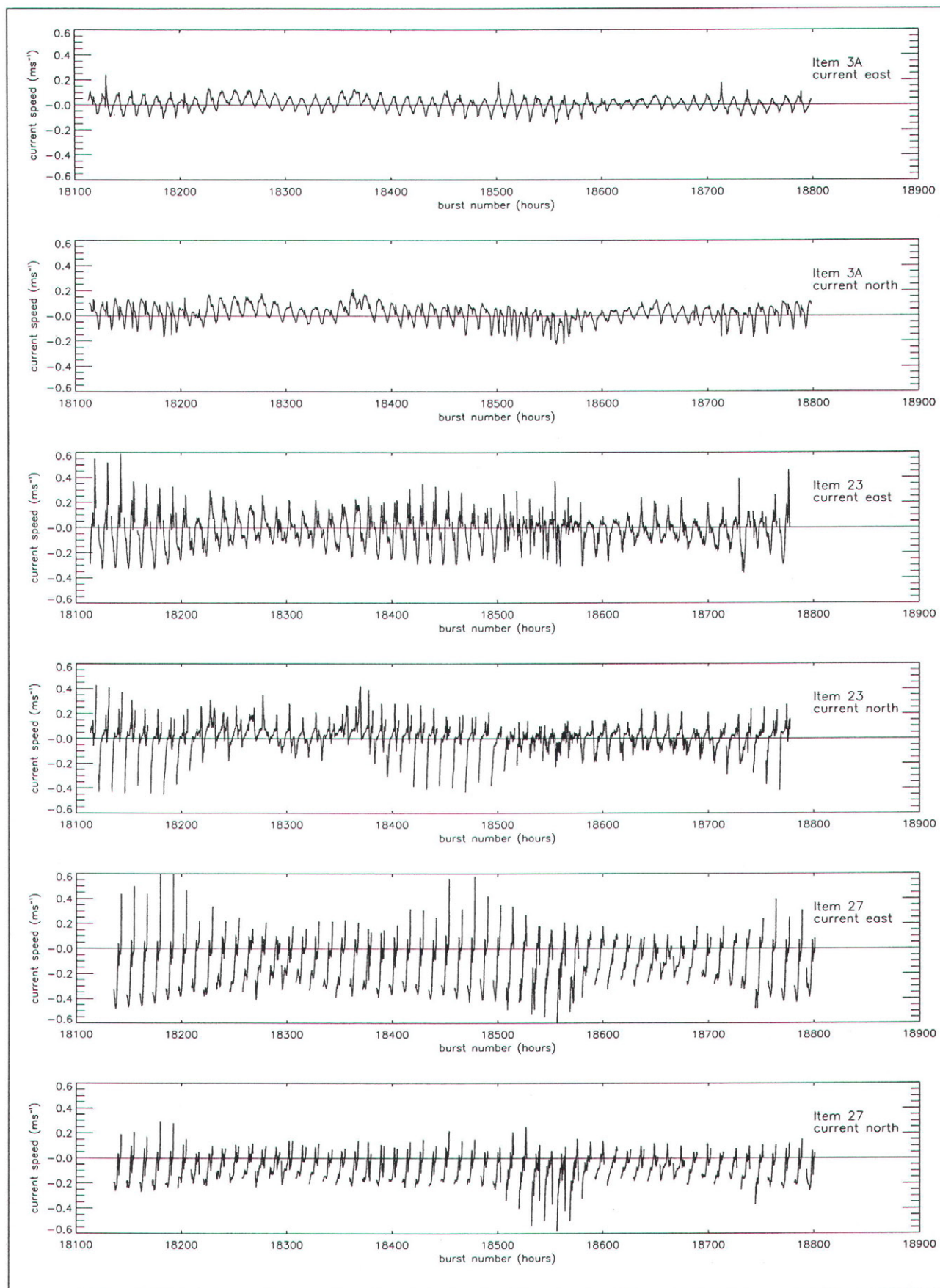


Figure 4.11 Main study time series currents U-V (items 3A, 23, 27)

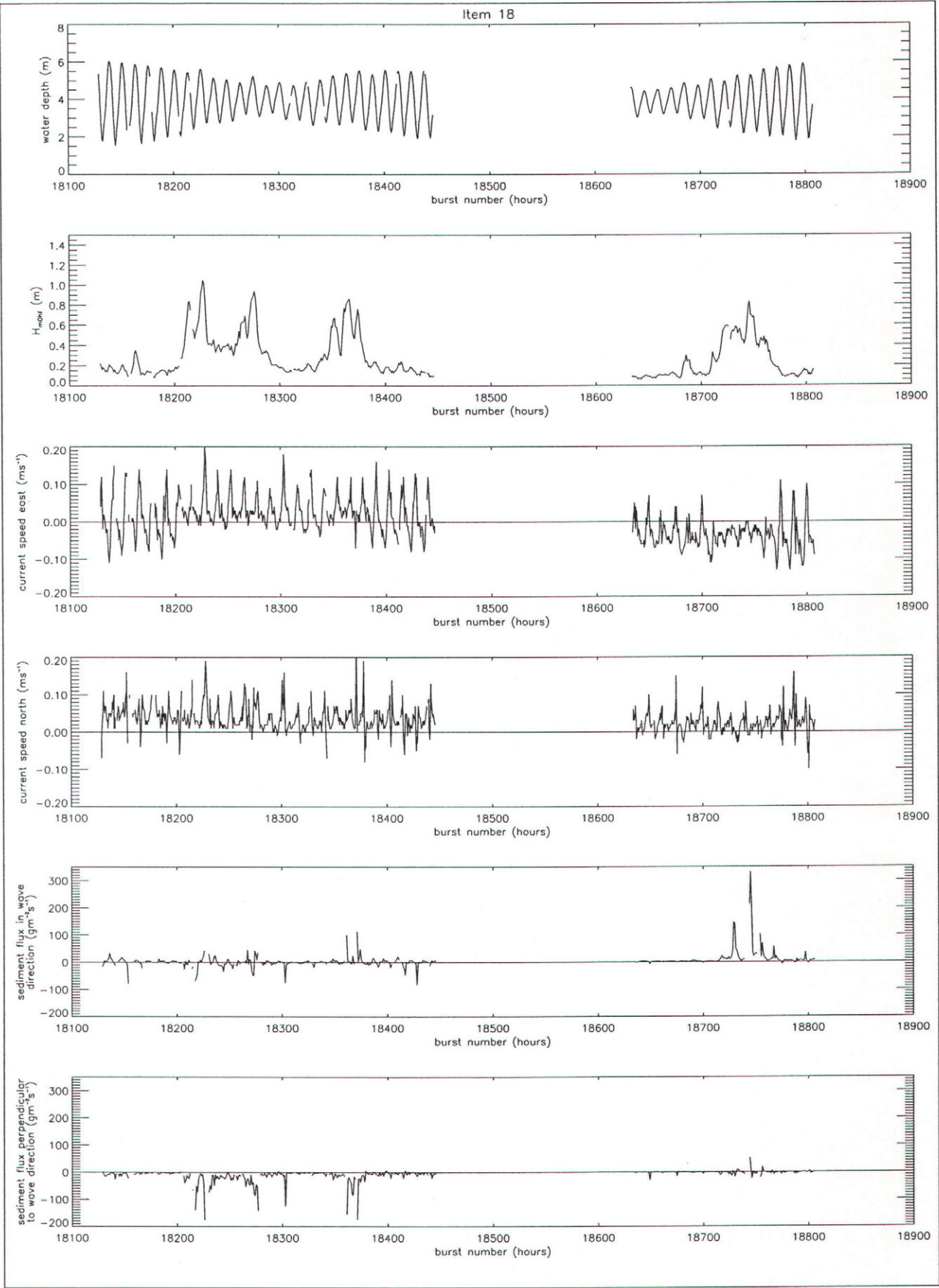


Figure 4.12 Main study time series water depth, wave height, currents U-V and sediment fluxes both in the wave direction and perpendicular to the wave direction (item 18A)

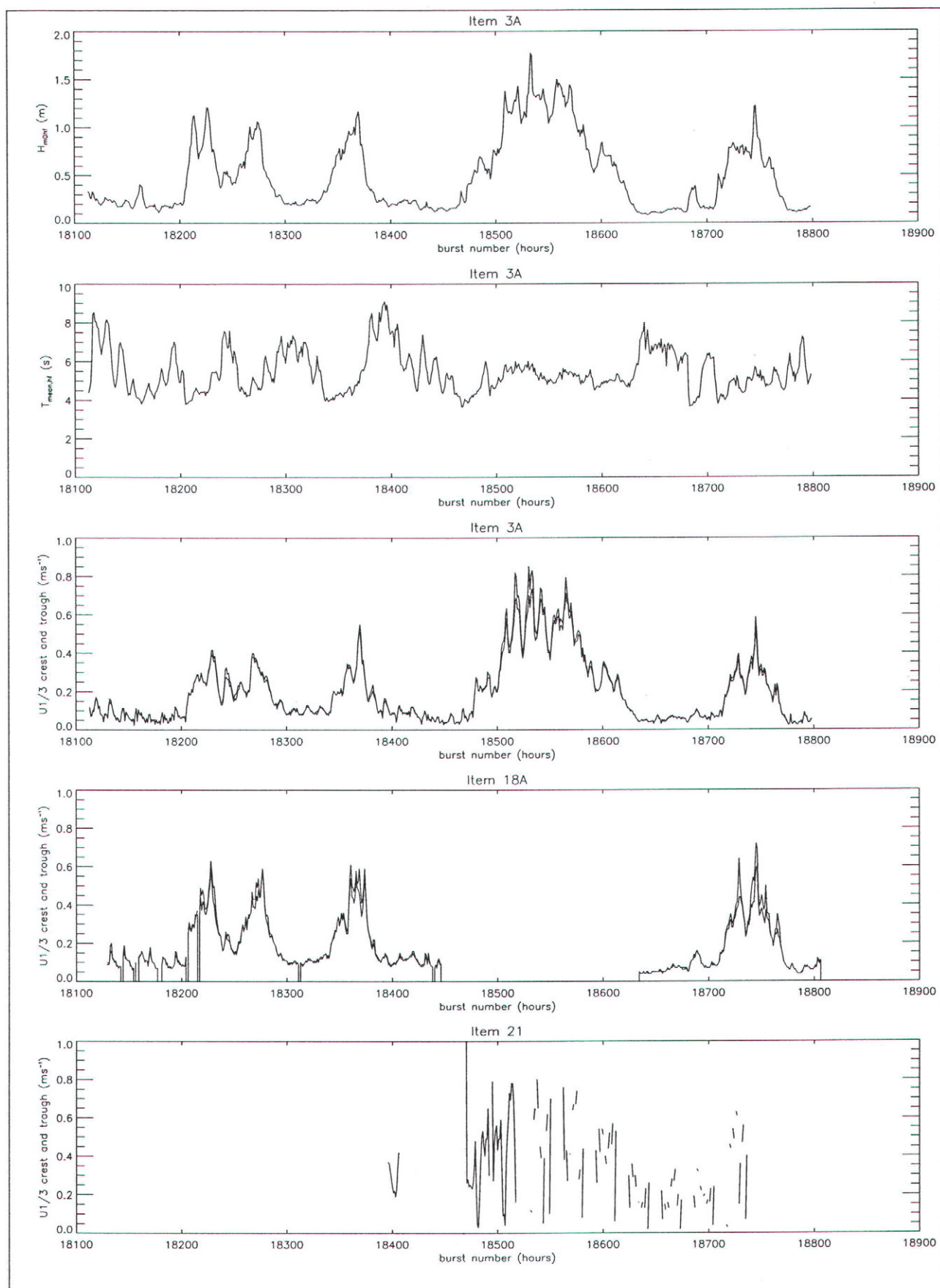


Figure 4.13 Main study time series wave height and period and significant orbital velocities under the wave crest and wave trough (items 3A, 18A, 21A)

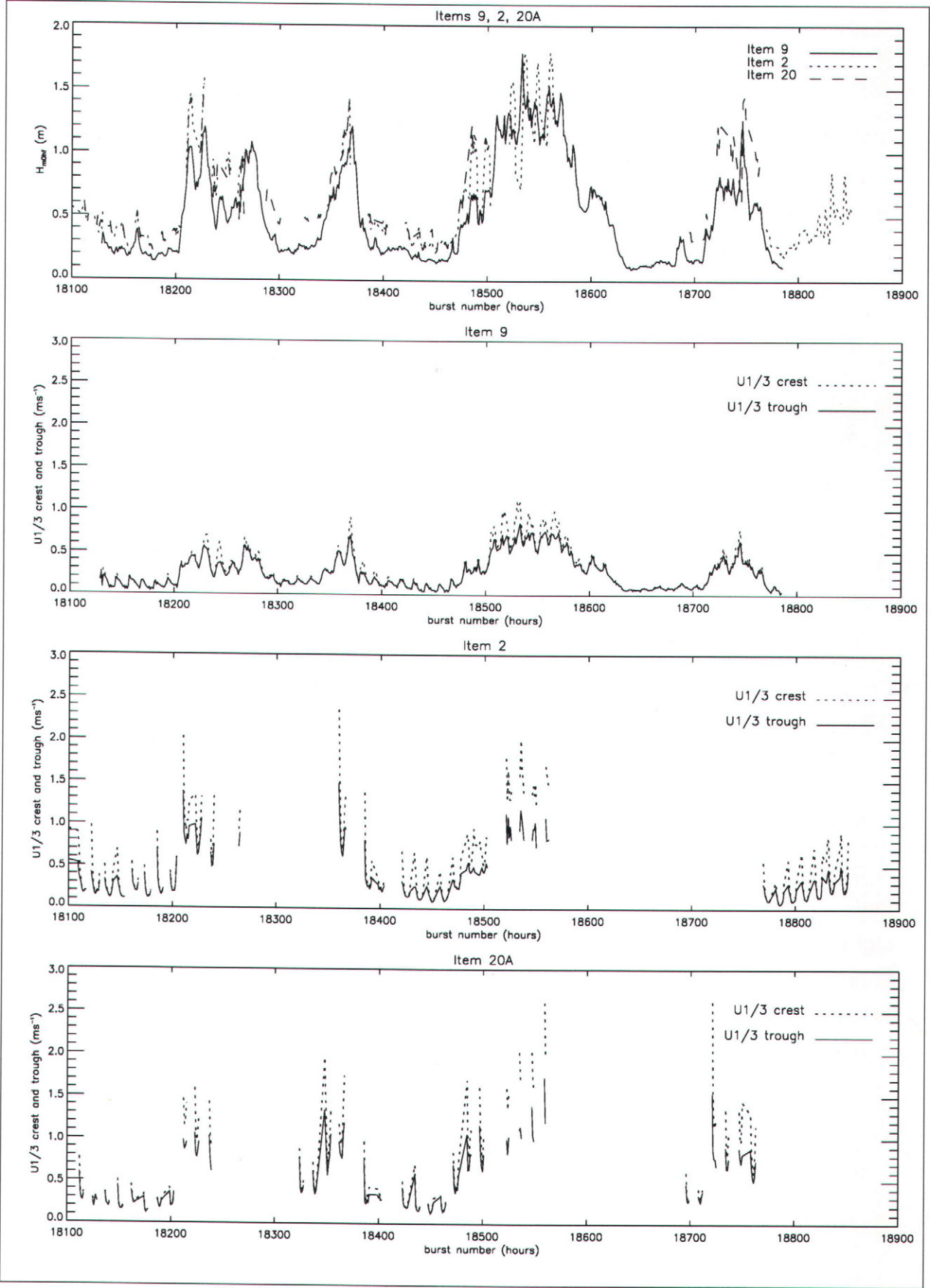
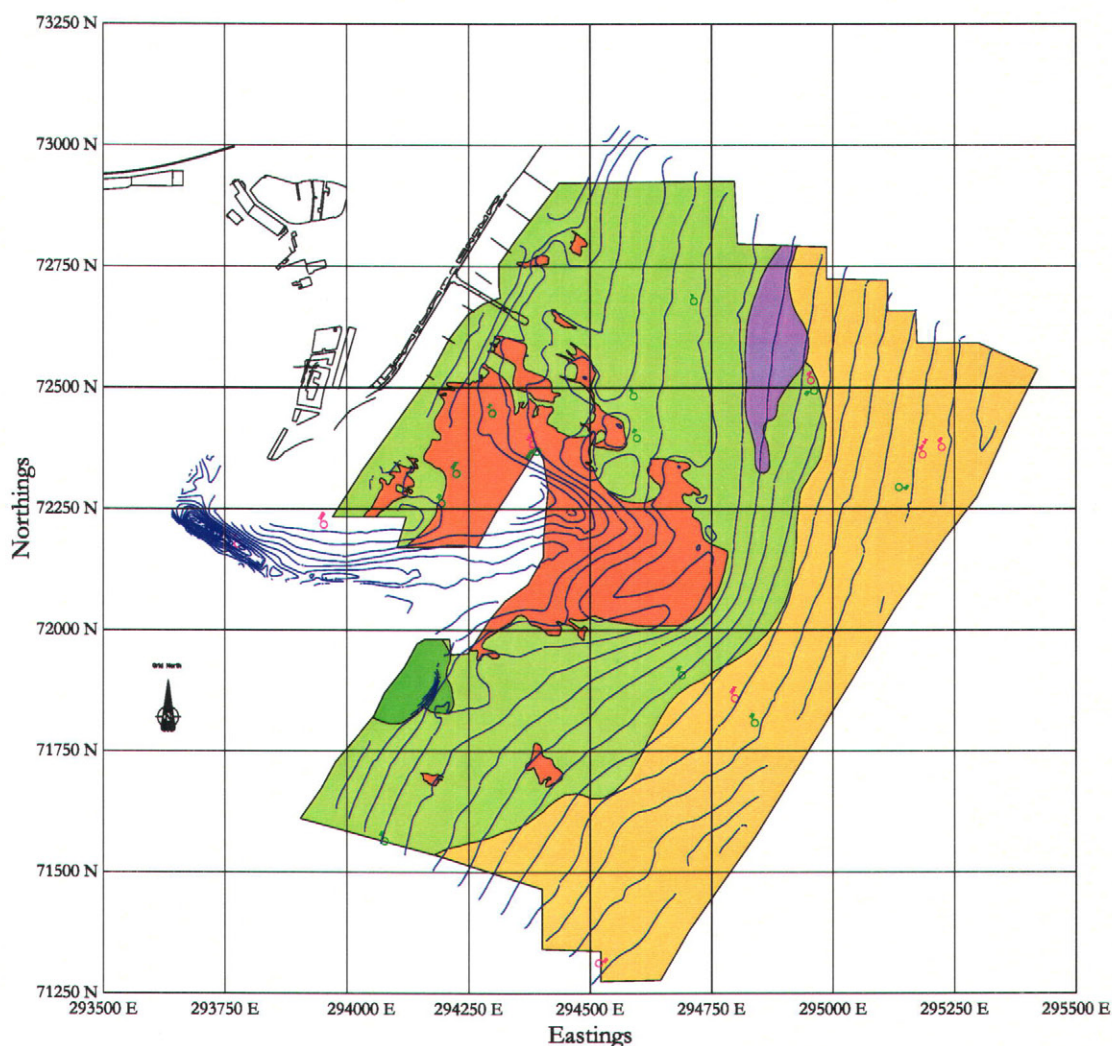


Figure 4.14 Main study time series wave height and significant orbital velocities under the wave crest and wave trough (items 9, 2, 20A)



- Red:** area with coarse ripples to megaripples (typical wavelength of 1m)
- Light green:** area devoid of bedforms
- Blue:** area with megaripples to sandwaves (typical wavelength of 7 – 10m)
- Yellow:** area with patchy texture possibly caused by fields of tube worms
- Dark green:** rock outcrops

Figure 4.15 Main study map showing distribution of bedforms (figure provided by Prof. J. Lanckneus/Dr V. van Lancker, Magelas)

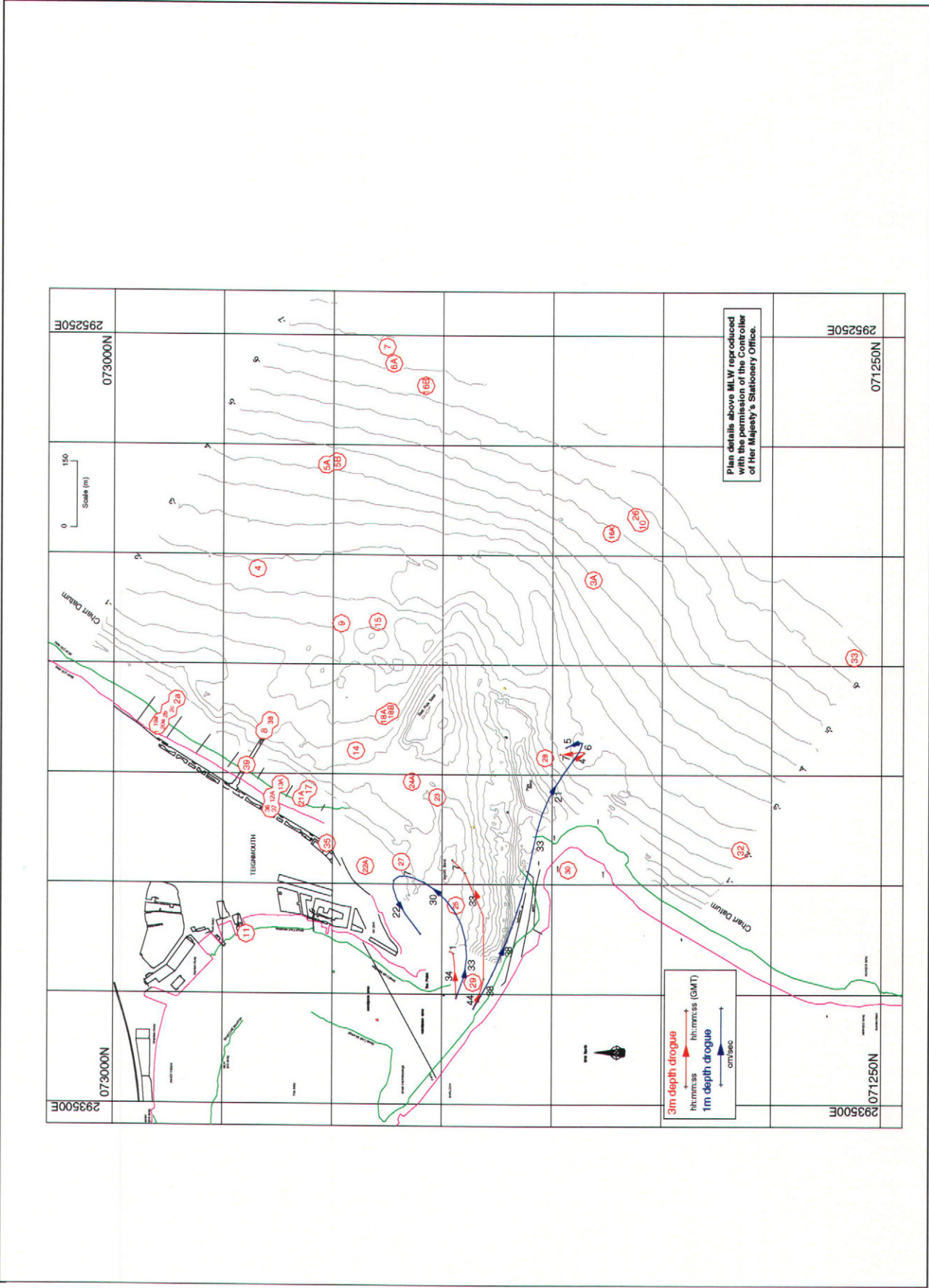


Figure 4.16 Main study drogue tracks for ebbing spring tide, 29 October 1999 (HW+0:22 hrs to HW+1:22 hrs)

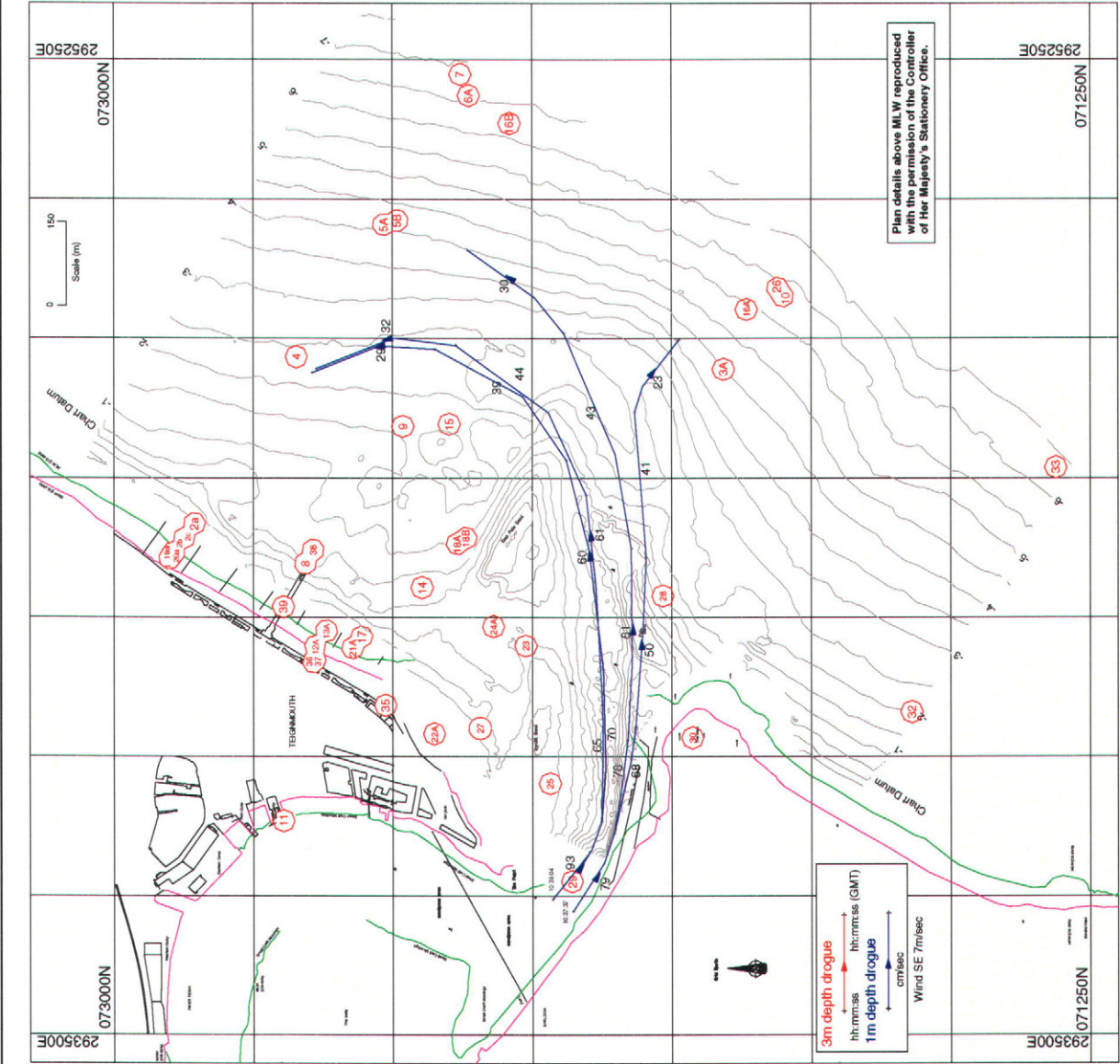


Figure 4.17 Main study drogue tracks for ebbing spring tide (HW +1:28 hrs to HW+2:16 hrs)

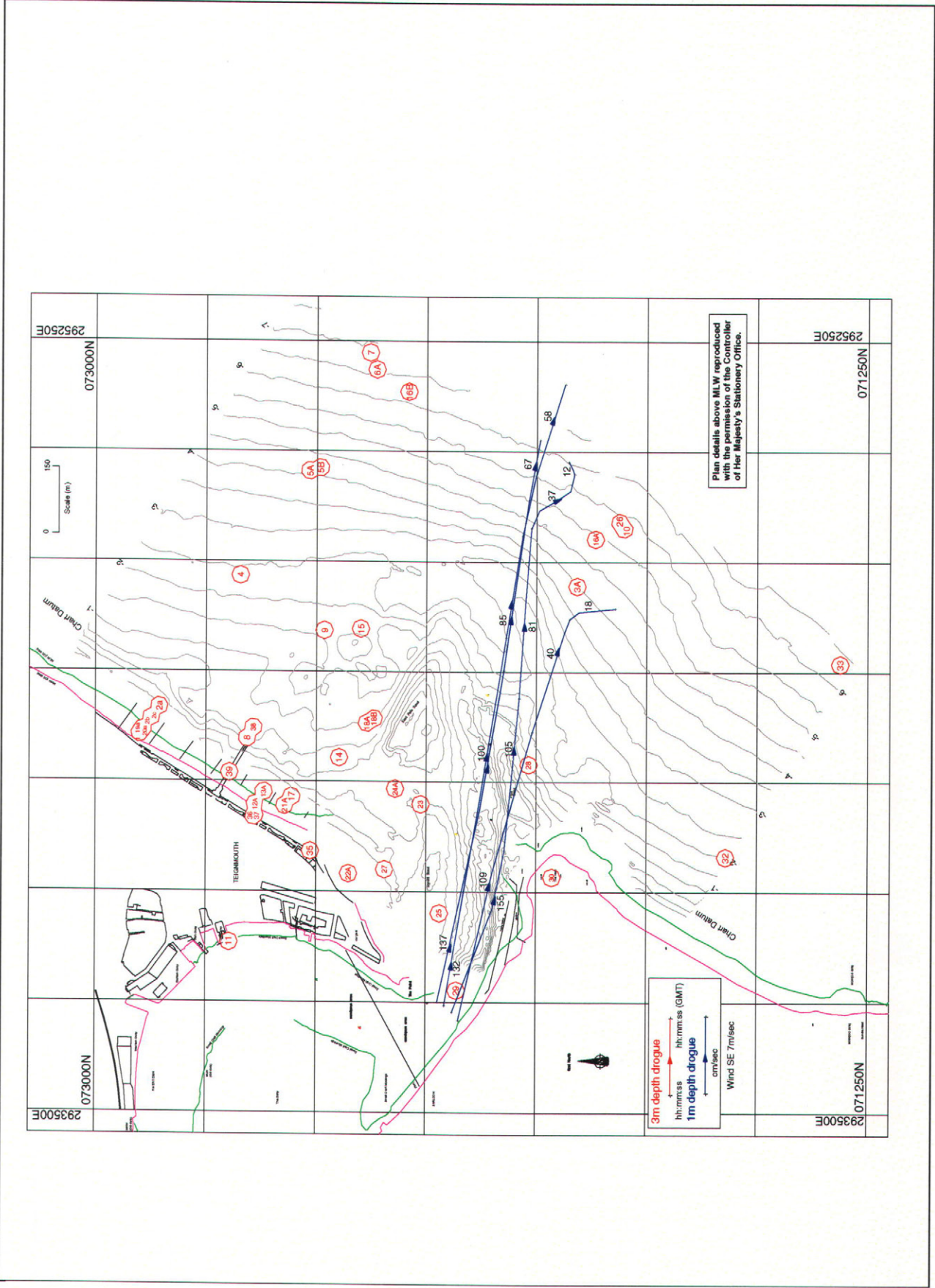


Figure 4.18 Main study drogue tracks for ebbing spring tide (HW+2:26 hrs to HW +2:59 hrs)

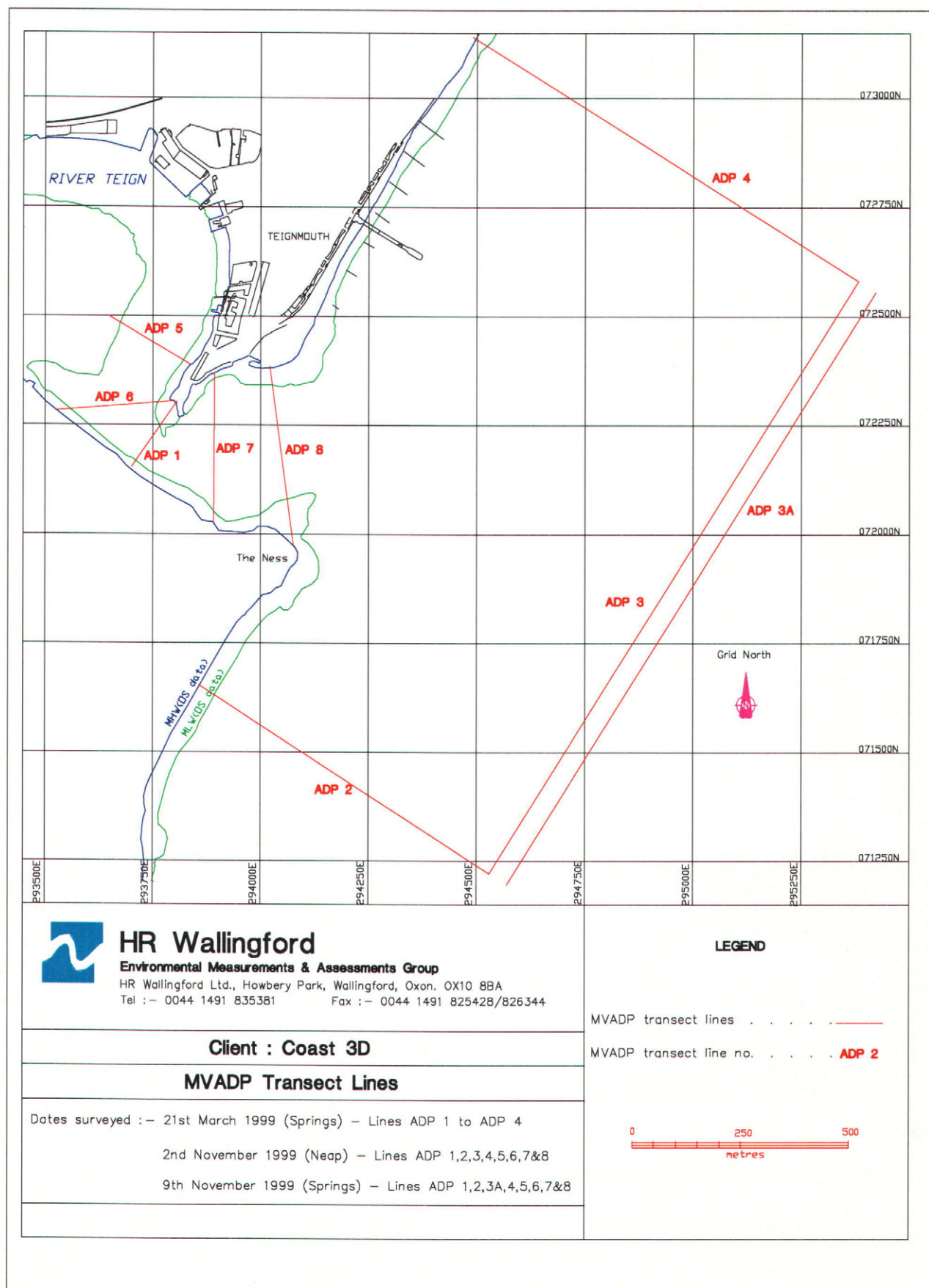


Figure 4.19 Main study transects for Vessel Mounted ADP surveys

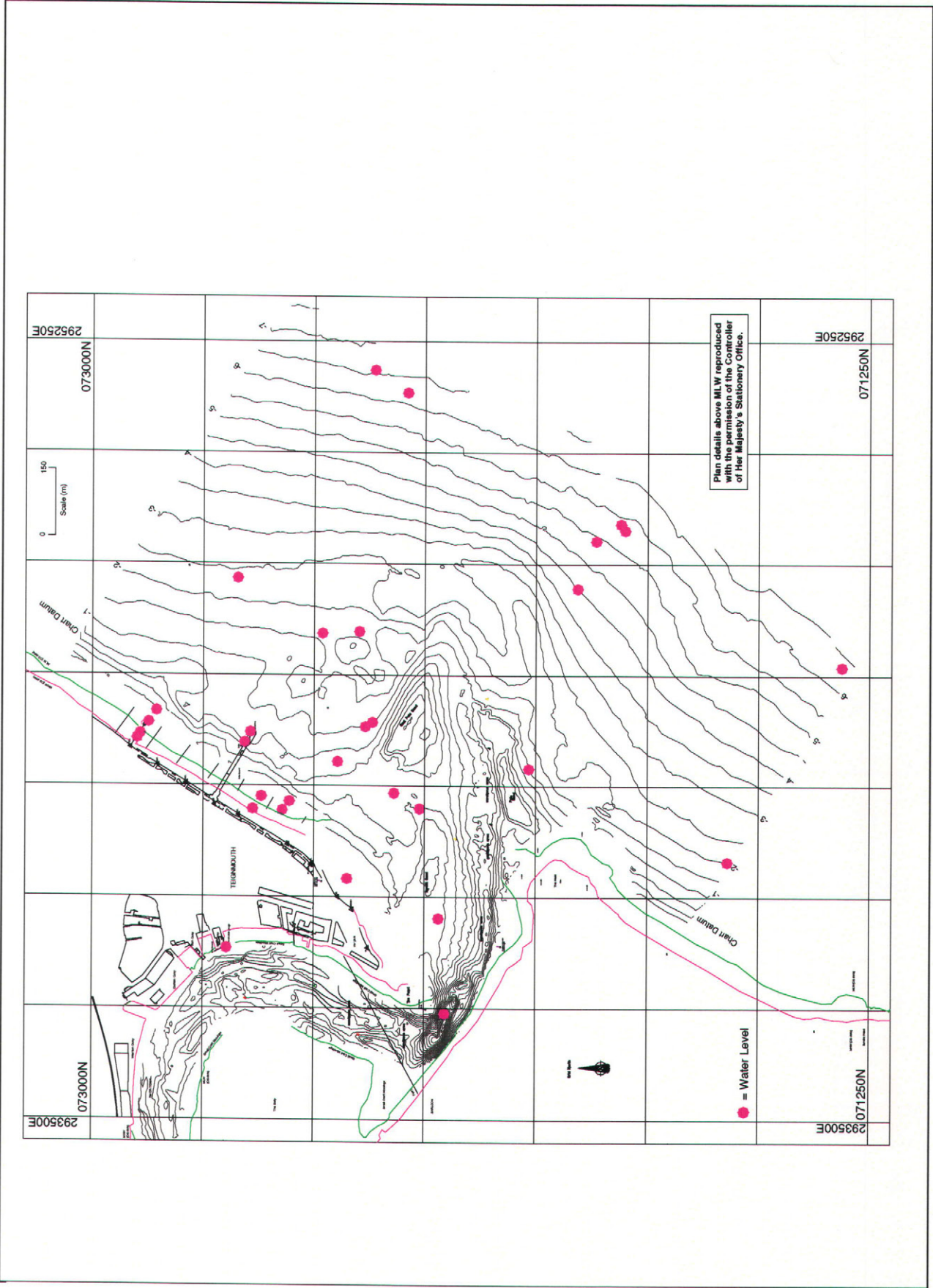


Figure 4.20 Main study locations at which water depths were measured (bathymetry from Figure 4.5)

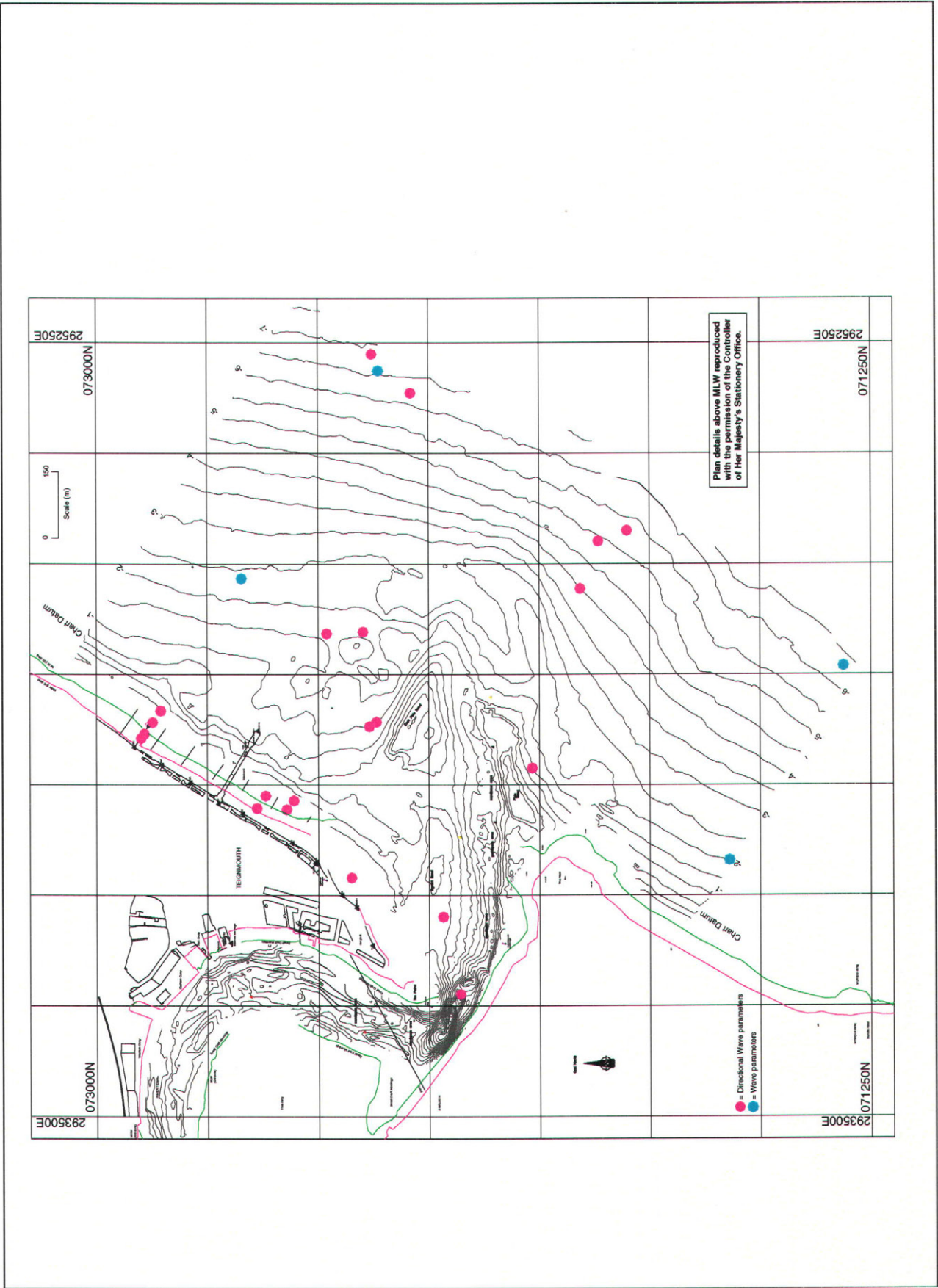


Figure 4.21 Main study locations at which wave parameters were measured

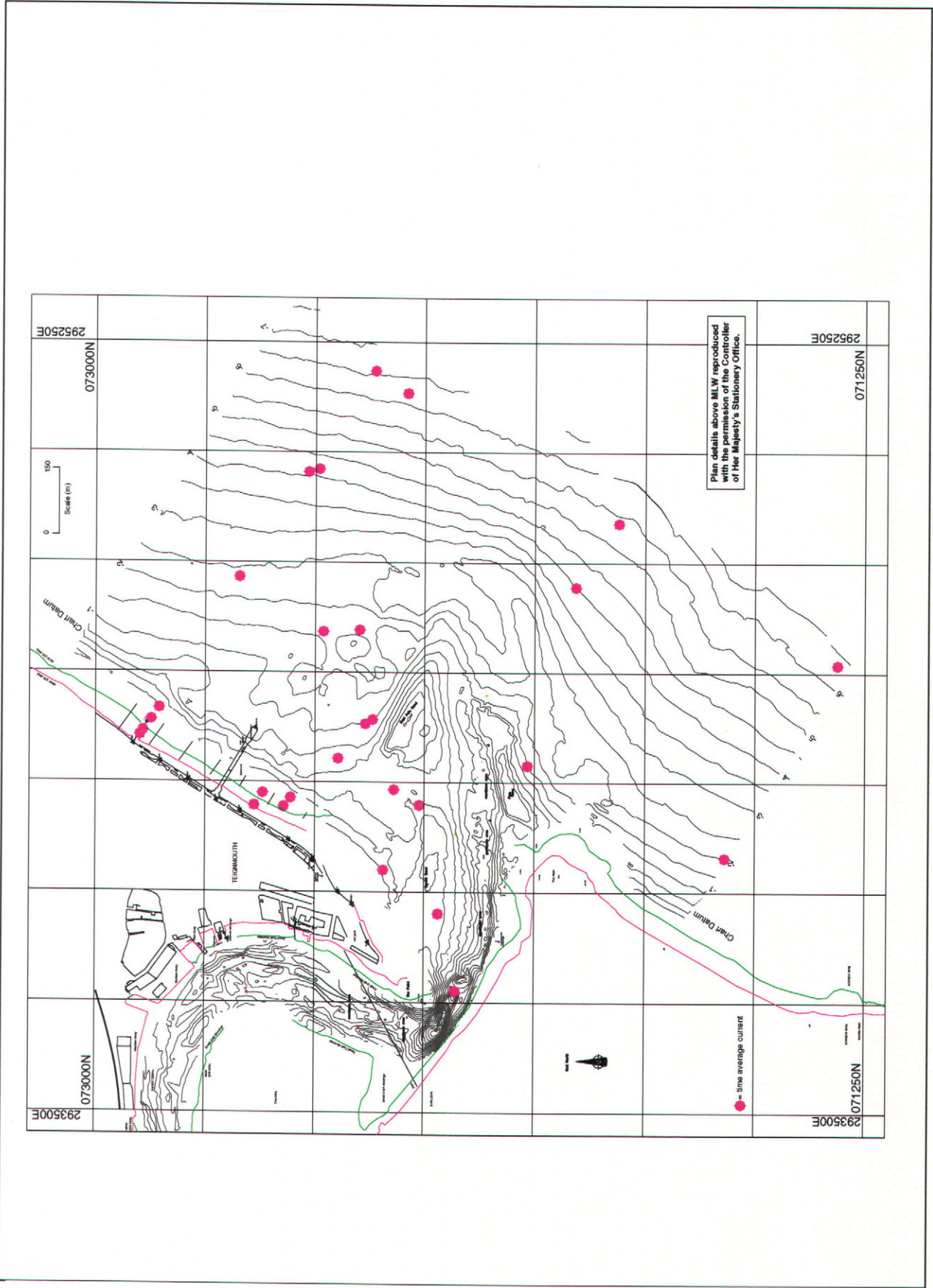


Figure 4.22 Main study locations at which time-averaged currents were measured

Figure 4.23 Main study locations at which wave orbital velocities were measured

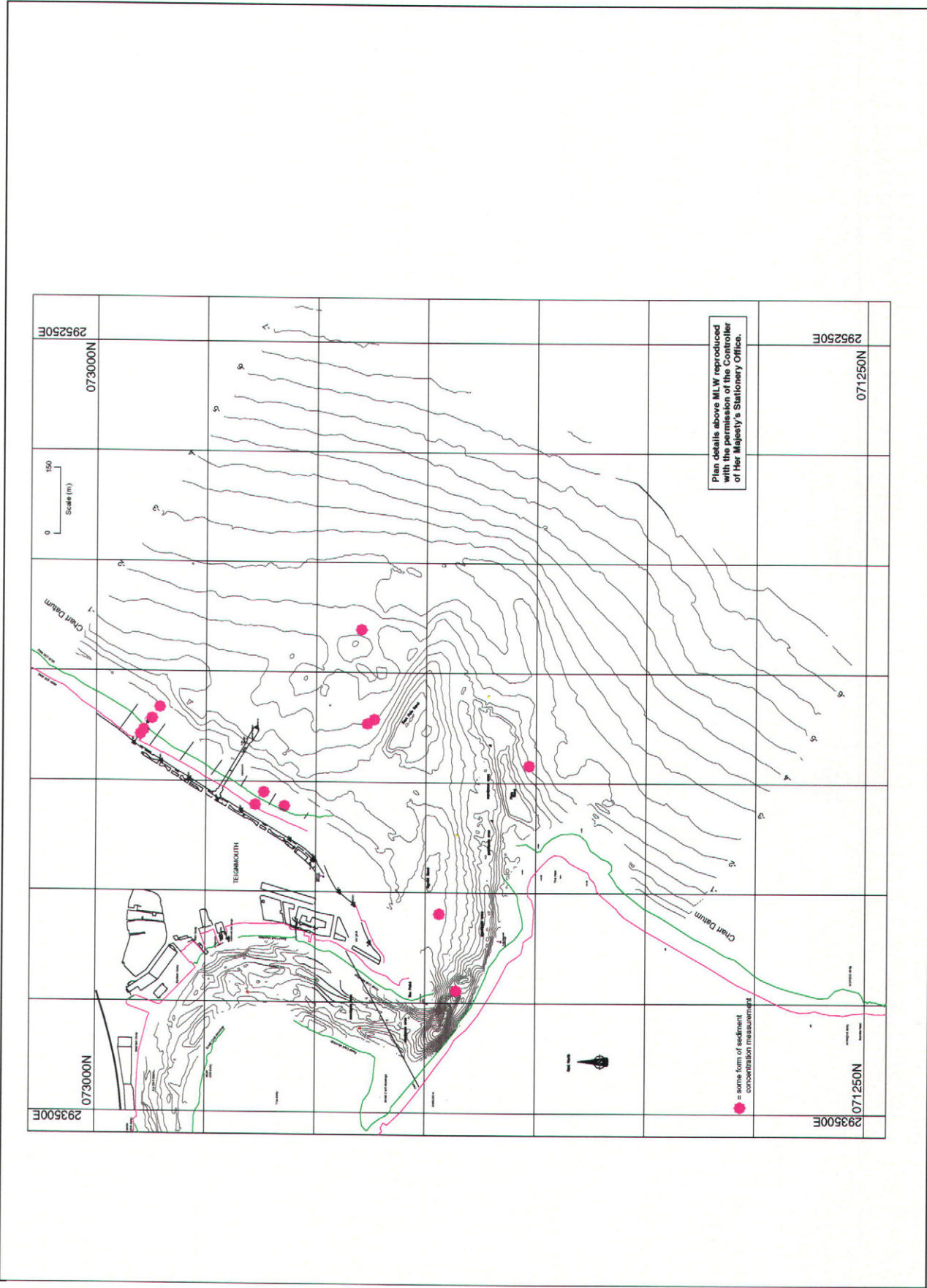


Figure 4.24 Main study locations at which sediment concentration parameters were measured

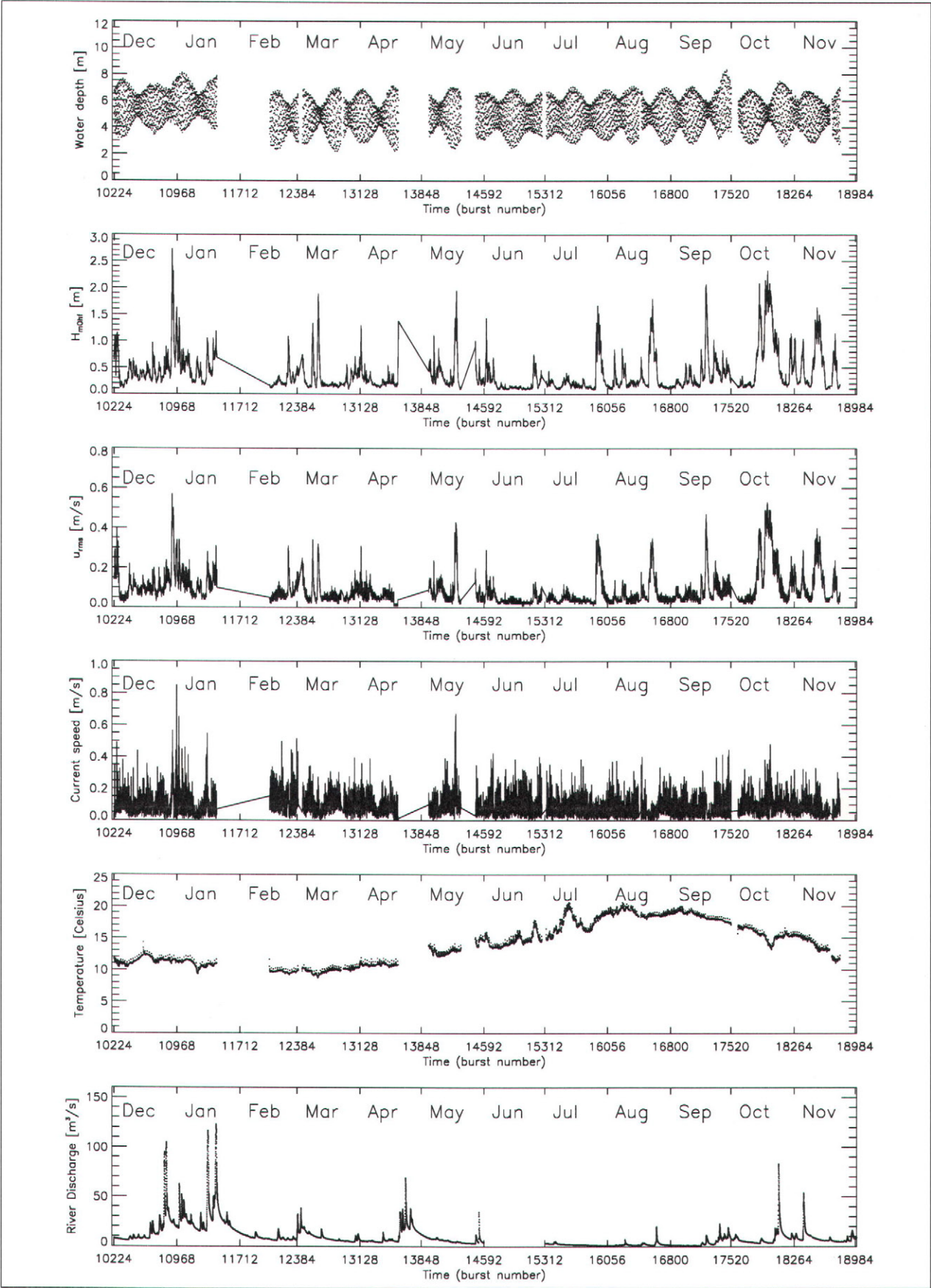


Figure 5.1 Time series water levels, wave height, RMS orbital velocity, current speed, water temperature (item 15) and river inflow (item 31 - provided by the Environment Agency)

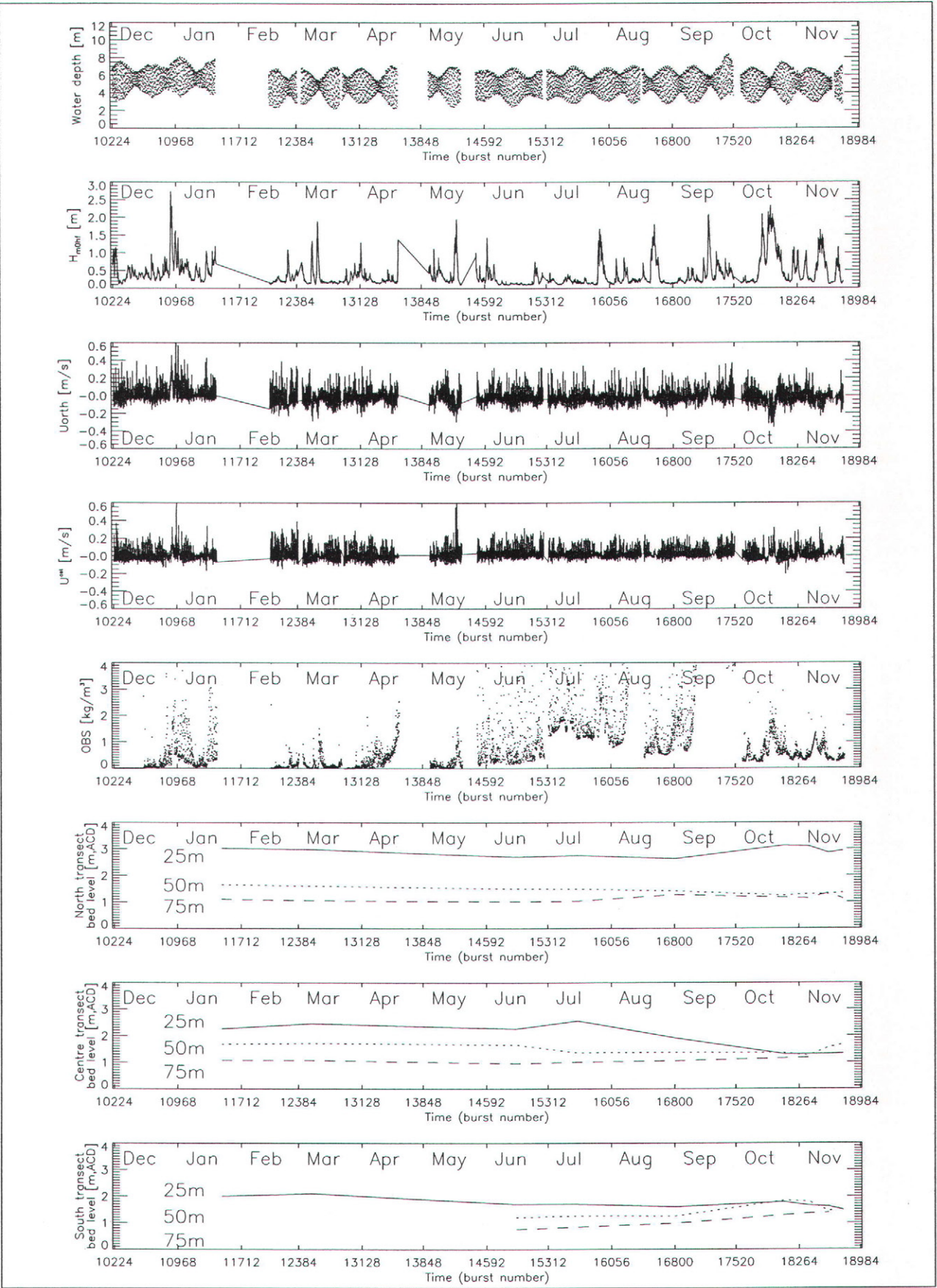


Figure 5.2 Time series beach levels (profile locations Figure 2.2)

Plates



Plate 1 **The Teign Estuary and nearshore looking north east. Photograph taken 14 June 1999.**
Copyright South West Water



Plate 2 Teignmouth during the pilot study; the nearshore banks at low tide on 3 March 1999 (top) and the beach on 16 March 1999 (bottom)



Plate 3 Teignmouth during the main study; the nearshore viewed from the north on 15 November 1999 (top) and the beach and nearshore banks at low tide on 24 November 1999 (bottom)

Appendices

Appendix 1

Bathymetric survey

Appendix 1 Bathymetric survey

1. Depths

Depths were recorded using a Raytheon DE719C survey echo sounder, with its transducer installed through the hull of the survey vessel. The layback from the DGPS antenna to the transducer face ($x=0.5\text{m}$ $y=-0.2\text{m}$) was recorded and this layback applied in the post processing of the data.

The Raytheon DE719C paper chart was marked and annotated automatically at 30 sec intervals during all seabed bathymetry collection. The digitised depth data was sent in real time nominally at 10 Hz and provided effectively a continuous record of seabed features along the survey line with “ping” intervals every 0.2m over the ground at a vessel speed of 2m/second.

Vessel speed depended on the effects of sea-state but was typically 2 to 3m/second.

The accuracy of this 208kHz echo sounder is quoted as 0.5% +/- 2.5cm of indicated depth

2. Data logging and survey navigation at sea

Positioning was achieved with a Trimble 4000RL/4000DL mobile DGPS survey navigation system, fitted with Everest Option multi-path rejection firmware, was used on the survey vessel for the calculation of all positions at sea. Data was logged at 1 Hz and the system was used in Lat/Long/Height mode.

All survey data and vessel guidance was displayed on a primary 15” colour VDU for the surveyor’s sole use.

The DGPS and the survey echo sounder were interfaced directly to the survey navigation logging and guidance PC. This desktop PC was also interfaced to an 80-column printer, a second monitor for the helmsman’s guidance display, and the RoxAnn seabed classification system.

Depth data was digitised by an external ESP Electronics MD5S unit and sent for immediate logging and time tagging to 0.01 second on the PC. Typical resolution provided by the MD5S is 0.01m.

Position data was output by the 4000RS on the vessel at 1 Hz, and was also time tagged and recorded by the PC.

3. Calibration of position, depth and tide sensors

HRW set up a series of permanent ground marks around the study area.. Some of these were re-installed for the main experiment.

Twice daily “bar checks” were used at the measurement site, subject to suitable sea and wind conditions, to calibrate the survey echo sounder and depth digitising system. If it was too windy or choppy for this to be done at the site in deep water, then usually a reduced “bar check” was carried out either in a shallower sheltered area or in the harbour.

The DGPS survey navigation system was calibrated by recording 1Hz DGPS position measurements prior to commencing any work at sea. Data was logged for 1.5 hours over a precisely co-ordinated point near to the usual berth of the survey vessel in the harbour (pgm HRW1 on The New Quay). This was necessary to establish that the system was functioning within specification.

This calibration point and the other seawall pgm’s were co-ordinated by HRW surveyors using a Geodimeter440 Total Station. A short “two leg” open traverse starting at the Ordnance Survey

Triangulation Point at The Point car park and ending at the landward end of Teignmouth Pier was completed. The only available reference object was the lighthouse vane, which was a few hundred meters away.

Conversion of recorded ETRF89 (WGS84) latitudes and longitudes to OSGB (1936 Datum) co-ordinates in the study area was based on a position datum correction value at Teignmouth provided by Grid Inquest v4.0 software. This software was developed for the Ordnance Survey and guarantees a nominal accuracy of 0.20m (RMS) horizontal and 0.10m (95%) vertical. These values are validated by the Ordnance Survey.

Additional daily calibration checks of the DGPS position were made, when possible and time permitted, by placing the bow of the survey vessel onto a co-ordinated point on the face of The New Quay. The layback of the bow was entered into the navigation PC and the resulting co-ordinate compared to the true value. The VDU display of the vessel outline and quayside target always provided a value within 1m of the true value.

4. Limiting sea conditions and estimated accuracy of depth data

A real time heave compensator was not available for the project; hence the sea conditions needed to be calm or slight for the collection of accurate seabed data.

A “rolling average” algorithm in the post-processing software, undertaken after the surveys’ completion, prior to tide correction and chart production, “smoothed” any wave or swell action on the 10 Hz logged depth data.

It is estimated that the following sea states will provide associated depth measurement post-processing accuracies over “shoals” and in “deeps” as below:

Seastate	Estimated accuracy
0.0 to 0.2 waves	0.1m in depths < 10m
0.2 to 0.5m waves	0.1 to 0.3m in depths < 10m
0.5 to 0.75m waves	>0.3m in depths < 10m

The above should be added to the quoted depth measurement accuracy.

The sea-state above is for short period waves (3 to 5 second) only. It should be noted that the effect of longer period swell of similar or greater heights is more difficult and often impossible to remove fully by the “rolling average” post-processing software without further corrupting the seabed level values.

Appendix 2

Log of activities in pilot study

Appendix 2 Descriptive log of pilot activities including instrument deployment

HRW activities: 1st – 26th March 1999

The following diary details the activities undertaken during the Pilot Study by HR Wallingford's survey vessel on work related to the Logistical Support aspects only.

1-6th Mobilise to site. Installing land based sensors as rough sea state delayed the arrival of survey vessel. Mobilise seabed sensor systems & frameworks.

7th-8th Mobilise vessel and the numerous seabed systems from Delft, University Utrecht & HRW.

9th Deploy seabed instruments at sites 33, 6, 26, 4 & 32. Seabed levels and positions logged.

10th Deploy seabed and surface sensor systems at sites 14, 24A, 18A & 25. Seabed levels and positions logged. Ten litre seabed sample from site 25 for Delft Hydraulics.

11th Sediment trap and current velocity measurements for Delft Hydraulics at mooring in river as sea conditions too rough.

12th Bathymetry of transects T43 to T22, mid-channel zigzag from seaward end of dredged channel to upper river, and cross check lines TCC3 and TCC2.

13th Bathymetry of transects T44 to T49, T11-T21 and T50-T54. Seabed grab samples at all 10 seabed sensor sites, excluding the Narrows site no. 29.

15th Personnel depart site.

19th Personnel return to site.

20th Sediment trap and current velocity measurements for University of Utrecht near the seaward end navigation channel. Grab sampling.

22nd Recover seabed and surface instruments from sites 26, 32, 4, 15, 6 and 33.

23rd Recover seabed and surface instruments from sites 25, 18A, 14, 24A and 29.

24th Bathymetry of transects T41 – T18, T44 - T61, and TCC2 and TCC3. Too much swell to continue.

25th Demobilise vessel as sea conditions too rough.

26th Vessel and personnel depart site.

Appendix 3

Log of activities in the main study

COAST3D**TEIGNMOUTH FIELD EXPERIMENT****DIARY OF EVENTS FOR THE MAIN EXPERIMENT**

Compiled by HR Wallingford from partner contributions

Version: 2.0

Date: 30 April 2001

Introduction

This report contains information relating to the activities during the COAST3D main experiment at Teignmouth UK during October and November 1999.

It has been compiled from information supplied by the experimenters, supplemented by details relating to the deployment of equipment and the control stations.

Material from the following partners is included:

- HR Wallingford
- University of Utrecht
- University of Caen
- University of Plymouth, IMS
- University of Plymouth, CE
- Proudman Oceanographic Laboratory
- Magelas

Additional supporting information on instrument positions and seabed levels are:

- Table showing the control information for the site, permanent ground marks and other reference points (Excel file: xyzcontrolver7excel95.xls)). Steve Hearn (HRW) visited Teignmouth on 25 February 2000 to check these once again. As a result some small changes to positions were made north east of the pier but the bulk of the data remained unchanged from the versions issued during and since the main experiment.
- Table giving details of ship deployed equipment including times, positions and seabed elevations (Excel file: deploylogver9_5.xls). The latter were derived by interpolation of the bathymetric charts analysed by Steve Hearn at HRW.
- The information on conversion from magnetic north is also included once again for completeness.

HR Wallingford

Coast3D Teignmouth Main Study October/November 1999

Completed activities-full study period ver3 sjh 1/12/99

rjsw 14/1/00

PP=post processing of data

Summary taken from sjh daily log sheets

Date	Activity	Tide
18-Oct	Mob to site	N
19-Oct	Mob site office. Load vessel with DGPS, echo sounders, RoxAnn, PC's, monitors, printers, spares etc	N
20-Oct	Install DGPS ref station at Pier. Programme & install Met Station	N
21-Oct	Install Hydrotide at the New Quay. Calibrate DGPS at New Quay pgm HRW1	I
22-Oct	Install new pgm's at the prom. Nr to previous location. Sites 17A, 16A, 10A, T46A, T47A. Programme/switch on HRW S4's x 4.	I
23-Oct	Mob tide loggers for pier. Test & trials of DE719C echo sounder on mvSCI	I
24-Oct	Heavy rain. Project admin. Levelling pgm's installed on 22/10	S
25-Oct	Deploy seabed frames at sites 6,4,26,33,32,5,14,3A. Lift site 6 - 90cm Waverider. Scour monitors installed	S
26-Oct	Deploy seabed frames at sites 25B (revised 25A), 9, 18A, 26A. Shorten ropes on surface markers	S
27-Oct	Bathy survey 1 - lines T39 to 7.	S
28-Oct	Bathy survey 1 - lines T40-53, 53-61, 1-6, TCC1-4.	S
29-Oct	Drogue tracking on ebb with UU. Processing of drogue data	I
30-Oct	Bad weather - project admin	I
31-Oct	MV ADCP trials. Project admin	N
01-Nov	Bad weather - project admin	N
02-Nov	MV ADCP 13 hours in calmish conditions	N
03-Nov	Mob vessel for side scan sonar in a.m. SSS in p.m. Calm conditions	N
04-Nov	Completed SSS in poor sea state. Grab samples at 33 sites	I
05-Nov	Bad weather - project admin & reporting to Jan Mulder	I
06-Nov	Grabs at 21 sites. Bathy survey 2 - lines T41-26. Low swell.	I
07-Nov	Complete grab sampling - 8 sites. Bathy survey 2 - lines T1-16, 25-17 + channel zig zag	S
08-Nov	Levelling Pier tide board & Scour Sensors. Lift UC frame 18A for service ashore. Complete Bathy survey 2 - lines T42-61	S
09-Nov	12.5 h MV ADCP in worsening sea state- some data loss due to vessel rolling	S
10-Nov	Project admin. Dismantle Met Station & send boards to manufacturer. Pump sampling/filter frames at UU site 25B	S
11-Nov	Bad weather - project admin & tidal data processing	S
12-Nov	Bad weather - project admin & install 3rd Hydrotide tide gauge - at Shaldon Bridge at LW	I
13-Nov	Bad weather - project admin	I
14-Nov	Programme S4 & MacroCTD for deployment. Modify Rikswaterstaat reports. MetWeb outlook form Met Office	I
15-Nov	Bad sea state - project admin	I
16-Nov	Calm sea. Redeploy UC 18a frame. Move PU frame from 6A to 26A. Bathy lines TCC1 to 4, & line T6 repeated 6 times (QA test)	N
17-Nov	Calm sea. Bathy lines T41 to 24, 1 to 5, & 7 to 15. V good data. No swell or waves affecting vessel. V good bar checks. Mob SSS	N
18-Nov	Slight to mod sea state. Complete Side Scan Sonar survey at 100m	N

	intervals normal and parallel to the shore. Generally good data	
19-Nov	Proj admin./Bathy 3 complete T23-16,T61-42/Download 2 Pier and 1 New Quay tide gauge.	N
20-Nov	Return fm sea at 0650 as 1-2m waves/Failed attempt to unlash hoses from UU frame 25B/Data processing of tides.	I
21-Nov	0615 at pier Hs=90cm/Inspect UU frame 25B-POL sensor cables removed/MVADP abandoned due to 1-1.5m swell/pm PP	I
22-Nov	Lift frames fm 32,33,4,5,26,6A,14,24A,23,28,25B,9	S
23-Nov	Lift frames fm 3A,6,29,15,18A	S
24-Nov	One release 2 drogues(20min)/Bathy4 T26-39/Strat demob SCI/XYZ control to AL of EA/Abandoned pm bathy as too much swell/Scour monitors recovered	S
25-Nov	Bathy4 T25-22/DE719C fail - dept site/Recover Shaldon Br Tide gauge/Pump sampling at 25B/Complete bathy4 poor sea state	S
26-Nov	Demob site office/pier DGPS/Met Sta/Tide loggers at pier & NQ/Zodiac/SCI. Skipper dept site	I
27-Nov	SJH & GP dept site. HRW pressure sensor left on Pier as too rough 26/11 to recover.	

Summary of activities of the Utrecht University Group (1)

Date	Activity	Either fill by hand or in Excel (I can provide blank form as file)
18-Oct		
19-Oct	miniframes measurements: burstnumber 17976 to 17980.	
20-Oct	measured beach transect	
21-Oct	measured beach transect, miniframe measurements: burstnumber 18027 to 18029.	
22-Oct	measured beach transect, miniframe measurements: burstnumber 18038 to 18042 and 18051 to 18055.	
23-Oct	measured beach transect, miniframe measurements: burstnumber 18063 to 18067 and 18075 to 18079.	
24-Oct	measured beach transect, miniframe measurements: burstnumber 18087 to 18092 and 18100 to 18103.	
25-Oct	measured beach transect, miniframe measurements: burstnumber 18110 to 18117.	
26-Oct	measured beach transect, miniframe measurements: burstnumber 18122 to 18130 and 18135 to 18143.	
27-Oct	measured beach transect, miniframe measurements: burstnumber 18147 to 18154 and 18161 to 18166, levelling UU beach transects.	
28-Oct	measured beach transect, miniframe measurements: burstnumber 18173 to 18179 and 18186 to 18191.	
29-Oct	measured beach transect, miniframe measurements: burstnumber 18198 to 18204 and 18210 to 18216.	
30-Oct	measured beach transect, miniframe measurements: burstnumber 18222 to 18228 and 18237 to 18240.	
31-Oct	measured beach transect, miniframe measurements: burstnumber 18248 to 18252 and 18261 to 18265.	
01-Nov	measured beach transect, miniframe measurements: burstnumber 18287 to 18290.	
02-Nov	measured beach transect, miniframe measurements: burstnumber 18299 to 18301.	
03-Nov	measured beach transect, miniframe measurements: burstnumber 18324 to 18328 and 18337 to 18341.	
04-Nov	measured beach transect, miniframe measurements: burstnumber 18348 to 18354 and 18360 to 18368, levelling UU beach transects	
05-Nov	measured beach transect, miniframe measurements: burstnumber 18385 to 18392.	
06-Nov	measured beach transect, miniframe measurements: burstnumber 18398 to 18404.	
07-Nov	measured beach transect, miniframe measurements: burstnumber 18421 to 18429 and 18433 to 18441.	
08-Nov	measured beach transect, miniframe measurements: burstnumber 18445 to 18453.	
09-Nov	measured beach transect, miniframe measurements: burstnumber 18458 to 18465 and 18470 to 18478.	
10-Nov	measured beach transect, miniframe measurements: burstnumber 18483 to 18490 and 18495 to 18502, levelling UU beach transects.	
11-Nov	measured beach transect, miniframe measurements: burstnumber 18521 to 18526.	
12-Nov	measured beach transect, miniframe measurements: burstnumber 18532 to 18538 and 18544 to 18550.	
13-Nov	measured beach transect, miniframe measurements: burstnumber 18557 to 18563	
14-Nov		
15-Nov	levelling UU beach transects	
16-Nov		
17-Nov		
18-Nov		
19-Nov		
20-Nov		

21-Nov
22-Nov
23-Nov
24-Nov
25-Nov
26-Nov

Summary of activities of the Utrecht University Group (2)

Date	Activity
18-Oct	
19-Oct	
20-Oct	levelling, rods measurements (17983-17985)
21-Oct	levelling, rods measurements (18007)
22-Oct	levelling, rods measurements (18034)
23-Oct	rods measurements, swash video, catching sed., sorting grainsize (18062-18063)
24-Oct	rods measurements, swash video, catching sed., sorting grainsize (18088)
25-Oct	levelling, rods measurements, swash video, catching sed., sorting grainsize (18112-18113)
26-Oct	rods measurements, swash video, catching sed., sorting grainsize (18129)
27-Oct	UU-transects (18157-18159), rods measurements, swash video, catching sed., sorting grainsize (18153)
28-Oct	rods measurements, swash video, catching sed., sorting grainsize (18177)
29-Oct	rods measurements, swash video, catching sed., sorting grainsize, piezometer (18201)
30-Oct	rods measurements, swash video, catching sed., sorting grainsize, piezometer (18227)
31-Oct	
01-Nov	
02-Nov	series of measurements: rods measurements, swash video, catching sed., piezometer (18298-18303)
03-Nov	levelling (18322), rods measurements, swash video, catching sed. (18325, 18327)
04-Nov	UU-transects, rods measurements, swash video, catching sed., piezometer (18350, 18352)
05-Nov	levelling (18370), series of measurements: rods measurements, swash video, catching sed., surface grainsize samples, 5 piezometers (18373, 18375, 18376)
06-Nov	
07-Nov	
08-Nov	levelling (18396)
09-Nov	
10-Nov	UU-transects (18493-18494), rods measurements, swash video, surface grainsize samples, 4 piezometers (18488-18489)
11-Nov	series of measurements: rods measurements, swash video, catching sed., 4 piezometer (18512-18514)
12-Nov	levelling (18542), series of measurements: rods measurements, swash video, catching sed., 4 piezometer (18536-18538)
13-Nov	series of measurements: rods measurements, swash video, catching sed., 4 piezometer (18559-18561)
14-Nov	
15-Nov	UU-transects
16-Nov	
17-Nov	
18-Nov	
19-Nov	
20-Nov	
21-Nov	
22-Nov	
23-Nov	
24-Nov	
25-Nov	
26-Nov	

Summary of activities of the Utrecht University Group (3)

Date	Activities near/on the Spratt Sand
18-Oct	Arrival Teignmouth
19-Oct	Installing equipment etc.
20-Oct	
21-Oct	Installing rods as fixed points
22-Oct	Transects Spratt Sand / manual survey of bedforms / deployment minitripod Spratt beach
23-Oct	Transects Spratt Sand / manual survey of bedforms
24-Oct	Transects Spratt Sand / manual survey of bedforms
25-Oct	Transects Spratt Sand / manual survey of bedforms
26-Oct	Transects Spratt Sand / manual survey of bedforms
27-Oct	Transects Spratt Sand / manual survey of bedforms
28-Oct	Transects Spratt Sand / manual survey of bedforms
29-Oct	Float tracking spring tide (HR boat)
30-Oct	
31-Oct	
01-Nov	
02-Nov	
03-Nov	Data editing
04-Nov	
05-Nov	
06-Nov	Transects Spratt Sand / manual survey of bedforms
07-Nov	Transects Spratt Sand / manual survey of bedforms
08-Nov	Transects Spratt Sand / manual survey of bedforms / float tracking around Spratt Sand
09-Nov	Photographs bedforms / morphological mapping / panorama photograph from Ness Head
10-Nov	Transects Spratt Sand / manual survey of bedforms
11-Nov	Transects Spratt Sand / manual survey of bedforms / float tracking around Spratt Sand
12-Nov	Transects Spratt Sand / manual survey of bedforms
13-Nov	Transects Spratt Sand / manual survey of bedforms
14-Nov	Transects Spratt Sand / manual survey of bedforms
15-Nov	Transects Spratt Sand / manual survey of bedforms
16-Nov	
17-Nov	Deployment minitripod Spratt Sand-channel / neap tide flow measurements
18-Nov	
19-Nov	Data editing
20-Nov	
21-Nov	
22-Nov	Transects Spratt Sand / manual survey of bedforms / Photographs bedforms
23-Nov	Transects Spratt Sand / manual survey of bedforms / float tracking around Spratt Sand
24-Nov	Tracer experiment Spratt Sand / morphological mapping Spratt Sand / float tracking around Spratt Sand
25-Nov	Making the Spratt Sand movie / undeploy equipment
26-Nov	Exit Teignmouth

*University of Caen***COAST3D Teignmouth main campaign Oct/Nov 1999****Completed activities**

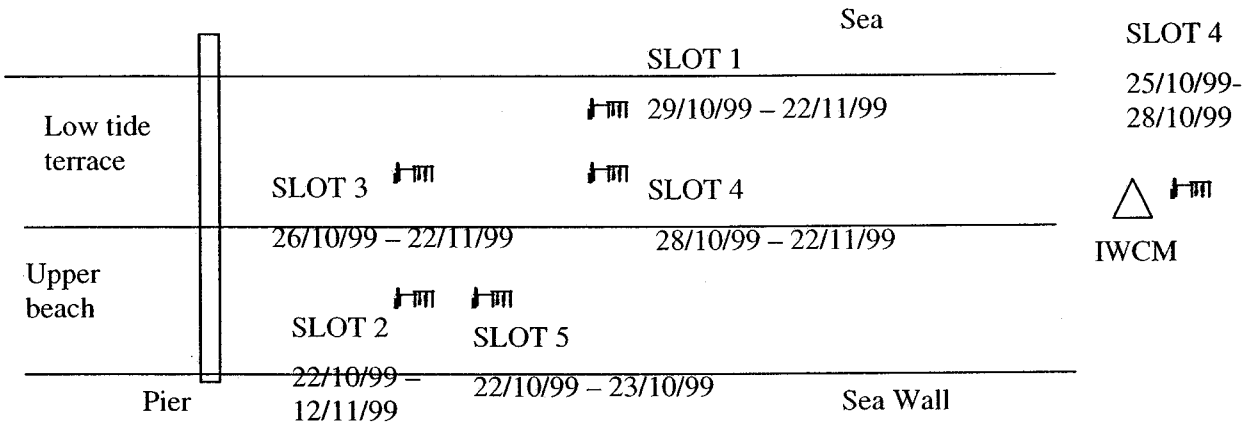
Date	Activity
18-Oct	
19-Oct	
20-Oct	arrival in Teignmouth, preparation of instruments
21-Oct	placing of swash rods, ADV and ADM frame -North of pier
22-Oct	placing of piezometers with JCB - North of pier
23-Oct	placing of swash rods and ADV frame - South of pier; Swash and tracer experiment 2pm - 0.30am
24-Oct	
25-Oct	deployment of items 5, 14, 23, 24a; placing of piezometers - South of pier; GPS beach survey
26-Oct	deployment of item 18a; placing of item 27 on Spratt Sand; GPS beach survey
27-Oct	GPS beach survey
28-Oct	
29-Oct	
30-Oct	
31-Oct	
1-Nov	Swash and tracer experiment 8am - 10pm
2-Nov	placing of ADM frame - South of pier
3-Nov	
4-Nov	Swash and tracer experiment 11am - 11pm
5-Nov	
6-Nov	
7-Nov	
8-Nov	GPS beach survey; item 18a out of water
9-Nov	GPS beach survey and The Salty
10-Nov	GPS beach survey
11-Nov	
12-Nov	
13-Nov	
14-Nov	
15-Nov	
16-Nov	Item 18a back in water
17-Nov	
18-Nov	
19-Nov	Swash and tracer experiment 12am - 10pm
20-Nov	Swash experiment 12am - 7pm
21-Nov	
22-Nov	
23-Nov	GPS beach survey
24-Nov	GPS beach survey
25-Nov	departure

FIELD DEPLOYMENT DIARY

COAST3D TEIGNMOUTH MAIN EXPERIMENT

Dr Jon Miles, Institute of Marine Studies, University of Plymouth, Drake Circus, Plymouth, Devon, UK,
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INSTRUMENT POSITION SKETCH



INSTRUMENTS ON EACH RIG:

- SLOT 1: Pressure Transducer (PT), Electromagnetic current meter (EM).
- SLOT 2: PT, EM, Optical Backscatter Sensor (OBS)
- SLOT 3: PT, EM, OBS.
- SLOT 4: PT, EM, OBS, Altimeter (ALT)
- SLOT 5: PT, Acoustic Doppler Velocimeter (ADV) OBS, ALT

DEPLOYMENT DIARY

22/10/99 11:00 BST
 Deployed SLOT 2 (EM, OBS, PT) and 5 (ADV, PT, OBS, ALTIMETER) 13.6m apart in longshore direction on upper (steeper) part of beach, halfway between position 16 and the pier (i.e. just in front of Beachcomber cafe).
 Observations: Large waves: 1-2m Wind SE 4.

22/10/99 23:50 BST

Downloaded both SLOTS and measured instrument heights. Damage to both SLOTS, from previous tide. SLOT 2 PT and OBS removed.

Observations: Waves 0.5-1m Wind SSE 3.

23/10/99

Downloaded SLOT 2 (just EM) and measured instrument height. SLOT 5 damaged and unusable for further measurements – removed.

24/10/99

Downloaded SLOT 2 (EM), measured instrument height.

Intertidal survey.

25/10/99

Installed SLOT 4 (EM, PT, OBS, ALTIMETER) near IWCM at approximately position 22.

Installed sector scanning sonar next to SLOT 4.

Observations: Waves 50cm, no wind.

Downloaded SLOT 2 (EM)

26/10/99

SLOT 4 not worked overnight. Replaced GPS antenna. Reset to log. EMCM offsets taken (in-situ in large bucket of seawater).

Sonar not logged, Clock reset.

SLOT 2: Installed new junction box to get PT and OBS working.

SLOT 3 (EM, OBS, PT) installed offshore of SLOT 2 on low tide terrace, just landward of shallow LW bar crest.

27/10/99

All SLOTS: Downloaded and instrument heights taken

SLOT 2 EMCM offsets taken.

SLOT 4 Logging correctly

SLOT 3: Not logged overnight.

Observations: Ripples by SLOT 3: (Wavelength 240cm / 8 ripples)

Installed rig for new SLOT 4 position along the beach (SE) from SLOT 3

28/10/99

All SLOTS: Downloaded and instrument heights taken

SLOT 4 Moved to new position. Set to Burst sampling: 40minutes (4800 samples) at 2Hz once every 186minutes (logging over HW and LW).

SLOT 3 Continuous logging at 4 Hz

SLOT 2 Continuous logging at 4 Hz

29/10/99

TV interview with Phillippa Mathews from Westcountry TV. Short documentary shown in East Devon on evening news.

All SLOTS: Downloaded and instrument heights taken

SLOT 2: Set to 2Hz

SLOT 3: Set to burst sample : 40minutes (4800 samples) at 2Hz once every 186minutes (logging over HW and LW).

SLOT 4: Offset taken (15:23)

Intertidal survey.

30/10/99

SLOTs 1,3 and 4 burst sampling. Low tide terrace only just un-covered at LW.

SLOT 2: Downloaded and instrument heights taken. Erosion underneath EM on last tide. Instruments lowered to new bed height. Battery pack loose. Battery connector broken.

31/10/99

SLOT 2: Downloaded and instrument heights taken. Lots of accretion. Instrument heights raised.

1/11/99

SLOT 2: Downloaded and instrument heights taken. Erosion at rig, instruments lowered.

2/11/99

SLOT 2: Downloaded and instrument heights taken.

3/11/99

SLOT 2: Downloaded and instrument heights taken, heights raised.

4/11/99

SLOT 2: Downloaded and instrument heights taken.

Observations at SLOT 4 (just uncovered, still burst sampling): Ripples wavelength 10cm, height 2cm.

Intertidal survey.

5/11/99

SLOT 2: Downloaded and instrument heights taken, battery change. Some erosion at rig. Instruments lowered slightly

Breakfast meeting with Jean Lankneuse in Bay Hotel to discuss sediment sampling strategy.

Observations: Waves 1-3m on waverider, Period 4 seconds.

6/11/99

SLOT 2: Downloaded and instrument heights taken.

SLOT 4: Battery change.

Observations: Waves 30cm, Wind WNW.

7/11/99

SLOTs 1,3,4 Downloaded and instrument heights taken, new batteries added. Set to continuous logging at 2 Hz.

SLOT 2. Downloaded. Continuous logging at 2 Hz.

8/11/99

All SLOTs Downloaded and instrument heights taken. Batteries changed where necessary, Bedforms noted: flat bed at SLOTs 1 and 2 (seaward facing beach slopes), ripples by SLOTs 3 and 4 (landward side of bar crest). All data backed up.

Sediment sampling.

Observations: Sea very flat. Waves height on beach ~ 4cm.

Intertidal survey.

9/11/99

All SLOTs Downloaded and instrument heights taken. Batteries changed where necessary, Bedforms noted: flat bed at SLOTs 1 and 2 (seaward facing beach slopes), ripples by SLOTs 3 and 4 (landward side of bar crest). All data backed up.

Observations: Waves height on beach ~ 20cm. Wind Easterly 2.

10/11/99

All SLOTS Downloaded and instrument heights taken. Batteries changed where necessary, Bedforms noted: flat bed at SLOTS 1 and 2 (seaward facing beach slopes), ripples by SLOTS 3 and 4 (landward side of bar crest). Small wave ripples (10-15cm) and mega ripples (up to 2m). All data backed up.

Observations: Waves heights on beach at LW~ 30cm, increasing to 60cm+. Wind North Easterly 3-4. SLOTS 1 and 3 set to burst mode, SLOTS 2 and 4 set to continuous.

SLOT 2 instruments lowered.

Faint cusps on beach by SLOT 2, longshore wavelength 14m.

Strong longshore current towards the south.

11/11/99

SLOT 4 Downloaded, set to burst sampling with new battery, instrument heights taken. SLOTS 1 and 3 continuing in burst mode, instrument heights taken. SLOT 2 downloaded and instrument heights taken, set to continuous sampling.

Observations: Wind: NE 4, Large waves (1m+). Waves confused at SLOT3 on final part of ebb by reflections from slope break.

Visited modellers after field tasks.

12/11/99

SLOT 2 suffered on last tide in the big waves. EM head broken and at an angle, PT and OBS bracked failed. SLOT 2 downloaded and instrument heights taken, and removed from beach.

Observations: Ripples at SLOT 4, wavelength 10cm.

Big waves from NE, Strong longshore current to South in mid surf-zone, especially just after LW (LW+2hrs)

Reflections from slope break at SLOT 3. Clapotis Gaufre moving south

Morphology: No cusps, considerable sand movement to the south.

13/11/99

Visited site to check on instruments visually from beach.

SLOTS 1,3 and 4 now all underwater in burst sampling mode.

Waves: 0.5m, ENE direction.

14/11/99

Visited site to check on instruments.

Observations: Stony part of low tide terrace at base of upper beach now completely covered by fine sand.

Ripples detected in this area underfoot by Peter (in dry suit!).

Argus images at 2:00pm for this day show a large angle of wave incidence from NE over Low tide terrace.

15/11/99

Intertidal beach survey.

Waves 30cm, plunging at break point with 2-3 waves in surf zone inside.

Wind direction: from NE

16/11/99

Visual check on instruments.

Waves: Flat calm

Wind: Light NW

17/11/99

Visual check on instruments.

Waves: Occasional 10cm wave, otherwise flat.

Wind. Very light NW

18/11/99

Visual check on instruments

Waves: Flat calm

Wind: Light NW

20/11/99

Visual check on instruments

Waves: 0.5 – 1m

Wind NNE 3-4

21/11/99

Visual check on instruments

Took instrument heights

Bedforms around Slot 3

Waves 0.5m

Wind NE 2-3

22/11/99

Instruments removal

All Slots: Downloaded and instrument heights taken. Instrument offsets taken.

SLOT 1 Ripples 10cm, SLOT 3 Ripples 16cm, SLOT 4 Ripples 16cm.

Offshore: 730D recovered by HR survey vessel.

Intertidal survey.

23/11/99

Removed instrument frames from beach.

24/11/99

Checking survey set out with HR and Caen co-ordinates

END OF DEPLOYMENT

SITE PERSONNEL

Regular Site Personnel:

Dr Jon Miles (COAST3D)

Peter Ganderton (COAST3D)

Andy Saulter (COSMOD)

Survey Team:

Ismael Imarino Tapia (UoP)

Adrian Hicks (UoP)

Andrea McKinley (UoP)

Extra field assistance gratefully received from:

Cyril Mallet (UoP)

Eduardo Siegle (UoP)

Ken Kingston (UoP)

Malcolm Christie (UoP)

Paul Turner (UoP)

Andy Manning (UoP)

Brad Morris (UoP)

Guest appearances:

Rebecca King

Maria Ganderton

Sophie Saulter

Under the guidance of:

Dr Paul Russell (COAST3D)

Prof. David Huntley (COAST3D)

+ denotes data collected

University of Plymouth (Civil Engineering) - Teignmouth Main Experiment							
Date/Time (GMT)	Burst	WRS	IWCM	Date/Time (GMT)	Burst	WRS	IWCM
24/10/99 15:00:00	18087			27/10/99 09:00:00	18153		
24/10/99 16:00:00	18088			27/10/99 10:00:00	18154		
24/10/99 17:00:00	18089			27/10/99 11:00:00	18155		
24/10/99 18:00:00	18090			27/10/99 12:00:00	18156		
24/10/99 19:00:00	18091			27/10/99 13:00:00	18157		
24/10/99 20:00:00	18092			27/10/99 14:00:00	18158	+	
24/10/99 21:00:00	18093			27/10/99 15:00:00	18159	+	
24/10/99 22:00:00	18094			27/10/99 16:00:00	18160	+	
24/10/99 23:00:00	18095			27/10/99 17:00:00	18161	+	
25/10/99 00:00:00	18096			27/10/99 18:00:00	18162	+	
25/10/99 01:00:00	18097			27/10/99 19:00:00	18163	+	
25/10/99 02:00:00	18098			27/10/99 20:00:00	18164	+	
25/10/99 03:00:00	18099			27/10/99 21:00:00	18165	+	
25/10/99 04:00:00	18100			27/10/99 22:00:00	18166	+	
25/10/99 05:00:00	18101			27/10/99 23:00:00	18167	+	
25/10/99 06:00:00	18102			28/10/99 00:00:00	18168	+	
25/10/99 07:00:00	18103			28/10/99 01:00:00	18169	+	
25/10/99 08:00:00	18104			28/10/99 02:00:00	18170	+	
25/10/99 09:00:00	18105			28/10/99 03:00:00	18171	+	
25/10/99 10:00:00	18106			28/10/99 04:00:00	18172	+	
25/10/99 11:00:00	18107			28/10/99 05:00:00	18173	+	
25/10/99 12:00:00	18108			28/10/99 06:00:00	18174	+	
25/10/99 13:00:00	18109			28/10/99 07:00:00	18175	+	
25/10/99 14:00:00	18110			28/10/99 08:00:00	18176	+	
25/10/99 15:00:00	18111			28/10/99 09:00:00	18177	+	
25/10/99 16:00:00	18112			28/10/99 10:00:00	18178	+	
25/10/99 17:00:00	18113			28/10/99 11:00:00	18179	+	
25/10/99 18:00:00	18114			28/10/99 12:00:00	18180	+	
25/10/99 19:00:00	18115			28/10/99 13:00:00	18181	+	
25/10/99 20:00:00	18116			28/10/99 14:00:00	18182	+	
25/10/99 21:00:00	18117			28/10/99 15:00:00	18183	+	
25/10/99 22:00:00	18118			28/10/99 16:00:00	18184	+	+
25/10/99 23:00:00	18119			28/10/99 17:00:00	18185	+	+
26/10/99 00:00:00	18120			28/10/99 18:00:00	18186	+	+
26/10/99 01:00:00	18121			28/10/99 19:00:00	18187	+	+
26/10/99 02:00:00	18122			28/10/99 20:00:00	18188	+	+
26/10/99 03:00:00	18123			28/10/99 21:00:00	18189	+	+
26/10/99 04:00:00	18124			28/10/99 22:00:00	18190	+	+
26/10/99 05:00:00	18125			28/10/99 23:00:00	18191	+	+
26/10/99 06:00:00	18126			29/10/99 00:00:00	18192	+	+
26/10/99 07:00:00	18127			29/10/99 01:00:00	18193	+	+
26/10/99 08:00:00	18128			29/10/99 02:00:00	18194	+	+
26/10/99 09:00:00	18129			29/10/99 03:00:00	18195	+	+
26/10/99 10:00:00	18130			29/10/99 04:00:00	18196	+	+
26/10/99 11:00:00	18131			29/10/99 05:00:00	18197	+	+
26/10/99 12:00:00	18132			29/10/99 06:00:00	18198	+	+
26/10/99 13:00:00	18133			29/10/99 07:00:00	18199	+	+
26/10/99 14:00:00	18134			29/10/99 08:00:00	18200	+	+
26/10/99 15:00:00	18135			29/10/99 09:00:00	18201	+	+
26/10/99 16:00:00	18136			29/10/99 10:00:00	18202	+	+
26/10/99 17:00:00	18137			29/10/99 11:00:00	18203	+	+

26/10/99 18:00:00	18138			29/10/99 12:00:00	18204	+	+
26/10/99 19:00:00	18139			29/10/99 13:00:00	18205		+
26/10/99 20:00:00	18140			29/10/99 14:00:00	18206	+	+
26/10/99 21:00:00	18141			29/10/99 15:00:00	18207	+	+
26/10/99 22:00:00	18142			29/10/99 16:00:00	18208	+	+
26/10/99 23:00:00	18143			29/10/99 17:00:00	18209	+	+
27/10/99 00:00:00	18144			29/10/99 18:00:00	18210	+	+
27/10/99 01:00:00	18145			29/10/99 19:00:00	18211	+	+
27/10/99 02:00:00	18146			29/10/99 20:00:00	18212	+	+
27/10/99 03:00:00	18147			29/10/99 21:00:00	18213	+	+
27/10/99 04:00:00	18148			29/10/99 22:00:00	18214	+	+
27/10/99 05:00:00	18149			29/10/99 23:00:00	18215	+	+
27/10/99 06:00:00	18150			30/10/99 00:00:00	18216	+	+
27/10/99 07:00:00	18151			30/10/99 01:00:00	18217	+	+
27/10/99 08:00:00	18152			30/10/99 02:00:00	18218	+	+
30/10/99 03:00:00	18219	+	+	01/11/99 22:00:00	18286	+	+
30/10/99 04:00:00	18220	+	+	01/11/99 23:00:00	18287	+	+
30/10/99 05:00:00	18221	+	+	02/11/99 00:00:00	18288	+	
30/10/99 06:00:00	18222	+	+	02/11/99 01:00:00	18289	+	
30/10/99 07:00:00	18223	+	+	02/11/99 02:00:00	18290	+	
30/10/99 08:00:00	18224	+	+	02/11/99 03:00:00	18291	+	
30/10/99 09:00:00	18225	+	+	02/11/99 04:00:00	18292	+	
30/10/99 10:00:00	18226	+	+	02/11/99 05:00:00	18293	+	
30/10/99 11:00:00	18227	+	+	02/11/99 06:00:00	18294	+	
30/10/99 12:00:00	18228	+	+	02/11/99 07:00:00	18295	+	
30/10/99 13:00:00	18229	+	+	02/11/99 08:00:00	18296	+	
30/10/99 14:00:00	18230	+	+	02/11/99 09:00:00	18297	+	
30/10/99 15:00:00	18231	+	+	02/11/99 10:00:00	18298	+	
30/10/99 16:00:00	18232	+	+	02/11/99 11:00:00	18299	+	
30/10/99 17:00:00	18233	+	+	02/11/99 12:00:00	18300	+	
30/10/99 18:00:00	18234	+	+	02/11/99 13:00:00	18301	+	
30/10/99 19:00:00	18235	+	+	02/11/99 14:00:00	18302	+	
30/10/99 20:00:00	18236	+	+	02/11/99 15:00:00	18303	+	
30/10/99 21:00:00	18237	+	+	02/11/99 16:00:00	18304	+	
30/10/99 22:00:00	18238	+	+	02/11/99 17:00:00	18305	+	
30/10/99 23:00:00	18239	+	+	02/11/99 18:00:00	18306	+	
31/10/99 00:00:00	18240	+	+	02/11/99 19:00:00	18307	+	
31/10/99 01:00:00	18241	+	+	02/11/99 20:00:00	18308	+	+
31/10/99 02:00:00	18242	+	+	02/11/99 21:00:00	18309	+	+
31/10/99 03:00:00	18243	+	+	02/11/99 22:00:00	18310	+	+
31/10/99 04:00:00	18244	+	+	02/11/99 23:00:00	18311	+	+
31/10/99 05:00:00	18245	+	+	03/11/99 00:00:00	18312	+	+
31/10/99 06:00:00	18246	+	+	03/11/99 01:00:00	18313	+	+
31/10/99 07:00:00	18247	+	+	03/11/99 02:00:00	18314	+	+
31/10/99 08:00:00	18248	+	+	03/11/99 03:00:00	18315	+	+
31/10/99 09:00:00	18249	+	+	03/11/99 04:00:00	18316	+	+
31/10/99 10:00:00	18250	+	+	03/11/99 05:00:00	18317	+	+
31/10/99 11:00:00	18251	+	+	03/11/99 06:00:00	18318	+	+
31/10/99 12:00:00	18252	+	+	03/11/99 07:00:00	18319	+	+
31/10/99 13:00:00	18253	+	+	03/11/99 08:00:00	18320	+	+
31/10/99 14:00:00	18254	+	+	03/11/99 09:00:00	18321	+	+
31/10/99 15:00:00	18255	+	+	03/11/99 10:00:00	18322	+	+
31/10/99 16:00:00	18256	+	+	03/11/99 11:00:00	18323	+	+
31/10/99 17:00:00	18257	+	+	03/11/99 12:00:00	18324	+	+
31/10/99 18:00:00	18258	+	+	03/11/99 13:00:00	18325	+	+
31/10/99 19:00:00	18259	+	+	03/11/99 14:00:00	18326	+	+
31/10/99 20:00:00	18260	+	+	03/11/99 15:00:00	18327	+	+
31/10/99 21:00:00	18261	+	+	03/11/99 16:00:00	18328	+	+
31/10/99 22:00:00	18262	+	+	03/11/99 17:00:00	18329	+	+
31/10/99 23:00:00	18263	+	+	03/11/99 18:00:00	18330	+	+

01/11/99 00:00:00	18264	+	+	03/11/99 19:00:00	18331	+	+
01/11/99 01:00:00	18265	+	+	03/11/99 20:00:00	18332	+	+
01/11/99 02:00:00	18266	+	+	03/11/99 21:00:00	18333	+	+
01/11/99 03:00:00	18267	+	+	03/11/99 22:00:00	18334	+	+
01/11/99 04:00:00	18268	+	+	03/11/99 23:00:00	18335	+	+
01/11/99 05:00:00	18269	+	+	04/11/99 00:00:00	18336	+	+
01/11/99 06:00:00	18270	+	+	04/11/99 01:00:00	18337	+	+
01/11/99 07:00:00	18271	+	+	04/11/99 02:00:00	18338	+	+
01/11/99 08:00:00	18272	+	+	04/11/99 03:00:00	18339	+	+
01/11/99 09:00:00	18273	+	+	04/11/99 04:00:00	18340	+	+
01/11/99 10:00:00	18274	+	+	04/11/99 05:00:00	18341	+	+
01/11/99 11:00:00	18275	+	+	04/11/99 06:00:00	18342	+	+
01/11/99 12:00:00	18276	+	+	04/11/99 07:00:00	18343	+	+
01/11/99 13:00:00	18277	+	+	04/11/99 08:00:00	18344	+	+
01/11/99 14:00:00	18278	+	+	04/11/99 09:00:00	18345	+	+
01/11/99 15:00:00	18279	+	+	04/11/99 10:00:00	18346	+	+
01/11/99 16:00:00	18280	+	+	04/11/99 11:00:00	18347	+	+
01/11/99 17:00:00	18281	+	+	04/11/99 12:00:00	18348	+	+
01/11/99 18:00:00	18282	+	+	04/11/99 13:00:00	18349	+	+
01/11/99 19:00:00	18283	+	+	04/11/99 14:00:00	18350	+	+
01/11/99 20:00:00	18284	+	+	04/11/99 15:00:00	18351	+	+
01/11/99 21:00:00	18285	+	+	04/11/99 16:00:00	18352	+	+
04/11/99 17:00:00	18353	+	+	07/11/99 12:00:00	18420	+	+
04/11/99 18:00:00	18354	+	+	07/11/99 13:00:00	18421	+	+
04/11/99 19:00:00	18355	+	+	07/11/99 14:00:00	18422	+	+
04/11/99 20:00:00	18356	+	+	07/11/99 15:00:00	18423	+	+
04/11/99 21:00:00	18357	+	+	07/11/99 16:00:00	18424	+	+
04/11/99 22:00:00	18358	+	+	07/11/99 17:00:00	18425	+	+
04/11/99 23:00:00	18359	+	+	07/11/99 18:00:00	18426	+	+
05/11/99 00:00:00	18360	+	+	07/11/99 19:00:00	18427	+	+
05/11/99 01:00:00	18361	+	+	07/11/99 20:00:00	18428	+	+
05/11/99 02:00:00	18362	+	+	07/11/99 21:00:00	18429	+	+
05/11/99 03:00:00	18363	+	+	07/11/99 22:00:00	18430	+	+
05/11/99 04:00:00	18364	+	+	07/11/99 23:00:00	18431	+	+
05/11/99 05:00:00	18365	+	+	08/11/99 00:00:00	18432	+	+
05/11/99 06:00:00	18366	+	+	08/11/99 01:00:00	18433	+	+
05/11/99 07:00:00	18367	+	+	08/11/99 02:00:00	18434	+	+
05/11/99 08:00:00	18368	+	+	08/11/99 03:00:00	18435	+	+
05/11/99 09:00:00	18369	+	+	08/11/99 04:00:00	18436	+	+
05/11/99 10:00:00	18370	+	+	08/11/99 05:00:00	18437	+	+
05/11/99 11:00:00	18371	+	+	08/11/99 06:00:00	18438	+	+
05/11/99 12:00:00	18372	+	+	08/11/99 07:00:00	18439	+	+
05/11/99 13:00:00	18373	+	+	08/11/99 08:00:00	18440	+	+
05/11/99 14:00:00	18374	+	+	08/11/99 09:00:00	18441	+	+
05/11/99 15:00:00	18375	+	+	08/11/99 10:00:00	18442	+	+
05/11/99 16:00:00	18376	+	+	08/11/99 11:00:00	18443	+	
05/11/99 17:00:00	18377	+	+	08/11/99 12:00:00	18444	+	
05/11/99 18:00:00	18378	+	+	08/11/99 13:00:00	18445	+	
05/11/99 19:00:00	18379	+	+	08/11/99 14:00:00	18446	+	
05/11/99 20:00:00	18380	+	+	08/11/99 15:00:00	18447	+	
05/11/99 21:00:00	18381	+	+	08/11/99 16:00:00	18448	+	
05/11/99 22:00:00	18382	+	+	08/11/99 17:00:00	18449	+	
05/11/99 23:00:00	18383	+	+	08/11/99 18:00:00	18450	+	
06/11/99 00:00:00	18384	+	+	08/11/99 19:00:00	18451	+	
06/11/99 01:00:00	18385	+	+	08/11/99 20:00:00	18452	+	
06/11/99 02:00:00	18386	+	+	08/11/99 21:00:00	18453	+	
06/11/99 03:00:00	18387	+	+	08/11/99 22:00:00	18454	+	
06/11/99 04:00:00	18388	+	+	08/11/99 23:00:00	18455	+	
06/11/99 05:00:00	18389	+	+	09/11/99 00:00:00	18456	+	
06/11/99 06:00:00	18390	+	+	09/11/99 01:00:00	18457	+	

06/11/99 07:00:00	18391	+	+	09/11/99 02:00:00	18458	+	
06/11/99 08:00:00	18392	+	+	09/11/99 03:00:00	18459	+	
06/11/99 09:00:00	18393	+	+	09/11/99 04:00:00	18460	+	
06/11/99 10:00:00	18394	+	+	09/11/99 05:00:00	18461	+	
06/11/99 11:00:00	18395	+	+	09/11/99 06:00:00	18462	+	
06/11/99 12:00:00	18396	+	+	09/11/99 07:00:00	18463	+	
06/11/99 13:00:00	18397	+	+	09/11/99 08:00:00	18464	+	
06/11/99 14:00:00	18398	+	+	09/11/99 09:00:00	18465	+	
06/11/99 15:00:00	18399	+	+	09/11/99 10:00:00	18466		
06/11/99 16:00:00	18400	+	+	09/11/99 11:00:00	18467		
06/11/99 17:00:00	18401	+	+	09/11/99 12:00:00	18468		
06/11/99 18:00:00	18402	+	+	09/11/99 13:00:00	18469		
06/11/99 19:00:00	18403	+	+	09/11/99 14:00:00	18470		
06/11/99 20:00:00	18404	+	+	09/11/99 15:00:00	18471	+	
06/11/99 21:00:00	18405	+	+	09/11/99 16:00:00	18472	+	
06/11/99 22:00:00	18406	+	+	09/11/99 17:00:00	18473	+	
06/11/99 23:00:00	18407	+	+	09/11/99 18:00:00	18474	+	
07/11/99 00:00:00	18408	+	+	09/11/99 19:00:00	18475	+	
07/11/99 01:00:00	18409	+	+	09/11/99 20:00:00	18476	+	
07/11/99 02:00:00	18410	+	+	09/11/99 21:00:00	18477	+	
07/11/99 03:00:00	18411	+	+	09/11/99 22:00:00	18478	+	
07/11/99 04:00:00	18412	+	+	09/11/99 23:00:00	18479	+	
07/11/99 05:00:00	18413	+	+	10/11/99 00:00:00	18480	+	
07/11/99 06:00:00	18414	+	+	10/11/99 01:00:00	18481	+	
07/11/99 07:00:00	18415	+	+	10/11/99 02:00:00	18482	+	
07/11/99 08:00:00	18416	+	+	10/11/99 03:00:00	18483	+	
07/11/99 09:00:00	18417	+	+	10/11/99 04:00:00	18484	+	
07/11/99 10:00:00	18418	+	+	10/11/99 05:00:00	18485	+	
07/11/99 11:00:00	18419	+	+	10/11/99 06:00:00	18486	+	
10/11/99 07:00:00	18487	+		13/11/99 02:00:00	18554	+	+
10/11/99 08:00:00	18488	+		13/11/99 03:00:00	18555	+	+
10/11/99 09:00:00	18489	+		13/11/99 04:00:00	18556	+	+
10/11/99 10:00:00	18490	+		13/11/99 05:00:00	18557	+	+
10/11/99 11:00:00	18491	+		13/11/99 06:00:00	18558	+	+
10/11/99 12:00:00	18492	+		13/11/99 07:00:00	18559	+	+
10/11/99 13:00:00	18493	+		13/11/99 08:00:00	18560	+	+
10/11/99 14:00:00	18494	+		13/11/99 09:00:00	18561	+	+
10/11/99 15:00:00	18495	+		13/11/99 10:00:00	18562	+	+
10/11/99 16:00:00	18496	+	+	13/11/99 11:00:00	18563	+	+
10/11/99 17:00:00	18497	+	+	13/11/99 12:00:00	18564	+	+
10/11/99 18:00:00	18498	+	+	13/11/99 13:00:00	18565	+	+
10/11/99 19:00:00	18499	+	+	13/11/99 14:00:00	18566	+	+
10/11/99 20:00:00	18500	+	+	13/11/99 15:00:00	18567	+	+
10/11/99 21:00:00	18501	+	+	13/11/99 16:00:00	18568	+	+
10/11/99 22:00:00	18502	+	+	13/11/99 17:00:00	18569	+	+
10/11/99 23:00:00	18503	+	+	13/11/99 18:00:00	18570	+	+
11/11/99 00:00:00	18504	+	+	13/11/99 19:00:00	18571	+	+
11/11/99 01:00:00	18505	+	+	13/11/99 20:00:00	18572	+	+
11/11/99 02:00:00	18506	+	+	13/11/99 21:00:00	18573	+	+
11/11/99 03:00:00	18507	+	+	13/11/99 22:00:00	18574	+	+
11/11/99 04:00:00	18508	+	+	13/11/99 23:00:00	18575	+	+
11/11/99 05:00:00	18509	+	+	14/11/99 00:00:00	18576	+	+
11/11/99 06:00:00	18510	+	+	14/11/99 01:00:00	18577	+	+
11/11/99 07:00:00	18511	+	+	14/11/99 02:00:00	18578	+	+
11/11/99 08:00:00	18512	+	+	14/11/99 03:00:00	18579	+	+
11/11/99 09:00:00	18513	+	+	14/11/99 04:00:00	18580	+	+
11/11/99 10:00:00	18514	+	+	14/11/99 05:00:00	18581	+	+
11/11/99 11:00:00	18515	+	+	14/11/99 06:00:00	18582	+	+
11/11/99 12:00:00	18516	+	+	14/11/99 07:00:00	18583	+	+
11/11/99 13:00:00	18517	+	+	14/11/99 08:00:00	18584	+	+

11/11/99 14:00:00	18518	+	+	14/11/99 09:00:00	18585	+	+
11/11/99 15:00:00	18519	+	+	14/11/99 10:00:00	18586	+	+
11/11/99 16:00:00	18520	+		14/11/99 11:00:00	18587	+	+
11/11/99 17:00:00	18521	+	+	14/11/99 12:00:00	18588	+	+
11/11/99 18:00:00	18522	+	+	14/11/99 13:00:00	18589	+	+
11/11/99 19:00:00	18523	+	+	14/11/99 14:00:00	18590	+	+
11/11/99 20:00:00	18524	+	+	14/11/99 15:00:00	18591	+	+
11/11/99 21:00:00	18525	+	+	14/11/99 16:00:00	18592	+	+
11/11/99 22:00:00	18526	+	+	14/11/99 17:00:00	18593	+	+
11/11/99 23:00:00	18527	+	+	14/11/99 18:00:00	18594	+	+
12/11/99 00:00:00	18528	+	+	14/11/99 19:00:00	18595	+	+
12/11/99 01:00:00	18529	+	+	14/11/99 20:00:00	18596	+	+
12/11/99 02:00:00	18530	+	+	14/11/99 21:00:00	18597	+	+
12/11/99 03:00:00	18531	+	+	14/11/99 22:00:00	18598	+	+
12/11/99 04:00:00	18532	+	+	14/11/99 23:00:00	18599	+	+
12/11/99 05:00:00	18533	+	+	15/11/99 00:00:00	18600	+	+
12/11/99 06:00:00	18534	+	+	15/11/99 01:00:00	18601	+	+
12/11/99 07:00:00	18535	+	+	15/11/99 02:00:00	18602	+	+
12/11/99 08:00:00	18536	+	+	15/11/99 03:00:00	18603	+	+
12/11/99 09:00:00	18537	+	+	15/11/99 04:00:00	18604	+	+
12/11/99 10:00:00	18538	+	+	15/11/99 05:00:00	18605	+	+
12/11/99 11:00:00	18539	+	+	15/11/99 06:00:00	18606	+	+
12/11/99 12:00:00	18540	+	+	15/11/99 07:00:00	18607	+	+
12/11/99 13:00:00	18541	+	+	15/11/99 08:00:00	18608	+	+
12/11/99 14:00:00	18542	+	+	15/11/99 09:00:00	18609	+	+
12/11/99 15:00:00	18543	+	+	15/11/99 10:00:00	18610	+	+
12/11/99 16:00:00	18544	+	+	15/11/99 11:00:00	18611	+	+
12/11/99 17:00:00	18545	+	+	15/11/99 12:00:00	18612	+	+
12/11/99 18:00:00	18546	+	+	15/11/99 13:00:00	18613	+	+
12/11/99 19:00:00	18547	+	+	15/11/99 14:00:00	18614	+	+
12/11/99 20:00:00	18548	+	+	15/11/99 15:00:00	18615	+	+
12/11/99 21:00:00	18549	+	+	15/11/99 16:00:00	18616	+	+
12/11/99 22:00:00	18550	+	+	15/11/99 17:00:00	18617	+	+
12/11/99 23:00:00	18551	+	+	15/11/99 18:00:00	18618	+	+
13/11/99 00:00:00	18552	+	+	15/11/99 19:00:00	18619	+	+
13/11/99 01:00:00	18553	+	+	15/11/99 20:00:00	18620	+	+
15/11/99 21:00:00	18621	+	+	18/11/99 16:00:00	18688		
15/11/99 22:00:00	18622	+	+	18/11/99 17:00:00	18689		
15/11/99 23:00:00	18623	+	+	18/11/99 18:00:00	18690		
16/11/99 00:00:00	18624	+	+	18/11/99 19:00:00	18691		
16/11/99 01:00:00	18625	+	+	18/11/99 20:00:00	18692		
16/11/99 02:00:00	18626	+	+	18/11/99 21:00:00	18693		
16/11/99 03:00:00	18627	+	+	18/11/99 22:00:00	18694		
16/11/99 04:00:00	18628	+	+	18/11/99 23:00:00	18695		
16/11/99 05:00:00	18629	+	+	19/11/99 00:00:00	18696		
16/11/99 06:00:00	18630	+	+	19/11/99 01:00:00	18697		
16/11/99 07:00:00	18631	+	+	19/11/99 02:00:00	18698		
16/11/99 08:00:00	18632	+	+	19/11/99 03:00:00	18699		
16/11/99 09:00:00	18633	+	+	19/11/99 04:00:00	18700		
16/11/99 10:00:00	18634		+	19/11/99 05:00:00	18701		
16/11/99 11:00:00	18635		+	19/11/99 06:00:00	18702		
16/11/99 12:00:00	18636		+	19/11/99 07:00:00	18703		
16/11/99 13:00:00	18637		+	19/11/99 08:00:00	18704		
16/11/99 14:00:00	18638		+	19/11/99 09:00:00	18705		
16/11/99 15:00:00	18639		+	19/11/99 10:00:00	18706		
16/11/99 16:00:00	18640			19/11/99 11:00:00	18707		
16/11/99 17:00:00	18641			19/11/99 12:00:00	18708		
16/11/99 18:00:00	18642			19/11/99 13:00:00	18709		
16/11/99 19:00:00	18643			19/11/99 14:00:00	18710		
16/11/99 20:00:00	18644			19/11/99 15:00:00	18711		

16/11/99 21:00:00	18645			19/11/99 16:00:00	18712		
16/11/99 22:00:00	18646			19/11/99 17:00:00	18713		
16/11/99 23:00:00	18647			19/11/99 18:00:00	18714		
17/11/99 00:00:00	18648			19/11/99 19:00:00	18715		
17/11/99 01:00:00	18649			19/11/99 20:00:00	18716		
17/11/99 02:00:00	18650			19/11/99 21:00:00	18717		
17/11/99 03:00:00	18651			19/11/99 22:00:00	18718		
17/11/99 04:00:00	18652			19/11/99 23:00:00	18719		
17/11/99 05:00:00	18653			20/11/99 00:00:00	18720		
17/11/99 06:00:00	18654			20/11/99 01:00:00	18721		
17/11/99 07:00:00	18655			20/11/99 02:00:00	18722		
17/11/99 08:00:00	18656			20/11/99 03:00:00	18723		
17/11/99 09:00:00	18657			20/11/99 04:00:00	18724		
17/11/99 10:00:00	18658			20/11/99 05:00:00	18725		
17/11/99 11:00:00	18659			20/11/99 06:00:00	18726		
17/11/99 12:00:00	18660			20/11/99 07:00:00	18727		
17/11/99 13:00:00	18661			20/11/99 08:00:00	18728		
17/11/99 14:00:00	18662			20/11/99 09:00:00	18729		
17/11/99 15:00:00	18663			20/11/99 10:00:00	18730		
17/11/99 16:00:00	18664			20/11/99 11:00:00	18731		
17/11/99 17:00:00	18665			20/11/99 12:00:00	18732		
17/11/99 18:00:00	18666			20/11/99 13:00:00	18733		
17/11/99 19:00:00	18667			20/11/99 14:00:00	18734		
17/11/99 20:00:00	18668			20/11/99 15:00:00	18735		
17/11/99 21:00:00	18669			20/11/99 16:00:00	18736		
17/11/99 22:00:00	18670			20/11/99 17:00:00	18737		
17/11/99 23:00:00	18671			20/11/99 18:00:00	18738		
18/11/99 00:00:00	18672			20/11/99 19:00:00	18739		
18/11/99 01:00:00	18673			20/11/99 20:00:00	18740		
18/11/99 02:00:00	18674			20/11/99 21:00:00	18741		
18/11/99 03:00:00	18675			20/11/99 22:00:00	18742		
18/11/99 04:00:00	18676			20/11/99 23:00:00	18743		
18/11/99 05:00:00	18677			21/11/99 00:00:00	18744		
18/11/99 06:00:00	18678			21/11/99 01:00:00	18745		
18/11/99 07:00:00	18679			21/11/99 02:00:00	18746		
18/11/99 08:00:00	18680			21/11/99 03:00:00	18747		
18/11/99 09:00:00	18681			21/11/99 04:00:00	18748		
18/11/99 10:00:00	18682			21/11/99 05:00:00	18749		
18/11/99 11:00:00	18683			21/11/99 06:00:00	18750		
18/11/99 12:00:00	18684			21/11/99 07:00:00	18751		
18/11/99 13:00:00	18685			21/11/99 08:00:00	18752		
18/11/99 14:00:00	18686			21/11/99 09:00:00	18753		
18/11/99 15:00:00	18687			21/11/99 10:00:00	18754		
21/11/99 11:00:00	18755			24/11/99 06:00:00	18822		
21/11/99 12:00:00	18756			24/11/99 07:00:00	18823		
21/11/99 13:00:00	18757			24/11/99 08:00:00	18824		
21/11/99 14:00:00	18758			24/11/99 09:00:00	18825		
21/11/99 15:00:00	18759			24/11/99 10:00:00	18826		
21/11/99 16:00:00	18760			24/11/99 11:00:00	18827		
21/11/99 17:00:00	18761			24/11/99 12:00:00	18828		
21/11/99 18:00:00	18762			24/11/99 13:00:00	18829		
21/11/99 19:00:00	18763			24/11/99 14:00:00	18830		
21/11/99 20:00:00	18764			24/11/99 15:00:00	18831		
21/11/99 21:00:00	18765			24/11/99 16:00:00	18832		
21/11/99 22:00:00	18766			24/11/99 17:00:00	18833		
21/11/99 23:00:00	18767			24/11/99 18:00:00	18834		
22/11/99 00:00:00	18768			24/11/99 19:00:00	18835		
22/11/99 01:00:00	18769			24/11/99 20:00:00	18836		
22/11/99 02:00:00	18770			24/11/99 21:00:00	18837		
22/11/99 03:00:00	18771			24/11/99 22:00:00	18838		

22/11/99 04:00:00	18772			24/11/99 23:00:00	18839		
22/11/99 05:00:00	18773			25/11/99 00:00:00	18840		
22/11/99 06:00:00	18774			25/11/99 01:00:00	18841		
22/11/99 07:00:00	18775			25/11/99 02:00:00	18842		
22/11/99 08:00:00	18776			25/11/99 03:00:00	18843		
22/11/99 09:00:00	18777			25/11/99 04:00:00	18844		
22/11/99 10:00:00	18778			25/11/99 05:00:00	18845		
22/11/99 11:00:00	18779			25/11/99 06:00:00	18846		
22/11/99 12:00:00	18780			25/11/99 07:00:00	18847		
22/11/99 13:00:00	18781			25/11/99 08:00:00	18848		
22/11/99 14:00:00	18782			25/11/99 09:00:00	18849		
22/11/99 15:00:00	18783			25/11/99 10:00:00	18850		
22/11/99 16:00:00	18784			25/11/99 11:00:00	18851		
22/11/99 17:00:00	18785			25/11/99 12:00:00	18852		
22/11/99 18:00:00	18786			25/11/99 13:00:00	18853		
22/11/99 19:00:00	18787			25/11/99 14:00:00	18854		
22/11/99 20:00:00	18788			25/11/99 15:00:00	18855		
22/11/99 21:00:00	18789			25/11/99 16:00:00	18856		
22/11/99 22:00:00	18790			25/11/99 17:00:00	18857		
22/11/99 23:00:00	18791			25/11/99 18:00:00	18858		
23/11/99 00:00:00	18792			25/11/99 19:00:00	18859		
23/11/99 01:00:00	18793			25/11/99 20:00:00	18860		
23/11/99 02:00:00	18794			25/11/99 21:00:00	18861		
23/11/99 03:00:00	18795			25/11/99 22:00:00	18862		
23/11/99 04:00:00	18796			25/11/99 23:00:00	18863		
23/11/99 05:00:00	18797			26/11/99 00:00:00	18864		
23/11/99 06:00:00	18798			26/11/99 01:00:00	18865		
23/11/99 07:00:00	18799			26/11/99 02:00:00	18866		
23/11/99 08:00:00	18800			26/11/99 03:00:00	18867		
23/11/99 09:00:00	18801			26/11/99 04:00:00	18868		
23/11/99 10:00:00	18802			26/11/99 05:00:00	18869		
23/11/99 11:00:00	18803			26/11/99 06:00:00	18870		
23/11/99 12:00:00	18804			26/11/99 07:00:00	18871		
23/11/99 13:00:00	18805			26/11/99 08:00:00	18872		
23/11/99 14:00:00	18806			26/11/99 09:00:00	18873		
23/11/99 15:00:00	18807			26/11/99 10:00:00	18874		
23/11/99 16:00:00	18808			26/11/99 11:00:00	18875		
23/11/99 17:00:00	18809			26/11/99 12:00:00	18876		
23/11/99 18:00:00	18810			26/11/99 13:00:00	18877		
23/11/99 19:00:00	18811			26/11/99 14:00:00	18878		
23/11/99 20:00:00	18812			26/11/99 15:00:00	18879		
23/11/99 21:00:00	18813			26/11/99 16:00:00	18880		
23/11/99 22:00:00	18814			26/11/99 17:00:00	18881		
23/11/99 23:00:00	18815			26/11/99 18:00:00	18882		
24/11/99 00:00:00	18816			26/11/99 19:00:00	18883		
24/11/99 01:00:00	18817			26/11/99 20:00:00	18884		
24/11/99 02:00:00	18818			26/11/99 21:00:00	18885		
24/11/99 03:00:00	18819			26/11/99 22:00:00	18886		
24/11/99 04:00:00	18820			26/11/99 23:00:00	18887		
24/11/99 05:00:00	18821			27/11/99 00:00:00	18888		

COAST3D Teignmouth Main Campaign 1999 – POL Diary Report**Monday 18th October 1999**

Paul Bell & Mike Burke arrived on site. X-Band Radar installed on roof of Teignmouth Pier, with the monitors and computer inside the amusement arcade. Radar commenced recording at 17:00 GMT, 64 images at 2.25 second intervals on the hour, every hour.

Peter Thorne and students Peter Watkins and Mairead Butler arrived in the evening.

Tuesday 19th October 1999

Acoustic Backscatter System (ABS) and Autonomous Sand Ripple Profiler (ASRP) mounted on UU frame ready for deployment at position 25B. The ABS has 3 transducer operating at 4MHz, 2MHz and 0.7MHz, recording profiles at 2cm intervals at a rate of 4Hz up to a maximum range of 1.28metres. The system recorded for 22 minutes on the hour, synchronised to the UU frame equipment via a trigger cable.

The ASRP was set to record a profile covering approximately 3metres of the sea bed every 5 minutes.

Wednesday 20th October 1999

Peter Thorne left the site.

Students took detailed measurements of the UU frame showing locations of all transducers.

Students left the site.

Thursday 21st October 1999 – Sunday 24th October 1999

Wait for weather window to power up and deploy the frame.

Monday 25th October 1999

Weather ok, ASRP powered up and set to record from 26th October 09:00 GMT.

Tuesday 26th October 1999

UU frame deployed to position 25B.

Jon Williams and Beverley Redmond arrive at site.

Radar power supply failed at 11am GMT

Wednesday 27th October

Jon Williams left the site.

Thursday 28th October

Beverley Redmond left the site.

ASRP and ABS transducers moved to a better position on the UU frame at position 25B. The ASRP was pointing across stream in the inlet – now pointing upstream.

Friday 29th October

Radar repairs completed, system re-installed at the pier, started recording again at 14:00 GMT.

ASRP data offloaded.

ABS trigger cable replaced due to abrasion damage.

Saturday 6th November

ABS program altered from 22 minute records to 11 minute records from 11am onwards.

Sunday 7th November

ASRP program altered to 1 minute sampling for one tidal cycle to try to resolve fast moving ripples.

Monday 8th November

ASRP data offloaded, program altered to 4 minute sampling.

Tuesday 9th November

ASRP program altered to 3 minute sampling – a compromise between resolving the fast moving ripples on the ebb tide and conserving battery power.

Saturday 13th November

Paul Bell left site.

Monday 22nd November

Paul Bell returned to site

All ABS cables found to have been ripped out of the ABS tube. Damaged cables replaced. The damage was thought to have occurred sometime over the weekend of the 13-14 November – ABS records should allow the time to be pinned down more accurately.

ASRP data shows the UU tripod (25) lifted off station at 17:30 GMT for recovery.

Kyle Betteridge arrived on site.

Tuesday 23rd November

UU tripod 25 recovered and instruments dismantled.

Wednesday 24th November

A scaffolding rig was put in place at the approximate location of position 25B. This contained the ABS and the pumped sample system.

The 0.7MHz ABS transducer was found to have a damaged connector and could not be used.

Thursday 25th November

Kyle Betteridge left the site.

Pumped sampling was attempted on the ebb tide in the morning, but the pumped sample hoses had become wrapped around the scaffolding frame and could not be reached. One of the cables was damaged and was replaced.

The frame was strengthened and the hoses untangled. Pumped samples were taken on the flood tide in the afternoon by HR Wallingford.

Mike Burke arrived on site with a van for the instrument recovery.

Friday 26th November

The radar was dismantled and removed from the pier, last recording was at 10:00 GMT. The ABS scaffolding frame was removed from the beach at low water.

Mike Burke and Paul Bell left the site.

Magelas

Day	Activity	Area completed	
03/11/99	mobilisation + installation		
	20 lines of side-scan sonar	OK	
04/11/99	17 lines of side-scan sonar	OK	
	36 Van Veen grab samples		
17/11/99	mobilisation + installation (late afternoon)		
18/11/99	16 lines of side-scan sonar perpendicular to the coast	OK	
	11 lines of side-scan sonar parallel to the coast line	OK	
	1 line of side-scan sonar in the harbour of Teighmouth		

The next 3 sections contain supporting information:

Coast 3D - Teignmouth June 1998, March & October 1999, February 2000										
HR Wallingford Ltd										
XYZ control points										
version 1.7										
Feb 28th	2000	sjh								
ODN=Ordnance Datum Newlyn (mean sea level derived from hourly readings at Newlyn 1/5/1915 to 30/4/1921)										
Admiralty Chart Datum (Teignmouth Approaches) is 2.65m below ODN						ACD height = (ODN height) + 2.65				
pgm=permanent ground mark (xyz provided) eg nail in yellow 50mm dia disk, or large nail in steel washer										
brg=360 degree bearing		distances=metres		tbrn=temporary bench mark (z provided only)			OSBM=Ordnance Survey Bench Mark (z only)			
n/a=not applicable		nd=no data		trig=Ordnance Survey triangulation point			OSGB=Ordnance Survey of Great Britain			
LSF used for Geodimeter 440 Total Station calculations = 0.9997396 at OS trig bolt The Point Car Park						122degOSGrid=121degTrue=125.5degMag(1999)				

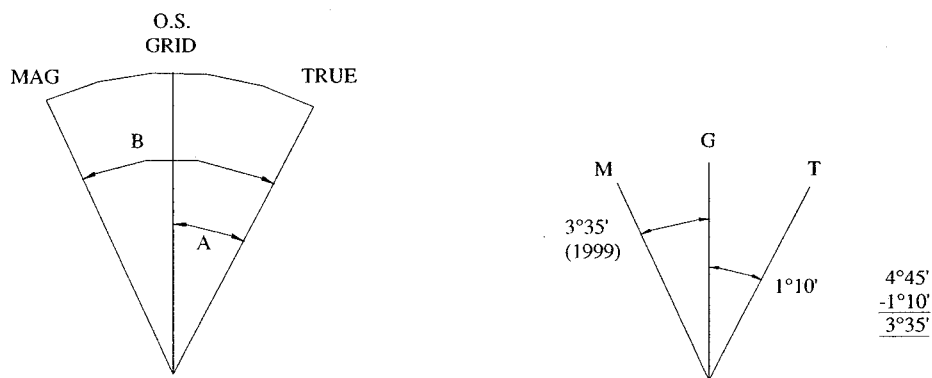
Coast3D Teignmouth Main Study October/November 1999					TABLE 2		(2 pages)									
HRWallingford, England																
Deployment & Recovery Log							ver9.5		sjh 17/03/2000							
NOTES																
1. nd=no data, n/a=not applicable																
2. Seabed levels are taken fron AutoCad dwg using interpolation from 1:1000 bathymetry data contour set. Large differences are an indication of bathymetry coverage/accuracy(deep water only)/seabed changes.																
3. Deployed co-ordinates sites 26 & 28 have been revised																
4. ACD is 2.65m below ODN																
5. Bathymetry survey dates: Survey1at 27-28/10/99, Survey 2 at 6-8/11/99, Survey 3 at 16-17,19/11/99, Survey 4 at 24-25/11/99																
6.Seabed levels use Version2 water level data																
											sensor ht	1999				
Date GMT	Site	Inst source	Inst	S.No.	Date GMT	Date GMT	Proposed coords		Actual coords		above bed	Survey1	Survey2	Survey3	Survey4	
On					into sea	out of sea	mE	mN	mE	mN	m	Seabed	Seabed	Seabed	Seabed	
												ACD(m)	ACD(m)	ACD(m)	ACD(m)	
22/10/99 13:00	6a	HRW	S4	5451291	25/10/99 08:16		295184	72360	295186	72363	1.00	-6.56	-6.57	-6.61	-6.64	
	6a		MicroWave	10426	25/10/99 08:16				295186	72363	0.43					
	6b		Directional Waverider	30024	25/10/99 08:16				295224	72378		-6.84	-6.86	-6.86	-6.87	
	6a		S4			23/11/99 08:13			295186	72363	1.00					
	6a		MicroWave			23/11/99 08:13			295186	72363	0.43					
	6b		Directional Waverider			23/11/99 08:10			295224	72378						
22/10/99 14:00	4	HRW	S4	5451476	25/10/99 08:54		294718	72668	294720	72669	1.00	-2.35	-2.43	-2.43	-2.40	
			MicroWave	10425	25/10/99 08:54				294720	72669	0.43					
						22/11/99 08:40			294714	72675						
22/10/99 11:00	26	HRW	Nortek ADP	N4593	25/10/99 09:16		294840	71810	294840	71810	0.66	-5.39	-5.37	-5.40	-5.44	
						22/11/99 09:32			294840	71810						
22/10/99 14:00	33	HRW	S4	18091501	25/10/99 14:20		294516	71310	294519	71312	1.00	-6.34	-6.36	-6.38	-6.41	
			MicroWave	10552	25/10/99 14:20		294516	71310	294519	71312	0.43					
						22/11/99 07:56			nd	nd						
22/10/99 14:00	32	HRW	S4	4911045	25/10/99 14:36		294080	71569	294080	71568	1.00	-2.00	-2.05	-2.06	-2.09	
			MicroWave	10550	25/10/99 14:36		294080	71569	294080	71568	0.43					
						22/11/99 07:34			294079	71572						
	29	HRW	Microspec	465	17/12/98		293777	72179	293777	72179	1.21/1.00	-3.69	-3.27	-3.64	-3.55	
						23/11/99 12:30			293777	72179						
	15	HRW	Microspec	466	30/11/98		294479	72311	294597	72398	1.21/1.00	-1.85	-1.82	-1.78	-1.73	
						23/11/99 14:05			294597	72398						
	5a	U Caen	S4	19261554	25/10/99 15:30		294947	72515	294955	72515		-4.10	-4.11	-4.16	-4.13	
						16/11/99 09:43										
	5b				16/11/99 09:46				294962	72491		-4.18	-4.22	-4.26	-4.26	
						22/11/99 08:55			294963	72490						
	14	U Caen	S4	19261544	25/10/99 15:41		294311	72440	294302	72449		-0.25	-0.22	-0.21	-0.24	
						22/11/99 13:23			294306	72446						
	3A	U Utrecht	various		25/10/99 16:37		294693	71913	294694	71906		-4.00	-4.02	-4.03	-4.08	
						23/11/99 07:45			294697	71909						
	24A	U Caen	S4	19261541	25/10/99 17:19		294236	72323	294237	72318		0.20	0.18	nd	0.17	
						22/11/99 13:33			294231	72320						
	23	U Caen	S4	19261542	25/10/99 17:24		294194	72259	294197	72261		0.57	0.57	0.45	0.52	
						22/11/99 13:40			294202	72262						
	28	U Utrecht	various		26/10/99 06:43		294285	72023	294289	72016		-0.94	-0.92	-1.07	-1.04	
						22/11/99 15:12			294289	72016						
	25B	U Utrecht	various		26/10/99 07:14		n/a	n/a	293953	72218		1.20	1.16	1.30	-1.20	
						22/11/99 17:30			293951	72219						
	9	U Utrecht	various		26/10/99 08:06		294593	72484	294594	72481		-1.62	-1.62	-1.69	-1.65	
						22/11/99 17:54			294592	72481						
	18Aa	U Caen	various		26/10/99 08:51		294384	72377	294383	72384		-1.02	-0.89	-0.98	-0.97	
						08/11/99 13:54										
	18Ab				16/11/99 09:29				294394	72368		-1.02	-1.00	-0.93	-0.93	
						23/11/99 15:20			294392	72369						
	26A	U Plymouth	Valeport Model 730	18518	26/10/99 15:29		n/a	n/a	294799	71859		-4.95	-4.92	-4.94	-4.98	
	26A		Wave Recorder			16/11/99 10:00	n/a	n/a	294804	71873						
	6A	U Plymouth	Valeport Model 730	18518	16/11/99 10:20		n/a	n/a	295135	72289		-6.21	-6.25	-6.28	-6.29	
			Wave Recorder			22/11/99 09:43			295137	72291						
tba	26B	U Plymouth	Pressure array	tba	tba	tba	tba		tba	tba		tba	tba	tba	tba	
				tba	tba	tba	tba		tba	tba		tba	tba	tba	tba	

Conversion between north points

True North is the standard north point for the Teignmouth study.

Conversions between Magnetic, Grid and True North are given in the following note prepared by Steve Hearn (HR Wallingford).

COAST3D
Teignmouth Norths in 1999



N Latitude	W Longitude	N.G. Coordinates E N		(Fixed) A	(Variable) B	Year	Source
50°32.50'	03°30.00'	293725	72462	1°09.5'	-	n/a	Norcon Surveyor II
50°32.50'	03°30.00'	293725	72462	-	5°20'	1994	Chart 26
50°32.50'	03°30.00'	293725	72462	-	4°45'	1999	Chart 26

NORTH'S		
MAG. (1999)	ORDNANCE SURVEY GRID	TRUE
000°00'	356°25'	355°15'
003°35'	000°00'	358°50'
004°45'	001°10'	000°00'
094°45'	091°10'	090°00'
184°45'	181°10'	180°00'
274°45'	271°10'	270°00'
090°00'	086°25'	085°15'
180°00'	176°25'	175°15'
270°00'	266°25'	265°15'

NOTE: True North refers to OSGB (1936) Datum

HR Wallingford Ltd.
Calc by SJH 27/7/1999
Drawn by ECS 10/8/1999
Filename: \\sapphire\ema\Ema\CurrentProjects\Teign1999Springsjh\Misc\TgnNorths.dwg

Appendix 4

Contents of Teignmouth pilot study database

Appendix 4: Contents of Teignmouth Pilot Study Database

COAST3D Pilot Experiment data is available on 1 CD-ROM and can be obtained from HR Wallingford on Payment of a handling fee. The data should only be used in conjunction with this report. The data CD for the Pilot Experiment also contains data from a baseline survey in 1998 and from the long-term monitoring at Teignmouth. The data CD therefore contains 3 main directories:

- 1) Teignmouth_Baseline
- 2) Teignmouth_Longterm_Monitoring
- 3) Teignmouth_Pilot

Teignmouth Baseline

This directory contains 3 files, primarily describing measurements made at Teignmouth in June 1998. They are:

1. *Bathymetry_Teignmouth_1998.xls*: the result of a survey made by ship in June 1998, the results of a seabed classification survey by USP RoxAnn system (which determines seabed type from acoustic reflections from the bed) and the digitised contours of an earlier chart of the estuary.
2. *1998_tide_gauges.xls*: water levels measured during June 1998 at the Pier (item 8) and at New Quay (item 11).
3. *Sediment_Teignmouth_June1998.xls*: results from visual inspection of 50 grab samples, plus sieve analysis of 24 samples and the results of a seabed classification survey by USP RoxAnn system (as above).

Teignmouth_Longterm_Monitoring

This directory contains 3 files and 1 subdirectory. The files are:

1. *Items 15_and_29_all.xls*: the derived parameters (such as wave heights, periods and currents) measured at items 15 and 29 from December 1998 to November 1999 inclusive. There is an 'Introduction' worksheet describing the data.
2. *River_discharge_item31.xls*: river discharges measured at the Environment Agency river gauging station on the river Teign from 1 December 1998 to 1 January 2000.
3. *Transects.xls*: details of bed elevation measurements made by University of Plymouth along the North, Central and Southern transects between 1995 and 1999. More details of the transects can be found earlier in this report.

The subdirectory is called **timeseries** and contains two subdirectories containing zipped timeseries of measurements made at items 15 and 29 from December 1998 to November 1999. The subdirectories are named after the items that collected the time series:

- Item15
- Item29

Each contains a readme file '*itemnn_timeseries_readme.txt*' with nn = 15 or 29 containing a description of the file naming convention and contents.

Teignmouth_Pilot

This directory contains seven files and one subdirectory. Each Excel file contains a description of the file's contents. The files are:

1. *VMADP_Teignmouth_Pilot.xls*. An Excel file containing Vessel-Mounted ADP surveys of currents around the boundary of the experimental area.
2. *Extra_Teignmouth_Pilot.xls*. An excel file containing data of a non-standard nature collected during the COAST3D Teignmouth Pilot experiment. This data came from Teignmouth SLOTS and some vertical profiles of current, temperature and salinity in the estuary. The SLOT data was analysed to the COAST3D standards but was not presented in a form that could be included easily in the P database (see below).
3. *P_Teignmouth_Pilot.mdb*. The COAST3D Teignmouth Pilot Experiment Parameter (P) database. This is an Access file containing the summary parameters from all the items (frames deployed at a point) analysed to the COAST3D standard and sent in a convenient format.
4. *table of measurements_pilot_ver3.doc*. This Word file contains details of the items deployed and the type of measurements made at each item.
5. *Sediment_Teignmouth_Pilot.xls*. This Excel file contains details of the analysed sediment samples collected at the locations of the offshore items (deployed by boat) during the Pilot Experiment. Each location has its own worksheet and there is a summary sheet giving d_{10} , d_{50} and d_{90} sizes and the co-ordinates of the samples.
6. *Bathymetry_Teignmouth_Pilot+1998.xls*. This Excel file contains details of bed levels measured by ship DGPS, quad-bike DGPS, and standard surveying in June 1998 and March 1999.
7. *MV_Teignmouth_Pilot.xls*. This Excel file is the COAST3D Teignmouth Model Verification database. It contains basically the same summary parameters that are in *P_Teignmouth_Pilot.mdb* and covers all items with summary parameters generated to the COAST3D standard and sent in a convenient format. (Data sent in an inconvenient format is in *Extra_Teignmouth_Pilot.xls* and *VMADP_Teignmouth_Pilot.xls*.)

The subdirectory is called **timseries** and contains six subdirectories containing zipped timeseries of measurements made during the Pilot Experiment. The subdirectories are named after the items that collected the time series:

- Item12a
- Item15
- Item16a
- Item18a
- Item21
- item22a

Each subdirectory contains 2 files: a readme file (either ascii text or Excel) with details of the timeseries contents and a single zipped file containing the timeseries.

Appendix 5

Contents of Teignmouth main study database

Appendix 5: Contents of Teignmouth Main Study Database

COAST3D Main Experiment data is available on 1 CD-ROM and can be obtained from HR Wallingford on Payment of a handling fee. The data should only be used in conjunction with this report. The data CD therefore contains 1 directory:

1. Teignmouth_Main

Teignmouth_Main

This directory contains six files and two subdirectories. Each Excel file contains a description of the file's contents. The files are:

1. *P_Teignmouth_Main.mdb*. The COAST3D Teignmouth Main Experiment Parameter (P) database. This is an Access file containing the summary parameters from all the items (frames deployed at a point) analysed to the COAST3D standard.
2. *table of measurements_main_ver3.doc*. This Word file contains details of the items deployed and the type of measurements made at each item.
3. *Sediment_Teignmouth_Main.xls*. This Excel file contains details of the analysed sediment samples collected during the Main Experiment. It also includes results from the Pilot and Baseline (June 1998) surveys for completeness.
4. *Bathymetry_Teignmouth_Main_V2.xls*. This Excel file contains details of bed levels measured by ship DGPS, quad-bike DGPS, LIDAR and standard surveying in the Main Experiment.
5. *MV_Teignmouth_Main.xls*. This Excel file is the COAST3D Teignmouth Main Experiment Model Verification database. It contains basically the same summary parameters that are in *P_Teignmouth_Main.mdb* and covers all items with summary parameters generated to the COAST3D standard.
6. *Teignmouth_Main_User_ManualWORD97.doc*. This Word file contains a user manual for the CD-ROM

The two subdirectories are:

- Teignmouth_Main\Extra_Teignmouth_Main
- Teignmouth_Main\Timeseries

The subdirectory Teignmouth_Main\Timeseries\ contains 14 subdirectories containing zipped timeseries of measurements made during the Pilot Experiment. The subdirectories are named after the items that collected the time series:

- Teignmouth_Main\Timeseries\Item01
- Teignmouth_Main\Timeseries\Item02
- Teignmouth_Main\Timeseries\Item03a
- Teignmouth_Main\Timeseries\Item09
- Teignmouth_Main\Timeseries\Item12a
- Teignmouth_Main\Timeseries\Item13a
- Teignmouth_Main\Timeseries\Item15
- Teignmouth_Main\Timeseries\Item17
- Teignmouth_Main\Timeseries\Item18a

- Teignmouth_Main\Timeseries\Item19a
- Teignmouth_Main\Timeseries\Item20a
- Teignmouth_Main\Timeseries\Item21a
- Teignmouth_Main\Timeseries\Item25
- Teignmouth_Main\Timeseries\Item28

Each subdirectory contains 2 files: a readme file (either ascii text, Word or Excel) with details of the timeseries contents and a single zipped file containing the timeseries.

The subdirectory Teignmouth_Main\Extra_Teignmouth_Main\ contains six subdirectories, each of which contains information on an unusual dataset collected during the Teignmouth Main experiment. The subdirectories are:

- Teignmouth_Main\Extra_Teignmouth_Main\Acoustic_Backscatter_System
- Teignmouth_Main\Extra_Teignmouth_Main\CTD_profiles
- Teignmouth_Main\Extra_Teignmouth_Main\item25pumped_samples
- Teignmouth_Main\Extra_Teignmouth_Main\Moving_Vessel_ADP
- Teignmouth_Main\Extra_Teignmouth_Main\Sand_Ripple_Profiler
- Teignmouth_Main\Extra_Teignmouth_Main\Teignmouth_Bedforms

Each directory contains either 1 or 2 files. If there are two files then they are data and a readme file explaining the data format. If there is only one file then a description of the data is included in the file.