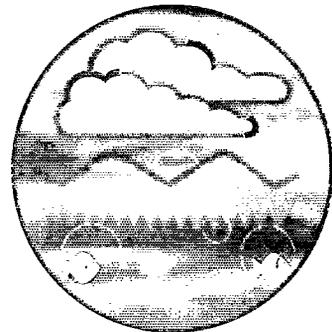
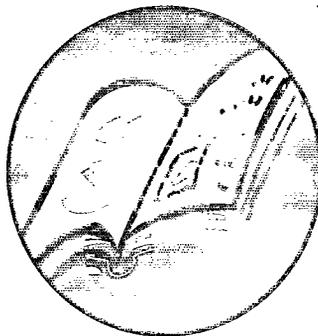
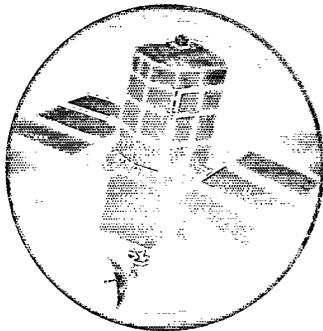


River Management Guidelines (Operational Activities) Phase 1 - Scoping Study



Research and Development

Project Record
W1/029/1



ENVIRONMENT AGENCY



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River Management Guidelines (Operational Activities) : Phase 1 - Scoping Study :

R&D Project Record W1/029/1

R W Hatton

Research Contractor:

R W Hatton

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Statement of Use

This report is the record of a scoping study into the feasibility of producing national guidelines for river management operations. The study forms the first phase in an envisaged two-phase project; Phase 2 comprising the compilation and production of the guidelines. This report is to be used in the planning and delivery of Phase 2.

Research Contractor

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List of Abbreviations

ADA	Association of Drainage Authorities
BAP	Biodiversity Action Plan
BRGA	British Reed Growers' Association
BS	British Standard
BTCV	British Trust for Conservation Volunteers
CIRIA	Construction Industry Research and Information Association
CIWEM	Chartered Institution of Water and Environmental Management
DoE	Department of the Environment
EP	Environmental Protection
EN	English Nature
FD	Flood Defence
FDMM	Flood Defence Management Manual
H&S	Health and Safety
IBU	Internal Business Unit
IDB	Internal Drainage Board
JNCC	Joint Nature Conservation Committee
MAFF	Ministry of Agriculture, Fisheries and Food
Misc	Miscellaneous
MSO	Management Services Officer
N/A	Not Applicable
NCC	Nature Conservancy Council
NP	National Power
NRA	National Rivers Authority
NVQ	National Vocational Qualification
OHP	Overhead Projector
PID	Project Initiation Document
R&D	Research and Development
RC&S Mtce	River Control & Structure Maintenance
RMG	Operational Guidelines for River Management
RSPB	Royal Society for the Protection of Birds
SEPA	Scottish Environmental Protection Agency
SLA	Service Level Agreement
SSP	Steel Sheet Piling
SSSI	Site of Special Scientific Interest
WO	Welsh Office
WWF	World Wildlife Fund

EXECUTIVE SUMMARY

This Report describes the findings from Phase 1 of a two-phased project aimed at producing national operational guidelines for river management which meet the needs of both engineering and conservation interests. The resulting output is to be called *Operational Guidelines for River Management*, referred to throughout this Report as the Guidelines. Phase 1 was a scoping study, to examine the feasibility of producing such Guidelines and to review source material. If found to be feasible, this is to be followed by compilation of the Guidelines in Phase 2.

Consultation was carried out with national, regional and area Environment Agency staff on the scope, format and contents of the Guidelines and on source material to use in its production.

Following consultation, a specification for the Guidelines was produced, together with a catalogue of source material. Where possible, copies of source documents were gathered to form a reference library. Areas where suitable material did not exist were identified. Recommendations were made on the most effective method for dissemination of the Guidelines.

A Project Initiation Document was produced for Phase 2. This is not included within this Project Record but is available from the Project Manager or the Research and Development section.

Key conclusions drawn from the scoping study were as follows.

- Consultation highlighted the clear need for a national handbook setting out best practice.
- The format of the Guidelines should comprise: an introductory section on general principles; operational guidance on a range of activities; appendices giving other sources of information and a checklist of enhancement work to consider.
- Each of the operational activity sections shall be split into three sub-sections: rationale; model specification; and illustrated practical guidance. The format of the latter shall allow its use as stand-alone material which can be laminated to form weatherproof "cab-cards" for maintenance operatives to use on-site.
- The operational activities included within the Guidelines shall be restricted to fluvial maintenance, including tidal reaches of rivers.
- On the basis of existing guidance material, the production of the Guidelines is feasible. One area where considerable resources would appear to be necessary is the provision of good quality and consistent artwork, this being particularly important for the practical guidance sections of the Guidelines.
- Area seminars should be the primary method for dissemination of the Guidelines.

It is recommended that Phase 2 of the project proceed.

KEYWORDS

River; Management; Flood Defence; Conservation; Standardisation; Maintenance.

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1. INTRODUCTION

There is a large and growing library of information relating to river management activities. This ranges from works such as the “*New Rivers and Wildlife Handbook*” to Specification Clauses for use in Service Level Agreements (SLAs) and Contracts. This information is distributed across all Regions and Functions of the Agency.

This fragmented distribution is inherently inefficient and a consistent national approach is impossible. There is a consequent danger that identified best practice may not be used in some areas due to lack of knowledge of it. This leads to inefficiency and inconsistency in dealing with other parties, particularly national bodies such as English Nature.

To rectify this disjointed and/or insular guidance, there is a need for a single, but comprehensive, Environment Agency source document. The purpose of the document would be to provide nationally consistent guidelines on river management operations. The document should integrate current available guidance; meet the needs of both engineering and conservation interests; be acceptable to all Functions and Areas; and be focussed specifically on the Agency’s requirements. The structure of the document should allow easy use by the key target audiences.

This Project Record describes the findings of a scoping study for such a document - to be entitled *Operational Guidelines for River Management*. The study forms the first phase in a two-phase project. Phase 2 will comprise the compilation, publication and implementation of the document into the Agency.

The document *Operational Guidelines for River Management* is referred to as “the Guidelines” throughout this report.

2. OBJECTIVES OF PHASE 1

2.1 Overall Objective

The overall objective of Phase 1 was to scope the production of national operational guidelines for river management (engineering and conservation) and to identify the gap between what is required and what is available to compile the Guidelines.

2.2 Specific Objectives

- a) To establish the scope of a national document giving guidelines on river management practices relating to routine maintenance operational activities, which meets the needs of both engineering and conservation interests.
- b) To identify, review, catalogue and collect suitable source material on river management operations and practices, to be utilised in Phase 2, and to identify any areas where material does not currently exist or cannot be made available.
- c) To prepare an outline framework for the guidelines, in the form of a template document, which will meet the needs of key target audiences.
- d) To recommend how implementation may be facilitated.
- e) To prepare a Project Initiation Document for Phase 2 (compilation of the document).

- f) To produce a report in the form of an R&D Project Record, detailing the work undertaken and the results.

3. METHODS

The Project was carried out under the direction of a Project Board which had a membership of:

Karen Rouen	Head Office, Conservation (Project Manager)
Peter Coxhill	Midlands, Flood Defence
Lyn Jenkins	South West, Conservation
Nigel Holmes	External R&D Advisor to Conservation
Paul Raven	Head of Conservation (Project Executive)
James Edwards	R&D Management Support Officer

The Project was monitored by the Project Manager through regular postal and telephone correspondence. The Project Board and Contractor met at the beginning and towards the end of the Project.

A cross-functional Working Group was also appointed for the Project. Their purpose was to review outputs from this Project and Phase 2, the guidelines document. Membership of the Group was:

Liz Galloway	Midlands, Environmental Assessment
Neil Guthrie	North West, Ecology
Liz Roblin	Welsh, Conservation
Neil Watson	Thames, Flood Defence
Andy Bullivant	Anglian, Direct Works
Mark Chapman	North East, Flood Defence
Ian Johnson	Southern, Fisheries
Jim Constantine	South West, Flood Defence

Some preparatory work for this project had been carried out by Environment Agency staff prior to the award of the project contract. This had produced:

- a draft template document comprising a contents list and example pages for one activity, dated January 1996;
- recommendations for the scope, format and contents of the document, based on the draft template, dated October 1996; and
- a provisional list of possible source material dated 5 January 1998.

To consult fully with all Agency staff of all relevant functions on the scope of the guidelines, both in layout and contents, a questionnaire was sent to National, Regional and Area staff in relevant Functions. Included with the questionnaire were the documents set out above. Copies of the questionnaire, the supporting documents and the circulation list are included as Appendix A.

A literature search was also carried out of external organisations, e.g. RSPB, and other sources.

4. COMMENTS ON TEMPLATE

Out of 97 questionnaires sent out, 77 were returned: an excellent response rate. The responses were analysed and the draft template document and list of source material were amended to take account of the comments.

A detailed list of comments received and a note of the action taken is given as Appendix B. The questionnaire returns are lodged with the Environment Agency's Project Manager. The main points to come out of the consultation are as follows.

- Generally, the form of the guidelines was accepted by consultees as appropriate. Comments were concerned with the requirements of maintenance operatives, where the need for laminated, weather-proof "cab cards" was widely supported. This will need to be borne in mind when arrangements are made for final production, since it is clear that a number of sub-sets, containing the practical guidance, will have to be prepared as a stand alone document.
- In Section 1 of the guidelines, sections were added covering duties relating to fisheries, pollution control and sustainable development. These sections will be very brief.
- A section covering the avoidance of pollution was added. This is confined to guidance on measures to prevent pollution and remedial "first aid" measures which may be taken if pollution occurs on site. No guidance is included on pollution control activities where the workforce is called out to a pollution incident. In these situations the workforce will proceed in accordance with instructions from Environmental Protection (EP) staff. This approach has been endorsed by Regional EP Managers.
- The following further activities were added - pumping; raised embankments; river control & structure maintenance; shoal management; concrete block revetment.
- Sandbag was changed to bagwork, to include concrete bagwork.
- Fencing was expanded to fencing, paths & stiles.
- A single category of piling was introduced, replacing steel sheet piling and trench sheeting and incorporating fibre reinforced cement sheet piling.
- Trees surgery/pollarding was retitled tree management.
- Habitat creation and enhancement is referred to under the relevant activity but detailed guidance is considered to be outside the scope of the guidelines. As an introduction to this work, with a bibliography giving further reading, an appendix has been added covering general aspects of habitat creation and enhancement, including those which do not fit into particular activities. If space allows, more detailed guidance on a small number of habitat creation/enhancement activities may be included in this Appendix.
- Timber revetment was split into spiling, faggoting/kidding, hurdles/mattresses and other timber revetment.

5. PROPOSED SCOPE, FORMAT AND CONTENTS OF THE DOCUMENT

The full specification for the *Operational Guidelines for River Management* document is set out in Appendix C.

The Guidelines are intended for detailed guidance to those practising river management. They are not intended for use in planning maintenance or deciding WHAT IS TO BE DONE, but are intended to set out HOW TO DO IT. They do not, therefore, cover Environmental Assessment or Cost Benefit, although there will be brief references to these areas in the introductory section of the Guidelines, Part 1.

Several consultees questioned the definition of 'routine' maintenance. This could, in the most extreme interpretation, be held to cover only such things as grasscutting which are carried out routinely. Most of the activities listed in Part 2 of the contents would not be considered to fall into the definition of 'routine'. Since the Guidelines clearly need to cover the activities listed, the term 'routine' has been dropped from descriptions. The Introduction (Part 1.1) will make clear the limitations on use and coverage of the Guidelines.

The definition of the Guidelines clearly excludes coastal (i.e. sea defence) maintenance. It was suggested that 'fluvial' should include tidal estuaries. The only activity not currently included which could be required by this revised definition is saltmarsh management. Since tidal reaches of rivers form a significant part of the maintained river network in some regions, it was decided that this revised definition should be used.

Although the Guidelines must exist as a 'stand-alone' reference, there will be a need for target groups to have sub-sections rather than the full document. This particularly applies to the manual workforce, where the content, format and medium needs special consultation and agreement with end-users.

The Guidelines are intended to be a generic document, equally useful for contractors, in-house workforce and those supervising and evaluating the quality of work carried out. They will also form a basis for Post Project Appraisal.

6. LIST OF SOURCE DOCUMENTS

In addition to the provisional list of possible source material circulated to consultees, a further 43 publications were identified by consultees as part of the literature review. Most source material, identified from the original provisional list, from responses to the questionnaire and identified from other sources, was reviewed. It was not possible to obtain source material for eight publications, as indicated in the Source Material Catalogue and the source material analysis spreadsheet forming part of Appendix E. These items need to be reviewed by the contractor for Phase 2 as part of his duties.

Material considered suitable for inclusion was catalogued in a standard format. This gave an outline of the content of the document, the operational activities covered, the scope of the document and whether it was primary, secondary or background reference:

- primary - the document contains key material which will be of direct use in compiling the Guidelines;
- secondary - the document contains useful material but it is not in a suitable form or sufficiently comprehensive for direct incorporation into the Guidelines;
- background - the document gives background information which needs to be referred to when compiling the Guidelines and needs to be listed in the bibliography, but is not likely to contain information suitable for incorporation into the Guidelines.

The catalogue forms Appendix D. Where possible, copies of source material were gathered to form an immediate reference library for Phase 2.

A list of operational activities, with references of relevant source material listed under each activity and a summary spreadsheet cross-referencing all operational activities and source material have also been produced. These form Appendix E.

7. COVERAGE OF EXISTING DOCUMENTATION

There are a wide range of documents which provide the source material for the introductory section of the Guidelines, Part 1. In many cases, for example sustainable development, there is a primary reference source from which to draw. Since Part 1 is intended to be a brief summary of the items listed, for use as an aide-memoir, the source material gives full coverage.

As would be expected, all operational activities/topics falling within the remit of the Guidelines are covered by specification clauses in some or all of the Regional SLA specifications listed in the source documents. In a number of cases, additional conservation specification clauses also cover the same activities. Further reference is provided in British Standards. This should permit the specification section of the Guidelines to be compiled relatively easily.

For most activities, to cover the rationale and practical guidance, Best-Practice guidance already exists, or will on completion of existing R&D projects. For those activities where no Agency best-practice has been published, there is usually good primary material available from other sources.

The following activities have no published Environment Agency best practice guidelines:

1. shrub clearance, bushing and hedge cutting;
2. tree management;
3. turf and grass reseeded;
4. tree and shrub supply, planting and maintenance;
5. reedbed establishment & maintenance;
6. concreting works;
7. bagwork;
8. fencing;
9. works within confined spaces;
10. vermin control.

Items 1-4 are well covered by other publications, particularly the *New Rivers & Wildlife Handbook*. Item 5 is partially covered by the same publication and in depth by RSPB/BRGA/EN guidebook on *Reedbed Management*. Items 6,7,9&10 appear to have little or no reference material for rationale and practical guidance, although 9 is principally a health & safety matter covered by the specification clauses existing in SLA documents and other Health and Safety documentation.

Although most activities have practical guidance, with illustrations, in referenced source documents, the quality and style of the artwork is variable. This will require the contractor to

redraft the artwork to produce consistency throughout the Guidelines, in addition to some requirement for new artwork where none exists at present.

This would appear to be the area of the Guidelines which will require the most new material since the format proposed does not translate directly from source documents. Careful selection will be necessary to ensure that the material in the practical guidance section is succinct, relevant and easily understandable. Considerable consultation with the identified list of consultees will be required to ensure that this is achieved. Since this is the section which will be directly used "on the ground", production of good quality, clear and explicit material is one of the primary requirements of Phase 2.

The following activities do not appear to have any suitable artwork in the source material, although in some cases little artwork would appear to be necessary:

- use of herbicides;
- invasive plant control;
- bagwork;
- debris clearance;
- work within confined spaces;
- vermin control;
- pumping;
- river control & structure maintenance;
- pollution avoidance.

8. PROPOSALS FOR DISSEMINATION

The method of dissemination of the Guidelines must take account of the following:

- the majority of responses from the questionnaire (54%) favoured area seminars either alone or in combination with regional seminars and/or trialling for dissemination of the Guidelines;
- the Guidelines are principally a consolidation of existing practice and not a radical new procedure which would require trialling;
- there is some need for a sharing of experiences and expertise, and team-building, between engineering and conservation and the seminar approach would facilitate this;
- there needs to be ownership of the Guidelines at all levels of the Agency, this cannot be achieved by simply issuing the document 'cold'.

The above points lead to the conclusion that a series of seminars is the only realistic way to introduce the Guidelines. This would most effectively be managed by small regional seminars attended by regional staff, followed by area seminars for area functional and contract department staff and then area seminars/practical demonstrations for the contract workforce with some input from area conservation and flood defence staff.

These seminars will be organised and presented by Agency staff. The Phase 2 contractor will be required to provide training for up to 25 selected staff, including the Project Board, Working Group, 8 additional regional representatives and one representative from Head Office. The additional regional representatives will be selected to compliment the composition

of the Working Group, so that one FD and one FER representative will be trained per region. The contractor will also be required to provide presentation materials (25 sets of overhead projector sheets and 1000 handouts) to facilitate the seminars.

9. PREPARATION OF PROJECT INITIATION DOCUMENT

The Project Initiation Document for Phase 2 of the project was prepared making the following assumptions:

- the source documentation gives full coverage of all activities and no further literature search will be necessary;
- artwork will have to be redrafted for most activities and, where appropriate, new artwork produced for the activities indicated above where none currently exists;
- the production of laminated "cab-cards" for the workforce will not be included in the contract as this can be organised locally by Agency staff;
- production costs are based on 250 copies of a 250 page document in black and white and 250 copies of a "read-only" disc containing the model specification clauses;
- the contractor will be required to provide all instruction materials for the implementation seminars, this requiring 25 sets of overhead projector material and 1000 sets of introductory notes, and to arrange training for 25 Agency staff - all to be included in the contract cost;
- the presentations at the Regional and Area seminars will be organised and run by Agency staff and the costs of meetings are included in the in-house costs;
- quarterly progress meetings will be held with the full Project Board;
- one meeting will be held with the Working Group, who will be mainly involved by postal correspondence.

The Project Initiation Document is not included in this Project Record. Copies are available from the Project Manager or the R&D Section.

10. CONCLUSIONS

- The proposed *Operational Guidelines for River Management* were welcomed by most consultees and there is a clear need for a national document setting out best practice.
- From the information which has been catalogued, it is clear that the objective of producing the Guidelines is feasible.
- Although most activities have practical guidance, with illustrations, in referenced source documents, the quality and style of the artwork is variable. This will require the contractor to redraft the artwork to produce consistency throughout the Guidelines, in addition to some requirement for new artwork where none exists at present.
- The scope was confirmed as covering river maintenance activities and not cost/benefit, environmental assessment or detailed guidance on habitat creation.
- The term 'routine' is misleading and should be dropped from descriptions of river management operations.
- The Guidelines must be generic, to cover all potential users.
- Area seminars should be the primary method for dissemination of the Guidelines.
- It is recommended that Phase 2 of the project proceeds.

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APPENDIX A

ORIGINAL CONSULTATION DOCUMENTS

RIVER MANAGEMENT GUIDELINES (OPERATIONAL ACTIVITIES)

PHASE 1- SCOPING STUDY- QUESTIONNAIRE

Please return to:

R. W. Hatton
14 Clyst Valley Road
Clyst St Mary
Exeter
EX5 1DD

Please complete details below:

Name:.....
Post:
Region/Area.....

1) Does the list of activities cover all aspects of your work? YES/NO

If NO, what activities are omitted?

.....

2) From the example given, is the format of the guidelines acceptable? YES/NO

If NO, what format would you prefer?

.....

3) Are there any omissions from the list of source documents? Please list below:

.....

.....

4) When the Guidelines are completed, what is the best route for dissemination?

- a) Regional seminars
- b) Area seminars
- c) Cascade briefings
- d) Trialling in areas/regions
- e) No strong view
- f) Other (please state)

Please return by 30 January 1998

Project Board, October 1997

RIVER MANAGEMENT GUIDELINES (OPERATIONAL ACTIVITIES)

CURRENT RECOMMENDATIONS FOR SCOPE, FORMAT AND CONTENTS

Project Board, October 1997

Title

River Management Guidelines (Operational Activities)

Aim

- To provide a comprehensive guide of best practice for environmentally sympathetic river management relating to routine maintenance operational activities.
- To provide model specifications incorporating this best practice.
- To provide practical guidance on best practice techniques, suitable for use on site.

Audience

Flood defence managers; client engineers / flood defence inspectors; contractor engineers; contractor operatives; reference for Conservation; Fisheries. Internal plus external contractors.

Format

- Loose-leaf document in clip folder. General introduction followed by sections on operational activities. Operational activities grouped into broad categories; finger-indexed to allow easy use. Each operational activity (topic) to be in 3 sub-sections: rationale (the Why?), model specifications (the What?) and practical guidance (the How?). Practical guidance sheets to be suitable for use on site ("cab-cards" which can be laminated by users). Handbook to be up-dated by replacement of individual sheets as and when necessary (see below).
- Model specifications to be available as a "read-only" computer file for insertion into contracts.
- Separate copy of all practical guidance sheets to be made available to allow multiple copying.

Scope

- Activities/topics to cover routine fluvial maintenance only. Coastal maintenance and non-routine fluvial work are not to be included. Enhancement techniques/activities to be included as "memory-joggers" in the Rationale section where appropriate. A checklist of enhancements can be given as an Appendix.
- Rationale sections to give principles & broad guidelines of best practice, H & S, management options, enhancement opportunities and things to consider when drawing up the specification. Other sources of information to be referred to. Best Practice to be set as the default option for all activities, with an "Acceptable Standard" also defined. Consideration should be given to a flow-chart "decision-tree" to guide the reader to the correct option.
- Specifications to give model clauses for each topic/activity: Best Practice (default option) and Acceptable Standard. This to relate to both Conservation and Flood Defence requirements, to avoid the need for two documents.
- Practical guidance to give illustrations, before and after. Again, this to relate to both Conservation and Flood Defence requirements.

Future Updates

The handbook should be up-dated as and when necessary by distribution of revised pages. Users would replace the existing pages with the revised versions. This will require:

- an inventory of users;

- someone to be responsible for maintenance of the up-to-date inventory and what up-dates have taken place;
- a page numbering system which is flexible enough to allow future revisions of individual pages.

Contents

1.0 GENERAL PRINCIPLES

- 1.1 Introduction (*Note: to include purpose of document and scope*)
- 1.2 Flood Defence Duty
- 1.3 Conservation Duty
- 1.4 (*Note: include principle of sustainability; possibly in a general section on principles of environmentally sympathetic river management?*)
- 1.5 Planning of maintenance activities (*Note: refer to MAFF Code of Practice & Flood Defence Maintenance System*)
- 1.6 How to use this handbook

2.0 ACTIVITIES

Dredging

- 2.1 De-silting
- 2.2 Re-forming
- 2.3 Re-grading/Re-sectioning

Vegetation Management

- 2.4 Aquatic weed cutting
- 2.5 Use of herbicides
- 2.6 Grass cutting and non-woody vegetation clearance
- 2.7 Shrub clearance, bushing and hedge cutting
- 2.8 Tree surgery / Pollarding
- 2.9 Invasive plant control
- 2.10 Turf & grass reseeding
- 2.11 Tree and shrub supply, planting & maintenance

Erosion Control and Revetment

- 2.12 Soft Revetment
- 2.13 Reedbed establishment & maintenance
- 2.14 Geotextile fabric
- 2.15 Timber revetments
- 2.16 Stone pitching
- 2.17 Natural block stone
- 2.18 Concreting works
- 2.19 Gabions & Gabion mattresses
- 2.20 Sandbags
- 2.21 Trench sheeting (for permanent works)
- 2.22 Steel sheet piling

Miscellaneous

- 2.23 Debris Clearance
- 2.24 Fencing
- 2.25 Disposal of materials on site
- 2.26 Disposal of materials off site
- 2.27 Works within confined spaces (incl. culverts)
- 2.28 Vermin control

APPENDICES

- A1 Other Sources of Information
- A2 Legislation
- A3 Checklist of enhancements

Note: the order given above is arbitrary.

Each activity to have sub-sections as follows:

Dredging

- 2.1 De-silting
 - 2.1.1 Rationale
 - 2.1.2 Model Specification
 - 2.1.3 Practical Guidance

- 2.2 Re-forming
 - 2.2.1 Rationale.
 - 2.2.2 Model Specification
 - 2.2.3 Practical Guidance

- 2.3 Re-grading/Re-sectioning
 - 2.3.1 Rationale
 - 2.3.2 Model Specification
 - 2.3.2 Practical Guidance

R & D PROJECT W1-029
RIVER MANAGEMENT GUIDELINES (OPERATIONAL ACTIVITIES) - PHASE 1

PROVISIONAL LIST OF SOURCE MATERIAL FOR PHASE 2

Project Board, 7 January 1998

_ denotes that this item is held in the project "library".

- 1 Operational material produced or supported by NRA or Env. Agency**
- 1.1 Rivers and Wetlands. Best Practice Guidelines. *Environment Agency, Midlands Region* (a series of advice leaflets, printed 1996) _
 - 1.2 Flood Defence Guidance for Conservation in Watercourse Maintenance Works. *NRA Thames Region, August 1994.* _
 - 1.3 Flood Defence Conservation Requirements for Watercourse Maintenance Works. *Environment Agency, Thames Region, March 1997, Draft.* _ (also included under item 1.15; contact for further information is Neil Watson, Flood Defence, Thames)
 - 1.4 Environmental Options. Specifications for Flood Defence Maintenance Works. *Environment Agency, Anglian Region, 1996, Draft.* _ (contact Gary Murphy, Anglian, for original copy of latest version)
 - 1.5 Specification clauses for River Maintenance Works. Best Working Practice. Draft, August 1995. *Lee Donaldson Associates for NRA Wessex Region.* _
 - 1.6 Conservation and the Flood Defence Maintenance Programme. Review of Practice and Procedures, and Future Guidance. *Environment Agency, Anglian Region, April 1996.* _
 - 1.7 The New Rivers & Wildlife Handbook. *RSPB, NRA & Wildlife Trusts, 1994.* _ (copy in project library is Karen Rouen's personal copy)
 - 1.8 River Idle River Maintenance Strategy. *Environment Agency Midlands Region.* _
 - 1.9 Environmental Assessment - Scoping Handbook for Projects. *Environment Agency, April 1996.* (Note: the Agency's national Environmental Assessment contact is Andrew Brookes, based at Steel House in London; the SW Region contact is Peter Nicholson)
 - 1.10 River Don Catchment, Flood Defence Maintenance Contract. *Environment Agency North East Region, Flood Defence Ridings Area, Don and Aire District.* _
 - 1.11 Service Level Agreement for River Maintenance Work. *Environment Agency Midlands Region.* _
 - 1.12 Specification for Watercourse Maintenance Work Carried Out by the Direct Works Department. *Environment Agency Midlands Region.* _
 - 1.13 Watercourse Maintenance Service Level Agreement, Volumes 1 & 2. *Environment Agency South West Region.* _
 - 1.14 Flood Defence Maintenance Service Level Agreement. *NRA North West Region, July 1995.* _ (currently being revised: contact is John Bell)
 - 1.15 Maintenance & Minor Capital Works, Contract Documents. *NRA Thames Region.* _
 - 1.16 Conservation in Maintenance Work. *NRA Wessex Region.* _

- 1.17 Potentially in preparation: an information sheet on disposal of dredgings, control of weed species, and the associated consenting process.
- The production of such an information sheet was being considered by SW Region as at December 1997. This was in response to an increasing number of complaints received from landowners within the Somerset Levels & Moors, regarding extensive growth of nettles, creeping thistle and hemlock water dropwort on the banks of watercourses in the area. EN, FRCA and the Agency had jointly decided that the problem stemmed from the practice of depositing dredged material on bank tops, this providing bare nutrient rich substrate for weed species to colonise. It also came to light that herbicide application was taking place adjacent to watercourses without Agency consent.
 - Contact Stuart Modie (Bridgwater; extn 4786) for further information.

2 Other operational material

- 2.1 Code of Practice on Environmental Procedures for Flood Defence Operating Authorities. *MAFF & The Welsh Office, 1996.* _
- 2.2 Sensitive ditching work. *Charles Beardall, Farming & Conservation, April 1996* (article).
- 2.3 Water vole handbook - contact Alastair Driver (Thames) for details of appropriate publication(s).

3 NRA and Environment Agency R&D publications

- 3.1 Guidelines for the Justification of River Maintenance; Environmental Guidelines for Vegetation Management in Channel; Environmental Guidelines for Vegetation Management on Banks. *NRA R&D Note 511, Silsoe College et al.* _

Background Documentation - Guidelines for River Vegetation Maintenance. *NRA R&D Project Record 536/1/ST, Silsoe College et al.*

(KJR has photocopy of Nigel Holmes' final draft, but not the published copy)

(N.B. this work is being up-graded: see 5.9)

- 3.2 Streambank Protection in England & Wales. *NRA R&D Note 22, 1991, University of East Anglia.* (Project 258) _
- 3.3 (Coastal) Revetment Systems and Materials. *NRA R&D Note 116, 1993, Sir William Halcrow & Partners.* (Project 266) _
- 3.4 Buffer Zones for Conservation of Rivers and Bankside Habitats. *NRA R&D Note 87, 1992, ICOLE Loughborough University.* _
- Buffer Zones for Conservation of Rivers and Bankside Habitats. *NRA R&D Project Record 340/5/Y, ICOLE Loughborough University.* _
- Understanding Buffer Strips. An information booklet. *Environment Agency, 1996.* _
- (N.B. Nigel Holmes knows of no further follow-up work since these reports)
- 3.5 Aquatic Weed Control Operation. Phase 1 Report - Existing Practice. *NRA R&D Note 189, Aquatic Weeds Research Unit.* _
- 3.6 Aquatic Weed Control Operation: Best Practice Guidelines. *NRA R&D Note 395.* _
- 3.7 Review of existing practices for fluvial maintenance operations. *NRA R&D Note 14.* (Project 200)
(N.B. Karen Rouen unable to get copy from R&D MSO; MSO's assistant ordered directly from FWR 5/8/97, but no progress as at 29/12/97)

- 3.8 Review of existing practices for fluvial grass management throughout the NRA. *NRA Project Record 213/1/Y*. (Project 213) ...
- 3.9 Control of invasive riparian and aquatic weeds. *NRA R&D Note 233, ICOLE*. (Project 294) ...
- 3.10 Aquatic Weed Control Operation - Best Practice Guidelines. *Environment Agency 1997* (leaflet). ... This is one of two outputs from the following R&D project: proposal C04(93)01 *Aquatic Weed Control Operation Phase III*.
- Project Manager is Dave Woodcock (Gainsborough office, Midlands Region).
 - Second output is a guidance manual. Contact R&D MSO for copy of manual (likely to be a Technical Report).
- 4 **CIRIA publications** (see publication brochure)
- 4.1 Disposal of dredged material to land (CIRIA; R157).
- 4.2 Engineering works and wetlands in lowland areas generally drained by gravity (CIRIA, TN123).
- 4.3 Protection of river and canal banks (CIRIA; B9)
(N.B. Peter Coxhill has a copy of this book which was co-authored by Mervyn Bramley)
- 4.4 Use of vegetation in civil engineering (CIRIA, B10)
- 4.5 Old waterfront walls - Management, maintenance and rehabilitation (CIRIA, B13)
- 5 **Ongoing Env. Agency R&D**
- 5.1 W5A(96)1 *Vegetation management of raised embankments*.
- Objective: To identify best practice on the management of grass and other vegetation on embankments and earthworks above original ground level.
 - Project Leader: Peter Coxhill.
 - Contract let in spring 1997; Phase 1 summer 1997; possibly Phase 2 for next two growing seasons.
- 5.2 W5A(96)2 *Management practices and habitat creation*.
- Objective: To identify successful practices in habitat creation from a study of existing Flood Defence management practices.
 - Originally due to start 96/97 and end 99/99. The project has been put on hold, however, due to funding issues.
 - Original Project Leader was Helen Grayson (North East: Coverdale House, York). But new Project Leader needs to be sought as Helen now cannot take on the role.
 - Contact for further information is Mike Briers (R&D MSO, NE Region).
- 5.3 W5A(96)4 *Benefits of urban maintenance operations*.
- Relates to the justification of maintenance, so not really relevant for handbook except perhaps to refer to it in the Introduction.
 - Start 96/97; end 97/98.
- 5.4 W5A(96)5 *Disposal of cut vegetation*.
- Objective: To prepare a guideline for the disposal of vegetation cut in channels as part of necessary annual maintenance, taking into account concern over the potential pollution to waterways arising from cut vegetation.
 - Supplementary to the R&D report, a brief guideline document will also be produced for use by operating personnel.
 - Project Leader: Stewart Powers (Midlands; West Bridgford, Nottingham).
 - Start 08/96; end 07/98. Draft report 01/97; monitoring trial operations in summer 1997; final report & guidance 03/98.

- Contract let to ADAS. Project running to schedule as at October 1997, so due to report by March 1998.
 - _ (outline of project)
- 5.5 C04(94)2 *Dredging techniques and operations: Best practice guidance.*
- Objective: To review the practice on the management of dredging and develop Best Practice guidelines.
 - Peter Coxhill has copy of the Funders report for *Inland Dredging Techniques - Guidance on Good Practice* from CIRIA.
 - Project Leader: John Buckingham (Midlands).
 - Scheduled to start 03/95 and end 02/96. Publication of final report by CIRIA has been delayed, however, but will hopefully be soon.
 - _ Copy of Introduction is in the project library. Contact John Buckingham (Midlands Region, extn 4890) for further information if required (John had only one final draft copy remaining as at 02/10/97!!).
- 5.6 G0(94)12 *River bank protection manual.*
- Objective: To produce a guidance document for the assessment of bank erosion problems and design of protection works along rivers and navigable waterways.
 - Project Leader: Brian Ayling (Anglian: Norwich).
 - Nigel Holmes has been involved.
 - Start 96/97; end 97/98. Will be 95% finished by 30/09/97. All technical detail will be finalised by then, but there may be minor clarifications following the "β testing" (test on novices). Final document due May 1998.
- 5.7 Proposal G01(95)9; Project 600 *Field trials on bank protection techniques*
- Objective: To carry out field trials on four different types of vegetative bank protection in order to assess and demonstrate soft and vegetative bank protection on rivers.
 - Project Leader: Liz Chalk (NE Region).
 - Contractor: River Restoration Project.
 - Start 03/95; end 03/97.
- 5.10 *Environmental Guidelines for Vegetation Management in Channel and on Banks*
- Implementation phase of R&D Note 511 (see item 3.1 above). Addressing the question "what work should be done?" rather than "how should we do it?". [Although the River Management Guidelines relate to the latter question, there is inevitably some overlap which needs to be recognised.]
 - Contractor: Dianna Ward / Silsoe College.
 - Contact Peter Coxhill for further details.
- 5.11 F01(95)3 *Coarse woody debris in British headwater streams.*
- Objective: To assess the ecological value of organic debris in rivers in order to assess consequences for river management.
 - Project Leader: Cath Beaver (Head Office until end 1997; seconded to Welsh Region, Cardiff, as from January 1998).
 - Project is two PhD studentships at Birmingham University, sponsored by the Agency.
 - Start 09/96; end 09/98.
 - The students may be able to contribute to the section on debris clearance, as they are drafting guidelines for clearance of coarse woody debris. Contact Cath Beaver to arrange this, and/or for further information.
- 6 **Other initiatives**
- 6.1 WWF and SEPA are funding a project to develop a River Management Manual for Scotland by the end of 1997/98. Contact Nigel Holmes for details.

Karen Rouen, 5 January 1998

MAILING LIST

The questionnaire was sent to Heads of Flood Defence, Fisheries, Conservation, Recreation & Navigation and the Conservation & Policy Co-ordinator at Head Office; Regional Flood Defence, FER, Contracts and PPC Managers; Area FD/WR, and FER Managers; Working Group members and some external consultees. Replies were received from the following:

Head Office

Brian Empson - Flood Defence Officer
Dr Paul Raven - Head of Conservation
Richard Howell - Conservation & Policy Co-ordinator

South West

Richard Horrocks - Regional FD Manager
Stuart Bray - Regional FER Manager
Paul Courtney - Regional Contracts Manager
Gordon Trapmore - Cornwall Area FD/WR Manager
Martin Williams - Cornwall Area FER Manager
Jim Constantine - Devon Area FD/WR Manager
Steve Douglas - Devon Area FER Manager
Richard Symonds - North Wx Area FD/WR Manager
Dr Roger Merry - North Wx Area FER Manager
Ian Hope - South WX Area FD/WR Manager
Graham Lightfoot - South Wx Area FER Manager

Welsh

Geoff Bayliss - Regional FD Manager
Dave Clarke - Regional FRCN Manager
Charlie Pattinson - Regional PPC Manager
Ron Clark - SE Wales Area FD/WR Manager
Meic Davies - N Wales Area FD/WR Manager
Alan Winstone - N Wales Area FER Manager
Colin Green - Contracts Manager South
Bill Harding - Contracts Manager North

Anglian

Steve Wheatley - Regional FD Manager
John Adams - Regional FRCN Manager
Mick Pearson - Regional PPC Manager
Nigel Woonton - Central Area FD Manager
Mike Evans - Central Area FER Manager
Andy Bullivant - Central Area Contracts Manager
Andy Baxendale - Northern Area FD Manager
Irven Forbes - Northern Area FER Manager
Eddie Markham - Northern Area Contracts Manager

John Hesp - Eastern Area FD Manager
Charlie Beardall - Eastern Area FER Manager

Midlands

Martin Stark - Regional FER Manager
Stewart Powers - Regional Contracts Manager
Andrew Skinner - Regional PPC Manager
Peter May - U Severn Area FD/WR Manager
Paul Bailey - L Severn Area FD/WR Manager
Alan Churchward - L Severn Area FER Manager
John Buckingham - U Trent Area FD/WR Manager
Martin Cooper - U Trent Area FER Manager
John Adams - L Trent Area FD/WR Manager
Keith Easton - L Trent Area FER Manager

North West

Jeff Lawrenson - Regional FD Manager
Mark Diamond - Regional FER Manager
Deryck Major - Acting Regional Contracts Manager
Jeremy Frost - Regional PPC Manager
Glynn Vaughan - North Area FD/WR Manager
Deryck Major - Central Area FD/WR Manager
Jonathon Shatwell - Central Area FER Manager
Phil Younge - South Area FD/WR Manager

North East

Steve Bailey - Regional FER Manager
Cyril McQuillan - Regional PPC Manager
Peter Kerr - Northumbrian Area FD/WR Manager
Godfrey Williams - Northumbrian Area FRCN Manager
Ken Barton - Ridings Area FD/WR Manager
John Pygott - Ridings Area FRCN Manager
Frank de Planta - Dales Area FD/WR Manager
Kevin Blackmore - Dales Area FRCN Manager
Mike Davies - Acting Dales Area Contracts Manager

Southern

Ken Allison - Regional FD Manager
Ian Johnson - Regional FRCN Manager
John Donaldson - Regional Contracts Manager
Alison Garrett - Kent Area FD Manager
John Morgan - Kent Area FRCN Manager
Andrew Davies - Sussex Area FD Manager
Jane Cecil - Sussex Area FRCN Manager
Tim Kermode - Hants/IOW Area FD Manager

Lawrence Talks - Hants/IOW Area FRCN Manager

Thames

Peter Borrows - Regional FD Manager
Roger Sweeting - Regional Fisheries Manager
Simon Read - Regional PPC Manager
Graham Cowell - NE Area FD/WR Manager
Mike Lawton - NE Area Contracts Manager
David Van Beesten - Acting SE Area FD/WR Manager
Alan Butterworth - SE Area F&E Manager
Barry Morrison - SE Area Contracts Manager
Roger Powling - W Area FD/wr Manager
John Sutton - W Area F&E Manager
Bob Warne - W Area Contracts Manager

Others

Gordon Heald - Chair of Design & Contracts Group
David Noble - Secretary of ADA (Association of Drainage Authorities)
Liz Galloway - Steering Group
Neil Guthrie - Steering Group
Liz Roblin - Steering Group
Neil Watson - Steering Group
Mark Chapman - Steering Group

APPENDIX B

DETAILED COMMENTS RECEIVED FROM CONSULTEES

Results of Questionnaire.

Additional activities/comments identified. (*Action taken in italics*)

Access arrangements *Site specific. General note in FD Duties Part 1*
Access culverts *Include in River Control & Structure Maintenance*
Adding gravel to streams *Include in Habitat Creation Appendix*
Aquatic weedcutting by boat *Include in Aquatic weedcutting*
Archaeology in Part 1 *Add sub-heading to Environmental Duty*
Artificial spawning beds)
Bank raising *Include in Raised Embankments*
Berm creation *Include in appropriate activity and Habitat Creation Appendix*
Booming to intercept cut weed *Include in Aquatic Weedcutting or Disposal of Material*
Change 'Reforming' to 'Gravel management' *Rejected*
Clearance of vegetation from structures prior to repair/repainting *Included in R C & S Mtce.*
Clearance of weedscreens *Include in Debris Clearance*
Coating/repainting *Include in River Control & Structure Maintenance*
Concrete bagwork *Amend 'Sandbags' to 'Bagwork' and include in new activity*
Concrete block revetments *New activity in Erosion Control & Revetment*
Conservation in Part 1 to become 'Environmental' *To become "Environmental Duty"*
Coppicing within tree surgery *Included*
Demolition *Outside scope of RMG*
Designated sites eg SSSIs *Include sub heading in Environmental Duty in Part 1*
Desilting to cover floating plant *Include in Desilting*
Dredging-silt agitation *Include in Desilting*
Dredging-spoil spread *Include in Disposal on Site*
Earthworks *Covered by Raised Floodbanks*
Emergency works *Outside the scope of RMG*
Enhancements *Appendix on Habitat Creation & Enhancement*
Faggots/kidding (erosion stabilisation) *New activity in Erosion Control & Revetment*
Fibre reinforced cement sheet piling *Combine with SSP & Trench Sheets as 'Piling'*
Fisheries & recreation aspects *Include in Section 1 under Conservation*
Fisheries duties (in Part 1) *Sub heading to Environmental Duty in Part 1*
Fishing platforms/swims *Outside scope of RMG*
Flail mowing *Include in Grasscutting*
Flap valve maintenance *Include in River Control & Structure Maintenance*
Flood bank repairs *Include in Raised Embankments*
Flood patrols *Outside scope of RMG*
Flood rack removal *Included in Debris Clearance*
Gravel arrestor weirs) *Include in Habitat Creation Appendix*
Gravel cleaning)
Gravel shoal removal *Include in Shoal Management*
Grid and blockage clearance *Include in Debris Clearance*
High water structure inspections *Outside scope of RMG. H&S matter*
Identifying & dealing with contaminated land *Dealing with contaminated silt included in Pollution Avoidance, otherwise outside scope of RMG*
Justification of maintenance work in Section 1 *Add sub-heading to FD Duty*
Non routine work *Not an Activity*
Outfall maintenance *Include in River Control & Structure Maintenance*

Paths, stiles etc. *Include in Fencing with expanded title*
Polewarring (chalking) *Include in Other Timber Revetment*
Pollution avoidance *New activity in Misc. section*
Protected species in Part 1 *Ditto*
Pumping *New activity in misc. section*
Pumping station maintenance *Include in River Control & Structure Maintenance*
Quality assurance checklist *Outside the scope of RMG*
Raised embankments- vermin control, reforming, regrading & resectioning *New activity*
Reinstatement of dredging *Include in Dredging activities*
Removal of animal carcasses *Include in Debris Clearance*
Removal of car bodies *Include in Debris Clearance*
Removal of fallen trees *Include in Debris Clearance*
Restore polluted environments *Outside scope of RMG*
Riparian responsibilities in Part 1 *Add sub-heading to FD Duty*
River control & structure maintenance *New activity in Misc. section*
Screen maintenance *Ditto*
Seasonal timing of work *Include in Part 1 under programming of works*
Shoal management *New activity in Dredging section*
Silt traps *Include reference to this in Desilting*
Small scale civil construction work *Outside scope of RMG*
Spiling *New Activity in Erosion Control & Revetment*
Split soft revetment into different categories (as hard rev) *Rejected*
Spoil levelling & brushing *Include in activities*
Stockpiling/disposal of cut weed *Include in Disposal of Material*
Trash dam clearance *Include in Debris Clearance*
Urban rivers *Not an activity. Specific points re. urban areas in appropriate activities*
Vegetation management *Covered by Activities already in use*
Water level control (sluicekeepers) *Outside scope of RMG*
Wetland enhancement/protection *Include in Habitat Creation/Enhancement Appendix*

APPENDIX C

SPECIFICATION FOR SCOPE, FORMAT AND CONTENTS OF OPERATIONAL GUIDELINES FOR RIVER MANAGEMENT

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OPERATIONAL GUIDELINES FOR RIVER MANAGEMENT - SPECIFICATION

Title

Operational Guidelines for River Management

Aim

- To provide a comprehensive guide of best practice for environmentally sympathetic river management relating to maintenance operational activities.
- To provide model specifications incorporating this best practice.
- To provide practical guidance on best practice techniques, suitable for use on site.

Audience

Flood defence managers; client engineers / flood defence inspectors; contractor engineers; contractor operatives; reference for Conservation; Fisheries. Internal plus external contractors. Evaluation of work and post project appraisal.

Format

- The Guidelines will be in loose-leaf binding in a clip folder. The general introduction will be followed by sections on operational activities, with an appendix giving a checklist and examples of habitat enhancement and a bibliography.
- Operational activities are to be grouped into broad categories, finger-indexed to allow easy use. Each operational activity (topic) will be in 3 sub-sections: rationale (the Why?); model specification (the What?) and practical guidance (the How?).
- Practical guidance sheets are to be suitable for use on site ("cab-cards" which can be laminated by users).
- The Guidelines will be produced in a format which will allow up-dating by replacement of individual sheets as and when necessary (see below).
- Presentation of material, particularly artwork, must be consistent throughout the Guidelines. This will require the redrafting of existing artwork referred to in the source literature.
- Model specifications are to be supplied as a "read-only" computer file for insertion into contracts.
- Separate copies of all practical guidance sheets are to be made available to allow multiple copying.
- Presentation (typeface, colour, layout etc.) must conform to the Agency standard specification for manuals, available from the R&D section.

Scope

- Activities/topics are to cover environmental best practice for fluvial maintenance, including tidal reaches of rivers. Coastal maintenance, i.e. sea defence is not to be included. Habitat enhancement, pollution avoidance and disposal of materials are to be

included as "memory-joggers" in the Rationale section where appropriate. Generic information on pollution avoidance and disposal of materials is to be given in specific activity sections. A checklist of habitat enhancements, with examples, is to be given as an Appendix, with detailed guidance on a few examples if space permits.

- Rationale sections are to outline the principles and broad guidelines of best practice, health & safety, management options, enhancement opportunities and things to consider when drawing up the specification. Other sources of information are to be referred to.
- Specifications are to give model clauses defining Best Practice for each topic/activity. This must relate to both Conservation and Flood Defence requirements, to avoid the need for two documents.
- Practical guidance is to give illustrations, where appropriate, of examples of best practice. Also to set out a "dos and don'ts" list. The aim is to include material which will form a quick reference document, for use on-site, covering items where maintenance operatives would be likely to need advice. Again, this is to relate to both Conservation and Flood Defence requirements.
- The contractor will prepare 3 activities for approval of the detailed format, content and presentation prior to full-scale production.
- Total size of the Guidelines will be around 250 sides of text on double sided pages.

Future Updates

The Guidelines should be in a format which will allow them to be up-dated as and when necessary by distribution of revised pages. Users would replace the existing pages with the revised versions. This will require:

- an inventory of users;
- someone within the Agency to be responsible for maintenance of the up-to-date inventory and what up-dates have taken place (to be determined by the Project Board);
- a flexible page numbering system to allow future revisions of individual pages.

Contents (*Italicised notes in the following contents and example activities sections provide expansion and amplification of the content and format and do not form part of the text*)

Part 1 - GENERAL PRINCIPLES (12-15 pages)

- 1.1 Introduction - *to include purpose of document and scope, target audience and limitations on use e.g. not for capital schemes, how this document fits in with other Agency documents, how to use the Guidelines.*
- 1.2 Flood Defence Duty - *to include legislative background, Agency FD Strategy, MAFF guidance, riparian responsibilities*
- 1.3 Environmental Duty - *to include legislative background, Agency Conservation, Fisheries, Recreation and Environmental Protection Duties and Strategies and Sustainable Development Duty. Conservation section to include protected species, SSSIs and archaeology.*
- 1.4 Planning of Maintenance Activities - *to include requirement to consult/options appraisal/planning of work (with flow charts), environmental assessment of significant work (SI 1199 & 1217), FDMM, seasonal timing of works, justification of maintenance work, duty of care, pollution avoidance, Habitats Directive - review of activities.*

Part 2 - ACTIVITIES (Each Activity 3-6 pages)

2. **General Specification Clauses.** *Preamble to detailed clauses set out in Model Specifications for each activity. This section will cover all general specification matters which are not covered by the individual activity clauses, to provide a complete, "stand-alone" model specification document.*
3. **Dredging**
 - 3.0 General Rationale
 - 3.1 De-silting - *to include agitation dredging*
 - 3.2 Re-forming
 - 3.3 Re-grading/Re-sectioning
 - 3.4 Shoal management
4. **Vegetation Management**
 - 4.0 General Rationale
 - 4.1 Aquatic weedcutting - *to include by boat*
 - 4.2 Use of herbicides - *to include BASIS trained EP Staff*
 - 4.3 Grass cutting and non-woody vegetation clearance
 - 4.4 Shrub clearance, bushing and hedge cutting
 - 4.5 Tree management
 - 4.6 Invasive plant control
 - 4.7 Turf and grass reseeded
 - 4.8 Tree and shrub supply, planting and maintenance
5. **Erosion Control and Revetment**
 - 5.0 General Rationale
 - 5.1 Soft revetment
 - 5.2 Reedbed establishment and maintenance
 - 5.3 Geotextile fabric
 - 5.4 Spiling
 - 5.5 Faggoting/Kidding
 - 5.6 Hurdles/Mattresses
 - 5.7 Other timber revetments
 - 5.8 Stone pitching
 - 5.9 Natural blockstone
 - 5.10 Concrete work
 - 5.11 Gabions and gabion mattress
 - 5.12 Bagwork - *to include sandbagging and concrete bagwork*
 - 5.13 Concrete block revetment
 - 5.14 Piling - *to include steel sheet piling, trench sheeting and fibre reinforced cement sheet piling*

6. Miscellaneous

- 6.1 Maintaining raised embankments
- 6.2 Debris clearance - *to include removal of fallen trees, weedscreen/grid clearance and carcass removal*
- 6.3 Fencing, gates and stiles
- 6.4 Disposal of materials on site
- 6.5 Disposal of materials off site
- 6.6 Works within confined spaces - *to include culverts*
- 6.7 Vermin control
- 6.8 Pumping
- 6.9 River control and structure maintenance
- 6.10 Pollution avoidance

Part 3 - APPENDICES

- A1 Habitat Enhancement Checklist and Examples (*20 pages; relating to both UK BAP species and others*)
- A2 Bibliography (*4 pages*)

Each activity to have sub-sections as follows:

3. Dredging

- 3.0 General Rationale
- 3.1 Desilting
 - 3.1.1 Rationale
 - 3.1.2 Model Specification
 - 3.1.3 Practical Guidance
- 3.2 Re-forming
 - 3.2.1 Rationale
 - 3.2.2 Model Specification
 - 3.2.3 Practical Guidance

EXAMPLES OF TYPICAL ACTIVITIES

These examples give the contractor an indication of the scope, format and content of activities.

The examples are not intended for incorporation unaltered into the final Guidelines. The Contractor will be expected to redraft these sections and follow the same consultation procedures as for all other sections.

For preliminary consultation, to gauge the overall layout, content and presentation, the Contractor will prepare three further activities for approval. This will include suggestions on alternative layouts, styles and details.

Following agreement of the Project Board on the general format, production of the remaining activities can be carried out. Consultation on the content of each activity will be required. This will be particularly important in respect of the Practical Guidance sections, where different activities are likely to require different treatment.

4.1 AQUATIC WEEDCUTTING

4.1.1 Rationale

This section is intended to cover the principles underlying the way in which the activity is to be carried out to constitute best practice and factors to be borne in mind when undertaking the activity. Specific details of working practice are set out in the Model Specification.

Principles

Aquatic plants are a valuable part of the aquatic ecosystem. They are a primary food source for some aquatic fauna and provide habitats and shelter for a wide diversity of wildlife. They help protect the banks and bed of the river from erosion.

Plants only become nuisance weeds when their growth becomes excessive and they adversely affect the functions of the river channel or the wildlife within it.

Management Options

Best Management Practice aims to encourage a diversity of plant species while preventing or controlling excessive growth.

Correct identification of weed species is essential in selecting best options for control. Control by herbicides is covered in Section 3.2. Most emergent, submerged and floating-leaved rooted plants can be effectively controlled by cutting. Channel size, water depth, and sometimes velocity, normally determine whether hand or machine cutting is used. In shallow watercourses, cutting 30% of the width gives 90% of the conveyance benefit. The aim should always be to cut the minimum width required.

Before selecting the method of weed control, consider:

- the level/standard of service required;
- the identity of the target species;
- the timing of the control operations;
- the possibility of using partial treatment;
- the existence of an SSSI or other environmentally sensitive site;
- the presence of rare or protected species.

If the option to use weedcutting has been selected, boat-mounted weed cutters are generally the fastest means of cutting weed. Few models harvest weed at the same time as cutting it.

Wheeled or tracked amphibious weedcutting boats can operate in shallow water but may be impeded by barriers in the channel and so need suitable slopes for access and egress.

Weed-cutting buckets fitted to the arm of land based excavators or tractors are slower than weed boats but cut closer to the bottom, giving longer control. They are the

preferred method in narrow watercourses, especially when banks need to be cut at the same time.

Hand cutting is slow and expensive but may be the preferred technique in small areas where access for machinery is poor or where rare or desirable plants are growing close to weeds.

To minimise environmental impact:

- avoid cutting in May or June during the main breeding season for birds, fish and invertebrates;
- only cut channel vegetation if possible, but if bank cutting is required, leave one bank uncut and either cut alternate banks in successive years or, if appropriate, leave one bank to develop scrub;
- bank cutting should only be carried out if the channel is narrow;
- leave some emergent aquatic weed to protect banks and a narrow fringe of terrestrial vegetation at the base of the bank where bank mowing is carried out;
- avoid using amphibious boats on shallow gravel beds in May/June and October/November when they will harm invertebrates and spawning fish.

Under the Environmental Protection Act (1990) and the Waste Management Regulations (1994), waste materials must be disposed of in an approved manner. Deposition of cut weed along the bank is, at present, an exempt activity provided that the quantity of material does not exceed specified limits.

Where there is insufficient space for disposal along, or close to, the bank, cut weed may have to be transported to a recognised tip.

Health and Safety

No specific points.

Habitat Enhancement (*Relating to both UK BAP species and others*)

- cutting a 30% sinuous pattern through weeds in an over-wide channel can help the river establish a self-sustaining low flow channel of increased velocity and coarse sediment, flanked by shoulders which accrete silts, leading to habitat diversification in time and reducing the need for vegetation control.

References for further information:

- 1) Aquatic Weed Control Operation - Best Practice Guidelines. Environment Agency Booklet
- 2) Aquatic Weed Control Operation - Best Practice Guidelines. R&D Note 395
- 3) Disposal of Cut Vegetation. R&D Report W5A(96)5
- 4) Aquatic Plants - A Guide to Recognition. D.H. Spencer-Jones & P.M. Wade. ICI Professional Products 1986.

4.1.2 Model Specification for Aquatic Weedcutting

1. Where especially rare plants are known for a specific river reach, these will be identified on maps by the Employer and these must be retained on site.
2. Aquatic weed control measures can result in the production of large quantities of vegetative matter which must be disposed of sensitively; particular attention should be paid to the avoidance of pollution by effluent arising from decomposition.
3. Management should be undertaken in an upstream direction to facilitate recolonisation by disturbed animals into cleared areas.
4. Cut weed growth and vegetation may be evenly spread on the adjoining land close to the top of the bank, embankment or rear of embankment. Resultant layers should never exceed 300mm depth of freshly cut material.
5. Aquatic vegetation is often 90% water. Temporary storage adjacent to the watercourse for up to 48 hours in heaps is possible to allow dewatering back into the channel. However, heaps of cut material must be relocated before 48 hours have elapsed such that the effluent drains to the landward side, subject to owner/occupier permission. The Contractor will be responsible for containment and safe disposal of any noxious substances which arise.
6. Aquatic weedcutting includes the cutting of submerged and emergent non-woody vegetation on beds and the lower portion of banks. The percentage of the channel width to be cut will be identified on drawings or work sheets. Bank cutting will not be undertaken unless specifically identified and will be restricted to one bank.
7. Aquatic vegetation is to be cut to retain shoot growth up to a maximum of 100mm, leaving bars and patches where specified.
8. Cut weed and vegetation must be removed from the water for disposal.
9. Any cut vegetation which is floating to a collection point can accumulate around screens, weirs, sluices, intakes or other structures and must be removed so that blockages are not allowed to occur, and/or interfere with the operation of such devices.
10. Aquatic plant removal includes the pulling or digging of aquatic vegetation including root mats and rhizomes from the bed.
11. Hemlock water dropwort rhizomes are toxic to stock and, where encountered, **must** be removed and disposed of safely.
12. No vegetation should be left in the channel to drift downstream and cause de-oxygenation or blockages.
13. Where silt is removed in association with vegetation, the material must be temporarily deposited close to the river bank for a minimum of 18 hours to enable invertebrates to crawl back to the river. Search for, and throw back, any fish or large invertebrates (mussels etc.).
14. No weedcutting should take place during May or June.

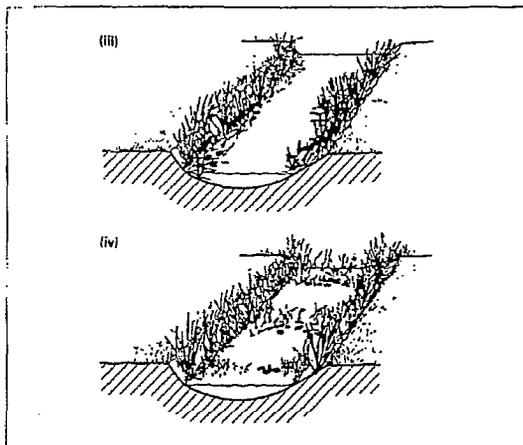
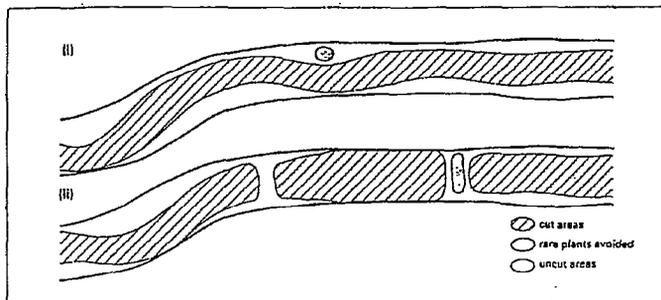
4.1.3 Practical Guidance on Weedcutting

This section is intended to illustrate key points and technical details. The content will vary considerably between activities, some will require little in this section, some will require several pages of detail.

The contractor will need to consult extensively with the identified consultees to establish the content.

When using weed-cutting boats:

- ensure the boat can be launched and retrieved in or near the working area;
- ensure that the boat can pass under, or be moved around, bridges, culverts and other obstructions;
- in flowing water, cut in an upstream direction;
- in shallow channels, retain water by leaving bars of weed, cut these last;
- where possible, leave uncut weed as marginal vegetation for bank protection and as habitats for wildlife; use sinuous cutting patterns where appropriate.



All illustrate <66% of vegetation cut.
Planforms illustrate:

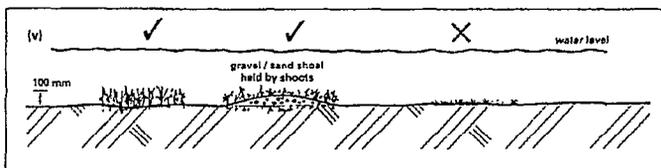
- i) sinuous cut leaving most margins untouched and avoidance of rare plant on one side of the watercourse
- ii) combination cuts which leave margins where appropriate / easy, avoid patches of rare plants in the centre of the channel, cut the complete width where locally this is critical and leaves strips across the channel to maintain minimum of 33% untouched

cross-sections illustrates

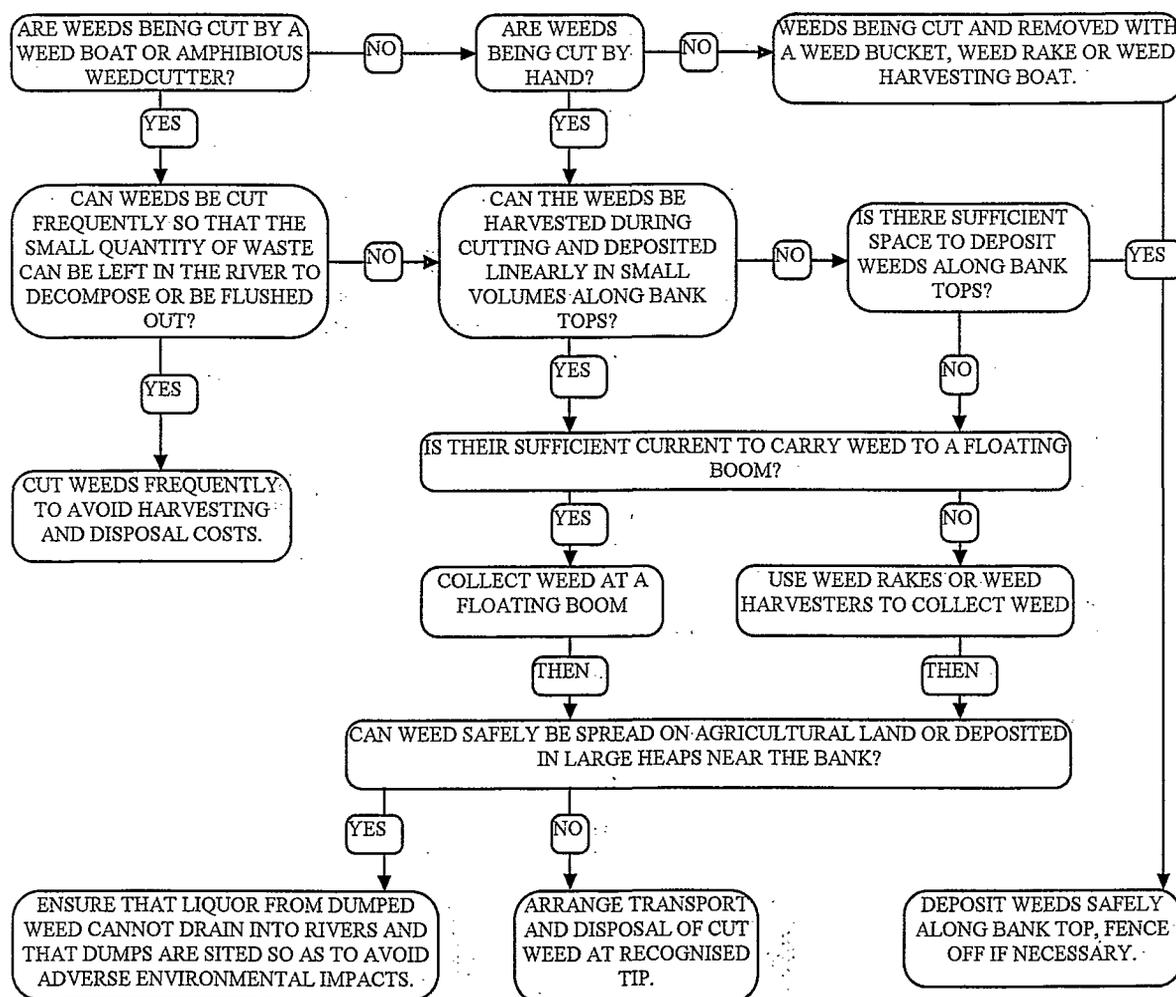
- iii) vegetation in marginal areas left untouched
- iv) patch cutting leaving one third uncut through retention of minimal fringes and some strips across the river

longitudinal-section

- v) shows minimum of 100 mm of shoot left



WEED DISPOSAL OPTIONS



When using land-based weed-cutting buckets:

- ensure appropriate access can be obtained;
- dump weed high on the bank so that it does not fall, or get washed, into the channel;
- fit fine mesh netting onto the bucket if weeds are mainly duckweed or filamentous algae (use floating booms to collect duckweed);
- avoid dumping filamentous algae on steep or unstable banks where it may kill grasses and destabilise the bank.

When disposing of weed:

- dump in small amounts at intervals along the bank top or spread evenly over agricultural land;
- do not obstruct access or public rights of way or dump onto crops;
- do not smother bank vegetation;
- do not dump into ponds, marshes or other valuable wildlife habitats;
- prevent liquor from rotting weed from draining into the river

4.5 TREE MANAGEMENT

4.5.1 Rationale

Principles

Trees and shrubs along river banks are often significant landscape features and, as such, extra sensitivity is required when managing them. Best Working Practice demands knowledge of the importance of various aspects of trees and shrubs for the river environment if inadvertent damage is not to be done. The following are important considerations:

- Underwater fine roots provide varied habitat for aquatic invertebrates and also fish spawning habitat, whilst those on banks help to stabilise friable soils.
- Trunks and large limbs overhanging water provide fish spawning habitat and shelter and branches arching over the water offer perch sites for kingfisher and the canopy produces important shade.
- Large cavities under root systems are potential resting (holt) sites for otters. If used, they are **PROTECTED BY LAW**.
- Hollows and cavities in mature trees are potential roosts and breeding habitats for bats. If used, they too are **PROTECTED BY LAW**.
- Old trees frequently support many breeding birds and are often covered by rich fern, lichen and moss communities.
- Trees, shrubs and bushes provide cover, food, shelter and breeding sites for many birds and other animals.

While trees and shrubs can create potential flood hazards and obstructions to machinery, the emphasis of Best Practice is **MANAGE** not **REMOVE**. Removal should be seen as a last resort unless it is small saplings growing within the channel.

Management Options

Because of the importance of trees and shrubs to the landscape and ecology of river corridors, management must aim to work around them wherever possible. When this is not possible, a limited number may have to be removed and others managed to provide access for machinery. In other instances, trees and shrubs require management to provide and maintain hydraulic conveyance.

Depending on the location of the trees, different management strategies will be appropriate. Some will require coppicing, others singling and others merely having limbs lopped. Trees should be appropriately marked.

Pollarding of willows is an activity that is especially closely linked to historical river corridor management. For this reason Best Practice is to encourage the management of ageing pollards and replacement of those lost. Without management old pollards may split and die with consequent risk of obstruction and loss of landscape and ecological value. Pollarded willows provide ideal material for cheap and effective new trees for

the future. It is Expected Practice for 5-10 new willows to be planted within 100m of a managed tree.

See Sections 5.3 and 5.4 for disposal of materials and Section 5.9 for advice on avoidance of pollution. *In appropriate activities e.g. Use of Herbicides, specific advice would be given in the activity rationale (see previous typical example on aquatic weedcutting).*

Health & Safety

Operatives engaged on tree work **MUST** have received appropriate training, particularly chainsaw operation. Full protective clothing must be worn. The Code of Practice for working in or near water, PPG5, must be followed.

Habitat Enhancement

- log pile holts constructed for otters
- leave tree stumps for possible otter holts
- log piles heaped to form dead-wood habitat for fungi, invertebrates, birds and small mammals

References for further information:

- 1) BS 3998:1989 Recommendations for tree work.
- 2) Trees. BTCV Conservation Handbook.
- 3) New Rivers & Wildlife Handbook. RSPB/NRA/Wildlife Trusts.

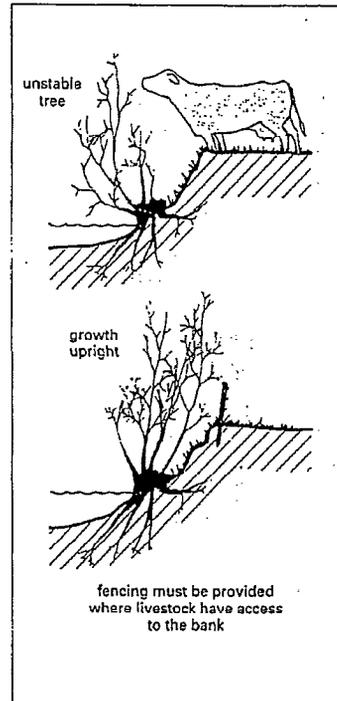
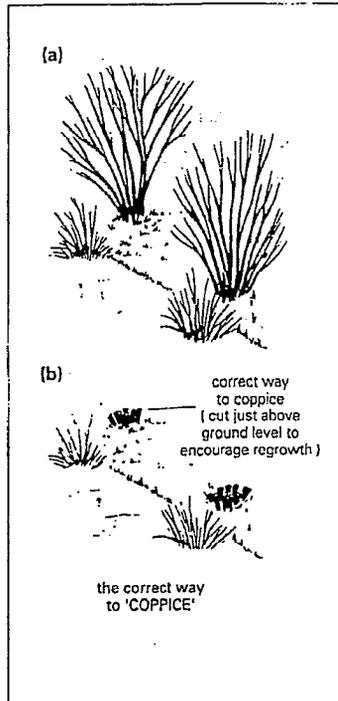
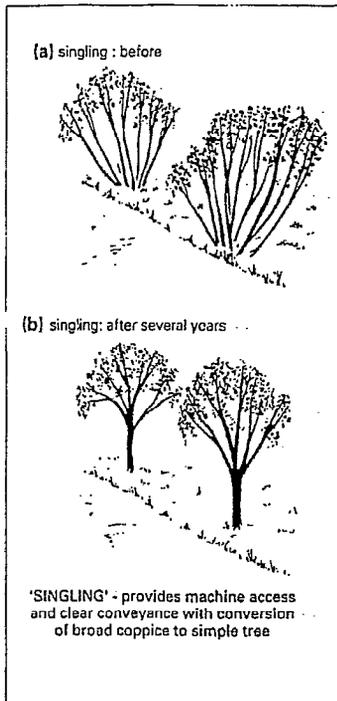
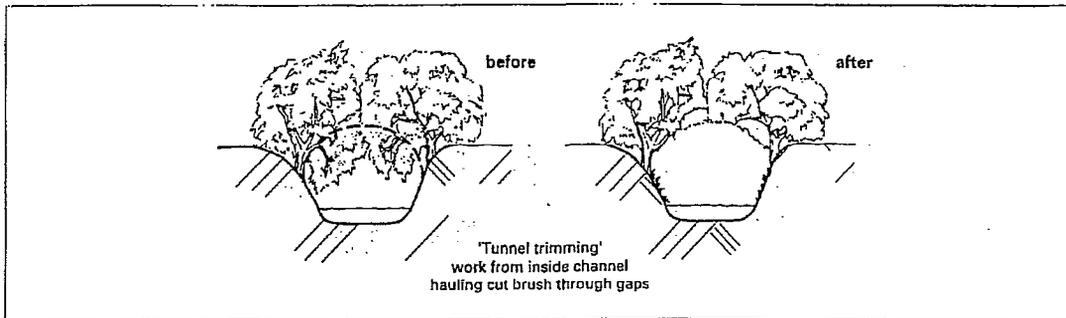
4.5.2 Model Specification for Tree Management

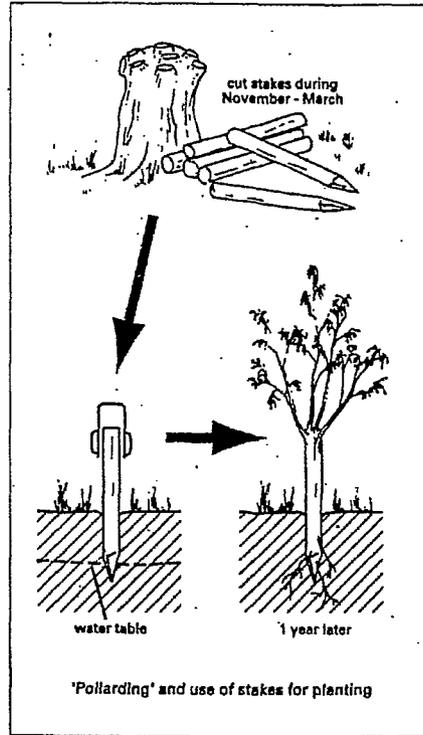
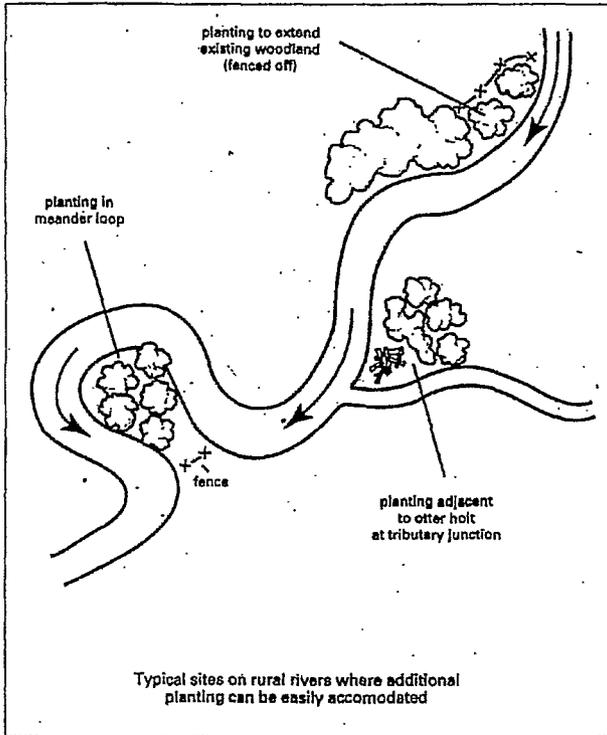
1. No tree work can be undertaken in the bird breeding season from mid-March to mid-July without first checking for the presence of nests. If nests are found to be occupied they should not be disturbed and the Engineer/Supervisor informed.
2. If bats are found at any time work must be stopped and the Engineer/Supervisor informed.
3. All operations shall be carefully carried out to avoid damage to the trees being treated or to the neighbouring trees, whether by equipment or by falling branches.
4. The Engineer/Supervisor will clearly mark those trees identified for tree surgery as follows: L = Branches to be lopped, P = Trees to be pollarded, F = Trees to be felled, C = Trees to be coppiced.
5. The Contractor shall conform to the appropriate Forestry Industry Safety Guides especially FSC 18 and carry out work to a minimum of British Standard 3998:1989.
6. The use of fungicidal or other sealants will not be permitted. All tools shall be sterilised after contact with diseased areas of trees or where disease is suspected, to prevent spread of infection.
7. All treework shall be undertaken with hand-held equipment. All cuts must be made into the live wood, and at an angle which allows free drainage off the face, taking care to avoid damage to branch collar. To obtain a good surface to cut face, paring with a knife or chisel may be necessary. When removing trees and/or heavy branches they must be sawn off in sections and carefully lowered to the ground, using slings if necessary, final cuts being made flush with the hole or junction with another branch, whichever is applicable, beginning with a quarter-diameter undercut. No stumps or hatpegs may be left.
8. The removal of dead wood shall mean the removal of all dead, diseased or dying branchwood and broken stumps, throughout the crown. The final cuts shall be made into living wood where possible.
9. No trees are to be felled without the prior approval of the Engineer/Supervisor.
10. Trees shall be distinguished from saplings or bushes as having a single trunk with a girth greater than 250mm measured 1m above ground level.
11. Trees should be cut down to ground level, in sections if necessary to prevent damage to adjoining trees or property. Tree felling includes mechanical grinding of stumps below ground level and reinstatement of the void thus created.
12. Branch lopping includes the cutting and removal of limbs or boughs overhanging a watercourse. Cuts should be back to live wood, avoiding damage to the collar and allowing free drainage. Final cuts should be made flush with the hole or junction with another branch, whichever is applicable, beginning with a quarter-diameter undercut. Girth shall be measured within 1m of the trunk or junction point.
13. Where re-pollarding is required to an individual tree the Contractor is to cut branches just above previous pollard height. Pollards created from previously un-pollarded trees should be cut 2m above ground level or immediately above a fork of the trunk if there is one between 2-4m above ground.
14. Limbs of pollards are to be cut so that new cuts are immediately above previous cuts, back to the crown, using oblique cuts to shed rainwater away from the trunk.
15. Pollarding should be undertaken between November and March inclusive only.
16. Burning of waste and brush must be undertaken away from live trees. The safe distance will be determined on site by the wind direction and amount of material for burning.

4.5.3 Practical Guidance for Tree Management

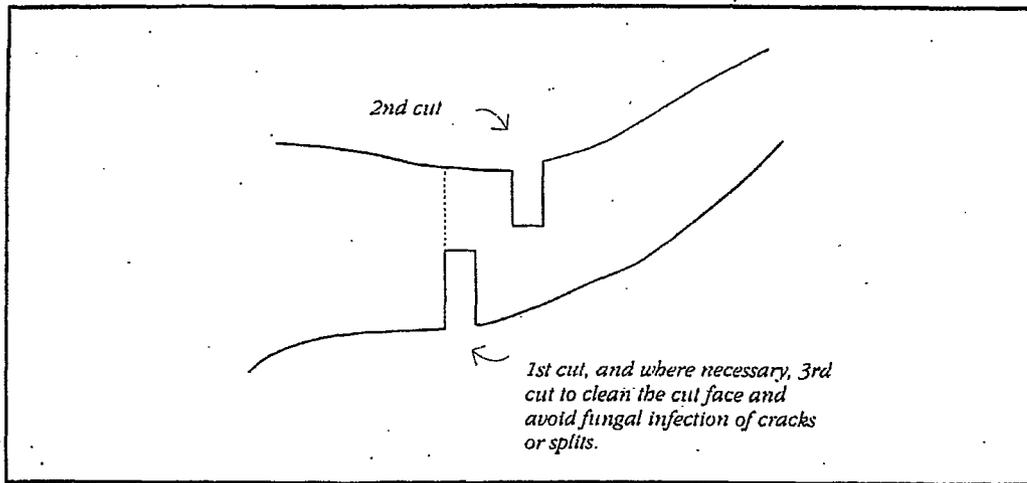
KEY POINTS

- DON'T**
- Carry out tree surgery between mid-March and mid-July without checking for nests.
 - Fell mature trees (girth exceeding 500mm) without approval.
 - Store toxic materials around trees.
 - Have fires near trees.
- DO**
- Check surveys for bats and otters have been carried out before starting.
 - Work on only one bank.
 - Use only hand-held equipment.
 - Protect trees from soil compaction and damage by fencing during work.





THICK STEMS: CUT WITH BOW SAW



APPENDIX D

SOURCE MATERIAL CATALOGUE

LIST OF SOURCE MATERIAL CATALOGUED

1. Environment Agency Operational material

- 1.1) River & Wetlands. Best Practice Guidelines. Midlands Region 1996
- 1.2) Flood Defence Guidance for Conservation in Watercourse Maintenance Works. Thames Region August 1994
- 1.3) Flood Defence Conservation Requirements for Watercourse Maintenance Works. Thames Region November 1997 (+ Draft March 1997)
- 1.4) Environmental Options. Specifications for Flood Defence Maintenance Works. Anglian Region March 1997 (+Draft 1996)
- 1.5) Specification Clauses for River Maintenance Works. Best Working Practice. Lee Donaldson for NRA Wessex Region August 1995 (Draft)
- 1.6) Conservation and the Flood Defence Maintenance Programme. Review of Practice & Procedures and Future Guidance. Anglian Region April 1996
- 1.7) The New Rivers & Wildlife Handbook. RSPB, NRA & Wildlife Trusts 1994
- 1.8) River Idle Maintenance Strategy. Midlands Region
- 1.9) Environmental Assessment-Scoping Handbook for Projects. National April 1996
- 1.10) River Don Catchment, Flood Defence Maintenance Contract. North East Region
- 1.11) Service Level Agreement for River Maintenance Work. Midlands Region
- 1.12) Specification for Watercourse Maintenance Work Carried out by the Direct Works Department. Midlands Region
- 1.13) Watercourse Maintenance Service Level Agreement (3 vols) South West Region
- 1.14) Flood Defence Maintenance Service Level Agreement. North West Region October 1997 (+ Draft July 1995)
- 1.15) Maintenance & Minor Capital Works. Contract Documents Thames Region
- 1.16) Conservation in Maintenance Work. Wessex Region
- 1.17) Understanding Buffer Strips. National 1996
- 1.18) Aquatic Weed Control Operations-Best Practice Guidelines. National 1997 (leaflet)
- 1.19) Pollution Prevention Guidelines 1,2,4,5,6,8,9,10 &14. National
- 1.20) Sustainable Development - Strategy. National
- 1.21) Sustainable Development - Conservation Duties. National
- 1.22) NVQ Handbook for River Operations. National
- 1.23) Minimum Environmental Standards. Anglian Region Eastern Area. Undated (Intended for use with 1.4)
- 1.24) Otters & Rivers Habitat Management NRA Technical Handbook Nr 3:1993
- 1.25) Water Vole Conservation Handbook (Draft). National
- 1.26) Environmental Specification Notes. Welsh Region
- 1.27) SLA Standard Specification. Welsh Region
- 1.28) Understanding Riverbank Erosion from a Conservation Perspective. NRA
- 1.29) Pollarding. Wessex Region
- 1.30) Assessment of the Conservation Input to Flood Defence Maintenance and Recommendations for Improvements. Niamh Carey for Southern Region 1996
- 1.31) Guidance for the Control of Invasive Plants Near Watercourses. National 1996
- 1.32) Good Practice in Agency Activities. Environmental Management Unit. *
- 1.33) Action Plans. Environment Agency
- 1.34) National Environmental Assessment Handbook. April 1998

2. Other Operational Material

- 2.1) Code of Practice on Environmental Procedures for Flood Defence Operating Authorities. MAFF/WO 1996
- 2.2) Sensitive Ditching Work - Charles Beardall, Farming & Conservation (Article)
- 2.3) BS 3998: 1989 Recommendations for Tree Work.
- 2.4) BS 5837: 1991 Trees in Relation to Construction.
- 2.5) Nature Conservation & Management of Drainage Channels. NCC/ADA 1989
- 2.6) British Waterways Environmental Code of Practice. *
- 2.7) Reedbed Management for Commercial and Wildlife Interests. RSPB/BRGA/EN 1996
- 2.8) The Environment Agency & Sustainable Development. MAFF/WO November 1996
- 2.9) Habitat Management for Invertebrates - A Practical Handbook. P. Kirby. NP/JNCC/RSPB 1992
- 2.10) Code of Practice on Conservation, Access & Recreation. DoE/MAFF/WO 1989
- 2.11) Open Space Management for Nature Conservation. Leicester City Council
- 2.12) Waterways and Wetlands. BTCV
- 2.13) Hedging. BTCV
- 2.14) Trees. BTCV *
- 2.15) Footpaths. BTCV

3. NRA/Environment Agency R&D Publications

- 3.1) Guidelines for the Justification of River Maintenance, Environmental Guidelines for Vegetation Management in Channels and on Banks. NRA R&D Note 511, NRA Project Record 536/1/ST
- 3.2) Streambank Protection in England & Wales NRA R&D Note 22 1991
- 3.3) Revetment Systems & Materials NRA R&D Note 116 1993
- 3.4) Buffer Zones for Conservation of Rivers & Bankside Habitats NRA R&D Note 87, NRA Project Record 340/5/Y
- 3.5) Aquatic Weed Control Operation Phase 1 Report - Existing Practice NRA R&D Note 189
- 3.6) Aquatic Weed Control Operation: Best Practice Guidelines NRA R&D Note 395
- 3.7) Review of existing practices for fluvial grass management throughout the NRA . NRA Project Record 213/1/Y
- 3.8) Control of Invasive Riparian & Aquatic Weeds. NRA R&D Note 233
- 3.9) Review of Aquatic Weedcutting on Somerset Levels & Moors 1997
- 3.10) River Geomorphology - A Practical Guide (draft) R&D Project 661
- 3.11) River Maintenance Evaluation. Environment Agency R&D Note 456
- 3.12) Trout Habitat Restoration: Fisheries Technical Manual No 1. R&D Report W18 *
- 3.13) Salmon Habitat Restoration: Fisheries Technical Manual No 4. R&D Report W44 *
- 3.14) Earth Embankment Fissuring Manual. R&D Technical Report W41.

4. CIRIA Publications

- 4.1) Disposal of Dredged Material to Land. R157
- 4.2) Engineering works and wetlands in lowland areas generally drained by gravity. TN123
- 4.3) Protection of river & canal banks. B9
- 4.4) Use of vegetation in civil engineering. B10
- 4.5) Old waterfront walls - Management, maintenance and rehabilitation. B13

4.6) Inland Dredging Techniques & Operations - Guidance on Good Practice R169 *

5. Ongoing Environment Agency R&D

5.1) W5A(96)1 Vegetation management of raised embankments

5.2) W5A(96)4 Benefits of urban maintenance operations *

5.3) W5A(96)5 Disposal of cut vegetation

5.4) G04(94)12 River bank protection manual - Draft Technical Report W5/i635/3

5.5) G01(95)9 Revetment Techniques Used on the River Skerne Restoration Project - Draft Technical Report W83

5.6) F01(95)3 Coarse woody debris in British headwater streams *

* Indicates publication not reviewed

CATALOGUE OF SOURCE MATERIAL

1. Operational Material Produced, or Supported, by the Environment Agency or NRA

1.1 Rivers & Wetlands - Best Practice Guidelines.

Environment Agency Midlands Region 1996

Contents: 46 loose sheets covering a range of conservation and river management topics. Aimed at raising awareness of issues involved in river management for the public and interested users. Generally not enough detail for RMG purposes but contain some good illustrations and artwork. Cover associated topics : legislation; river rehabilitation; buffer strips; bio-engineering; outfalls; fishing platforms; cattle drinks; otter holts; boardwalks; benches; pedestrian ramps & steps; weirs; ponds; nesting/roosting sites; archaeology; protected species.

Activities Covered: desilting; regrading/resectioning; shrub clearance, bushing & hedge cutting; tree management; turf & grass reseeding; tree & shrub supply, planting & maintenance; soft revetment; reedbed establishment & maintenance; geotextile fabric; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone pitching; natural blockstone; gabions & gabion mattress; piling; fencing, gates & stiles.

Source Category: Primary.

Type of Information: Guidance notes.

1.2 Flood Defence Guidance for Conservation in Watercourse Maintenance Works.

Environment Agency Thames Region August 1994

Contents: Detailed rationale, best practice specification and practical guidance for a range of operational activities. Good artwork, some from 'New Rivers & Wildlife Handbook'. Not sufficient detail for direct input into specifications (see 1.3).

Activities Covered: desilting; re-forming; regrading/resectioning; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; invasive plant control; turf and grass reseeding; geotextile fabric; spiling; faggoting/kidding; disposal of materials on site; disposal of materials off site.

Source Category: Primary.

Type of Information: Operational guidance notes.

1.3 Flood Defence Conservation Requirements for Watercourse Maintenance Works.
Environment Agency Thames Region March 1997

Contents: General work specification for operational river activities, links generic best practice guidance given in 1.2 to schedule of rate categories within Thames SLA. Detailed specification clauses for a number of river management activities, partly site-specific.

Activities Covered: desilting; reforming; regrading/resectioning; aquatic weedcutting; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; tree & shrub supply, planting & maintenance; disposal of materials on site; disposal of materials off site.

Source Category: Primary.

Type of Information: Specification.

1.4 Environmental Options - Specifications for Flood Defence Maintenance Works.

Environment Agency Anglian Region March 1997 (+ Draft 1996)

Contents: Specification for routine river maintenance (and some enhancement) work given as a series of hierarchical environmental options for each activity to achieve increasing levels of conservation value. Mainly consists of sheets of 'before and after' illustrations with cross-sections and plans.

Activities Covered: desilting; reforming; regrading/resectioning; aquatic weedcutting; grasscutting & non woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; maintenance of raised embankments.

Source Category: Secondary.

Type of Information: Specification/ practical guidance for river management.

1.5 Specification Clauses for River Maintenance Works - Best Working Practice.

Lee Donaldson for NRA Wessex Region August 1995

Contents: Sets out best working practice, together with higher and lower standards for a range of operational activities to protect and enhance conservation interest.

Activities Covered: desilting; reforming; regrading/resectioning; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; invasive plant control; fencing, gates & stiles; disposal of materials on site; disposal of materials off site.

Source Category: Primary.

Type of Information: Specification.

1.6 Conservation and the Flood Defence Maintenance Programme - Review of Practice and Procedures and Future Guidance.

Environment Agency Anglian Region April 1996

Contents: Reviews current maintenance practices and procedures regionally and nationally for consultation, liaison and identification of work required. Covers statutory requirement for consultation and legal framework. Lists key references. Identifies Action Plan to cover areas where need for improvement identified.

Activities Covered: None specifically.

Source Category: Background.

Type of Information: Operational review of procedure for preparing maintenance programmes.

1.7 The New Rivers & Wildlife Handbook.

RSPB/RSNC/NRA 1994

Contents: Update of 'Rivers & Wildlife Handbook' published in 1984. 426 page book produced as a practical guide to environmentally sensitive techniques of river management. Section 1 deals with hydrology & geomorphology, Section 2 with survey methods. Section 3, describing river management practices and giving examples of best-practice techniques contains much useful material and excellent artwork. Section 4 sets out a number of practical case studies again with excellent artwork.

Activities Covered: desilting; reforming; regrading/resectioning; shoal management; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; turf & grass reseeded; tree & shrub supply, planting & maintenance; soft revetment; reedbed establishment & maintenance; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone pitching; natural blockstone; gabions & gabion mattress; maintaining raised embankments.

Source Category: Primary.

Type of Information: Best-practice guidance manual for environmentally sensitive river management.

1.8 River Idle Maintenance Strategy.

Environment Agency Midlands Region

Contents: Site specific strategy plan for River Idle including maps of reach lengths and features. No detailed specification or guidelines. Appears no relevance for RMG.

Operational Activities Covered: None.

Source Category: Background.

Type of Information: Site specific strategy plan.

1.9 Environmental Assessment - Scoping Handbook for Projects

Environment Agency

Contents: Large manual in ring binder providing advice to developers, consultants and others on the general concerns of the Agency on specific types of development e. g. pipelines. Limited relevance to activity section of RMG. Although EA necessary for significant maintenance operations, this should be dealt with before specifying work to workforce. Needs reference in Part 1 of RMG.

Activities Covered: None.

Source Category: Secondary.

Type of Information: Guidance notes.

1.10 River Don Catchment Flood Defence Maintenance Contract.

Environment Agency North East Region

Contents: Full tender document for river maintenance contract for the River Don. Contains Standard Specification and Project Specific Information.

Activities Covered: Almost all.

Source Category: Primary for specification.

Type of Information: Tender document.

1.11 Service Level Agreement for River Maintenance Work.

Environment Agency Midlands Region

Contents: General SLA document, refers to separate specification (see 1.12). No useful material.

Activities Covered: None.

Source Category: Background.

Type of Information: Service level agreement.

1.12 Specification for Watercourse Maintenance Work Carried Out by the Direct Works Department.

Environment Agency Midlands Region

Contents: 39 page detailed specification for river maintenance activities.

Activities Covered: Almost all.

Source Category: Primary for specification.

Type of Information: Specification.

1.13 Watercourse Maintenance Service Level Agreement.

Environment Agency South West Region

Contents: 3 volume document setting out detailed service level agreement for river maintenance work. Volume 1 contains detailed 48 page specification for river maintenance activities.

Activities Covered: Almost all.

Source Category: Primary for specification.

Type of Information: Specification.

1.14 Flood Defence Maintenance Service Level Agreement July 1995.

Environment Agency North West Region.

Contents: Complete Service Level Agreement for river maintenance work carried out by Contracts Department for Client. Includes 34 page specification covering river maintenance activities.

Activities Covered: Almost all.

Source Category: Primary for specification.

Type of Information: Specification.

1.15 Maintenance and Minor Capital Works Contract Documents.

Environment Agency Thames Region

Contents: 5 volume tender document for river maintenance and minor capital works contracts and Service Level Agreement with Contracts Department. Document 1 Volume 3 Part 10 is a detailed 58 page specification for river operations containing both general and site-specific information. Includes 'Flood Defence Conservation Requirements for Watercourse Maintenance Works' (see 1.3). Other documents of very limited relevance.

Activities Covered: Almost all.

Source Category: Primary for specification.

Type of Information: Service level agreement/Specification.

1.16 Conservation in Maintenance Work.

Wessex Region NRA

Contents: 12 page booklet covering programming of maintenance works and consultation procedures. Contains summary of relevant legislation and list of Guidelines.

Activities Covered: None.

Source: Secondary - for Part 1 of RMG.

Type of Information: Guidance notes.

1.17 Understanding Buffer Strips.

Environment Agency 1996

Contents: 12 page information booklet aimed at environmentalists. Explains how riparian buffer strips work and sets out ways of producing landscape features which have a role in reducing the impact of agriculture on the water environment.

Activities Covered: None.

Source Category: Primary for Part 1 of RMG.

Type of Information: Guidance notes.

1.18 Aquatic Weed Control Operation - Best Practice Guidelines.

Environment Agency

Contents: 24 page A5 format booklet aiming to give those responsible for aquatic plant management a bankside guide to best practice for the control of most forms of aquatic vegetation. Produced as an output from R&D Project C04(93)01 - Aquatic Weed Control Operation Phase III.

Activities Covered: Aquatic weedcutting; use of herbicides.

Source Category: Primary.

Type of Information: Best Practice Guidance notes.

1.19 Pollution Prevention Guidelines (PPG).

Environment Agency

Contents: Series of 2-4 page guidelines setting out specifications and advice for measures to control pollution:

PPG1 - Prevention of pollution in controlled waters.

PPG2 - Above ground storage tanks.

PPG4 - Disposal of sewage where no mains drainage available.

PPG5 - Work in, near or liable to affect watercourses.

PPG6 - Working at construction & demolition sites.

PPG8 - Safe storage & disposal of used oils.

PPG9 - Prevention of pollution of controlled waters by pesticides.

PPG10 - High pressure water & steam cleaners.

PPG14 - Marinas & craft.

Activities Covered: Use of herbicides; concreting works; disposal of materials on site; disposal of materials off site; river control & structure maintenance; pollution avoidance.

Source Category: Primary

Type of Information: Specification and guidance notes.

1.20 Sustainable Development - The Agency's Conservation Duties.

Environment Agency November 1996

Contents: 11 page information booklet to give Agency staff an overview of the Agency's conservation duties.

Activities Covered: None.

Source Category: Primary for Part 1 of RMG.

Type of Information: Guidance notes.

1.21 Sustainable Development - A Strategy for Implementing the Environment Agency's Contribution to the UK Biodiversity Action Plan.

Environment Agency

Contents: 10 page information booklet presenting, for internal and external audiences, an overview of the approach which the Agency is adopting in respect of the UK Biodiversity Action Plan .

Activities Covered: None.

Source Category: Primary for Part 1 of RMG.

Type of Information: Advisory notes.

1.22 National Vocational Qualification Assessment for River Operations.

Environment Agency

Contents: Guidance notes for assessment procedures for NVQ assessment of 18 units forming the NVQ for river operations. Sets out the knowledge and understanding required to achieve the qualification and the evidence requirements and assessment methods. Part 1 of RMG should refer to the NVQ since RMG will provide the practical knowledge base to judge acceptable standards for NVQ.

Activities Covered: None directly.

Source Category: Background.

Type of Information: Training guidelines.

1.23 Minimum Environmental Standards.

Environment Agency Anglian Region Eastern Area

Contents: 14 pages of environmental specification clauses setting out minimum environmental standards to be applied to a number of operational activities. Some additional standards suggested.

Activities Covered: Desilting; regrading/resectioning; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; disposal of materials on site; disposal of materials off site.

Source Category: Primary for specification.

Type of Information: Specification.

1.24 Otters & River Habitat Management.

NRA Technical Handbook No 3

Contents: 58 page handbook for riparian owners and others who manage rivers providing a brief summary of the natural history and current status of otters, an overview of the past decline of otter populations, a description of preferred habitats and practical suggestions for river management to encourage otters back to old haunts.

Activities Covered: Desilting; re-forming; regrading/resectioning; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management.

Source: Primary for activities as habitat preservation. Also Part 1 under conservation and Appendix on habitat creation.

Type of Information: Guidance notes.

1.25 Water Vole Conservation Handbook. (Draft)

Environment Agency

Contents: Guidance manual intended to provide the incentive to restore and reinstate riparian habitat for water voles. Due for publication in June 1998.

Activities Covered: None specifically.

Source: Secondary - could provide input into specification and practical guidance for some activities. Also possibly in Part 1 under Conservation Duties and the Appendix on habitat creation and enhancement.

Type of Information: Guidance notes.

1.26 Environmental Specification.

Environment Agency Welsh Region

Contents: Detailed environmental specification clauses for 13 river activities. Intended to compliment SLA engineering specification.

Activities Covered: desilting; re-forming; regrading/resectioning; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; natural blockstone; disposal of materials on site.

Source: Primary.

Type of Information: Specification.

1.27 SLA Standard Specification Clauses Vol 1 Part 2.

Environment Agency Welsh Region

Contents: 28 page document containing standard specification clauses for SLA contract.

Activities Covered: Almost all.

Source: Primary for specification.

Type of Information: Specification.

1.28 Understanding Riverbank Erosion - An Information Booklet.

Environment Agency 1998

Contents: 24 page guidance booklet for landowners and managers giving a description of the processes causing erosion, legal aspects, effects of erosion and management practices. Practical guidance on dealing with erosion generally relating to soft revetment and tree planting encouraging landowners and managers to create habitats for wildlife.

Activities Covered: Tree management; tree & shrub supply, planting & maintenance; soft revetment; spiling; faggoting/kidding.

Source: Secondary.

Type of Information: Guidance notes.

1.29 Pollarding.

NRA Wessex Region

Contents: 4 page A5 booklet giving advice on best practice for pollarding trees.

Activities Covered: Tree management.

Source Category: Primary.

Type of Information: Guidance notes.

1.30 Assessment of the Conservation Input to Flood Defence Maintenance & Recommendations for Improvement.

Niamh Carey for Environment Agency Southern Region 1996.

Contents: Report on project for MSc to explore specifications & types of contract being issued to EWF and deficiencies regarding conservation. Recommendations to improve contract specifications to enhance conservation content. Details of specifications of several regions and notes for several activity areas.

Activities Covered: Desilting; reforming; regrading/resectioning; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance; bushing & hedge cutting; tree management; turf & grass reseeded; soft revetment; geotextile fabric; gabions & gabion mattress; piling; debris clearance; disposal of materials on site; disposal of materials off site; vermin control.

Source Category: Secondary.

Type of Information: Specification.

1.31 Guidance on the Control of Invasive Plants near Watercourses.

Environment Agency 1996

Contents: Small booklet, including laminated card, giving guidance on the control of Japanese Knotweed, Himalayan Balsam and Giant Hogweed. Based on R&D Note 233 (see 3.8)

Activities Covered: Invasive plant control.

Source Category: Primary.

Type of Information: Guidance notes.

1.32 Good Practice in Agency Activities.

Environment Agency Environmental Management Unit

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

1.33 Action Plans.

Environment Agency

Contents: 12 Booklets setting out how the Agency will implement their environmental strategy through its statutory functions. Action Plans for Flood Defence; Water Resources; Fisheries; Conservation; Recreation; Navigation; Water Quality; Land Quality; Waste Management & Regulation; Radioactive Substances Regulation; Process Industries Regulation; and An Environmental Strategy for the Millennium and Beyond. Contain useful information for Part 1 of RMG under FD and Environmental Duties.

Activities Covered: None.

Source Category: Primary.

Type of Information: Explanatory notes.

1.34 National Environmental Assessment Handbook.

Environment Agency April 1998

Contents: Document providing national guidance on the environmental assessment of the Agency's internal works and activities which result in a physical change in the existing environment. Handbook has sections covering purpose and background; introduction to environmental assessment; management of environmental assessment; and procedures for carrying out the environmental assessment process. Reference document for Part 1 of RMG.

Activities Covered: None.

Source Category: Primary for Part 1 of RMG.

Type of Information: Guidance notes.

2. Other Operational Material

2.1 Code of Practice on Environmental Procedures for Flood Defence Operating Authorities.

MAFF/WO 1996

Contents: 37 page booklet giving practical guidance to help the Environment Agency, Internal Drainage Boards and local authorities follow good environmental practice when considering and carrying out flood defence works. Section 3 sets out practical considerations relating to maintenance operations. Useful appendices on legal framework, environmental designations, land management schemes and bibliography.

Activities Covered: Desilting; re-forming; regrading/resectioning; shoal management; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; soft revetment.

Source: Primary, also for Section 1 of RMG.

Type of Information: Guidance notes.

2.2 Sensitive Ditching Work.

C Beardall. Farming & Conservation April 1996

Contents: 4 page magazine article providing guidelines for sensitive ditching.

Activities Covered: Desilting; re-forming; regrading/resectioning; aquatic weedcutting; use of herbicides.

Source Category: Secondary.

Type of Information: Simple guidance notes.

2.3 BS3998:1988 Recommendations for Tree Work.

British Standards Institution

Contents: 16 page booklet giving general recommendations for tree work. Includes practical advice, specification for work and safety precautions.

Activities Covered: Tree management.

Source Category: Primary.

Type of Information: British standard specification.

2.4 BS 5837: 1991 Trees in Relation to Construction

British Standards Institution

Contents: 35 page booklet setting out legal background on tree protection and giving advice on methods of protecting trees during construction work.

Activities Covered: Tree management.

Source Category: Secondary.

Type of Information: British Standard specification.

2.5 Nature Conservation and the Management of Drainage Channels.

Newbold, Honnor & Buckley ADA/NCC.

Contents: 108 page booklet giving guidance on the maintenance and care of lowland watercourses using methods which conserve plant and animal life. Artwork, useful information for habitat appendix.

Activities Covered: Desilting; re-forming; regrading/resectioning; aquatic weedcutting; use of herbicides; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management; turf & grass reseeding; reedbed establishment & maintenance; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone pitching; concrete block revetment.

Source Category: Primary.

Type of Information: Best Practice Guidance notes.

2.6 British Waterways Environmental Code of Practice.

British Waterways Board

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

2.7 Reedbed Management for Commercial and Wildlife Interests.

RSPB/BRGA/EN 1996

Contents: 212 page book giving practical guide to techniques of reedbed management, rehabilitation and creation to integrate wildlife and commercial interests. Part 1: Planning, Part 2: Management & Rehabilitation, Part 3: Creation and Part 4: Case Studies. Comprehensive advisory guidance notes and specification also covering habitat creation and specification areas. Good artwork.

Activities covered: Reedbed establishment & management.

Source category: Primary

Type of information: Best Practice Guidance.

2.8 The Environment Agency and Sustainable Development.

MAFF/DoE/WO November 1996

Contents: 29 page document giving, in Part I, statutory guidance on sustainable development to the Agency under Section 4 of the Environment Act 1995 together with explanatory information in Part II.

Activities Covered: None.

Source Category: Primary for Part 1 of RMG.

Type of Information: Statutory guidance.

2.9 Habitat Management for Invertebrates - A Practical Handbook.

P. Kirby. NP/JNCC/RSPB 1992

Contents: 150 page practical manual on management of invertebrates setting out the vulnerable habitat features which are important to invertebrates. Covers a wide range of lowland habitats, freshwater wetland section is particularly relevant to RMG. Some artwork.

Activities covered: desilting; re-forming; regrading/resectioning; aquatic weedcutting; grasscutting & non-woody vegetation clearance; tree management; reedbed establishment & maintenance.

Source category: Secondary.

Type of information: Practical guidance notes.

2.10 Code of Practice on Conservation, Access & Recreation.

DoE/MAFF/WO

Contents: 36 page document setting out ministerial guidance to NRA and others on performance of above duties in relation to Water Act 1989. No specific activities covered but reference for Part 1 of RMG.

Activities Covered: None.

Source Category: Primary.

Type of Information: Statutory guidance.

2.11 Open Space Management for Nature Conservation.

Leicester City Council

Contents: 73 page manual giving methods being used by LCC to conserve nature and improve wildlife opportunities in the management of public open spaces. Contains 51 standard specifications, practical details and some artwork. Not all relevant to RMG.

Activities Covered: Desilting; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting; tree management.

Source Category: Secondary.

Type of Information: Specification/guidelines.

2.12 Waterways and Wetlands.

BTCV

Contents: 186 page handbook on maintenance and improvement of habitats. Intended for use by conservation volunteers. Wealth of practical advice on management of waterways and wetlands, including many useful illustrations.

Activities Covered: Use of herbicides; shrub clearance, bushing & hedge cutting; tree management; reedbed establishment & maintenance; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; gabions & gabion mattress; bagwork; pumping.

Source Category: Secondary.

Type of Information: Guidance notes.

2.13 Hedging.

BTCV

Contents: 117 page manual giving practical guidance on hedgerow management. Aimed at conservation volunteers. Very detailed practical advice and artwork.

Activities Covered: Shrub clearance, bushing & hedge cutting.

Source Category: Primary.

Type of Information: Guidance notes.

2.14 Trees.

BTCV

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

2.15 Footpaths.

BTCV

Contents: 192 page manual giving practical guidance on construction of paths. Aimed at conservation volunteers. Details and practical advice on fencing and stiles.

Activities Covered: Fencing, gates & stiles.

Source Category: Primary.

Type of Information: Guidance notes.

3. NRA/EA R&D Publications

3.1 Environmental Guidelines for Vegetation Maintenance in Channels and on Banks. *NRA R&D Note 511 December 1997 (Draft)*

Contents: 32 page Guidelines designed to assist Flood Defence staff to determine the most environmentally suitable method of vegetation maintenance. Cover two aspects of routine maintenance, those in channel and on banks. Exclude floodbanks and management of woody vegetation. Decision tree and flow chart for selection of appropriate solution. R&D Project Record 536/1/ST 'Background Documentation - Guidelines for River Vegetation Maintenance' is included as a separate annex. R&D Note 511 was originally issued in 1996 for trialling in Regions (copy included in library) Current version supersedes that document.

Activities Covered: Aquatic weedcutting; grasscutting and non-woody vegetation clearance.

Source Category: Primary, 536/1/ST provides background information.

Type of Information: Best Practice Guidelines.

3.2 Streambank Protection in England and Wales. *NRA R&D Note 22 1991*

Scope: Output from R&D project.

Contents: Review of bank protection practices within NRA to establish their cost-effectiveness, environmental sensitivity and range of application with a view to promoting greater use of softer bio-engineering solutions. Useful guidance on sympathetic treatment for various bank protection methods. Rationale and practical guidance, some artwork and some specification, mainly from revetment manufacturers.

Activities Covered: Turf & grass reseeded; soft revetment; geotextile fabric; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; gabions & gabion mattress; concrete block revetment; piling.

Source Category: Primary.

Type of Information: Guidance notes/specification.

3.3 Revetment Systems and Materials. *NRA R&D Note 116*

Contents: Review of NRA coastal revetment systems.

Activities Covered: None.

Source Category: Background - some information on coastal revetments may be applicable to fluvial conditions.

Type of Information: Guidance notes.

3.4 Buffer Zones for Conservation of Rivers and Bankside Habitats.

NRA R&D Note 87 1992, NRA Project Record 340/5/Y 1992

Contents: Report on project which looked at role of buffer zones for conservation of rivers and bankside habitats. Consisted of literature review and 2 workshops involving NRA staff. Extensive list of references in Project Record.

Activities Covered: None.

Source Category: Background (see 1.17 above).

Type of Information: Guidance notes.

3.5 Aquatic Weed Control Operation Phase 1 Report - Existing Practice.

NRA R&D Note 189: 1993

Contents: 84 page report identifying current methods being used at that time in NRA to control aquatic weeds with costings. See 3.6 and 1.18 for best practice guidance.

Activities Covered: Aquatic weedcutting; use of herbicides.

Source Category: Background.

Type of Information: Review of current practice.

3.6 Aquatic Weed Control - Best Practice Guidelines.

NRA R&D Note 395: 1995

Contents: 172 page report outlining biology and ecology of aquatic weeds and the environmental implications of weed control operations. Describes the performance of different techniques and integrated management. Covers all common aquatic weed species with control options. Sets out best practice guidelines. See also 1.18.

Activities Covered: Aquatic weedcutting; use of herbicides.

Source Category: Primary.

Type of Information: Best Practice Guidelines.

3.7 Review of Existing Practices for Fluvial Grass Management throughout the NRA.
NRA Project Record 213/1/Y

Contents: 86 page report reviewing existing practice. Because of wide variation in practices, interim guidance notes could not be produced.

Activities Covered: Grasscutting & non-woody vegetation clearance.

Source Category: Background.

Type of Information: Operational review.

3.8 Control of Invasive Riparian and Aquatic Weeds.
NRA R&D Note 233: 1994

Contents: 88 page draft guidelines for control of Water Fern, Swamp Stonecrop, Japanese Knotweed, Giant Hogweed and Himalayan Balsam. A guidance leaflet is also available (see 1.31).

Activities Covered: Invasive plant control.

Source: Primary.

Type of Information: Draft Best Practice Guidelines.

3.9 Review of Aquatic Weedcutting on Somerset Levels and Moors.
South West Region 1997

Contents: Review of current practice in aquatic plant control on Somerset Levels & Moors. Useful section on potential effects of aquatic weedcutting and practical applications.

Activities Covered: Aquatic weedcutting.

Source Category: Secondary.

Type of Information: Operational review.

3.10 River Geomorphology - A Practical Guide.
Draft Report from R&D Project 661: 1997

Contents: 50 page review of uses for geomorphology in river management, sets out principles, end users and framework for geomorphological studies, presents case studies and outline briefs for applications.

Activities Covered: None.

Source Category: Secondary for Part 1 of RMG.

Type of Information: Guidance notes.

3.11 River Maintenance Evaluation.

NRA R&D Note 456

Contents: Report covering study to monitor and evaluate the impact of maintenance practices on 12 sites over a 3-year period (March 92 - October 95) and development of guidelines for management of the maintenance function. Covers two areas, justification and prioritisation of work and determination of best environmental practice. Best Practice is set out in detail in R&D Note 511 (see 3.1).

Activities Covered: Aquatic weedcutting; grasscutting & non-woody vegetation clearance; shrub clearance, bushing & hedge cutting.

Source Category: Background.

Type of Information: Guidance notes.

3.12 Trout Habitat Restoration. Fisheries Technical Manual No. 1.

R&D Report W18

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

3.13 Salmon Habitat Restoration. Fisheries Technical Manual No. 4.

R&D Report W44

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

3.14 Earth Embankment Fissuring Manual.

R&D Technical Report W41

Contents: Manual giving guidance on design, construction & maintenance of flood defence earth embankments with regard to the prevention or control of fissuring.

Activities Covered: Maintaining raised embankments.

Source Category: Secondary.

Type of Information: Best Practice Guidance.

4. CIRIA Publications

4.1 Guidance on the Disposal of Dredged Material to Land.

CIRIA Report R157: 1996

Contents: 156 page manual giving guidance on the safe, economical and effective disposal and management of dredgings. Aimed to help operators understand the implications of the Waste Management Licensing Regulations 1994. Part 1 covers practical guidance; Part 2 covers regulations.

Activities Covered: Disposal of materials on site; disposal of materials off site.

Source Category: Background.

Type of Information: Guidance notes.

4.2 Engineering Works and Wetlands in Lowland Areas Generally Drained by Gravity.

CIRIA Technical Note TN123: 1986

Contents: 59 page booklet identifying methods of accommodating conservation and creation of wetlands within or adjacent to areas subject to river and land drainage improvements. Provides guidance on capital and maintenance costs and recommends suitable methods through a series of case studies and recommendations. Not directly applicable to RMG, but possible reference for section on habitat creation.

Activities Covered: None.

Source category: Background.

Type of information: Guidance notes.

4.3 Protection of River & Canal Banks.

CIRIA B9: 1989

Contents: 200 page book providing guidance on selection and design for different methods of bank protection on rivers, canals, navigable waterways and drains. Identifies processes of erosion and other factors affecting the integrity of the bank, reviews current design practice and user experience and identifies engineering, economic and environmental parameters affecting choice in different locations. Many examples of different techniques given. Results are summarised in Water Practice Manual Book 8 - River Engineering, Part 2 Structures & Coastal Defence Works. CIWEM 1988.

Activities covered: soft revetment; reedbed establishment & maintenance; geotextile fabric; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone

pitching; natural blockstone; gabions & gabion mattress; concrete block revetment piling.

Source category: Primary.

Type of Information: Best Practice Guidelines.

4.4 Use of Vegetation in Civil Engineering.

CIRIA B10: 1990

Contents: 290 page guide on the engineering use of vegetation, aimed at civil engineers. Details uses of vegetation in 'bio-engineering'. Covers restraint of soil surfaces and stabilisation of soil masses. Main areas relevant to RMG are slope stability and erosion control. Includes use of vegetation in association with 'hard' revetment solutions as well as soft engineering. Principally focuses on the mechanics of each technique rather than conservation aspects. Good artwork and practical examples/advice on construction.

Activities covered: grasscutting and non-woody vegetation clearance; turf & grass reseeding; tree & shrub supply, planting & maintenance; soft revetment; reedbed establishment & maintenance; geotextile fabric; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone pitching; natural blockstone; gabions & gabion mattress.

Source category: Primary.

Type of Information: Best Practice Guidelines.

4.5 Old Waterfront Walls - Management, Maintenance & Rehabilitation.

CIRIA B13: 1992

Contents: 267 page book giving details of maintenance techniques for riverside walls through case studies of a large number of different wall types. Gives overview of strengths and failings, management of maintenance and, where appropriate, methods suitable for rehabilitation. Limited application to RMG, the works cited would normally be classed as major projects.

Activities Covered: None specifically.

Source category: Background.

Type of Information: Technical detail.

4.6. Inland Dredging Techniques & Operations - Guidance on Good Practice.
CIRIA R169: 1997

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

5. Ongoing EA R&D

5.1 Vegetation Management of Raised Embankments.

R&D Project W5A(96)1

Contents: R&D Project in progress. The objective of this project is to identify best practice in the management of grass and other vegetation on embankments and earthworks above original ground level. The Contract was let in spring 1997. First stage report (draft) identifies a range of vegetation on raised embankments from site visits to selected locations, from both designed mixes and natural generation. Recommendations are given for modification of existing management. Stage 2 will identify best environmentally practicable options. Peter Coxhill (Midlands Region) is Project Leader.

Activities Covered: Grasscutting and non-woody vegetation clearance; maintaining raised embankments.

Source Category: Primary even in uncompleted form.

Type of Information: R&D Report (eventually Best Practice Guidelines)

5.2 Benefits of Urban Maintenance Operations.

R&D Project W5A(96)4

Contents: Not yet reviewed.

Activities Covered:

Source Category:

Type of Information:

5.3 Disposal of Cut Vegetation.

R&D Project W5A(96)5

Contents: The objective of the project is to prepare guidelines for the disposal of vegetation cut in channels as part of annual maintenance, taking into account concern over the potential pollution of waterways arising from cut vegetation. It is also intended to produce a brief guidance document for operational personnel. Final report is due in March 1998 (currently in draft). Stewart Powers (Lower Trent, Midlands Region) is Project Leader.

Activities Covered: Disposal of materials on/off site.

Source Category: Primary.

Type of Information: Best Practice Guidelines.

5.4 River Bank Protection Manual.

R&D Project G01(94)12

Contents: The objective of the project is to produce a guidance manual for the assessment of bank erosion problems and design of protection works along rivers and navigable waterways. A draft Technical Report W5/i635/3 - A Guide to Erosion Assessment & Management has been produced. The aim is to encourage use of vegetation-based approaches wherever possible. A framework for decision making is identified to allow the selection of the appropriate strategy for bank protection to be selected. Details of a great number of different revetment types are set out in Appendix 2 with practical guidance and specification details. It is also intended to produce a shorter Field Manual for operational purposes. Brian Ayling (Anglian Region) is Project Leader.

Activities Covered: Tree management; tree & shrub supply, planting & maintenance; soft revetment; reedbed establishment & maintenance; geotextile fabric; spiling; faggoting/kidding; hurdles/mattresses; other timber revetments; stone pitching; natural blockstone; concrete works; gabions & gabion mattress; bagwork; concrete block revetment; piling; fencing, gates & stiles.

Source Category: Primary.

Type of Information: Best Practice Guidelines.

5.5 Revetment Techniques Used on the River Skerne Restoration Project.

Draft Technical Report W83

Contents: Report describes practical trials held on River Skerne, Dales Area, North East Region to assess four different types of vegetative bank protection. Description of design, construction and initial effectiveness of the revetment systems after 1 year.

Activities Covered: Soft revetment; geotextile fabric; spiling; hurdles/mattresses.

Source Category: Primary.

Type of Information: Operational review.

5.6 Coarse Woody Debris in British Headwater Streams.

R&D Project F01(95)3

Contents: Not yet reviewed, but the objective of this ongoing R&D project is to assess the ecological value of organic debris in rivers in order to assess consequences for river management. Being carried out by two PhD students at Birmingham University. Cath Beaver (Welsh Region) is Project Leader. Will produce Guidelines on best practice for the management of coarse woody debris in rivers. Final R&D Technical Report due end October 1998.

Activities Covered: Debris clearance.

Source: Assumed to be Primary.

Type of Information: Best Practice Guidelines (to be produced).

5.7 Vermin Control - Draft policy

Contents: The purpose of this document is to provide a policy on vermin control within the Environment Agency. Currently the policy is in first draft form and is being circulated for comments within the Agency. Robin Crawshaw, Recreation and Navigation Co-ordinator, Southern Region is responsible for the document.

Activities Covered: Vermin control.

Source: Assumed to be Primary in final form.

Type of Information: Best Practice Guidelines (to be produced)

APPENDIX E

SOURCE MATERIAL ANALYSIS BY ACTIVITY

LITERATURE ANALYSIS BY ACTIVITY LISTING

1.2 Flood Defence Duty

Primary sources: 1.33, 1.34, 2.1, 2.10.

Specification: N/A.

Secondary/background sources: 1.6, 1.16; 1.22, 3.10, 4.2.

Artwork: N/A.

1.3 Environmental Duty

Primary sources: 1.17, 1.19, 1.20, 1.21, 1.24, 1.33, 1.34, 2.1, 2.8, 2.10.

Specification: N/A.

Secondary/background sources: 1.16, 1.25, 3.4, 4.2.

Artwork: N/A.

1.4 Planning of Maintenance Activities

Primary sources: 1.34, 2.1.

Specification: N/A.

Secondary/background sources: 1.6, 1.8; 1.9, 1.16.

Artwork: N/A.

2.0 General Specification

Primary Sources(Specification): 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

3.1 De-silting

Primary sources: 1.1, 1.2, 1.7, 1.24, 2.1, 2.5, 4.6?

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.4, 1.30, 2.2, 2.9, 2.11.

Artwork: 1.2, 1.7.

3.2 Re-forming

Primary sources: 1.2, 1.7, 1.24, 2.1, 2.5, 4.6?

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.26, 1.27.

Secondary/background sources: 1.4, 1.30, 2.2, 2.9.

Artwork: 1.2.

3.3 Regrading/resectioning

Primary sources: 1.1, 1.2, 1.7, 1.24, 2.1, 2.5, 4.6?

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.4, 1.30, 2.2, 2.9.

Artwork: 1.2.

3.4 Shoal Management

Primary sources: 1.7, 2.1, 4.6?

Specification: None.

Secondary/background sources: None.

Artwork: 1.7.

4.1 Aquatic Weedcutting

Primary sources: 1.2, 1.7, 1.18, 2.1, 2.5, 3.1, 3.6.

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.27.

Secondary/background sources: 1.4, 1.30, 2.2, 2.9, 3.5, 3.9, 3.11.

Artwork: 1.2.

4.2 Use of Herbicides

Primary sources: 1.2, 1.7, 1.18, 1.19, 2.1, 2.5, 3.6.

Specification: 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.30, 2.2, 2.12, 3.5.

Artwork: None

4.3 Grasscutting & Non-woody Vegetation Clearance

Primary sources: 1.2, 1.7, 1.24, 2.1, 2.5, 3.1, 4.4.

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.4, 1.30, 2.9, 2.11, 3.7, 3.11.

Artwork: 1.2, 4.4.

4.4 Shrub Clearance, Bushing & Hedge Cutting

Primary sources: 1.1, 1.2, 1.7, 1.24, 2.5, 2.13.

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.4, 1.30, 2.11, 2.12, 3.11.

Artwork: 1.7.

4.5 Tree Management

Primary sources: 1.1, 1.2, 1.7, 1.24, 1.29, 2.3, 2.5, 2.14?, 5.4.

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.4, 1.28, 1.30, 2.4, 2.9, 2.11, 2.12.

Artwork: 1.2, 1.7.

4.6 Invasive Plant Control

Primary sources: 1.2, 1.31, 3.8.

Specification: 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: None.

Artwork: None.

4.7 Turf & Grass Reseeding

Primary sources: 1.1, 1.2, 1.7, 2.5, 3.2, 4.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30.

Artwork: 4.4.

4.8 Tree & Shrub Supply, Planting & Maintenance

Primary sources: 1.1, 1.7, 4.4, 5.4.

Specification: 1.3, 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.28, 2.4, 2.9.

Artwork: 1.1, 4.4.

5.1 Soft Revetment

Primary sources: 1.1, 1.7, 2.1, 3.2, 4.3, 4.4, 5.4, 5.5.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.28, 1.30.

Artwork: 4.3, 4.4.

5.2 Reedbed Establishment & Maintenance

Primary sources: 1.1, 1.7, 2.5, 2.7, 4.3, 4.4, 5.4.

Specification: 1.14, 1.15.

Secondary/background sources: 2.9, 2.12.

Artwork: 2.7, 4.3, 4.4.

5.3 Geotextile Fabric

Primary sources: 1.1, 1.2, 3.2, 4.3, 4.4, 5.4, 5.5.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30.

Artwork: 1.1, 1.2, 4.3, 4.4.

5.4 Spiling

Primary sources: 1.1, 1.2, 1.7, 2.5, 3.2, 4.3, 4.4, 5.4, 5.5.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.28, 2.12.

Artwork: 1.1, 1.2, 1.7, 4.3, 4.4.

5.5 Faggoting/kidding

Primary sources: 1.1, 1.2, 1.7, 2.5, 3.2, 4.3, 4.4, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.28, 2.12.

Artwork: 1.1, 1.2, 1.7, 4.3, 4.4.

5.6 Hurdles/mattresses

Primary sources: 1.1, 1.7, 2.5, 3.2, 4.3, 4.4, 5.4, 5.5.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 2.12.

Artwork: 1.1, 1.7, 4.3, 4.4.

5.7 Other Timber Revetment

Primary sources: 1.1, 1.7, 2.5, 3.2, 4.3, 4.4, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 2.12.

Artwork: 1.1, 1.7, 4.3, 4.4.

5.8 Stone Pitching

Primary sources: 1.1, 1.7, 2.5, 4.3, 4.4, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: None.

Artwork: 1.1, 4.4.

5.9 Natural Blockstone

Primary sources: 1.1, 1.7, 4.3, 4.4, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.26, 1.27.

Secondary/background sources: None.

Artwork: 1.1, 4.4.

5.10 Concrete Work

Primary sources: 1.19, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15.

Secondary/background sources: None.

Artwork: None.

5.11 Gabions & Gabion Mattress

Primary sources: 1.1, 1.7, 3.2, 4.3, 4.4, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30, 2.12.

Artwork: 1.1, 1.7, 4.3, 4.4.

5.12 Bagwork

Primary sources: 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 2.12.

Artwork: None.

5.13 Concrete Block Revetment

Primary sources: 2.5, 3.2, 4.3, 5.4.

Specification: None.

Secondary/background sources: None.

Artwork: 4.3.

5.14 Piling

Primary sources: 1.1, 3.2, 4.3, 5.4.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30.

Artwork: 1.1, 4.3.

6.1 Maintaining Raised Embankments

Primary sources: 1.7, 5.1.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.4, 3.14.

Artwork: 1.7.

6.2 Debris Clearance

Primary sources: 5.6?

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30.

Artwork: None.

6.3 Fencing, Gates & Stiles

Primary Sources: 1.1, 2.15, 5.4.

Specification: 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: None

Artwork: 1.1.

6.4 Disposal of Materials On Site

Primary sources: 1.2, 1.19, 5.3?

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23, 1.26, 1.27.

Secondary/background sources: 1.30, 4.1.

Artwork: 1.2.

6.5 Disposal of Materials Off Site

Primary sources: 1.2, 1.19, 5.3?

Specification: 1.3, 1.5, 1.10, 1.12, 1.13, 1.14, 1.15, 1.23.

Secondary/background sources: 1.30, 4.1.

Artwork: None.

6.6 Works Within Confined Spaces

Primary sources: None.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: None.

Artwork: None.

6.7 Vermin Control

Primary sources: 5.7.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: 1.30.

Artwork: None.

6.8 Pumping

Primary sources: None.

Specification: None.

Secondary/background sources: 2.12.

Artwork: None.

6.9 River Control & Structure Maintenance

Primary sources: 1.19.

Specification: None.

Secondary/background sources: None.

Artwork: None.

6.10 Pollution Avoidance

Primary sources: 1.19.

Specification: 1.10, 1.12, 1.13, 1.14, 1.15, 1.27.

Secondary/background sources: None.

Artwork: None.

