

Final Project Report

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 An electronic version should be e-mailed to c.csgfinrep@csg.maff.gsi.gov.uk

Project title	Estuaries research programme - Phase 1		
MAFF project code	FD1401		
Contractor organisation and location	HR Wallingford Ltd Howbery Park Wallingford Oxon OX10 8BA		
Total MAFF project costs	£ 594,687		
Project start date	28/12/98	Project end date	27/12/00

Executive summary (maximum 2 sides A4)

Estuaries Research Programme, Phase 1

Morphology and processes in estuaries

Research by the EMPHASYS consortium for MAFF Project FD1401, 1998-2000

In December 1998 MAFF, the Environment Agency and English Nature initiated Phase 1 of the Estuaries Research Programme. This 2-year project was carried out by the EMPHASYS* consortium which comprised consulting engineers, research laboratories and university researchers. The research was overseen by the Estuaries Advisory Group (EAG), an expert committee responsible for overseeing the entire UK Estuaries Research Programme. The EAG comprised representatives from UK funding agencies, end users of the research, and other researchers.

THE RESEARCH CONSORTIUM

- HR Wallingford (consortium leader)
- ABP Research and Consultancy
- Department of Marine Sciences and Coastal Management, University of Newcastle
- Department of Geology, Royal Holloway College, University of London
- Proudman Oceanographic Laboratory
- Posford Duvivier
- Professor Keith Dyer
- British Geological Survey
- CEFAS, Lowestoft Laboratory
- WL | Delft Hydraulics (The Netherlands)

* Estuarine Morphology and Processes Holistic Assessment SYstem

- Plymouth Marine Laboratory
- Centre for Ecology and Hydrology, Dorset
- School of Ocean and Earth Science, University of Southampton

PREDICTING ESTUARY MORPHOLOGY

Flood defence, navigation, water quality and conservation all influence, and in turn are influenced by, the shape (morphology) of an estuary. One of the challenges in predicting changes in the morphology is choosing a suitable prediction method. Three main approaches exist:

- *Bottom-up methods* represent detailed processes over short timescales
- *Top-down methods* are based on conceptual ideas and operate at larger space and longer timescales
- *Hybrid methods* combine the best features of both the above

The EMPHASYS consortium investigated how different predictive methods can be used to evaluate different management strategies.

ESTUARY SELECTION

Six estuaries were selected for detailed work, i.e. collation of data, model testing and analysis. The selection was constrained by the availability of data related to long-term changes in form (i.e. bathymetry, intertidal profiles, topography). Without such data the realistic testing of predictive methods was not possible. It was also important that the chosen estuaries should represent contrasting and complementary classes of UK estuaries. For example, with and without industrialisation, both cohesive and non-cohesive sediments, macro and meso-tidal, and both constrained and unconstrained by hard geology.

To facilitate an informed decision, 18 estuaries from across the UK were reviewed for their key characteristics:

- geological controls, historical development, and data availability and quality.

From these the EAG, in consultation with the consortium, selected the following six contrasting estuaries for special study. The research on these estuaries is relevant to most of the estuaries in the UK.

Estuary Name	Geographical Location	Tidal Description	Indicative Use
Blackwater	East Coast	Macrotidal	Rural
Humber	East Coast	Macrotidal	Industrial
Mersey	West Coast	Macrotidal	Industrial
Ribble	West Coast	Macrotidal	Urban
Southampton Water	South Coast	Mesotidal	Urban
Tamar	South West	Macrotidal	Rural

TOOLS FOR ESTUARINE MANAGEMENT

Version 1B of the report “A guide to prediction of morphological change within estuarine systems” has been produced by the EMPHASYS Consortium during Phase 1 of the research. It provides information and guidance for estuary managers, stakeholders and interest groups on key questions that might arise with respect to estuary morphology and issues related to flood defence, navigation, water quality and nature conservation. The report:

- Clarifies the link between the morphology of the estuary (its shape and underwater contours) and estuary management
- Highlights the relevance of making predictions of morphological change to informed decision making in estuarine areas
- Provides best practice advice on what questions need to be asked, and the information and methods that can be applied to forecast the effects of development and protection schemes on estuarine flood defence and navigation, with due regard to water quality and conservation needs
- Reflects, through research in Phase 1, the current understanding of the strengths and limitations of the available predictive methods
- Presents in a clear fashion the steps to be taken when applying the available methods to a particular plan or activity

- Illustrates the use of the guidance in decision making through a Worked Example

PROJECT DELIVERABLES

As well as publishing the best practice guide for predicting morphological change, the main achievements of the project are presented in a range of reports and papers, and as an electronic database:

- An electronic database^{*}, containing a directory of existing data sources for estuaries, data for the broad properties of 79 UK estuaries, and detailed hydrodynamic, bathymetric and sedimentary information for six selected UK estuaries
- A comprehensive modelling report with papers describing the key facts about the modelling tests undertaken in the project and the lessons learnt. The key results are summarised in a synopsis paper
- A report presenting the recommendations for future estuarine data collection and research, as determined by the consortium in consultation with the EAG and other external parties
- A range of reports, including one on the database, and papers describing in more detail various aspects of the work undertaken in the project
- A one-day seminar presentation of the research to estuary managers and other end-users, researchers, and policy makers, including a worked example of how to use the best practice guide

* Available subject to licensing restrictions by the data originators. Contact the Project Manager rjsw@hrwallingford.co.uk for further information

Scientific report (maximum 20 sides A4)

The outputs from the EMPHASYS research consortium are contained in the following key reports available from the research consortium. For more details contact HR Wallingford Ltd: telephone 01491 835381 or visit the project website <http://www.hrwallingford.co.uk/projects/ERP1>

EMPHASYS Consortium. 2000. A Guide to Prediction of Morphological Change within Estuarine Systems. Version 1B. Research by the EMPHASYS Consortium for MAFF Project FD 1401. Report TR 114. HR Wallingford, UK. December 2000.

EMPHASYS Consortium. 2000. Recommendations for Phase 2 of the Estuaries Research Programme. Final Report. Research by the EMPHASYS Consortium for MAFF Project FD 1401 (Task Leader: Professor K Pye). Report TR 113. HR Wallingford, UK. December 2000.

EMPHASYS Consortium. 2000. Modelling Estuary Morphology and Processes. Final Report. Research by the EMPHASYS Consortium for MAFF Project FD 1401. Report TR 111. HR Wallingford, UK. December 2000.

ABP Research and Consultancy Ltd. The Estuaries Research Programme, Phase 1- Databases. Research by the EMPHASYS Consortium for MAFF Project FD 1401. Report No. R.848 and CD-ROM. November 1999.

Posford Duvivier Environment. 2000. Legislative Report. Research by the EMPHASYS Consortium for MAFF Project FD 1401. March 2000.

Posford Duvivier. 2000. The Estuaries Research Programme, Phase 1A - Predictive Methods Report. Research by the EMPHASYS Consortium for MAFF project FD1401. March 2000.

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Project Code: FD1401
Project Title: Estuaries Research Programme, Phase 1 - EMPHASYS
Project Leader/Officer: Dr S W Huntington
Contractor Address: HR Wallingford Ltd, Howbery Park, Wallingford, Oxon OX10 8BA
Project Start Date: 28/12/98
Project End Date: 27/12/00
Final year project costs: £491,315
Total project costs: £1,123,278

Contract: CSA4938

Staff Input by Grade

SPGS	Grade	Partner (staff input, person years by grade)											In addition:	
		HRW	ABP	UoN	RHC	PD	KRD	DH	UoS	POL	PML	BGS	CEFAS	CEH
UG6	Professor/Director/Group Manager	0.35	0.22	0.37	0.31	0.25	0.28	0.06	0.03	0.87	0.11			0.07
UG7	Principal Scientist/Researcher/Engineer	0.47	0.02	0.43		0.06		0.16			0.19	0.26	0.11	
SSO	Senior Scientist/Researcher/Engineer	0.75	0.99			0.56			1.04		0.41		0.11	
HSO	Scientist/Researcher/Engineer	0.78	1.31		1.00	0.05		0.18		0.87	0.24	0.09	0.05	0.01
SO	Graduate Scientist/Researcher/Engineer	0.07		0.52		0.57					0.00	0.16	0.08	0.02
ASO	Assistant/Technician	0.14	0.38			0.03					0.86			
Total staff input (person years)		2.56	2.92	1.32	1.31	1.51	0.28	0.40	1.07	1.73	1.80	0.51	0.35	0.10
													TOTAL	15.87

Signature

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Project Manager, HR Wallingford Ltd