

REPORT ON EFFECTIVE FLOOD WARNING DISSEMINATION

Fourth Draft 8 September 1998

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EXECUTIVE SUMMARY

This project has considered three key areas for the Agency's flood warning service.

- a) The Agency's policy and standards for flood warning.
- b) Surveys to establish guidance on flood warning needs and appropriate dissemination methods.
- c) Dissemination Plans and associated documents.

Existing documentation has been reviewed in the light of the Easter floods and specifically the Preliminary Report by Peter Bye and Mike Horner. Practice outside the Agency has also been considered - in particular the manual of Australian practice "Flood Warning: An Australian Guide."

The Final Draft of the *Flood Warning Strategy for England and Wales 1997/8 to 2001/2* gives a comprehensive view of the Flood Warning Service prior to the Easter Floods. The Strategy is supported but certain aspects need to be more closely defined. In particular the policy on coverage needs to be developed and the assessment of risk to life incorporated.

The *National Performance Specification* (for Dissemination) produced as part documentation for the 1996 National Flood Warning Dissemination Project is still valid and provides a useful statement of the outputs from the flood warning system. A revised and updated Performance specification would provide a framework which could contain the agreed detailed specifications for various elements of the system.

Nine issues have been identified and key actions recommended as shown in Table 1.

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ACTIVITY/ISSUE	ACTION	IMPLEMENTATION	RESOURCES
A. POLICY & STANDARDS OF SERVICE			
<p>Issue A.1</p> <p>Is Agency FW policy clear?</p> <p>Where is/is not a service provided?</p> <p>Too many locations where standards of service cannot be met?</p>	<p>Revise <i>National Flood Warning Strategy</i> to include:</p> <ul style="list-style-type: none"> A Policy Statement (esp. coverage, local awareness & plain English) Two standards for Public warnings - General & Specific. Introduction of Standby & Major incident messages to Local Authorities & Emergency Services. Priorities on Risk to Life & on probability/Impact. Delete references to 2% flood risk <p>Revise and update <i>National Performance Specification for Flood Warning Dissemination</i> as a framework to contain agreed detailed specifications for elements of the service including;</p> <ul style="list-style-type: none"> Colour Codes FW messages (FAX, AVM & Floodcall) Performance Monitoring Model documentation Quality Assurance & Document Control Procedures 	<p>Draft <i>National Flood Warning Strategy</i> included as Appendix 1</p>	Minor
<p>Issue A.2</p> <p>Colour codes not used consistently.</p> <p>Misunderstood by Public.</p> <p>No national agreed standard for "standby" or "major incident" for local authorities or emergency services.</p>		<p>Draft <i>National Performance Specification for Flood Warning Dissemination</i> included as Appendix 2.</p>	Minor
<p>Issue A.3</p> <p>Current prioritisation on existing service, less than 1 in 50 events and main river. Is this now appropriate?</p> <p>No methodology for Safeguarding life reflected in priorities?</p> <p>How are large defended areas being dealt with?</p>			

ACTIVITY/ISSUE	ACTION	IMPLEMENTATION	RESOURCES
B. FLOOD WARNING LEVELS OF SERVICES STUDIES (FWLOSS)			
<p>Issue B.1 General approach to FWLOSS agreed but implementation varies as to extent, resources, timescale. No agreed approach to determine the whole of the problem. Methods for dealings with risk to life, breaches and blockages not developed. Wide variations in Database of properties at risk.</p>	<p>Bring existing Regional FWLOSS into a National Project using a consistent methodology.</p> <p>Implementation should allow high priority sites where ever they are to be dealt with early, (Tidal, Main river, Defended or Non main river).</p> <p>National reporting format similar to LTPs to be implemented.</p>	<p>National Project manager appointed and methodology agreed by Dec 1998. High priorities site identified and progressed by Dec 1999.</p> <p>RFDC included budget for improvement programmes at January 1999 Committees.</p> <p>Example FWLOSS methodology included as Appendix 3.2, Draft Risk to life prioritisation methodology as Appendix 3.3</p>	<p>Major All regions</p>
<p>Issue B.2 Emergency response not currently included in assessments of service. Important link in flood mitigation.</p>	<p><i>Development under Emergency Response Project (R Logan)</i></p>		
<p>Issue B.3 As system expands, are the most appropriate dissemination methods being used? Concern as to AVM performance with FAX. Will AVM cope with expansion? New telephone alert systems being developed. Has technology moved on?</p>	<p>The current usage of AVM should be subject of a general review,, esp. Capacity, use as a FAX, testing, maintenance of database.</p> <p>Review performance of Radio Stations</p> <p>Investigate alternative telephone alert systems.</p>	<p>Full review and update <i>Implementation of F/W Technology Report 1995</i>, as guidance as to the most appropriate usage by March 1999. Review of AVM usage by Dec.1998</p> <p>Section 4 of this Report gives an initial review of dissemination Methods.</p>	<p>Moderate</p>

ACTIVITY/ISSUE	ACTION	IMPLEMENTATION	RESOURCES
C. DISSEMINATION PLANS & OTHER DOCUMENTS			
<p>Issue C.1 There is a need for presenting Dissemination Plans in a consistent and clear manner.</p> <p>Plans need to be quality assured as to contents and controlled to ensure consistency between copies.</p>	<p>Ensure all plans conform to existing Dissemination Plan Model (June 1997). Develop template for maps using FPI.</p> <p>Ensure Quality Assurance and Document Control procedures are in place for Dissemination plans and other FW documentation. Use of NE Regions Code of Practice for Controlled Documents used as national standard.</p>	<p>Regions to self audit plans by March 1999. Template for maps by March 1999. Plans re issued Sept. 1999. Checklist Plans included as part of Appendix 4.1</p> <p>Regions to introduce Quality Assurance and Document Control Procedures by March 1999.</p> <p>Draft Quality Assurance procedure included as Appendix 4.1</p>	<p>Moderate All regions</p> <p>Moderate Little work in some regions, significant in others</p>
<p>Issue C.2 The public do not know about or inspect Dissemination Plans as originally intended.</p>	<p>Development as part of Public Awareness Project (M. Whiting)</p>		
<p>Issue C.3 There is need for better links between Agency Plans and Local Authority/Major Incident Plans/Police Procedures.</p> <p>The role of the Environment Agency is clearly defined with respect to flooding, but this is not the case for other bodies.</p>	<p>Development of a National Model for Major Incident Plans.</p> <p>Roles to be defined by a National Joint Committee, - MAFF, Home Office, EA, Local Authorities, Police etc.</p>	<p>Model to be developed and agreed by March 1999. Plans in place for Major sites by September 1999.</p> <p>SW Major Incident Plan Model is included as Appendix 4.3</p>	<p>Moderate Variations with a number of major sites.</p>

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1 INTRODUCTION

The purpose of this report is to review the flood warning dissemination element of the flood warning service provided by the Environment Agency. The report considers three key areas for the Agency's flood warning service.

- a) The Agency's policy and standards for flood warning messages.
- b) Surveys to establish existing levels of service and flood warning needs.
- c) Dissemination Plans and associated documents.

In *Floods Across Europe* Edit. Penning-Rowsell & Fordham 1994, a staged flood warning model was put forward against which the state of development in various EC countries could be assessed. The model considered the whole of the flood warning system termed the FFWRS - Flood Forecasting, Warning, & Response Systems. Table 1.1 describes the each of the five stages of development and table 1.2 gives the 14 specific criteria on which the assessment was undertaken. Figure 1 shows the 1994 assessment for the UK, France, Portugal, Germany and the Netherlands.

Considerable progress has been made since 1994, in particular the change in 1996 to the dissemination of flood warning when the NRA was given the lead role together with the requirement to produce dissemination plans. The floods that occurred in Easter 1998 did highlight a number of weaknesses in the current FFWRS for England and Wales. The Environment Agency clearly wishes to progress towards the "Advanced" stage of development and the general review following the Easter Floods does give the opportunity to reconsider and address those aspects which appear weak.

The Preliminary Assessment Report by Peter Bye listed 16 *Lessons from and responses to the experiences on the issue of warnings*. This report makes reference to the Bye report and other aspects of the Easter Floods in recommending changes to the current approach.

Table 1.1 A staged development model of Flood Forecasting & Warning Response System (FFWRS)

1 Rudimentary	2 Beginnings of FFWRS development	3 Intermediate	4 Approaching Advanced	5 Advanced
<p>FFWRS are largely unused, but unofficial flood warning and response occurs.</p> <p>Less than 10% of geographical area served by FFWRS.</p> <p>FFWRS are almost entirely forecast-dominated but forecasting methods are rudimentary.</p> <p>The legal underpinning of FFWRS is weak, powers are mainly permissive and there is no liability for error. Where FFWRS exist warnings are untargeted, general ones either generally broadcast or communicated using primitive means.</p> <p>There is a closed approach towards making flood risk information available and no attempt to educate the public about flood hazards.</p> <p>FFWRS are assumed to be effective; there is no performance measurement, and no question of identifying standards.</p> <p>FFWRS agencies act independently; rivalry exists rather than effective cooperation.</p>	<p>FFWRS are largely unused, but efforts to increase use of FFWRS identifiable. Unofficial flood warnings and response in use.</p> <p>Less than 25% of geographical area served by FFWRS.</p> <p>FFWRS remain forecast-dominated but some recognition of need to improve warning dissemination and/or response. Forecasting methods starting to be improved beyond rudimentary; maybe weather radar being installed in pilot locations.</p> <p>Some legal basis to FFWRS. Warnings remain largely untargeted and communicated by primitive means. Closed approach public flood risk information, no or little attempt to educate the public about flood hazards. Possibly some recognition of the ineffectiveness of FFWRS, but no formal means of feeding back lessons of failures.</p> <p>No performance targets or standards identifiable.</p> <p>FFWRS agencies act independently; rivalry rather than cooperation rules.</p>	<p>A FFWRS philosophy or approach is clearly identifiable, as are efforts to enhance FFWRS. Unofficial flood warnings and response in use. More than 25% but less than 50% of geographical area served by FFWRS. FFWRS are no longer forecast-dominated; attention is focused upon the warning dissemination problem and improving public response. A mixture of forecasting methods is used ranging from rudimentary to relatively sophisticated; weather radar has spread. Laws defining responsibilities of some agencies may exist, but probably focus upon forecasting and less clear on warning dissemination and response. Warning officials fear legal liability for error. Some targeting of warnings with some messages carrying information on more precise location and timing of flooding. Warning dissemination agencies and agents are identifiable. Information on the flood hazard is generally available, though not yet utilised effectively although there is some attempt to inform public about flood warning procedures. The limitations of FFWRS are now fairly widely recognised, and there is some effective learning through hindsight review. A number of forecast orientated performance indicators are in use; regional standards possibly with national standards, may have been identified. Agencies understand the need for close liaison but liaison shortcomings remain.</p>	<p>Positive strategies are being adopted to enhance FFWRS, and significant advances have been achieved. FFWRS are no longer forecast-dominated; considerable attention has been given to improving both warning dissemination and response. Geographical coverage by FFWRS is greater than 50%. FFWRS have been enhanced through application of more sophisticated forecasting and communication technologies; the latter may be under experimentation. Legal responsibilities for forecasting, warning dissemination and response are clearly defined and legal liability for error is also clearer with agencies either indemnified for mistakes or liabilities constrained. Warning messages contain full information on location, timing, anticipated flood depths etc. The warning dissemination process is well defined and rehearsed. Relaxed attitudes towards availability of flood risk information and strategies used to educate public of both the flood risk and warning and response procedures. Effectiveness of FFWRS now defined and research commissioned and/or completed on performance of FFWRS. Research and hindsight review findings being used to improve FFWRS. National standards in place; agency liaison problems being ironed out.</p>	<p>Clearly identifiable FFWRS philosophy in place for some time; approach is marked by balance between investment in forecasting and in warning and advanced response. Advanced technologies have been applied to FFWRS in the forecasting, warning and response phases. Geographical coverage of FFWRS is greater than 50%. Legal responsibility for all phases of FFWRS are defined; legal liabilities are defined but limited through indemnity or other constraint. Warning messages are well targeted using reliable and detailed data-base; information in messages is full and includes behavioural advice. Warning dissemination methods include use of modern technologies such as automatic telephone systems and pagers. Property owners may obtain full information on their risk of flooding and this information is publicly accessible. Flood plain users are regularly and fully informed of flood warning and response procedures and can obtain personal advice. A national strategy for measuring FFWRS effectiveness is in place, with performance targets set for future improvements. Performance indicators extend to warning dissemination and to response. There is close liaison and regular rehearsal between FFWRS agencies.</p>

Reproduced from *Floods Across Europe* Edit. Penning-Rowsell & Fordham 1994

Table 1.2 Criteria-development matrix for Stage Development Model of FFWRS

Development stages					
Characteristics or criteria	1	2	3	4	5
1. Flood warning philosophy	Rudimentary		Intermediate		Advanced
2. Dominance of forecasting vs warning	Forecast dominant		Equal		Equal & improved accuracy
3. Application of technology to FFWRS	Model with manual extrapolation		Mixture		Fully automated
4. Geographical coverage	<10%		<50%		>50%
5. Laws relating to FFWRS	No laws/ permissive		Laws		Laws with liability
6. Content of warning messages to public	'Blanket': general location		Mixed: location/ timing		'Target': severity/location & timing
7. Methods of disseminating flood warning	General broadcast		Wardens/ agencies/police		Personal phone/fax/pager
8. Attitudes to freedom of risk/hazard information	Little request only		Restricted to general flood plain		Open specific property
9. Public education about warnings	Minimum		Some, eg colour codes		Fully informed
10. Knowledge of FFWRS effectiveness	Denial of failure		Recognise limitations		Research tested
11. Dissemination of lessons learned	Little		Partial		Full
12. Performance targets and monitoring	None		Key indicators only		Accuracy/ timely/reliable
13. National standards	Parochial		National/ regional variations		National/ international
14. Organisational culture	Independent		Agency liaison		Service level agreement with agencies
1: Basic-little development 3: Improved performance but some failures apparent 5: More advanced performance; failures reduced					

Reproduced from *Floods Across Europe* Edit. Penning-Rowsell & Fordham 1994

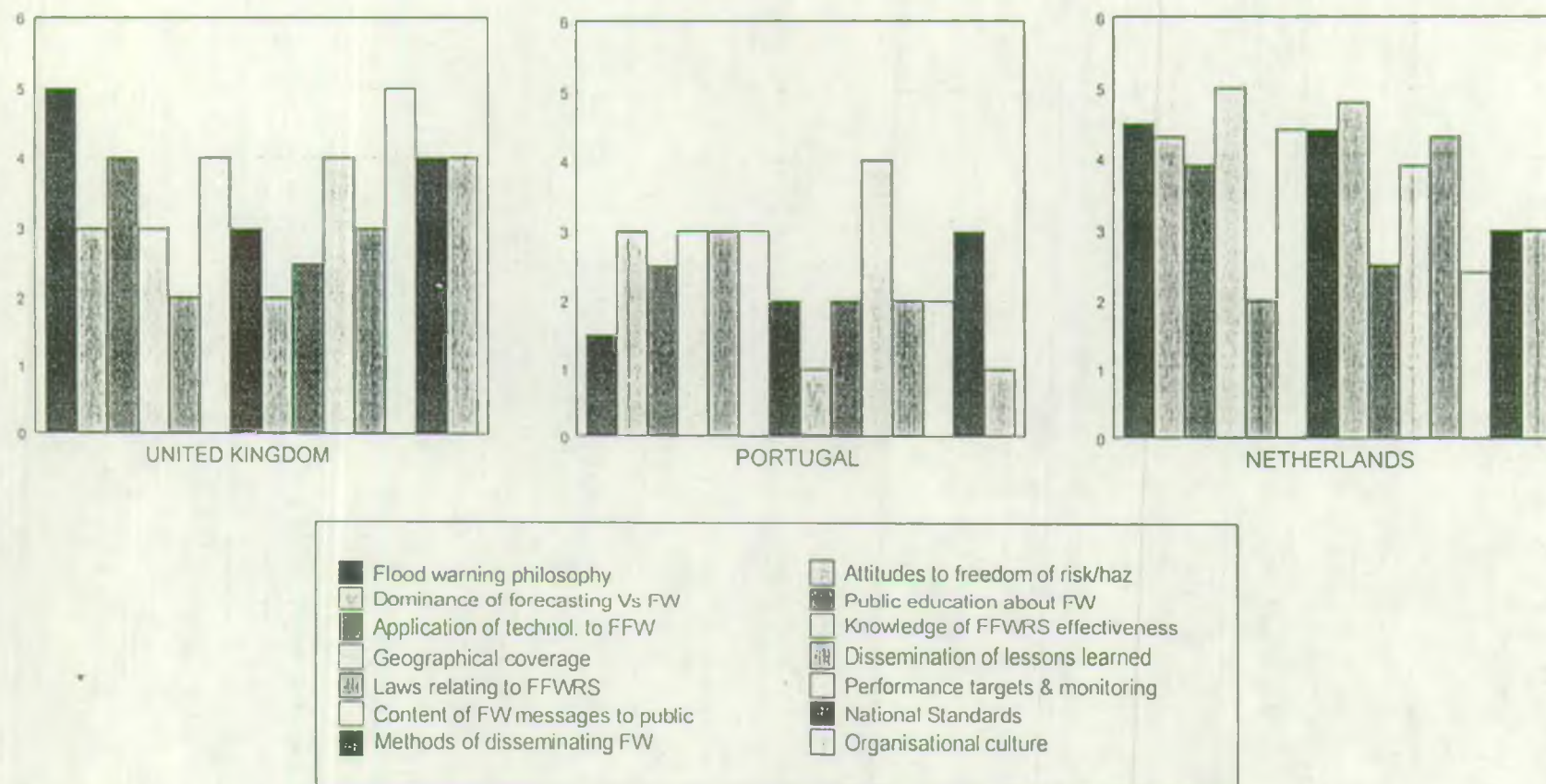


Figure 1 - Graphs showing the relative development stages of FFWRS in the UK, Portugal and the Netherlands in 1994
(Reproduced from *Floods Across Europe* Edit. Penning-Rowell & Fordham 1994)

2 POLICY & STANDARDS OF SERVICE

2.1 REVIEW OF CURRENT SITUATION

2.1.1 Legislation

Section 166 of the Water Resources Act 1991 gave the NRA powers to provide and operate inland flood warning systems. These were transferred to the Environment Agency under Section 2 of the Environment Act 1995. Section 148 of the Water Resources Act described the arrangements for the Minister (MAFF) to make grants towards the cost of flood warning systems but the Ministry (or the Welsh Office) do not have direct powers to carry out such works.

Section 148 of the Water Resources Act defines flood warning systems as applying to any inland water and does not distinguish between main river and ordinary watercourse.

2.1.2 MAFF Policy

In their 'Strategy for Flood and Coastal Defence in England and Wales' MAFF state, "*The safeguarding of lives must clearly be the highest priority.*" They go on to state "*In theory comprehensive flood warning systems alone might achieve this by permitting people at risk to be moved to safer areas.*" Reflecting this, flood warning is given the highest priority for grant aid, ranking above urban coastal/tidal defences, urban fluvial defences, rural coastal/tidal defences and new rural fluvial defences.

The MAFF Project Appraisal Guidance Note (PAGN) gives some guidance on assessing the benefits of flood warning schemes. Paragraphs 2.56 and 2.57 of that document read:

2.56 *Flood warnings give flood plain residents and businesses the opportunity to reduce both tangible damage (by shifting belongings or stock) and the stress impact of unexpected flooding. The potential benefits are a function chiefly of the warning time given. In practice however actual benefits have been shown to be only a small proportion (perhaps as low as 10-20%) of this upper bound. This shortfall arises because potential benefits have to be multiplied by the following factors in order to arrive at expected benefits:*

- *the proportion of households/firms to which the warning is disseminated with sufficient lead time to take effective action*
- *the proportion of residents available to be warned*
- *the proportion able to respond; and*
- *the proportion able to respond effectively*

2.57 *The appraisal of flood warning benefits (in principle no different from the appraisal of other benefits) is thus subject to much uncertainty. No comprehensive technical guidance is available.*

Although the protection of human life is quoted by both MAFF and the Agency as their highest priority, no reference to this is made in the Flood Warning paragraphs of PAGN. The section in PAGN on Health and Related Impacts of Flooding states:

"Although flooding has caused loss of life in the UK, the probability is considered too low to warrant its inclusion in the vast majority of appraisals. If, in the exceptional case, there is empirical evidence that allows robust probabilities of risk to life to be estimated and the Ministry accepts that it is appropriate, quantification will be by reference to values published by the Department of Transport."

Table 1 of the DETRs **Highways Economics Note No.1** quotes the average value of the prevention of a fatality as £847,580 at June 1996 prices. This equates to some 746 House Equivalents.

2.1.3 Environment Agency Policy

The Agency's principle aim for flood defence is 'to provide effective defence and warning systems to protect people and property against flooding from rivers and the sea'.

The Environment Agency's **Customer Charter** states '*Prior warning will be provided (two hours in general) to people living in designated flood risk areas where a flood forecasting facility exists and where lead times enable us to do so*'

In its document '**An Action Plan For Flood Defence**', published this year, key deliverable targets over the next five years are quoted, in order to reflect its stated aims. In relation to providing an effective flood warning service these are:

- *Developing and implementing an effective flood forecasting service through improvements to weather radar, storm tide warning and fluvial forecasting*
- *Issuing timely flood warnings to those at risk where possible*
- *Educating the public and organisations on the risk of flooding and their responsibilities*
- Identify the need for extending the flood warning service
- Testing emergency procedures annually

2.1.4 Flood Warning Strategy

Prior to the Easter floods the National Flood Warning Strategic Board had been developing '**The Flood Warning Strategy for England and Wales 1997/8 to 2001/2**'. Formal adoption of this document has been postponed to enable any lessons learnt from the Easter floods to be incorporated. However the document had reached its Final Draft stage by April 98 and reflects thinking and practice current at that time. (Appendix 2)

The Strategy does not comment on coverage of flood warnings although there is mention of technical feasibility and economic viability.

The Strategy commits the Agency to undertaking Flood Warning Levels of Service Surveys (FWLOSS) from which programmes of improvement will be drawn up.

This document discusses priorities for the flood warning service and states:

- *The highest priority for the Agency is to maintain and provide the existing flood warning service as described in Flood Warning Dissemination Plans.*

• *The priorities for improvement and extension to the service are where the likelihood of flooding is high (a 2% chance or higher of flooding each year) in order of risk to human life and land use, namely:*

- *High, then medium density urban;*
- *Low density urban or rural with limited numbers of properties;*
- *Agricultural land with stock;*
- *Other property and assets including transport and utilities;*

where it is technically possible to provide a flood warning which is far enough in advance of flooding to justify the cost of the service. These priorities should be established through the systematic Flood Warning Levels of Service method of appraisal.

• *A flood warning service for the coast and defined Main River will generally rank higher priority than for ordinary watercourses.*

The use of 2% probability (or a 1 in 50 year event) as the cut off for prioritising extensions to the flood warning service does not mean that the Agency only issues warnings to those properties effected up to this level of event. It is used to suggest a nationally consistent figure for future improvements. Coverage is currently variable although many areas of the country have developed their database of at risk properties based on old Section 24(5) maps that show the 1 in 100 or highest known flood outline. Flood plain mapping being produced by the Section 105 Project is providing further information on flood risk areas.

2.1.5 Major Incident Plans

Where the probability of flooding is lower (less than 2% chance of flooding each year) but concern for human safety is high the Strategy indicates the need for the Agency to advise Local Authorities about significant flood risks and encourage the preparation of Major Incident Plans which include specific flood risks.

The document 'Dealing With Disaster' published by the Home Office in 1992 suggests a police led senior co-ordinating group for planning, training for, and exercising the local response to emergencies. This would include chief officers of the emergency services, the local representative of NHS management and local authority chief executives. It goes on to state that the senior level co-ordination arrangements may need to be supported by working level groups to carry out detailed work and that it is good practice to involve others whose responsibilities are particularly relevant to local disaster preparedness, including statutory bodies such as the National Rivers Authority. No specific definition of a Major Incident is given, but guidance tends towards incidents where significant numbers of people are involved in some way.

2.1.6 National Performance Specification

The Report *Flood Warning Dissemination Project (Feb 1996)* (the Andy Baxendale report) was produced as guidance to Regions on how to implement the National Project. It contained as an appendix a National Performance Specification for flood warning dissemination. It was used to ensure that the output from the flood warning service was consistent even if the methods between Regions varied. The Performance Specification set out is still appropriate although some matters of detail would need to be updated. The Report also included model FAX message containing the

recommended format and contents. No national specification exists for the AVM scripts although best practice has been discussed in National Groups. A Draft National Floodcall User Guide does exist which gives guidance on the contents of Floodcall messages.

2.2 IMPLICATIONS OF EASTER FLOODS

2.2.1 Coverage of Flood Warnings Service

The Preliminary Assessment Report of the Independent Review Team on the Easter floods recognises the event was one of exceptional intensity and speed of development. At the time of reporting the opinion on severity was that the probability of the event occurring was 2% to 0.7% (50 to 150 year return period). In many areas this was the highest recorded event and was in excess of the floods used to produce existing flood plain maps. The Agency therefore had no knowledge of how far the flooding was likely to extend in many locations and were unable to warn many effected people. In at least one location (Melton Mowbray) at Easter, flooding is thought to have been enhanced beyond the theoretical 1 in 100 year outline by the partial blockage of a bridge.

Public expectation however was clearly that people expect to receive a flood warning, wherever they are, if their property is flooded. The Agency has to consider how far it can go in meeting this aspiration.

The draft Flood Warning Strategy gives priority to areas at greater risk than 2% (1 in 50) and the Section 105 flood maps use 1% (1 in 100) for fluvial situations and 0.5% (1 in 200) for tidal.

A number of "lessons" from the Bye Report are related to this issue.

- 2) *"Measures in addition to those currently taken, are needed to improve and thereafter maintain at higher level the awareness of communities in flood plain areas about their vulnerability and of the services from the Agency and the other response organisations."*
- 10) *"For areas known to be at risk from main river flooding, achieving more connections to AVM and maintaining or introducing flood wardens, would seem the best course of action."*
- 11) *"With regard to better alerting areas not previously thought to be at risk from main river flooding, such as large parts of Leamington, more reliable prior identification of flood prone land, possibly adopting alternative methods to those used presently, would seem the best course of action."*

The question of who is covered by the flood warning service and who is not, is a key policy issue and is fundamental to determining how the Agency provides its service. Should a probability limit be used to give the extent of flooding up to which the Agency provides direct warnings?

Coverage is currently variable across the country with some Regions aiming to provide warnings to all main river, whilst others only provide them to specific locations.

The Flood Risk Maps currently being updated via the Section 105 Project are based either on historical floods or hydraulic modelling. Hydraulic modelling is by its nature imprecise, and historical records can be inaccurate. It is therefore difficult to arrive at a precise boundary line between floods of different probabilities. The Agency has in recent years been moving towards a more specific warning service which indicates what property will flood. The maps within the Dissemination Plans often show a limited area of the flood plain to which direct warnings are given.

There would seem to be a need to publicise to a greater extent the flood risk maps being developed through the Section 105 Project. The Public having been made aware that they live in a flood risk area would no doubt wish to know the position concerning flood warning. The Agency's response could be one of the following:

- A - the Agency's service only covers those areas specifically identified where a flood forecasting capability exists and the 2 hours standard could be achieved. A programme of improvements will over a period increase the number of locations covered where this is technically feasible and economically viable.
- B - the Agency's policy is to endeavour to provide a flood warning service for all locations known to be at risk of flooding from the sea or from rivers. In many locations the Agency will be able to give specific details elsewhere the warning may be of a general nature. A programme of improvements will over a period increase the number of locations where specific details can be given. The service will be limited where flood conditions develop rapidly, are highly localised or are of little consequence to the community.

Response "A " would seem to have been found untenable after the Easter floods. The Public flooded by a major river simply will not accept that they were not covered.

Response "B" would offer a means of covering at least all the locations which the Agency have identified as at risk albeit to a low level initially.

The Australian practice is to provide both a general warning service, via the media, in addition to the direct or specific warning service.

General warnings can deal with wide spread low level events, the risk of high intensity local events and extreme events where the extent may be beyond current knowledge. General warnings will be of less value than specific warnings but can be at least the best information available. In most flood events the Agency has considerable knowledge and understanding of the situation. The flood warning arrangements need to allow that knowledge to reach the public domain so that the Public can help themselves with the best information available. General Warnings offer the advantage of allowing an early communication of flood risk, stressing self-help and increasing awareness. The General and Specific designation for warnings would indicate the level of detail given not the size of the flood event.

By offering a general warning service to all areas known to the Agency the issue becomes one of the level of service being offered in a specific location rather than whether a service is offered at all. Standards of service can be set which the Agency

can deliver rather than working to a single standard which can not be met in a large number of locations.

2.2.2 Flood Warnings to defended areas

In several locations flood defences were overtopped during the Easter Floods. Peter Bye's lesson is:

12) *"For defended areas where the defences are old and their integrity has been questioned, such as Northampton, the provision of direct warnings should be considered"*.

Should people who are protected by flood defences, but still at risk of flooding from events of greater magnitude than those for which the defences were designed, be provided with a flood warning service? Many locations are currently not covered as they are deemed to be relatively safe. All locations where flooding occurred behind defences at Easter appear to have suffered from overtopping rather than a breach. While some warning can be given for overtopping, breaches cannot normally be predicted. If a direct warning service were to be considered for people in defended areas should the warnings be triggered by breaches and/or overtopping? Urban areas are much more prone to blockages, how should they be handled?

The provision of flood defences can never remove the risk of flooding but they reduce the risk to acceptable levels. Many thousands of properties can lie behind defences, or even millions as in London. 1) The Average Annual Damages (AAD) approach of economic assessment of flood damage used in FDMM is shown in table ???. The Average Annual Number of House Equivalents (AAN) calculated for a undefended village (1 in 2 - 10 years) and a defended town (1 in 100 - 500 years). The Town has more than double the villages AAN. This shows that the potential economic benefit from warnings to a defended area could be significantly greater than the undefended village. Other than in the smaller defended areas this would push the current direct warning systems such as AVM or Flood Wardens beyond their limits. Although the risk of these defended people flooding is low, the impact could be very high. It is likely that providing a specific service could be very cost beneficial, however this should be demonstrated. Warnings would generally be given by means of the media, and possibly loudhailers or sirens.

Forecasting systems should be able to be adapted to predict when overtopping is likely to occur into a defended area. However, breaches are less easy to predict. Asset surveys are being carried out on all the Agency's defences and poor condition assets are being identified. Flood emergency staff should be aware identified weak spots by means of a regularly updated register. This could also include sites where temporary works are taking place. The site could then be inspected during an event. Maintenance and Development Control staff should be required to update such a register.

A paper was presented to this year's MAFF Conference entitled 'A Risk Assessment Approach To The Prediction And Modelling Of Structure Blockage During Flood Flows', following a preliminary study that had been commissioned by South West Region of the Agency. This was aimed at how best to address the issue of blockage in Section 105 flood plain mapping studies. The study had produced a Blockage Risk Model on a computer spreadsheet program. Where, using this process, structures are

estimated to have a medium or high risk of blockage and the consequences of flooding due to blockage are severe, there was a recommendation that this is incorporated into hydraulic models and additional 1 in 100 year flood outlines are added to flood plain maps.

The methodology can produce a probability of a blockage occurring at any particular structure and a decision would then need to be taken as to whether to increase the area that receives a flood warning based on this probability, or whether a Major Incident Plan and a generalised warning should cover any enhanced levels

The ERLOS initiative mentioned elsewhere in this report set standards for the Agency's operational response. Use of techniques for assessing the risk and consequence of blockages would assist in targeting the emergency workforce debris runs to achieve these standards.

2.2.3 Risk to Life

In the Easter Floods there were tragically five deaths resulting from the flooding and the widespread flooding of caravans presented a high risk situation. The risk to life is stated as the reason for Flood Warning's high priority by MAFF and the Agency. No risk to life assessment methodology is however used to identify high risk locations and to prioritise real time actions or improvements to the service. A French methodology for flood risk is described in a paper in 1997 by Henri Dumay - Director of Water Development, BECOM. The floodplain is zoned by degree of hazard. The key factors being, land use, proximity to defences, flood depth and velocity. Risk to life is to a degree independent of economics and should be assessed separately from other aspects. The Agency's policy and standards should reflect the importance of the issue.

2.2.4 Warning messages to the Public

The public need to understand what the warning means so that they will respond effectively. The Public Opinion Surveys in "At Risk" areas undertaken by BMRB in both 1997/98 and 1996/97 show that the Public misunderstand Colour Codes. *"Most people associated the colour coded warnings as the likelihood/risk of flooding rather than its extent."* "Red" coded warnings are effective in that the public interpret the meaning as imminent serious flooding. Amber warning appear to be most open to serious misunderstanding in that they are taken as still being safe while a small number of properties can be flooded. There is also evidence that there is still significant variation in the way colour codes are being used, particularly yellow. This is a result of the need to provide a standby type warning or a generalised warning.

This issue is related to Peter Bye's lesson;

- 1) *The public is inadequately educated about the Agency's flood warning role and the potential value of the warning service is not fully realised as a consequence.*

The Australian Flood Warning guide states *"Warning messages should use plain language and avoid technical terms and jargon. They should seek to persuade people as to what to do. 'Word pictures' focusing on the expected impact of the flood should*

be used." For specific warnings the follow terms are used to indicate the extent of flooding **Minor, Moderate, and Major**. These term equate in meaning to the Agency's Yellow, Amber, Red codes.

In 1996 the Project Board for the National Flood Warning Dissemination Project supported a recommendation from their Public Relations subgroup that colour codes should not be used in communication with the Public, but retained for use with the emergency services. Although this was rejected at the time, currently North West and Anglian do not use colour codes in with AVM warnings. In Regions such as SW, where it has been possible to educate small groups, the colour codes are highly valued.

It would seem that the issue is to ensure that warning messages provide the required information and motivate the public to take action. Colour codes may or may not be part of the solution. The Agency should be committed to using plain English and reviewing the content of warning messages against minimum information requirements.

Bye Report June 1998

- 8) *Where warnings appear to be over delayed in some catchments, trigger points should be re-examined.*

The review of trigger levels is covered in another project, however there is often a degree of uncertainty as to the decision to issue a warning due to lack of data, conflicting data or rapidly changing data. The reaction by the Flood Duty Officer may be to delay until there is a clearer view. Such a delay of course may result in the warning being issued too late. Frequent issuing of warnings when no flooding follows, however will result in undermined confidence in the service and no effective action being taken. On balance it would seem better to issue a warning rather than delay. This is often referred to as a "failsafe" approach or using the "precautionary principle." This approach should be clearly stated in the Agency's policy in order that the Flood Warning Officer can act with confidence and the public are aware that they may receive a number of warning where no flooding results.

Warning messages to the Local Authorities and Emergency services

Bye Report (May 1998)

- 16) *Public and emergency services need a better understanding of the role of the Agency in providing flood warnings in all situations and the relevance of flood development planning comments, maintenance and improvement works.*

The use of colour codes do add value when dealing with Local Authorities and Emergency Services and should be retained. There should be a review of compliance with detailed guidance as to the use of colour codes issued by the Flood Warning Dissemination Project in February 1996. Colour codes should only be used to indicate the extent of flooding.

In order to comply with requests from the LA and Emergency Services for early warning of a flood event, a separate "standby message" is recommended. This is of most value if it can be issued during working hours. The operation of a "standby message" must be a matter for local agreement, however it should be a service that the Agency is prepared to offer.

The Flood Warning Strategy, envisages that at a certain magnitude of flood, the flood warning service will become part of a Major Incident Plan. There were examples of inconsistency between Local Authorities during the Easter floods. In Midlands Region West Mercia Police opened a Gold Control in Worcestershire, attended by the Agency but there was no similar arrangement in Warwickshire. In Thames Region the Agency offered to attend Oxford County Council Emergency Centre in Thames Valley Police HQ but this offer was declined. In Anglian Agency staff worked in Gold Control rooms at Huntingdon and Bedford but although a Gold Control was set up for Northamptonshire the Agency was not invited to attend. It is the Agency's current policy to encourage Local Authorities to develop flooding related issues in Major Incident Plans. Would a consistent approach to the production of Major Incident Plans, and the related trigger points at which they are initiated, be useful?

Directly provided warnings and Major Incident Plans are not mutually exclusive. Where large numbers of properties are affected, even if they have received a warning, there is a role for the local authorities and the emergency services in providing assistance. There has been some resistance in the past from local authority Emergency Planning Officers to setting a precise level for triggering a Major Incident Plan, but there is clearly a planning need to set a scenario at which Major Incident Plans would be triggered and look also at worst case situations. Agreement on trigger situations needs to be made at local level. The guidance on how this should be done may need to come from the Emergency Planners' professional organisations and the emergency services. One forum for doing this might be to reconvene the National Joint Committee of representatives from MAFF, the Home Office, Environment Agency, Local Government and Police, which met previously when responsibility for dissemination of warnings was taken over from the police. This could also assist in clarifying the roles of the various bodies involved in disaster planning.

2.3 POLICY & STANDARDS OF SERVICE DOCUMENTS

Bye Report June 1998

- 1) *The public is inadequately educated about the Agency's flood warning role and the potential value of the warning service is not fully realised as a consequence.*
- 2) *Measures in addition to those currently taken, are needed to improve and thereafter maintain at higher level the awareness of communities in flood plain areas about their vulnerability and of the services from the Agency and the other response organisations. In order to communicate clearly the Agency's role a concise description of the flood warning service offered and the standards to which it will perform*

That the Agency's role is not clearly understood is apparent from both the Bye Report and the Public Opinion Surveys undertaken by BMRB. A clear statement describing the service and the standards to which it will be performed would aid communication.

The Flood Warning Strategy could be amended to include a policy statement and key standards.

The National Performance Specification contains a more detailed description of the service together with standards and how they will be monitored. This document could

be updated and become a "live" document such that as revised standards are agreed they are contain in a single reference document.

By use of an amended Flood Warning Strategy and reissuing the National Performance Specification it should be possible to produce two concise documents which describe the service, both internally and externally.

2.4 RECOMMENDED ACTIONS - POLICY & STANDARDS OF SERVICE

Recommendation 2.1 Introduce into the Flood Warning Strategy a policy statement defining Agency policy on:
Coverage of service
General and specific warnings
Priority given to high risk to life situations.

Awareness of flood risk
Co operation with Local Authorities and Emergency Services
Contents and issuing of warning messages

An amended Draft Flood Warning Strategy is attached as Appendix 1.

Recommendation 2.2 Re publish a National Performance Specification (NPS), including a full description of the service and outputs, standards and targets.

A revised National Performance Specification is attached as Appendix 2.

Recommendation 2.3 As part of the NPS revise and reissue minimum standards for the content of flood warning messages reinforcing commitment to plain English. Including messages by FAX, AVM and Floodcall.

Recommendation 2.4 As part of the NPS ensure that information on the condition of assets and temporary works made available to those involved with flood warnings.

Recommendation 2.5 Consideration should be given to reserving the colour coding for other public bodies involved in emergency planning and introducing a standby message by agreement with Local Authorities and Emergency Services.

Recommendation 2.6 Take up the question of trigger levels for Major Incident Plans with emergency planners groupings and incorporate in such plans clear guidance on the roles of the Agency, local authorities, the police, etc. Consideration should be given to reconvening the National Joint Committee to assist in this process.

- Recommendation 2.7** Where the properties warned are based on a flood plain envelope ensure that whole conurbations or discrete areas of conurbations are included. Carry out risk analyses of the potential for blockages at key structures and the consequences of blockages occurring.
- Recommendation 2.8** Collate existing research on Benefits of Flood Warning and ensure it is widely disseminated and used. Commission further R&D if necessary to develop methods of incorporating risk to life.

3 LEVELS OF SERVICE STUDIES

3.1 REVIEW OF CURRENT SITUATION

3.1.1 Agency documents

The Environment Agency (the Agency) has powers to provide Flood Warnings for areas at risk from flooding, whether saline or fluvial. These warnings have been developed over the years in different Regions and the consistency of approach is difficult to quantify. The Agency has therefore identified the need to be able to compare the performance of different flood warning schemes throughout the country, particularly following the extensive flooding of Easter 1998.

The key standard for flood warning is the lead time of the warning in advance of flooding. The potential benefits of flood warning depend principally on the warning time given. The Level of Service for Flood Warning is given in the Agency's Customer Charter which states *"prior warning will be provided (2 hours in general) to people living in designated flood risk areas where a flood forecasting facility exists and where lead times enable us to do so"*

The Environment Agency has developed a draft National Flood Warning Strategy for England and Wales (the National Strategy) and this states in the main aim that *"Protecting human life is the highest priority. The risk of flooding can be reduced but not removed and so there is a need to warn people when flooding is going to occur. A timely warning provides the opportunity for those at risk to seek safety and to reduce damage and distress."* It also states *"The Agency vision is to reduce the risks associated with flooding wherever cost effective and environmentally acceptable measures are feasible and can be funded. It is the aim of the National Flood Warning Strategic Board to ensure the Agency's position as pre-eminent in flood warning through the provision of an appropriate, reliable and cost-effective service."* The full draft National Strategy is included (with recommended changes) in Appendix 2.

In terms of the Level of Service the National Strategy states *"the Agency will seek to improve and extend the flood warning network where this can be justified"*. It goes on to state *"the Agency will develop and adopt best national practice to appraise need using the Flood Warning Levels of Service Study (FWLOSS) approach, and draw up programmes of improvement in each region"*. This Levels of Service (LOS) study for Flood Warning has been developed using an approach by which:

- 1) a target standard (or level) of service can be set
- 2) the current standard (or level) of service can be measured / recorded.

A summary of the Agency's approach to LOS was produced in a paper by Mark Tinnion and Linda Aucott in June 1997 (see Appendix 3).

3.1.2 ERLOS (Emergency Response Levels of Service)

Prior to creation of the Environment Agency the National Rivers Authority (NRA) had recognised the need to consider target levels of service for flood warning and a national R and D Project was commissioned in 1992. This culminated in the production of R and D Note 106 by Middlesex University's Flood Hazard Research Centre. In 1993 Peter Borrowes of Thames Region chaired a national group on ERLOS

(Emergency Response Levels of Service) and a paper was written by the Region's Flood Defence Manager Peter Borrowes to clarify the requirements for system performance and thereby prioritise and make more efficient the use of resources. The paper recommended that for flood warning, the Level of Service will be:-

"To issue an advance warning of flooding in accordance with a nationally agreed and consistent (colour coded) procedure, identifying the river reach or coastal zone at risk, together with an indication of public safety aspects and properties and land at risk and an assessment of certainty."

The Target will be:-

"To provide the public at risk with at least two hours advance warning."

The ERLOS Paper also went on to cover Flood Defence operational response, and this can impact on the public perception of how successful the Agency is in Flood Warning. The LOS for operational response was stated as:-

"To operate NRA installations and defences to design criteria, to formulate and maintain a plan for responding to flooding and the failure of NRA flood defence assets and, to mobilise resources to attend flooding incidents within a specific time depending on the location and the potential consequences of the incident."

The target was:-

"For NRA installations and defences to arrive on site within one to two hours from receipt of alarm, depending upon the housing equivalents at risk; and for other reported incidents, to attend within 2 to 4 hours from receipt of report, depending upon the house equivalents at risk."

A brief survey was undertaken to ascertain how the ERLOS study has impacted on each Region and a summary of the results are shown in Table 3.1.

3.1.3 National Flood Warning Dissemination Project

In February 1996 the Dissemination Project superseded the Flood Warning elements of the ERLOS initiative and by October 1997 the draft National Flood Warning Strategy for England and Wales was produced, and internally the Agency began to consider consistency of approach for LOS.

Prior to 1996 successful dissemination of flood warnings was low and it was assessed that the public's awareness of flood warnings was about 45%. The Dissemination Project set the target of making this figure 80% by 2001. A more detailed summary of the Performance Targets is given in the Flood Warning Dissemination Project Report by Andy Baxendale (February 1996). Further information is also in R and D Note 463.

A summary of the performance targets are as follows:

OPM 1 Proportion of properties flooded who received warning prior to flooding 80%
OPM 2 Proportion of properties flood who took action to mitigate damage 52%
OPM 3 Awareness of at least 1 method of obtaining warnings available no target

The Agency measures success externally and internally:

- 1) Externally - by Market Research contracts and Public Opinion Surveys
- 2) Internally - by the factors of Accuracy, Reliability (of dissemination methods and public awareness) and Timeliness (known as the ART of flood warning)

A Baseline Survey was carried out by John Chatterton in February 1997 which showed marked regional variation in the level of service being provided in each region.

3.1.4 Survey of current ERLOS & FWLOSS work

At present the issue of prioritisation work is split between an Area responsibility in some Regions and Regional in others. This can make Regional consistency an issue and a common national format and programme difficult to achieve. Additionally Regional priorities for Levels of Service studies can be affected by staffing levels, regional initiatives such as replacement telemetry, forecasting developments, Regional Flood Defence Committee commitment and funding for Flood Warning.

ERLOS was really the first consistent national initiative on Levels of Service. Unfortunately it was not fully implemented. However, since the initial ERLOS Report the Agency Regions have undertaken FWLOSS assessments in a relatively independent way. Tables 3.2, 3.3 and 3.4 show the current situation on progress on Flood Warning Levels of Service surveys across the Agency.

A questionnaire was circulated in August 1998 and the results are shown in tables 3.1 to 3.4. From the questionnaire responses there are a number of conclusions.

Only NE region undertook an ERLOS survey although 6 Regions still use the Report.

FWLOS surveys are being undertaken in 6 Regions in some form.

There is no nationally consistency on the prioritisation of improvements.

3.2 IMPLICATIONS OF THE EASTER FLOODS AND BYE REPORT.

3.2.1 Bve Report

The Preliminary Assessment Report by the Independent Review Team on the Easter Floods (the Bye Report) recommends review of the Environment Agency's National Flood Warning Strategy. Appendix B of the Bye Report sets out summarised statements from the Strategy for consideration in the Easter Flood Review. Statements of particular relevance to Levels of Service are as below:

4) A key standard is the warning lead time provided to people at risk before the onset of flooding, since this determines how much damage can be avoided. The Agency sets this as a level of service against which performance can be measured. 'Prior warning will be provided (two hours in general) to people living in designated flood risk areas where flood forecasting facilities exist and where lead times enable us to do so' (quoted from the Environment Agency Customer Charter).

5) The Agency will set nationally consistent and achievable standards for flood warning.

14) The highest priority for the Agency is to maintain and provide the existing flood warning service as described in the Flood Warning Dissemination Plans.

15) The priority for Major Incident Plans is where the likelihood of flooding is low (less than 2% chance of flooding each year) but concern for human safety is high. Areas protected by defences which could fail or be overtopped should receive higher attention than (otherwise similar)

unprotected areas. The Agency will encourage and work with local authorities according to this ranking."

The main text of the Bye Report gives no indication that the Review Team intend to change the basic thrust of Flood Warning Levels of Service studies. However, there are areas where the report does provide an indication that more emphasis should be given to certain aspects of Levels of Service work.

On Prioritisation the Bye Report comments in section 7.1:-

"The Agency's power to provide and operate flood warning systems is permissive and not a statutory duty. The understanding gained from the preliminary review enquiries is that the Agency's flood warning services apply to flooding from some reaches of rivers and watercourses dedicated as main river, and not to flooding from other reaches of the natural drainage systems, commonly referred to as ordinary watercourses. However, there appears to be no legal restriction on the Agency preventing the provision and operation of warning systems in relation to ordinary watercourses"

This clarification gives support to the need to consider all rivers and watercourses in assessing flood warning priorities, and by implication areas at risk from tidal flooding.

The National Strategy puts protecting human life as the top flood warning priority. This is supported in the Bye Report as follows:-

Section 7.1 *"The Agency's document Flood Warning Strategy for England and Wales 1997/1998 to 2001/02 is at final draft stage. The strategy establishes plans for improving the warning services currently provided. It is understood that capital expenditure programmes for flood warning and defence will reflect the identified projects and expenditures."*

Section 7.2 *"People temporarily in the risk areas include those at caravan sites and in boats. The Easter flood tragically demonstrated the magnitude of the risks and the devastating effects on caravans and boats. Whilst the needs of these people are similar to those for individuals living and working in the risk areas, greater emphasis should be placed on prior awareness and the effective communication of strongly worded warnings prompting a decision on rapid evacuation."*

Section 8.1 *"The Agency gives priority attention to potential and actual main river flooding but otherwise responds to flooding from ordinary watercourses working jointly with local authorities and the police."*

It is clearly import that assesmmnt of Risk to life is included in the assessment of levels of service and prioritisation of improvements.

3.2.2 Consistency of Approach

Clarification on a consistent approach to undertaking and presenting levels of service assessments in accordance with a common format is urgently required. Questionnaire responses indicate that Regions are currently working at significantly different speeds and to considerably different depths of investigation. The need to place protecting human life at the top of the priority list needs incorporating into the methodology.

At present the cost and number of properties seems to drive priority, primarily because an accepted way of consistently assessing loss of life risk has not been produced in this country until now. A key policy issue is that of prioritisation combining both Cost/Benefit assessments and Risk to Life Assessments. Although further research and development is needed into the factor which increase risk to life this should not delay the introduction of a simply system as soon as possible.

FWLOS is of importance in responding to comments raised in the Bye Report and to improving the current organisational arrangements with local authorities (unitary and two tier).

In addition ERLOS should be reviewed and the operational elements implemented to produce consistent emergency incident response standards across the Agency. ERLOS would also help the Agency to explain how it targets emergency resources which assists in liaison with outside bodies, as well as making Agency staff more aware of their roles. This is particularly valuable for explaining the limitations on our reaction to Major Incidents

3.2.3 National Quality Assurance

To enable effective consistency a firm programme of phased delivery of the FWLOS exercise to the National Flood Warning Board needs to be established. Although the principle of performance rather than method specification has been used since implementation of the Dissemination Project, minimum levels of input are needed. An effective national collation of data, to enable a clear understanding of the extent of levels of service issues, can only be achieved through adopting a consistent approach. If the analogy of the Flood Defence Capital and Maintenance Programmes is used then a consistent set of similar tools to those in FDMM are needed for Flood Warning.

3.2.4 Resource Implications

The length of main river, coastline and non-main river varies from Region to Region and Flood Warning Resourcing doesn't necessarily reflect this. The regional and local Flood Defence Committees influence priorities and funding and this helps with local accountability, but causes problems with national consistency.

It must also be recognised that the lengths of non-main river (or ordinary) watercourses, and the flooding issues associated with them, requires close liaison and cooperation with local authorities. Unless commitment from the Local Authorities is forthcoming progress could be limited.

An open and understandable approach to the commitment of resources to Flood Warning is clearly needed and the FWLOS survey should support this aim.

3.2.5 Education of Agency Staff

The Bye Report states:-

"Some Agency staff involved with the warnings appear to be unclear about the relevant powers and duties of their organisation. Also, some have poor awareness of

the roles, organisational arrangements and flood related procedures in other bodies. This is not helpful to understanding the needs and properly planning to meet them."

The above statement confirms the need for a consistent approach to planning improvements and extensions to the flood warning service. Staff need to be familiar with the issues involved and committed to tackling the problems associated with Levels of Service studies. Out sourcing such studies (unfortunately) prevents this "ownership" and understanding of the flood warning issues.

3.3 SUMMARY OF RECOMMENDATIONS

- | | |
|--------------------|---|
| Recommendation 3.1 | Bring Regional FWLOSS into a National Project using a consistent Methodology. The Methodology should draw on FDMM (Flood Defence Maintenance Manual) standard methods and nationally consistent data sets - such as Sea Defence Survey, SOS, Asset Survey, Section 105. Identify consistent methods for dealing risk to life, defended areas, and breach scenarios. |
| Recommendation 3.2 | Undertake the National Project by phases that allow high priorities locations wherever they are to be programmed early. Using Nationally consistent Target completion dates. |
| Recommendation 3.3 | Adopt a Nationally consistent reporting format for progress |
| Recommendation 3.4 | Implement the emergency operational response aspects of ERLOS so that Agency staff (internally) and the public, local authorities and the emergency services (externally) are aware of how the Agency's operational response to flooding incidents is focused. |
| Recommendation 3.5 | National Guidance should be given to Flood Defence Committees on the importance of providing adequate funding to the Flood Warning Service |

An example Methodology for FWLOSS is included as Appendix 3.1 and Risk to Life

Table 3.1 Erlos Questionnaire Responses by Region

	Anglian	North East	North West	Midlands	Southern	South West	Thames	Welsh South East	Welsh South West
Has ERLOS been undertaken in your region ?	No	Yes	No	No	No	No	No	No	No
How was this study undertaken ?	N/A	Desktop	N/A	N/A	Section 24 (5) Land Drainage Survey	N/A	N/A	N/A	N/A
Is this report still referred to for flood warning purposes ?	Yes	Yes	N/A	Yes	Yes	Yes	N/A	N/A	N/A

Table 3.2 FWLOS : PROGRESS

	Anglian	North East	North West	Midlands	Southern	South West	Thames	Welsh South East	Welsh South West
1 Has FWLOS been undertaken in your region ?	Yes, ongoing.	Yes	Yes, currently underway.	Yes	No	Yes, currently underway.	No	N/A	Yes, ongoing.
2 How was this study undertaken ?	Other reports and in-house knowledge.	Desktop (Section 24 and 105).	Desktop and brainstorming. (Section 105 maps).	Desktop, Brainstorming & Historic analysis.	Section 24	Detailed study via consultants.	Used Thames Region Reach System document & site visits.	N/A	Desktop
3 Does FWLOS concentrate on existing coverage or include expansion ?	Expansion	Expansion	Phase 1 relates to current zones. Phase 2 includes expansion.	Existing services.	All inclusive.	Expansion	Existing coverage.	N/A	Expansion
4 Does FWLOS cover non-main river ?	Partly	Yes	Yes, but lower priority.	No, but may next year.	No	Yes, but in Phase 3.	No	N/A	No
5 Does FWLOS cover tidal and coastal ?	Yes	Yes	Yes	Yes	Yes, the applied methodology does.	Yes	Tidal	N/A	Yes
6 At what LOS does FWLOS incorporate 1:50, 1:100, 1:200 Return Periods ?	1:50	1:100 generally.	All, but areas prone to frequent flooding given higher.	1:50-1:100 generally. May reach 1:150.	1:50 fluvial and is probably greater for coastal.	1:100 or greater.	Statutory flood risk maps used which have no specific return period.	N/A	Based on worst known flood scenario.

7	Has prioritisation of sites been undertaken?	Yes	Yes	Yes, for existing sites.	Yes, for existing sites	All sites are of an equal priority.	Risk areas given equal weight and then phased as main river, coastal / tidal / non-main.	Yes	N/A	Ongoing
8	What criteria was used to prioritise FWLOS giving weighting as necessary?	Low / no cost schemes implemented. Greatest cost benefit ratio was used.	?	Phase 1 = priority = cost * HE * flooding frequency.	Sites inherited from police. HE's used in future.	N/A	Generally cost / benefit, high risk, quick fix.	Frequency of flooding and No. of properties at risk.	N/A	H/E calculations
9	Was FWLOS undertaken in-house or by consultants?	In house	In house	In house	In house	N/A	Specification - in house. Work - Consultant.	Would be in house	N/A	In house
10	Who has ownership of FWLOS in your region's areas?	Area Flood Defence Managers.	Region responsibility for overall strategy, but there is area input.	Area and Regional Flood Warning Teams.	Tim Harrison	Regional Flood Defence Manager.	Region manages and has ownership.	Region	Area, when undertaken.	Areas
11	Is FWLOS prioritised regionally?	No	Yes	Yes	Once business plan is finished	Yes	Yes	Yes	No	No
12	Will FWLOS be updated / amended?	Yes	Yes	Yes	Yes, every 2 years.	Yes	Yes	Yes	Yes, when undertaken.	Yes, monitored against actual.
13	Are there systems in place for this to be undertaken?	Yes, annual review.	Yes	Not Yet	Yes	Yes	Yes	No	Not Yet	Yes
14	Please provide programme for implementing FWLOS.				Study into expanding FW			No programme available.	Programme to be devised.	

Table 3.3 FWLOS : METHOD

	Anglian	North East	North West	Midlands	Southern	South West	Thames	Welsh South East	Welsh South West
1 Has cost / benefit analysis been undertaken on existing / future flood risk areas ?	Yes	Yes	No, but it will be done for improvements and future zones.	Yes, through R&D report 463 & by Alkins 5yr strategy for FW and forecasting.	No	Yes	For general flood defence purposes but not for existing / future areas.	No	Yes?
2 What methodology was used ?	HE's and Red Book.	FDMS	HE's and Alkins and Chatterton's work.	John Chatterton methodology (detail in above reports).	N/A	HE's	HE's	N/A	HE's
3 Has loss of life been incorporated in any study ?	No	No	No	Not sure.	N/A	No	No	N/A	No

Table 3.4 FWLOS : DEFENDED AREAS

	Anglian	North East	North West	Midlands	Southern	South West	Thames	Welsh South East	Welsh South West
1 Is the asset condition known of existing flood defences to flood risk areas ?	No	Basic asset condition is known from surveys 2-4 yrs old.	Yes	Yes	Partial via FDMS	Yes	Yes	Unsure, due to time constraints placed.	Yes
2 What format is this in ?	Sea Defence Survey and various in land formats.	FDMS and inspection reports.	FDMS	FDMS	Sea Defence Survey and FDMS.	Sea Defence Survey and FDMS.	No consistent format.	See above.	Compatible with FDMS.
3 Will any future asset condition changes be identified for flood warning purposes ?	Yes	Yes	No	Yes	Yes	Possibly	No	As above.	No
4 Is this incorporated into risk analysis ?	No	Yes	No	No	No	No	No	As above.	No
5 Has a breach been considered ?	Not fully.	Yes	No	No	Yes	Yes	Yes	As above.	No

4 DISSEMINATION METHODS

4.1 REVIEW OF CURRENT SITUATION

4.1.1 POLICY

The Core Flood Warning Service can be defined by the statement in David Pelleymounter's Flood Warning Dissemination PID (Feb 1996) as follows:

"To provide timely, accurate warnings of flooding to areas at risk throughout England and Wales where a flood forecasting system is in place."

The above is the baseline by which all services need to comply.

The Flood Warning Dissemination PID defines the Project Products as:

"A Dissemination Plan - Environment Agency taking the lead role in preparing and maintaining the plan."

A Broadcast System - Disseminating flood warning messages to those affected using a wide range of methods including the media."

An Alert System - Disseminating flood warning messages directly to those affected together with local authorities and emergency services."

A Public Awareness campaign - To improve the understanding of those affected by flooding so that they are better able to help themselves and to encourage the formation of self help groups."

The Agency Flood Warning Dissemination Methods cover two of the major elements listed above as follows by providing:

- i) An alert (sometimes called hook) mechanism to draw deteriorating conditions to the notice of the public and to put them on notice that a colour flood warning has been issued in their locality and
- ii) An ongoing information service (or broadcast) to keep interested parties aware of developments and to update them as new developments occur.

4.1.2 THE ALERT SYSTEM

Andy Baxendale's Dissemination Project Report states the following about the flood warning alert system:

"The Environment Agency will aim to provide the following service throughout England and Wales by 2001."

Flood Warnings provided for river, tidal and coastal flooding where a forecasting system is established. Define areas covered."

An alert system to hook into the broadcast system, primarily Automatic Voice Messaging. Tried and tested methods typically Wardens, Sirens, Loudspeaker Vans may also be used where the resource is available. These methods may be provided by the Environment Agency, Police or Local Authority."

4.1.2.1 The AVM (Automatic Voice Messaging)

This equipment comprises a computer with voice recording capability, which is connected to the national telephone network over normal public telephone lines.

Individuals who live in, or have business or other interests in identified flood risk areas, are asked for contact information and confirmation that they agree to have their details included on the AVM. Each positive response is then matched to the appropriate flood risk zone and all of the individuals who wish to receive prior warning of flooding in that locality form a discrete 'group' in the computer database. In this way a whole series of dissemination groups is built up. When warnings are to be issued it is simply a matter of selecting the appropriate groups to target the warning.

A simple voice message has been recorded expressing that, 'A flood warning has been issued for your area. Please listen to local radio stations for further information or dial the Environment Agency's Floodcall Service on 0645 881188'. Thirty three outgoing telephone lines are connected to the AVM. It is over these lines that the recorded message is passed to all contacts in the relevant groups. Each AVM machine also has the capability of issuing faxes and pager messages.

According to the manufacturer the equipment has a theoretical capacity of delivering 1600 calls each hour, but this is dependent upon the speed of answering calls, the length of the message being passed on, and the efficiency of the telephone network.

The AVM utilises an MS Access database of telephone numbers to enable alert warnings to be given directly to the public. This database is populated and maintained by Environment Agency Flood Warning Staff. Unfortunately there is no National guidance on best practice for database management resulting in a multitude of approaches to obtaining, storing and updating data.

Postal liaison is a common method used to collect the relevant information but its success is questionable. A public awareness survey conducted by BMRB and published in May 1998 entitled "Report on 1998 and 1997 Public Awareness Surveys" shows in Table 3-f (Spontaneous awareness of flood warning methods) that when asked "What methods for providing such warnings, if any, are you aware of?" that the highest percentage of respondents spontaneously stating the AVM were in North West and South West Regions. Internal liaison with these Regions confirms that they have undertaken a lot of direct personal liaison with AVM customers - by visiting properties at risk in many cases.

Table 4.1 Summary of AVM management and usage per Region

Region	Total Man Hours spent on database management.	Total Numbers on the AVM
North West	1514	9128
North East	2805	4000
Midlands	1341	1720
Wales	2224	3350
Anglian	500 (plus one Area was unable to say)	4178
Thames	104	1500
Southern	962	3750
South West	1924	2500
Total	11374	30126

One Full time equivalent = $37 * 52 = 1924$ hours

Apart from Thames Region the AVM is used as the primary alert system throughout the Agency. Most Regions also have a back up system in place in case of failure of, or if problems occur with the AVM, and in most cases this is by vehicle mounted loudhailer.

Costs of the AVM are currently assessed as follows:

AVM set up costs £800k

AVM enhancements £100k

Total no of recipients on AVM nationally 30000

Total no of man hours on database maintenance (ie status quo) 11500 (6 FTE)

Annual AVM database maintenance cost currently assessed as $6 \times £25k = £150k$

Annual AVM maintenance cost (with Kingston) £100k

Total AVM maintenance cost (status quo) £250k pa

Also the Environment Agency is reaching saturation point on the AVM in some Regions, therefore the purchase of new hardware will soon be required.

4.1.2.2 Faxing

Andy Baxendale's Dissemination Project Report states *"All warnings to be faxed to Police, Local Authorities, and appropriate Public Utilities and Major Industries. In silent hours a single 24 hour contact telephone number must be provided."*

Fax messages are the main means of contact with the Police, Local Authorities (LA's) and commercial concerns. Telephone calls are also made to recipients of faxes to draw attention to the fact that a flood warning fax has been sent.

The AVM was set up to deliver Voice messages but has been developed to include fax messages in some Regions. Many of the problems associated with Flood

Warning Dissemination using the AVM are as a result of using the AVM to fax recipients. (AVM Managers Meeting - 14 July 1998).

Fax messages sent to LA's via the AVM can arrive after voice messages are sent to the public. This is not satisfactory for the LA's. Also in many events the first contact with LA's out of office hours is to a duty officer. The duty officer requires a telephone call in many LA's as faxes go to the office and will only be actioned the following working day.

Regions who use alternative methods eg Surefax do not appear to have problems faxing. Fax messages can be disseminated through Mercury Surefax much more efficiently than when mixed in with telephone voice messages on the AVM. Like the AVM, contact details of prospective recipients of fax information are held in predetermined groups, depending upon the localities they have an interest in. To invoke the system, a single fax is transmitted to Mercury Surefax. The key presses used to transmit the original document contain a dissemination code which is read by the central computer. The fax is then automatically retransmitted, simultaneously to all intended recipients.

Mercury Surefax is currently used in Anglian and North West Regions of the Agency. South West Region have developed Autofax and this is now being trialed by North West Region as an "in house" alternative to the Surefax system. Interim evaluation indicates that it can effectively perform the tasks carried out by Surefax.

4.1.2.3 Flood Wardens

Flood Wardens are volunteers from the public who are prepared to help out in their locality to reduce the risks associated with flooding. Many are recruited, organised, equipped and trained by local authorities with assistance from the Agency. Very well informed Flood Wardens can give advice on simple protective measures which can be taken by householders in risk areas long before flooding is forecast. When flood warnings are issued they can double check to ensure they have been received by the target population and are being acted upon and they can take action on their own account if, from their local knowledge, they realise that some households are unoccupied or contain residents with special needs. They can also provide invaluable assistance after an event with advice and practical assistance.

It is believed the availability of flood warden schemes adds a quality and value to the service which cannot be replicated by formal information services. Older or infirm residents may be particularly reassured by the presence of a warden.

In some localities flood warden schemes are used as the prime means of disseminating warnings to the public, particularly in areas where short term residency is the norm and where householders are unlikely to have developed local knowledge of their own. Caravan Parks may therefore be prime locations for the development of warden schemes.

In Regions with a history of wardens (See Table 4.3 - Dissemination Methods Questionnaire), recruitment appears not to be as big an issue as other Regions. Regions without a history of wardens, or in areas where warden schemes have been

withdrawn or scaled down, recruitment can prove to be unsuccessful (NW Region could not find any volunteers for the Woolley Bridge Zone). In the Upper Trent Area of the Midlands Region Flood Wardens are leaving the current scheme in Staffordshire for the usual reasons (eg dying, moving etc) and it is becoming increasingly difficult to recruit new wardens. This appears to be because the AVM can effectively replace them so they have nothing to do except act as a back up system. Worries over possible negligence and litigation have also played a part in the reduction of Flood Wardens.

Reports suggest that Regions that use wardens have a good success rate of dissemination of Flood Warnings. The Flood Warning Project - Technology Sub Group Report of October 1995 suggests in fact sheet 3 "*(Flood Warden) Schemes work better in rural and middle class urban areas*".

Southern Region have developed a system where each AVM recipient is asked whether they are prepared to be a warden. Therefore the AVM alert system is backed up with wardens.

In many Regions Flood Warden schemes are operated and managed in conjunction with local authorities and the current situation is that only three Regions feel able to recruit new flood wardens. Only South West Region offer any form of financial reward for this service and the view from other Regions is that the prime motivator is community spirit. On average each warden warns about 10 people.

4.1.2.4 Sirens

Fixed sirens are used as a first line alerting system in some places. Many of the systems consist of ex-world war sirens, although in most cases the control mechanisms have been completely updated and in some localities, modern electronic sounders have been brought into use.

Sirens are usually owned, operated and maintained by local authorities.

BMRB surveys show that sirens appear to provide a comfort factor for the public, well beyond their real capability. Flooding is often accompanied by severe gales and other adverse weather conditions. These are the very conditions when most members of the public are likely to be found at home, behind double or even triple glazed windows, with heavy curtains and home entertainment in the form of television or music playing loudly.

The meaning of the siren note is also in doubt. In some localities they are sounded to advertise the fact that a red flood warning has been issued, the intention being that individuals should commence action to safeguard themselves and their properties. In others they are not sounded until flooding actually commences. In this guise they are intended as a final intimation of looming disaster.

Owing to the uncertainty of note penetration and the doubt about the meaning, siren systems have limited application as a credible alert system, but surveys show that the public rate them very highly. However, where they are of undoubted value is in open spaces such as parks and large gardens or even in caravan parks and

marinas where there are no other means of educating a transient public to local warning systems. They would be even more effective if they were backed up by strategically located notices and handbills for temporary residents explaining their meaning but even if these were not available or were not seen, the siren note in these localities should prompt individuals to be alert and to ask questions.

Sirens will alert the public within a zone but the public needs to be educated of what the siren means. People within Flood Risk areas need to be informed what the siren represents.

An important feature of having a siren system in place is the increased public awareness. The regular exercising and testing of the units provides a tangible reminder that the area is at risk of flooding and prompts the public to ask questions about the system in place.

It would appear that Sirens are used for Flood Warning in only four of the Agency's Regions namely, Anglian, North East, North West and South West. Nationally a total of 155 sirens are used and by far the most are in Anglian Region where there are over 135, nearly all of which are owned by local authorities who either activate them or in many cases allow this task to be undertaken by the police.

The capital cost of installing sirens is currently thought to be between £300 and £500 per site.

4.1.2.5 Loudspeaker Units

The Agency holds a number of sets of public address equipment or loudspeaker units at strategic locations within the Regions. The equipment is designed to be temporarily fitted to vehicles to deliver warning messages. The advantage of temporary fixing is that it allows the equipment to be used on any available vehicle. Messages can be broadcast from a microphone within the vehicle or by means of a pre recorded looped tape. Consequently there is a high degree of quality control over the message which is passed, but the operator is not precluded from making broadcasts if the situation changes whilst mobile.

The equipment is intended in some Regions to be used as a fail safe system. For example, the AVM produces a broadcast log showing which calls are successful and which are not. If it is recognised that small clusters of calls are not being successfully received, a public telephone line fault should be suspected and the loudspeaker is intended to be used to fill in such gaps in the dissemination process.

The equipment is also by some Regions to cover larger urban Areas where the maintenance of a AVM database would be too large and infrequently used.

It is also intended to use it where there are transient populations at risk and in areas where there is no formal flood warning service, but where a known flood risk of a temporary nature develops. A survey of all Agency Regions indicates that there are in excess of 100 loudhailer units held within the organisation for Flood Warning

purposes. Of these six are hand held units and the availability of units seems to vary from Region to Region.

Loudhailers can be deployed to Flood Risk Zones during an event if the transport system allows. A pre-recorded or live message can be played. This method is effective where the zone is concentrated geographically, but for a long rural reach could prove to be ineffective. Also Agency vehicles with loud hailer trained drivers need to be available. Current NW Regional policy is to deploy Loud hailers to zones that will reach amber level (resources permitting).

Loud hailers can be deployed (road system allowing) to areas not covered by other Alert systems. Loud Hailer Vans were deployed during a recent emergency in NW Region where a reservoir was in danger of being breached. The incident passed without flooding but the Loud hailer vans were on stand by.

In Central Area NW Region pre-planned route maps showing how to get to a zone, and the route to be followed in issuing warnings for various levels of warning have been produced. Thus even staff unfamiliar with the site can be sent out to issue an alert. However, if this procedure is adopted nationally then a review of the way loudhailers are currently deployed would be appropriate.

Current cost assessments indicate that the capital cost of vehicle mounted loudhailers is about £600 per loudhailer.

4.1.3 THE BROADCAST SYSTEM

Andy Baxendale's Dissemination Project Report states: *"A broadcast system of dissemination for property flood warnings transmitted regularly via Local Radio, TV, Ceefax, Teletext, AA Road watch and Met Office. Warnings affecting roads only will also be broadcast via AA Road watch."*

Appendix 3.5 of the same report goes on to say: *"Update warnings will be broadcast immediately when received, if requested by the E.A. interrupting programmes if necessary. The Radio Station will record the time an update warning is broadcast. This will be used after a flooding event to monitor the time delay from EA initiation of Warning to Radio Station Broadcast."*

4.1.3.1 Local Radio

Other than the very smallest, almost all local radio stations have been approached to provide a broadcast service for flood warnings. Some which close overnight remain open and on air throughout the period of risk to ensure that the public have timely and up to date information. Besides reading out warnings verbatim, the stations include associated news and human interest stories which gives very wide publicity to the threat of flooding and detailed local information which it would be difficult to disseminate in any other way.

4.1.3.2 Ceefax, Teletext, AA Roadwatch and Television / Met Office

Each of the above are informed of predicted flooding and each include the flood warnings in broadcasts to the public with varying degrees of success.

Table 4.2 Summary of Current Arrangements with TV stations

1.	Thames Fax warnings to Met Office and IWP and issue press releases during major flood event, but do not fax flood warnings direct to TV stations.
2.	Southern Do not fax flood warnings direct to TV stations, but do fax to Met Office and IWP. Issue press releases to all media when more than 2 ambers or 6 yellow warnings in force. Contacting weather presenters direct this year to aim to improve service.
3.	South West Established informal arrangements with Westcountry TV to broadcast warnings during TV news bulletins at the station's discretion. Plan to approach other TV station newsrooms direct this year. Also fax to Met Office.
4.	Wales Fax newsrooms and Met Office, but warnings usually only feature as a result of Agency press releases (same as many regions)
5.	North West Currently reviewing TV policy; warnings faxed to weather centres; press release major events, consider formal arrangements with TV news programmes would be difficult to achieve and favour improving service which weather presenters should be providing.
6.	North East Stopped paying Met Office fee but still issue warnings to regional weather centre and 10 major reds to London weather centre. Don't fax TV stations direct. Are in contact with BBC and IT to pursue improving coverage through local weather bulletins.
7.	Midlands Fax BBC and IT stations and have workable arrangement with Central TV via the Weather Department. All stations supplied with Floodcall logo to aid graphic presentation.
8.	Anglian Fax Met Office who transmit to BBC TV and Radio. Anglian Weather Centre (independent system) provides warnings to Anglia TV who have recently asked for messages to be faxed direct. Issue press releases during major events where there is a build up over several days.

A consistent pattern emerging is that the Met Office contract costing £1k per annum per Region, is not working satisfactorily. Very few warnings faxed through actually appear in any form during the local TV or Radio weather forecast, let alone with any direct reference to the Agency.

4.1.3.3 Role of the Police

Norfolk Constabulary have retained their role to pass on flood warning information to the public. They do this largely through a system of well trained and very experienced flood wardens. All other forces have opted out of their routine flood warning dissemination roles.

Most Police forces have agreed to attempt to issue warnings of flooding to the public in the event of major equipment failures in the Agency, subject to availability of patrol strengths and other pressures upon them at the time.

Nationally, the Home Office is the lead Government Department with responsibility for issuing information to the public in the event of a major disaster. It is planned to do so through the Police which is the only organisation with the spread of staff available and the communications infrastructure to be effective. Where a flooding disaster occurs or is anticipated in areas not covered by a flood warning dissemination service, it is expected that the Police will use their best endeavours to pass on warnings to the public. This procedure has been confirmed in many local authority areas and, where a county council exists, is included in those county council major disaster plans.

4.1.3.4 Floodcall

The Floodcall equipment is owned by Cable and Wireless but it is programmed and updated remotely over the telephone by Environment Agency staff.

Effectively it is a series of electronic voice boxes. When there is no threat of flooding, access to the system will play a recording saying there are no flood warnings for that area. When floods are predicted a voice recording is inserted in each individual box giving detailed information for the locality it relates to. Members of the public are encouraged to make use of Floodcall as a primary means of keeping themselves informed of the issue of flood warnings and the progress of flooding events.

Once flood warnings have been issued to the public it is equally important that they be cancelled once the risk has passed. This can be surprisingly difficult to achieve. Infrequent instances have occurred where radio stations have continued to give out flood warnings, even though they have been cancelled, but it is also known that once information reaches the public domain, it is passed on by word of mouth over fairly lengthy periods of time. To counteract this problem, interim messages are used on Floodcall to clarify that flood warnings for that area have been cancelled. This information remains on the system for some 24 hours before reverting to the standard message.

It is recognised that some individuals have difficulties with the operation of telephone keys to access information of this nature, despite being guided through the process by voice cues. Each individual box can be accessed directly by using a unique telephone number, known as QuickDial. All individuals who live in flood risk areas, where a flood warning service is provided, have been informed of the appropriate Quickdial number to access the information they require directly and easily.

4.2 IMPLICATIONS OF THE EASTER FLOODS AND BYE REPORT

4.2.1 ALERT SYSTEMS

4.2.1.1 Bye Report

From The Environment Agency Report to the Minister it states that "...71% (of messages sent by the AVM) were received. Upper Trent achieved 94% success rate for all warning messages (Yellow and Amber only)"

What the report fails to identify was the calls per hour performance of the AVM or the lead time the calls gave the recipients. This information is vital for effective review of the appropriateness of AVM.

During the Easter floods the AVM was operating at approx 600 calls per hour according to the Anglian Region representative at the recent AVM Managers meeting on 14th July 1998. One minute long messages were used and Anglian Region made 1400 calls. It was understood at the start of the Dissemination Project that with 30 lines the AVM should be able to make 1500 calls per hour. The slowness of the AVM may be due to the recent improvements in Version 2 of the AVM software.

The BYE report section 7.2 states: "*People temporarily in risk area include those at caravan sites and in boats. The Easter Flood tragically demonstrated the magnitude of the risks and the devastating effects on caravans and boats. Whilst the needs of these people are similar to those above for individuals living and working in the risk areas, greater emphasis should be placed on prior awareness and the effective communication of strongly worded warnings prompting a decision on rapid evacuation.*"

The BYE report Appendix D states:

- "10) For areas known to be at risk from main river flooding, achieving more connections to AVM and maintaining or introducing flood wardens, would seem the best course of action.
- 11) With regard to better alerting areas not previously thought to be at risk from main river flooding, such as large parts of Leamington, more reliable prior identification of flood prone land, possibly adopting alternative methods to those used presently, would seem the best course of action.
- 12) For defended areas where the defences are old and their integrity has been questioned, such as Northampton, the provision of direct warnings should be considered.
- 16) Public and emergency services need a better understanding of the role of the Agency in providing flood warnings in all situations and the relevance of flood defence development planning comments, maintenance and improvement works."

Since the Easter Floods Archie Robertson has stated that dissemination methods "*should be needs driven*". The Flood Warning Project - Technology Sub Group

Report of October 1995 contains twenty three fact sheets for Methods of Dissemination. However, implementation has tended to be technology driven with the AVM generally considered the preferred alert system in many Regions. The Easter Floods have now provided an opportunity to review the needs of those living in flood warning zones and to again consider the alternatives available for flood warning dissemination.

4.2.1.2 Use of AVM (Voice and Fax)

For a flood warning service to be effective it must be robust with all possible scenarios considered. The Alert systems must be simple and instructive to the population at risk. To rely on one alert system only may put the Agency in a vulnerable position. When considering Alert systems extreme weather must also be a factor taken into account; telephone lines may be down (AVM or similar), Power supplies may be down (sirens) therefore local generators may need to be considered, roads to areas at risk of flooding may not be passable (Loudhailer Vans), Risk to Life (flood wardens) so a holistic view to alerting the public must form part of any flood warning system.

The AVM is undoubtedly the Agency's current primary means of alerting the public to the risk of flooding. If this system is to remain effective improvements will be required.

Possible AVM improvements to be considered are:

- 1) More telephone lines in existing AVM
- 2) More AVM machines and telephone lines (existing specification) for new databases
- 3) Upgraded / New AVM machines (higher specification)

The performance of the AVM is under review following the Easter Floods. Its performance was far slower than most Agency staff expected and a test at Worthing will take place shortly to assess the effectiveness of the AVM. It needs to be noted that this test is not a National test of the system at the moment.

At present there are no national guidelines for setting up, maintaining and extensive testing of the AVM. If a full test was undertaken then benefits include: a performance check of AVM (during extreme events); education of the public to the AVM message; and collection of any data errors in system.

However, for the test to be successful public awareness and expectation need to be considered in detail prior to commencement. To avoid adverse impact each recipient or warden could be contacted by post prior to the test. This would involve Agency staff resources, and a fundamental point is will the public read the letter or treat it as junk mail.

Wide public advertising in the local or national media is one way of informing the public of tests, but this could lead to people requesting to be on the AVM system in areas where the Agency cannot provide a service. The costs of advertising would need to be assessed.

The cheapest cost option for the Agency is a "Cold Test". However, this could lead to public confusion, especially on second numbers and at places of work. Agency switchboards would need to be open for the duration of any test and adequate numbers of staff made available to take any calls. Also, switchboard staff would need training on standard answers for general questions.

John Neat has stated at the AVM Managers Meeting on 14 July 1998 that the AVM was introduced as "*best system available at the time*" (1995) and that future developments may not use the AVM in its current state. If the AVM is considered the best way forward then additional resource requirements for database administration need to be quantified and clearer guidance on management and testing of the AVM are required to ensure National consistency.

During the proposed tests at Worthing it is understood the following tests will be made:

- 1) On the existing set up (2 fax lines and 30 voice lines)
 - a) check the performance (calls per hour) for voice only
 - b) check the performance (calls per hour) voice and fax
- 2) On a proposed new set up (6 fax lines and 30 voice lines)
 - a) check the performance (calls per hour) for voice only
 - b) check the performance (calls per hour) voice and fax

Comprehensive results are expected sometime in August from Martin Whiting (Southern Region).

No one system is fool proof and therefore for the Agency to provide a robust alert system all alternatives need to be considered. A multi alert system will provide a more robust system.

4.2.1.3 Robustness of Alert Systems

Andy Baxendale's Dissemination Project Report states "*Property subject to Red or Amber Flood Warnings to have available at least one broadcast system and one alert system. In areas where no broadcast system is available two alert systems will be provided*".

The Alert of a Flood is considered the most important feature of flood warning dissemination. To provide one alert system only is not considered to be robust. A back up alert system needs to be in place. The main Alert system in current use across the country is the AVM. Each AVM database is backed up by another AVM database but the alert will not reach recipients if the telephone network has failed. It was reported at the AVM Managers meeting on 14th July that some telephone lines were felled during the Easter 1998 flood event. Secondary systems need to be considered when setting up flood risk zones for this type of eventuality.

The need for a secondary system to AVM is apparent for "mobile" recipients within Flood Risk Areas. This is supported in Section 7.2 of the Bye Report which demands effective communication for a decision on rapid evacuation for people temporarily in a risk area. As well as caravan parks it is important to remember that mobile recipients could be in commercial, retail, residential or recreational areas.

4.2.2 REVIEW OF BROADCAST SYSTEMS

The two main broadcast systems utilised by the Environment Agency are Floodcall and local radio stations. Other methods are currently available, but are dependent on either sufficient funding being available, political will or both. Examples of other systems include Television, Internet and possibly Digital Television.

4.2.2.1 Timeliness, Reliability and Coverage of Radio Broadcasts

Many of the local BBC radio stations revert to the BBC world service after 11pm so usually no broadcasts can be made about local flooding after this time. The Agency needs to know which stations these are as no reference is currently made to this in the local leaflets, so people could be listening to the "wrong" station.

In the experience of NW Region, some of the commercial stations do not broadcast the flood warnings promptly or thoroughly. This information has been gained by monitoring local radio broadcasts during flood events.

Results from the questionnaire show that none of the Agency's Regions follow (Andy Baxendale's Dissemination Project Report App A 3.5) nor any kind of follow up. Reports that the media perform well may well be the case but these cannot be justified from the information currently in the national arena.

The evidence available suggests that the Agency does not follow up faxes sent to Radio stations with a telephone call in most situations, therefore the Agency does not know whether a broadcast will be (or has been) made. This is especially relevant to silent hours faxes. Will the fax lay in a vacant office until morning? (similar problem to that of LA's).

National Radio Stations are not informed at present about local flooding so people who listen to these, who may not be property owners within a Flood Risk Area but are at risk from flooding, are not informed (caravan owners, people in cars etc). Also, the recent Easter Floods caused tailbacks on the motorway system outside the local radio's broadcast area. The motorists in the tailback were unaware of the cause. If broadcasts were extended to national radio stations many of the motorists could have cancelled journeys and much distress been avoided.

The Report to the Minister (by the Environment Agency) indicates a wide involvement by Radio stations but this table needs expanding to indicate how many Radio Stations were involved and the type of Radio Station ie commercial / BBC. This is important for silent hours events. Also, survey information is needed to see if during the Easter events people did tune into local radio stations following an alert.

4.2.2.2 Floodcall

Andy Baxendale's Dissemination Project Report states "*The Environment Agency will provide a telephone information service to manage feedback from the public.*"

This recorded message system will operate via an 0990 telephone number will enable the public to find out details of flood warnings in force for their area."

The Environment Agency's Easter Report to Ministers (Section 5.2.2) states that the effectiveness of Floodcall is to be evaluated. Once the results of this study are available they are expected to provide the way forward for the use of Floodcall.

4.2.2.3 Review of Television and Met Office Services

The National Flood Warning Public Awareness Group has produced a review of television and Met Office Services in June 4, 1998 for the National Flood Warning Implementation Team (NFWIT).

4.2.3 New Systems

4.2.3.1 Terrestrial TV Messaging.

From the BMRB 1998 survey "Prompted awareness of flood warning methods" for people in the "At Risk Sample" local TV response was at 49% (AVM 23%). The public perception is that warnings will be issued by TV but this is the only medium that the Agency does not use effectively in the seven Agency Regions in England. Welsh Region are understood to issue warnings on TV which is a text band that appears at the bottom of the screen. The message is sent using the terrestrial system which is received by every TV not just those at Risk.

Although a broadcast system, terrestrial TV could be used as an "Alert" system at present. The Text band message could read "The Environment Agency has issued flood warnings for some areas in NW Region - details of which are on teletext page 105". This type of message could alert at risk people whilst not generating undue alarm. The teletext message then contains "BROADCAST" information. Unfortunately there are limitations to this method as the television needs to be turned on for it to be effective.

4.2.3.2 Digital TV Messaging

With the onset of digital television flood warning messages can be targeted to at risk properties only according to postcode. The message will be a text message that would appear on the recipients screen. TV's turned off using stand-by can be activated to come on and display messages. As well as "Alert" messages the system could disseminate "Broadcast" information. Messages can be activated by the Agency plotting an area on a digital map and sending this to the digital TV control which will then broadcast the message.

The Environment Agency first became aware of the possibilities of using Digital TV for disseminating flood warnings at the beginning of the dissemination project in 1995/6.

Other parties are interested in Digital TV to disseminate warnings and these include the Home Office and the Police.

4.2.3.3 Public Warning and Information by Telephone (PWIT)

Following the end of the cold war the government ceased funding the national siren system in 1992. PWIT has been proposed to provide a national warning system for all organisations who may be involved in incidents and emergencies which require warning of the public eg Emergency Services, Local Authorities etc.

The system is similar to the Agency's AVM although the telephone number database will contain all telephone numbers including ex directory and cable. Messages will be activated by the user (eg Agency) and the flexibility of the system allows random zones to be identified, thereby making it possible to capture extreme flood events. The system can also be used for other incidents that the Agency may be involved in e.g. Pollution incidents.

Initial reports indicate that the system will perform at approximately 12000 one minute calls per hour. The PWIT system will be provided by a telephone company (e.g. BT) who have the capability to divert non emergency calls away from the incident area and therefore maintain the performance of the telephone network.

There are no technical problems with the Public Warning and Information by Telephone (PWIT) system. However, legalities and regulations need to be overcome before PWIT can be instigated. A steering group has been set up which reports to the Home Office. David Moses of Hertfordshire CC is chair of the group. Dale Enyon (Emergency Planning - HQ) is the Agency's representative on this group.

The problems that need to be overcome before PWIT can be implemented include:

- OFTEL need to ensure that competition between telephone companies exists. However it appears that it would not be practical for more than one supplier to invest capital in providing the service.
- The supply of equipment will need to be in accordance with European Competition Laws.
- The system will need to comply with the Data Protection Act.
- The Home Office will need to approve the system.

The PWIT system will not be available until the above difficulties are overcome. Initial reports suggest that this may take 3 to 5 years.

The cost of the above system will be shared across all users, therefore a high take up will be required for the system to be cost effective and therefore feasible. The use of the system will be charged at local rate ie currently 4.2p per call.

Tallis Consultancy of British Telecom (0800) 567287, would be keen to supply the service when the above problems are overcome.

An alternative system to PWIT can be provided by private data collection Agencies.

4.2.3.4 Experian

Experian is a data collection company and they are already employed by the Environment Agency to collect address details for properties within the flood plain for Section 105 purposes.

Experian is a subsidiary of GUS (Great Universal Stores) and have access to the telephone operator network that GUS use for home shopping.

Experian can collect over 80% of all telephone numbers (including ex directory) within every flood risk area (including defended areas and coastal areas) and issue flood warnings on behalf of the Agency using a telephone operator system. Other companies that have used the operator service offered by Experian include British Gas and Boots Chemist.

The database of telephone numbers is live and therefore any changes are easily identified.

The collection and use of the telephone numbers for emergency purposes only is in accordance with the Data Protection Act.

The at risk areas will need to be previously identified by the Agency. These areas can be subdivided in any way the Agency chooses. Experian can further divide areas by demographic profile.

Message content will need to be agreed in advance. Different messages can be assigned to different groups. Messages can be further sub divided into demographic profiles. For example a different message can be given to industrial, commercial and residential recipients. Messages can be divided again by demography - ie Bungalow owners can have a different message than two storey houses; areas with high proportion of elderly people can have a different message than areas with young families. Using operators as opposed to pre recorded messages has the advantage that the Agency can be satisfied that the recipient understands the message (and that the message is delivered to a competent adult).

The message will be delivered by trained operators and can therefore be developed to include "Broadcast" information for protecting property. Another advantage that using an operator service allows for survey information to be collected when the message is delivered. This will help the Agency to review and develop the Agency's Flood Warning Service.

Initial reports suggest that Insurance companies may wish to partner the Agency and put added value to the messages. As part of the message script each property's insurance company can be easily identified (supplied to Experian by the insurance company and attached to the property address and telephone number). Recipients can then be advised of contact numbers for their insurance company. The

insurance company can then react more quickly to flood events. It is also believed that Insurance companies may be willing to part fund the warning service.

Experian can offer a total capacity of 25000 one minute calls per hour. This is far greater than the 1500 calls per hour that the AVM is capable of. Calls can be prioritised and unsuccessful calls are automatically re-queued until answered. All calls can be logged as well as recorded.

The service will be organised on a national scale and will therefore offer the Agency National consistency. The service can be activated at a local level.

The service can be offered for 365 days a year, 24 hours a day.

The cost will be divided into: initial set up costs (some of these can be spread over the term of the contract); database management and the number of calls made. Experian would also accept Target Price Contracting, where profits are shared, a Fixed Price Contract or a Measurement Contract.

Experian are keen to expand into Home Shopping by digital TV in the near future. They will be then be able to offer a service similar to Digital TV Messaging as outlined above.

Alternative suppliers to Experian are available on the market to allow competition to take place.

Table 4.3 Advantages and disadvantages of alternative telephone Alert Systems such as PWIT & Experian

Advantages	Disadvantages
<ul style="list-style-type: none"> Increased poll rate (could lead to increased message length and change from Alert to Alert AND Broadcast) The Alert will be from an operator as opposed to a recorded message. This is seen as adding value to the message. Agency resources on AVM database management freed. The amount of Agency resources required to maintain the AVM database may have been under estimated in the initial PID. It was reported at the AVM system managers meeting (14/7/98) that about 15 to 20% of telephone numbers change in an area each year. It is very time consuming to pick up these changes. A supplier would deal with all the above under a new system. The Agency would be able to manage the flood warning system with much greater consistency 	<ul style="list-style-type: none"> The Agency would not have direct control over the database. Agency will not have direct control over the calling system. However this is similar to Regions who currently use Surefax to disseminate fax's. The Regions who use Surefax have reported that the system works well. The Agency may not have "consent" of recipients to call them. This may be a problem even if the system will only be used for emergencies. For specific sites properties can be informed that this system may operate. Contractual considerations with Kingston.

4.3 SUMMARY OF RECOMMENDATIONS

- Recommendation 4.1** The current usage of the AVM should be subject to a general review. In particular:
- a) The saturation point of each AVM database needs to be calculated prior to any AVM expansion. Lead times for warnings needs to be taken into account for a Region wide event.
 - b) The use of the AVM as FAX system. The current status of the system as a Best Interim Solution for FAX should be reconsidered.
 - c) Regular Testing of the system at least once a year. The entire database to be queued on each AVM and sent with a test message.
 - d) If AVM is to continue to be used as the primary Alert system then the Agency should investigate the possibility of getting telephone numbers from BT etc instead of home owners direct (in agreement with the Home Office and Ofel with respect to the Data Protection Act.)
- Recommendation 4.2** Each AVM recipient should be asked whether they are prepared to be a warden. This could be added to all contact letters nationally.
- Recommendation 4.3** The AVM is most effective as a primary alert where a limited number of recipients need to be contacted quickly. Where the number of recipients is large or for sites with a mobile population such as caravan parks and recreational areas, consideration should be given to other methods of alert e.g Sirens, or Loudhailers. Existing warnings should be reviewed to determine whether AVM is the most appropriate alert method.
- Recommendation 4.4** The Agency must investigate and fully review the performance of radio stations and the publics use of broadcast information during the Easter event before the system is effectively widened.
- Recommendation 4.5** Review, Update and re-issue the fact sheets from the "Implementation of Technology Report" in light of their success since 1995.
- Recommendation 4.6** A detailed investigation of alternative telephone systems needs to be undertaken. This should include:
- 1. Quality assurance of using an outside supplier.
 - 2. Added value of using operators as opposed to recorded message

3. A full cost benefit analysis including AVM capacity, annual administration cost of AVM database and future Agency resources to increase AVM use against the cost of using an outside supplier.
4. Willingness of Insurance Companies to part fund operator system.

Table 4.4 Dissemination Methods Questionnaire

Region	North West			North East			Midlands			Wales			Anglian			Thames	Southern	South West	
	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central				Eastern
Respondents	Martin Wilson	Alex Cornish	Mike Fraser	Paul Dodds	Ooug Whitfield	Bryan Nelson	Russell Dutton	Mark Swain	Kevin Rogers	Dave Norman	Melc Davies	Steve Taylor	Andy Irving	Itoland Crighton	Bryony May	Mike Steen	Joanne Hirst	Russell Turner	Linda Aucott
1 Do you have a primary alert system?	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
2 What is your primary alert system?	AVM	AVM	PA covers the largest zone and the majority of recipients, but the AVM is used for the majority of the zones.	AVM & Foxax Loud	AVM, Sirens, Loud Hailers	AVM, PA, Warden	AVM	AVM	AVM and Flood Wardens	AVM and Flood Wardens	AVM	AVM	AVM	AVM	AVM	AVM	Flood Wardens direct via telephone	AVM	AVM/PA Sirens
3 Is this system backed up with another system?	Yes, Loud Hailers and 1 Siren	Yes, Loud Hailers	Yes - manual dial and public. Where AVM deployed PA used as well	Yes paper copy? Use Loud Hailers	Loud Hailers if AVM and Siren fail	There are contingency plans	The information on the AVM is also stored on two other AVMs on at the Regional office and one at an Area office. They also have Wardens and Loud Hailers	The information on the AVM is also stored on two other AVMs on at the Regional office and one at an Area office. They also have Wardens and Loud Hailers	The information on the AVM is also stored on two other AVMs on at the Regional office and one at an Area office. They also have Wardens and Loud Hailers	The information on the AVM is also stored on two other AVMs on at the Regional office and one at an Area office. They also have Wardens and Loud Hailers	The system is backed up on a weekly basis via the Engine, it is also copied onto the other two area offices AVM in the region.	It is backed up at the other area offices in the region and a paper copy is kept at hand	It is backed up at the other area offices in the region and a paper copy is kept at hand	Loud Hailers and in places are used (Lincolnshire coast)	There are Loud Hailers but there are no formal procedures for using them.	The database is held on 3 other AVMs in this region which can be remotely accessed. Also an agreement with police that if all else fails they will send out cars and a helicopter to warn areas. And there also the EA loud hailers.	All Flood Wardens and Direct recipients of warnings are backed up on the AVM	Backed up independently at region on AVM and 1 at the area	Yes
For the AVM In your Area / Region																			
4 Total number of recipients numbers on database (including 2nd numbers)	4978	3800	350	Under 1000	1800	1200	320	800	Currently 250 mainly Flood Wardens and Local Authorities Etc. This number is expected to increase significantly.	350	There are approximately 1,700.	950	700	1468	200	2510	1500	3750	2500

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Region	North West			North East			Midlands				Wales			Anglian			Thames	Southern	South West	
	Area	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central				Eastern
5	Percentage Recipients on AVM (where AVM is the main system)	77%	70%	57%	7	80%	Between 60% - 80%		80%	10%, due to their system, they have just done a mail shot and only 33% have replied so far.		Between 65% and 70%	2.5%	18%	Variable	?	100%	AVM is not the main system, however, 100% of direct recipients are on the AVM	8%	80%
6	Database administration - How is the database kept up to date?	By the Flood Warning Officer	By the Flood Warning Officer	Re-leaflet every zone every 2 years. AVM data stored on Access and then loaded onto AVM	By the Flood Warning Officer	Directly onto AVM		Done via mailshot	ACCESS remotely transferred	ACCESS remotely transferred	ACCESS remotely transferred	Area Flood warning Officer	By manager with paper record	By manager: Signed recipient contact sheets updated annually drive the database records	Immediately updated when a request comes in and changed via Access	This is being reviewed but is currently done straight on to the AVM	Post event checks on unobtainable numbers. Initial letter is followed by a recorded delivery letter and if no answer they are struck off.	As and when required by the system manager	Done in ACCESS and then imported	1 Full Time equivalent
7	When was the last recipient poll made?	Dec 1997	Autumn 1997	Woolfen Bridge 3/98 and Leigh 7/98	July 1997	July 1997	July 1997	September 1997	September 1997	September 1997, But the Local Authorities tend to update the EA when there is a change anyway.	There is one planned in a couple of weeks and the last was 2 years ago	Spring 1998	August 1997	Commenced 3rd August 1998	September/October 1997. Non replies chased up in Jan 1998	1996	Have not felt able because of the resources implications, but will do if they get time and resources.	August 1997	September 1997	Doing it now
8	How successful was the return?	Went up from 60% to 77%	12%. From 58% to 70%	Poor - Approximately 25 - 30%	7	Approximately 80%	Very Successful	50% return rate	Not Known, Mark Swain was not there when the last pote was carried out	?	25% success		Successful with the right resources available but not from an overall perspective	Waiting responses	Very	High Approximately 70%	N/A	Very Successful	3%	Not known yet

Region	North West			North East			Midlands				Wales			Anglian			Thames	Southern	South West
Area	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central	Eastern			
9 Is this annual/biannual?	Annual at minute, but probably biannual from now on.	Annual in first year biannual thereafter.	Biannual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual	Annual. Previously undertaken by mailshot. Due to poor uptake a more proactive stance now being taken. This involves knocking on doors and "selling" the service to our customers.	Annual	A strategy on this is still being developed	N/A	Annual	Annual	Annual
10 How are no returns administered?	No Change	No change	Assume details still correct	Followed up until satisfied	Assume no change	Follow up with 4 letters - then struck off	Originally No change, but they are now considering a follow up procedure until satisfied	No change	No change due to the nature of the system this is not a major problem.	No change	Followed up until satisfied	Followed up until satisfied	Followed up until confirmation of customer requirements/non requirements satisfied	Followed up until satisfied	They are followed up by letter and if still no reply then left.	Post event checks on unobtainable numbers. Initial letter is followed by a recorded delivery letter and if no answer they are struck off.	Followed up by a phone call	Remained	Followed up until satisfied
11 Staff time involved with database management	300 hours	1 Full time equivalent for 5 months	15 to 20%	20% of 1 Full time equivalent	Approximately .5 to 1 Full Time equivalent	0.5 of Full Time Equivalent	1 Full Time Equivalent for 25% of year	10% of 1 Full time equivalent	400 hours	5 hours per week	0.5 Full time equivalent	40 days per year	0.5 Full time equivalent	5% of 1 Full Time Equivalent	?	20% of 1 Full Time Equivalent	2 hours per week	0.5 Full Time Equivalent	1 Full Time equivalent
12 Do you use wardens?	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Not officially, as they are owned by Lincolnshire Emergency Planning (LEP), whom the EA warn and then they inform the wardens. Wardens are also on AVM	Yes	No	Yes	Yes	Yes, there are 2 bailiffs and they shut gates, feed information back and if needs be use loud trailer

Region	North West			North East			Midlands				Wales			Anglian			Thames	Southern	South West
Area	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central	Eastern			
13 If not why not?	Historical	Not tried, but there is a perceived lack of interest.	Lack of interest from public	Historical and legal problems	Historical and doubts about liability						Historical		Historical	Investigating future areas where a warden scheme may be successful.		Legal and insurance implications. The resources required to manage them, no sites found where they would perform better than the AVM.			Historical, resources and not really appropriate to the area
14 How were they recruited?						They approached the EA	Existed before EA took over warning duties	Not sure	They are recruited by Local Authorities and in one case the NFU.	Local Authority		Historical police		In Lincolnshire via LEP	Currently recruiting for more zones by going to Parish and town councils		Local liaison with members of the public living in flood risk areas.	Some were inherited. A new scheme has been implemented, whereby residents are asked on back of form as to whether they want to be wardens.	?
15 Do they have deputy cover?						Yes	Yes	No	Yes	Yes		No		Yes	Yes		Yes	Yes	Yes
16 Can you recruit for new zones?						No	No, to difficult to recruit new people	No	Not considered so far because of lack of resources.	Yes		Not actively pursuing recruits due to problems with current wardens		High Possibility	Yes		Yes	Yes	No
17 What type of community?						Hamlet	Predominantly rural	Holiday Home site	Mixture of urban and rural and social class	Rural		Farmers - rural		In Lincolnshire, wardens are used for coastal warnings.	Rural villages		All types of community	Mixture	1 is in a rural village, and the other is coastal
18 How many people do they warn?						10	12 each	22	1500	10 per warden. Total 120 properties.		200, and there are 20 wardens i.e. about 10 persons per warden.		In Lincolnshire in excess of 400.	?		Varies. But the average is about 20 people. The max is 100.	There are 30 wardens and warn on average 10 people.	The one in the rural village warns 10 properties, the other does not warn.
19 What equipment are they given?						No	None	None	None	None		None		Torches, surcoats and Identity cards.	None		None	None	Non

Region	North West			North East			Midlands				Wales			Anglian			Thames	Southern	South West
Area	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central	Eastern			
20 How often do you meet with flood wardens?						Not regular - liaison once a year or as required (after an event)	Annually	Talk every 3 months	When Local Authorities request a meeting			Biannually		At least twice a year	Met once in 1996. But are now looking to communicate more frequently esp. new zones		Annually, more often with key wardens		Monthly
21 How are they rewarded?						No	None	None	None	None		None		No - community spirited	None		Volunteer	None	£200 pa
22 Approximate cost						No	None	None	No cost to EA. Local Authority administrative costs not known.	None		None		Minimal	None		None	None	£400 pa
Sirens																			
23 Do you warn by sirens?	Yes in 1 zone	No	No	No	Yes at three locations	No	No	No	No	No	No	No	No	Yes	There is a siren system in place	No	No	No	Yes at 2 locations
24 Where they inherited or new?	Inherited				Inherited									Agency sirens inherited from Fensland District Council	N/A				1 was new
25 Who owns them?	Either Fire station or County Council				Local Authority, but EA maintain them									Sirens in Lincolnshire owned and operated by LEP. Sirens in Wisbech owned by EA and operated by LEP	Norfolk Police				EA
26 How are they activated?	Via the police				Regional telemetry									Via Linc CC	EA warn Police who in turn decide if areas are to be warned.				Telemetry
27 How many people are warned?	170 properties, not all are on the AVM				Approximately 2000 properties									Upward of 25000	3000				120 at one site 50 at other
28 Annual cost of sirens?	Nothing				£1000									Not Known	N/A				£2000 pa each

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Region	North West			North East			Midlands				Wales			Anglian			Thames	Southern	South West
Area	North	Central	South	Northumbria	Ridings	Dales	Upper Trent	Lower Trent	Upper Severn	Lower Severn	Northern	South East	South West	Northern	Central	Eastern			
29 Do you use loud hailers as a primary alert?	No	No	Yes	No	Yes	Yes	No	No	They have done once and in the area they are now trying to get people on the AVN.	No	Yes	Yes	Yes in large conurbations	No	No	No	No	Yes	Used for major incidents - key alert system. But unhappy with them
30 How many people do they warn (per zone and total)			2500		4 zones total = 7300 properties	Large urban area Pop. = 2 - 5000			Estimated 100		Approximately 650.	30000	2500 people at 3 sites		N/A	N/A		Two sites total 12717	Work is now being conducted to find it out but potentially 10,000
31 Do you use Loud hailers as a secondary alert?	Yes	Yes	Yes	No	Not formally	Yes	Yes	Yes	Possibly for extreme events in urban areas	No	No	Yes as a back up	Possibly	Possibly	No formal procedures, but could be done on an ad hoc basis	N/A	No	Yes	Yes
32 How many people do they warn?	Potentially 2831, if AVN fails	Potentially 3800, realistically 1000	350	Still developing as the equipment has just been purchased	None		The size of the biggest zone is 10000 - 20000. And	Potentially 30000 at Nottingham	500-700 at a number of urban locations			950		Biggest catchment 2500	Unknown	N/A		20000	As backup it can cover up to 5000
33 How many loud hailers do you have?	2	2	8	3	5 vehicle mounted and 6 hand held	15	1	2	2			Not sure but every EA vehicle has one and there are 2 mobile units	8	8	8	N/A		10	20
34 Cost per loud hailer?	Brought before his time	£500		Under £1000 each	Hand held £90		?	?	£500			?	£500	Unknown	?	N/A		£500	Total £8000 - brought via National Contract
35 Are they on Agency vehicles?	Can go on any vehicle	Can go on any vehicle	Mainly on lease vehicles - some Agency vehicles	Currently on Operations vehicles but are dismountable	Yes	Yes, but can go on any vehicle. Plus there is one hand held	Can go on any vehicle	Can go on any vehicle	Can go on any vehicle, but more than likely go on a badged land rover		Yes	Yes	Can go on any vehicle	Can go on any vehicle	Can go on any vehicle	N/A		Can go on any vehicle	Can go on any vehicle
* The figures in this row are not exact as they are constrained by time and resources and so are a best guess. In some areas exact numbers were not known and so they quoted the population living within the largest zone.																			
They fully appreciate the fact that they could not warn this number using loud hailers but offered it as a starting figure.																			

5 MODEL DISSEMINATION PLAN

5.1 REVIEW OF CURRENT SITUATION

5.1.1 Flood Warning Dissemination Plans

5.1.1.1 Format

Flood Warning Dissemination Plans (FWDP's) are in place in all regions and all conform to the same basic format. The template for the current dissemination plan is based on the plan first developed in Wales and revised in June 1997 (Copy in Appendix 5). The plan outlines the roles of the various participating Authorities, gives general information about the Flood Warning and Dissemination process, defines the area covered by the plan and then details the flood warning dissemination arrangements at specific locations, including maps indicating the areas known to be at risk of flooding.

The June 1997 template is used by all regions except Anglian Region who are still using the original version of the template. The text and general layout of the template is amended and/or added to, to reflect local arrangements and knowledge. However, there is no existing standard for the production of the flood risk area maps contained within the plans. Therefore the appearance, layout and scale etc. of these maps vary from area to area as well as between regions.

5.1.1.2 Document Control and Quality Assurance

Document Control and Quality Assurance are two distinct activities. Document Control is the process required to keep track of "controlled" documents to ensure that the copy owners always have an up to date version of the document. Quality Assurance, on the other hand, is a checking procedure to ensure that the contents of the document are correct and that the person responsible for the document is satisfied with the content and is prepared to authorise it for issue.

The FWDP template uses Document Control procedures based on the NRA Northumbria and Yorkshire Region "Code of Practice for Controlled Documents" (Edition 2, 30/10/95) which is based upon Quality Assurance Standard BS5750. All regions appear to be implementing the document control procedures as designed for the template.

Each FWDP is assigned an owner who is responsible for authorising editing and amendments to the plan. The owner is often the Area Flood Defence and Water Resources Manager, although this does depend on each Region's organisation for Flood Warning.

With respect to Quality Assurance of the FWDP contents there are currently no documented Quality Assurance procedures, although it may be assumed that the owner of the document must be satisfied before he will allow its issue.

5.1.1.3 Distribution

The FWDP's are not widely available in the public domain. The master document is generally held at the appropriate Area or Regional office and may be viewed by the public at these locations. The evidence is that few (if any) members of the public have visited the Agency offices to view the plans.

Copies of the plans are issued to the relevant Local Authorities and Police force. The holders of the documents tend to be Emergency Planning Officers, Chief Executives and Chief Constables.

5.1.1.4 Links to Local Authority and Police Procedures and Major Incident Plans

Liaison arrangements with Local Authorities and Police forces and the links to Operational Response Plans and Major Incident Plans are detailed within the FWDP's. The Dissemination plans themselves do not include trigger levels for the definition of a major incident since this is an operational decision taken by the relevant LA and/or Police Force.

The FWDP's do not (and were never intended to) detail the operational response and duties of the different organisations during a major flood incident. However, the FWDP's do refer to each individual organisations Incident Plans and procedures which are triggered by each organisation independently.

Major Flooding Incident Plans are being drawn up in South West Region for urban areas prone to flooding e.g Salisbury. The Major Incident Plan for Salisbury differs from the FWDP in that it specifies the operational responsibilities and agreed actions of the relevant organisations rather than just detailing the Flood Warning Dissemination means and procedures. The Major Incident Plan is activated when a Red-Major Flood Warning is issued by the Environment Agency or if the Local Authority or Police Force consider it wise to do so.

North West Region have plans in place called Operation Albion for fluvial events and Operation Neptune for tidal events. These are similar to the South West's Major Incident Plans in that they set out the operational responsibilities and agreed actions of the relevant organisations for a major flood incident but on a county basis rather than for specific urban areas. The documents were developed in the early 1980's and are owned and managed by the Emergency Planning Units of the counties involved.

5.1.2 The Use of Colour Coded Flood Warnings

5.1.2.1 Current Agency Practice

Internal detailed guidance on the use of Yellow, Amber and Red colour coded warnings was included in the "Flood Warning Dissemination Project Report, February 1996".

The colour coded flood warnings are widely used throughout the Agency although there is some inconsistency in their application e.g. Yellow warnings are used in

some locations as an operational standby alert for Local Authorities and Police rather than as notification of flooding to low lying areas.

The BMRB National Awareness and Post Event surveys indicate that there is fair public recognition of the colour coded system but poor understanding of what each colour meant. The general public perception is that each colour is an indicator of the likelihood/risk of flooding or its imminence, rather than the extent of flooding expected.

The majority of those questioned in the At Risk survey had a good understanding that a Red warning indicates a significant event, although the exact action it should prompt is not clearly understood. The Yellow warning would appear to be less well understood but this may not be important if the sample surveyed are not targeted to receive yellow warnings. What is important is that those who are affected by Yellow and Amber flood warnings understand the consequence to themselves when they receive this warning.

It is interesting to note that the BMRB survey found that 71% of those who already had a copy of the Flood Warning leaflet understood the colour coded system. This statistic would seem to suggest that education and publicity is effective in improving understanding.

5.1.2.2 Australian practice

In the publication "Flood Warning: An Australian Guide" clear guidance is given on the design of flood warning messages. The guide suggests that:

"... many warnings fail to generate any feelings or interest at all. The message should therefore contain wording which is designed to motivate or arouse."

"The message should describe the flood, say what is expected to happen and indicate how people should act."

"Warning messages should use plain language and avoid technical terms and jargon."

"Warnings and bulletins should make use of word pictures which look towards the likely impacts of the flood in the future as well as identifying what has already happened. Where uncertainty exists about likely effects, it should be noted within the message."

In Australian practice the terms "minor", "moderate" and "major" are used as equivalent to "yellow", "amber" and "red". However, these terms are supplemented by the use of a word picture which describes what the flood will look like, with an emphasis on the likely impact as it relates to people. For example,

"Major flooding is expected by Thursday midday. Houses in A and B streets will be inundated, river flats between X and Y will be flooded and the Z bridge across the river will be closed."

5.1.3 Flood Warning Alert and Broadcast Systems

5.1.3.1 Previous Reviews

A "Review of National Implementation" of the Flood Warning Dissemination Project was undertaken in November 1996 by J B Chatterton and Associates. This compared how each region had implemented the various elements of the project (FWDP's, AVM, Floodcall) and made recommendations for improving consistency and standardisation. Many of the recommendations have been implemented but it is clear there is still considerable scope for improving the consistency and standards of the various outputs.

The recommendations made regarding the FWDP's were addressed by the Dissemination Plan Sub Group which was set up by the National Flood Warning Implementation Team. The sub group implemented the majority of the recommendations which resulted in the revised June 1997 FWDP template. The main outstanding recommendation is for the standardisation of maps included in the FWDP's. The sub group also recognised that the recommendations made in the review regarding emergency response issues should not be addressed within the FWDP's and recommended that:

"Emergency or Incident Response Plans need to be developed by Regions, where they don't exist, to address these concerns. The template is now more focused on dissemination alone."

The Chatterton Review considered the use of the AVM both in terms of the actual message content and the management/use of the system. It was as a result of this review that the first tranche of recently completed system enhancements were instigated. In addition a review of the AVM fax facility is currently underway.

With respect to the voice message content the review recommends:

"There should, however, be a standard in the consistency of the base information given, ie river, colour code, reach/zone location, Floodcall number, radio station, and acknowledgement. This standard varies across Regions."

With respect to Fax message content the review recommends:

"Regions should ensure that fax messages should include the following basic information:

- Agency logo address and telephone number*
- Colour code and forecast*
- General flood locations and where available, more specific details*
- Reference to Floodcall*
- Fax reference number"*

As a result of the Chatterton Review improvements have also been made to the Floodcall system, notably a revised system script and improved call statistics monitoring.

5.1.3.2 Current Agency Practice

5.1.3.2.1 Automatic Voice Message (AVM) Scripts

There is currently no national standard for the contents of AVM voice scripts, although some guidance was given in the Flood Warning Dissemination Project Report.

Thames Region do not at present use the AVM for dissemination of Voice messages. Instead the AVM is used to disseminate fax warnings to the media only and personal telephone calls are made direct to flood wardens.

All other Regions disseminate voice warnings via the AVM and there is a degree of commonality in the content of the scripts, and some notable exceptions. All Regions except Anglian and North West include the colour code. Other information included in the message is the Floodcall number (Wales and North East also include the QuickDial code), the area affected and some acknowledgement instructions. The message is either repeated sentence by sentence or in its entirety. In Wales the message can last up to two minutes because the message is also repeated in Welsh and because more specific flood information is provided, such as anticipated levels and flood locations.

5.1.3.2.2 Flood Warning Fax Formats

Guidance and example fax formats were contained in the Flood Warning Dissemination Project Report. However the appearance and contents of the faxes vary greatly between Regions depending on the method of fax distribution. The appearance of faxes issued via fax agencies are considerably different to those issued directly from within the Environment Agency by the AVM or other means.

A standard fax is currently being developed for national use for the issue of warnings to Teletext and Ceefax.

5.1.3.2.3 Floodcall Scripts

The Floodcall system script is specified centrally and is therefore not subject to Regional variation. The actual Flood Warning message is recorded live at the appropriate Flood Warning centre during the event by reading from a Region/Area specific script to which can be added any local information and/or details regarding the scale and timing of the event, and specific locations likely to be affected by the flood. This information will vary dependant on local knowledge, information and Flood Forecasting arrangements.

A Draft Floodcall User Guide exists and has been adopted by a number of Regions. This guide includes the minimum information to include on a Floodcall message.

5.2 IMPLICATIONS OF THE EASTER FLOODS

5.2.1 Issues Raised in the Preliminary Report by the Independent Review Team

5.2.1.1 Documentation

In addition to FWDP's, there are several other procedural and operational documents used in providing the Flood Warning service. Each Region has its own procedures for Flood Forecasting, Flood Warning and Flood Operations or Response. The format of the procedures and documents are necessarily different in order to reflect the differences in approach and organisation to flood forecasting and warning activities, for example whether flood warnings are issued from Regional or Area Offices.

Specific areas of concern raised by the Independent Review in respect of Flood Warning documentation include:

- lack of Documented Quality Assurance procedures
- Inconsistency of document presentation between Regions
- Documentation would benefit from simplification

With particular reference to the FWDP's the Report states "*some maps and descriptions are inadequate for describing the flood risk areas.*" This was certainly the case in Leamington where flood levels far exceeded all previous recorded events. The maps contained in the FWDP are based upon historic information which was the best information available at the time.

The degree of document control and quality assurance applied to Flood Warning Procedural and Operational manuals varies from Region to Region. Although all regions have some form of document control in place, Quality Assurance tends to be undertaken on an Ad-hoc basis and is not necessarily recorded. Both North East and South West Regions employ structured Document Control and QA procedures which entails recording of the checks undertaken and authorisation by the document owner.

5.2.1.2 Links to Local Authority and Police Procedures and Major Incident Plans

Flood Warnings at Easter were disseminated in accordance with the methods described in the FWDP's and therefore the plans must be considered to have been a success in this respect. However, the value of the FWDP's to the Agency and the other organisations involved at Easter has not been ascertained. Whether the plans were referred to as a "working" document during the event is doubtful since they are not operational plans but simply a means of recording how and to whom flood warnings are to be disseminated.

The Agency, Local Authorities and Police all have their own generic operational procedures for dealing with major incidents. The triggering of these procedures is determined by each individual organisation which can result in differing responses for the same event. For example, a major incident was declared by West Mercia

Police in Hereford and Worcester but in Warwickshire, where the impact of the floods was greater, the Police did not declare a major incident.

The Preliminary Report states that " *It appears that there were some serious failures in relation to interfacing and co-operation*". The input that the Agency has into other organisations plans with respect to flooding is unclear and there may be more scope for coordination of joint effort, sharing of information and definition of roles during a major flood incident. In order to prevent disparity of approach, a national lead would be necessary.

The Easter Flood Event was an exceptional event. River levels in many locations far exceeded any previous records and areas not previously thought to be at risk were flooded. The procedures and plans in place seem to have worked well until the event escalated into a major incident. In some locations this transition was so rapid that events overtook the plans and procedures. Despite this the Agency responded well and have received commendations for their efforts.

5.3 RECOMMENDATIONS

5.3.1 Flood Warning Documentation

5.3.1.1 Format

Recommendation 5.1 Existing FWDP to be audited by use of a checklist and by comparison to the June 1997 model and then modify to suit minimum requirements.

A draft Check List is included as Appendix 4.1. The June 1997 Model Dissemination Plan is included as Appendix 4.2

Recommendation 5.2 Review June 1997 model FWDP template. The primary issues here are consistency and simplification of presentation. Check the text against Plain English standards.

Recommendation 5.3 Produce a template and guidelines for flood risk maps contained in FWDP's based on current best practice. Specify the use of the Flood Plain Information system for the production of all maps.

Document Control and Quality Assurance

Recommendation 5.4 Instigate Quality Assurance procedures and documentation for ALL FLOOD WARNING DOCUMENTATION in accordance with current best practice and ISO 9002.

A draft Quality Assurance Procedure is attached as Appendix 4.1

Recommendation 5.5 Instigate Document Control procedures for ALL FLOOD WARNING DOCUMENTATION using the NE region's code of practice. The existing Document Control procedures should be reviewed in due course as they are based on BS5750 which has now been superseded by ISO 9002.

FWDP Distribution

Recommendation 5.6 Consider wider distribution of FWDP's. The FWDP's are public documents intended for public viewing. Access should be made easier. Suggested methods;

- Linking into public awareness campaigns when the plans are republished every September.
- Maintain copies in Agency Public Register Rooms
- Distribute copies to relevant public libraries
- Make a copy available when the Agency is represented at shows, conferences and exhibitions.
- Consider making the information available over the Internet on the Agency's Web page.

Links to Local Authority and Police Procedures and Major Incident Plans

Recommendation 5.7 It is recommended that representation is made to reconvene the joint committee (which originally defined the Agency's new role with respect to flood warning) to consider the roles of all bodies during a flood event.

Recommendation 5.8 Promote the development of Major Incident Plans for flooding based on the South West and North West Regions models. The document would be specific to flooding and would set down the agreed roles and actions of all of the involved parties during a flood. The trigger flooding situation would be defined as a "Major Red."

Recommendation 5.9 The value of the FWDP to other organisations should be investigated as its use to others a working document is unknown. North West Region have developed a questionnaire which may be adapted.

The Use of Colour Coded Flood Warnings

The apparent lack of public understanding of the colour coded warning system is a concern. This may be addressed in several ways:

Recommendation 5.10 The "value added" of colour coded flood warnings to the public should be investigated further by undertaking targeted surveys to determine the understanding of those at risk to Yellow and Amber events i.e. farmers and owners of isolated properties. The results of this study

may determine whether the Agency persists in its policy of issuing colour coded flood warnings direct to the public.

AVM scripts, Fax Formats and Floodcall Scripts

The key issues are consistency and the communication of meaningful information which encourages the recipient to respond:

Recommendation 5.11 The National Performance Specification should include minimum information requirements for:

- Model Fax formats
- Model AVM scripts
- Model Floodcall scripts

Addition of local information should not be discouraged but minimum standards should be set.

Recommendation 5.12 An audit of existing outputs by comparison to the appropriate model to be undertaken in each region.

6 CONCLUSIONS AND RECOMMENDATIONS

Table 6.1 contains all the recommendation from the report. The suggestions as to Priority, Timescale, Ease of Delivery and Dependencies are made against each recommendation.

Table 6.1 Summary of Recommendations

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Policy & Standards	<p>Recommendation 2.1 Introduce into the Flood Warning Strategy a policy statement defining Agency policy on:</p> <p>Coverage of service General and specific warnings Priority given to high risk life situations</p> <p>Awareness of flood risk Cooperation with Local Authorities and Emergency Services Contents and issue of warning messages</p> <p>An amended Draft Flood Warning Strategy is attached as Appendix 1</p>	High	Nov. 1998	Low Resources High Challenge	Need to secure agreement from many groups.
	<p>Recommendation 2.2 Republish a National Performance Specification (NPS), including a full description of the service and outputs, standards and targets.</p> <p>A revised National Performance Specification is attached as Appendix 1.</p>	High	Nov. 1998	Moderate	Need to secure agreement from many groups.
	<p>Recommendation 2.3 As part of the NPS revise and reissue minimum standards for the content of flood warning messages reinforcing commitment to plain English. Including messages by FAX, AVM and Floodcall.</p>	Medium	Sept.1999	High Resource, Low Challenge	May require the re writing of a large number of FW messages with minor changes

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Policy & Standards ..contd	Recommendation 2.4 As part of the NPS ensure that information on the condition of assets and temporary works made available to those involved with flood warnings.	Medium	Sept 1999	Low Resources Medium Challenge	Need to link into Maintenance and Development Control sections.
	Recommendation 2.6 Take up the question of trigger levels for Major Incident Plans with emergency planners groupings and incorporate in such plans clear guidance the roles of the Agency, local authorities, the police etc.	High	Major sites by Sept.1999	High Resources High Challenge	Significant Workload. Agreement required with LA required.
	Recommendation 2.7 Where the properties are based on a flood plain envelope ensures that whole conurbations or discrete areas of conurbations are included. Carry out risk analyses of the potential for blockages at key structures and the consequences of blockages occurring.	Low	Sept 2000	Medium Resources Low Challenge	
	Recommendation 2.8 Collate existing research on Benefits of Flood Warning and ensure it is widely disseminated and used. Commission further R&D if necessary to develop methods of incorporating risk to life.	Low	Set up by Sept 1999 then ongoing	Medium Challenge	
Levels of Service	Recommendation 3.1 Bring Regional FWLOSS into a National Project using a consistent Methodology. The Methodology should draw on FDMM (Flood Defence Maintenance Manual) standard methods and nationally consistent data sets - such as Sea Defence Survey, SOS, Asset Survey, Section 105. Identify consistent methods for dealing with risk to life, defended areas and breach scenarios.	High	National project set up by Dec1998, High Priority sites identified by Dec 1999.	High Resources Medium Challenge	Target will be difficult in some regions where FWLOSS have not fully started.

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Levels of Service ..contd	Recommendation 3.2 Undertake the National Project by phases that allow high priorities locations wherever they are to be programmed early.	High	Dec 1999	Medium	
	Recommendation 3.3 Adopt a Nationally consistent reporting format for progress.	High	Dec 1998	Low	Regional agreement needed to support reporting.
	Recommendation 3.4 Implement the emergency operational response aspects of ERLOS so that Agency staff (internally) and the public, local authorities and the emergency services (externally) are aware of how the Agency's operational response to flooding incidents is focused.				Development by Emergency Response Project (R Logan)
	Recommendation 3.5 National Guidance should be given to Flood Defence Committees on the importance of providing adequate funding to the Flood Warning Service.	High	Paper by Dec1998	High	Need to change priorities in some cases
	Recommendation 4.1 The current usage of the AVM should be subject to a general review. In particular: a) The saturation point of each AVM database needs to be calculated prior to any AVM expansion. Lead times for warnings need to be taken into account for a Region wide event. b) The use of the AVM as FAX system. The current status of the system as a Best Interim Solution for FAX should be reconsidered.	High	AVM group currently organising tests Review of AVM usage by Dec 1998	Medium to High	

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Levels of Service ..contd	c) Regular testing of the system at least once a year. The entire database to be queued on each AVM and sent with a test message.	Medium	Sept. 1999	Medium	
	d) If AVM is to continue to be used as the primary Alert system then the Agency should investigate the possibility of getting telephone numbers from BT etc instead of home owners direct (in agreement with the Home Office and Ofel with respect to the Data Protection Act).	Medium	Sept. 1999	Medium	
	Recommendation 4.2 Each AVM recipient should be asked whether they are prepared to be a warden. This could be added to all contact letters nationally.	Low	Sept. 1999	low	
	Recommendation 4.3 The AVM is most effective as a primary alert where a limited number of recipients is large or for sites with a mobile population such as caravan parks and recreational areas, consideration should be given to other methods of alert, eg Sirens, or Loudhailers. Existing warnings should be reviewed to determine whether AVM is the most appropriate alert method.	Medium	Sept 2000	High	Dissemination methods reviewed with updating of Dissemination Plans
	Recommendation 4.4 The Agency must investigate and fully review the performance of radio stations and the public's use of broadcast information during the Easter event before the system is effectively widened.	Medium	Sept 2000	Medium	Dissemination methods reviewed with updating of Dissemination Plans
	Recommendation 4.5 Review, Update and re-issue the fact sheets from the "Implementation of Technology Report" in light of their success since 1995.	Medium	March 1999	medium	Guide to form part of NPS

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
	Recommendation 4.6 A detailed investigation of alternative telephone systems needs to be undertaken.	Medium	April 1999	low	
Dissemination Plans and Other Documents	Recommendation 5.1 Existing FWDP to be audited by use of a checklist and by comparison to the June 1997 model and then modify to suit minimum requirements.	High	Audit March 1999 Plans Reissued if required Sept. 1999	Low challenge Medium Resources	
	Recommendation 5.2 Review June 1997 model FWDP template. The primary issues here are consistency and simplification of presentation. Check the text against Plain English standards.	Low	New Model Sept. 1999 Plans reissued Sept 2000	Low challenge Medium Resources	
	Recommendation 5.3 Produce a template and guidelines for flood risk maps contained in FWDP's based on current best practice. Specify the use of the Flood Plain Information system for the production of all maps.	Medium	March 1999	High challenge low Resources	Needs agreement from regions
Document Control and Quality Assurance	Recommendation 5.4 Instigate Quality Assurance procedures and documentation for ALL FLOOD WARNING DOCUMENTATION in accordance with current best practice and ISO 9002.	High	A draft Quality Assurance Procedure is attached as Appendix 4.1	Low challenge Medium Resources	

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Document Control and Quality Assurance ..contd	FWDP Distribution Recommendation 5.6 Consider wider distribution of FWDPs. The FWDPs are public documents intended for public viewing. Access should be made easier.				Development as part of Public Awareness Project (M Whiting)
	Recommendation 5.7 It is recommended that representation is made to reconvene the joint committee (which originally defined the Agency's new role with respect to flood warning) to consider the roles of all bodies during a flood event.	High	By Dec 1999	High Challenge	Need Central Government support to define roles
	Recommendation 5.8 Promote the development of Major Incident Plans for flooding based on the South West and North West Regions models. The document would be specific to flooding and would set down the agreed roles and actions of all of the involved parties during a flood. The trigger flooding situation would be defined as a "Major Red".	High	Model by March 1999, Major Sites by Sept 1999	High Resources High Challenge	Significant Workload. Agreement required with LA required.
	Recommendation 5.9 The value of the FDWP to other organisations should be investigated as its uses to others as a working document is unknown. North West Region have developed a questionnaire which may be adapted.	Low	Feed into review of Model	low	

Activity/Area	Recommendation	Priority	Timescale	Ease of Delivery	Dependencies/ Comments
Document Control and Quality Assurance ..contd	Recommendation 5.10 The "value added" of colour coded flood warnings to the public should be investigated further by undertaking targeted surveys to determine the understanding of those at risk to Yellow and Amber events ie farmers and owners of isolated properties. The results of this study may determine whether the Agency persists in its policy of issuing colour coded flood warnings direct to the public.	Medium	Sept 1999	Low	
	Recommendation 5.11 The National Performance Specification should include minimum information requires for: - Model Fax formats - Model AVM scripts - Model Floodcall scripts Addition of local information should not be discouraged but minimum standards should be set.	Medium	Dec 1998	Draft Spec. included in report.	
	Recommendation 5.12 An Self audit of existing outputs by comparison to the appropriate model to be undertaken in each region.	Medium	Sept. 1999	Medium Resources	

APPENDIX 1 - FLOOD WARNING STRATEGY, INCORPORATING PROPOSED AMENDMENTS

XXXXXXXXXX Additional Text

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THE ENVIRONMENT AGENCY

THE FLOOD WARNING STRATEGY FOR ENGLAND AND WALES 1997-8 to 2001-2

1 INTRODUCTION

The principal aim of the Environment Agency (the Agency) is to protect or enhance the environment, taken as a whole, in such a way as to contribute to sustainable development. This will be achieved either directly, through the Agency's operational and regulatory activities, or by working with or influencing the activities of others.

Flood Defence is one of the Agency's functions. It aims to reduce the risk of flooding and to provide timely warning systems for people and property against flooding from rivers and the sea. This is achieved through four main activities:

- Flood Warning, including data acquisition and flood forecasting
- Operations, including the maintenance of rivers and flood defences
- Improvements, including new flood defence schemes
- Regulation, including advice to planning authorities on new development

This document provides the Strategy for Flood Warning in England and Wales.

1.1 Flood Warning Aim

Protecting human life is the highest priority. The risk of flooding can be reduced but not removed and so there is a need to warn people when flooding is going to occur. A timely warning provides the opportunity for those at risk to seek safety and to reduce damage and distress.

The Ministry of Agriculture, Fisheries & Food (MAFF) and the Welsh Office (WO) are the Government departments with responsibility for flood defence, and flood warning is their highest priority.

MAFF/WO priorities:

1. Flood Warning.
2. Urban coastal/tidal defences.
3. Urban flood defence; environmental assets of international importance.
4. Rural coastal/tidal defences; existing rural flood defences and drainage works; environmental assets of national significance.
5. New rural flood defence works, environmental assets of local significance.

The National Flood Warning Strategic Board provides national direction and co-ordination of all flood warning activity within the Agency.

The Agency's aim is to reduce the risks associated with flooding wherever cost effective and environmentally acceptable measures are feasible and can be funded.

The National Flood Warning Strategic Board will seek to ensure the Agency's position as pre-eminent in flood warning through the provision of an appropriate, reliable and cost-effective service.

1.2 Flood Warning Policy Statement

It is the Agency's policy to endeavour to provide a flood warning service for all locations known to be at risk of flooding from the sea or from rivers. In many locations the Agency will be able to give specific details elsewhere the warning may be of a general nature. In practice the service will be limited where flood conditions develop rapidly, are highly localised or are of little consequence to the community.

The Agency will encourage local awareness of flood risks and understanding of the flood warning service. The Agency will use plain English in its communications with the Community. The Agency is committed to working closely with Local Authorities and Emergency Services. The Agency will use a precautionary approach in taking decisions on the issue of flood warnings.

2 FLOOD WARNING RATIONALE

Every region has areas at risk of flooding from rivers and the sea. Nationally about 7% of these areas are developed, within which people live with the risk of flooding even if this is reduced by man-made defences. Flood warnings do not prevent flooding but can safeguard life and allow time to reduce damage and loss.

Measuring the value of flood warnings raises the following questions:

- Do flood warnings get to the right people, and how?
- Are flood warnings accurate?
- Is sufficient warning time given to take effective action?
- Are the people at risk and the emergency services prepared?
- How can the cost of the flood warning service be justified?

The Agency looks at each part of the overall flood warning service to answer these questions.

2.1 Flood Warning Response

Flood warning is worthwhile if it results in life being safeguarded and property damage being reduced, and if the benefits exceed the cost of the service. A warning is of little value unless it is acted upon.

The Agency can undertake only limited emergency response itself, but seeks to prepare the public to help themselves.

The Agency will seek to raise the average effectiveness of response after receipt of a warning.

An essential part of this is to undertake a comprehensive campaign to raise the level of awareness in flood risk areas, so that people understand the flood warning service and know what action should be taken when flooding occurs.

Local Authorities and emergency services are also kept informed in order that they may fulfil their responsibilities in responding to major incidents.

2.2 Flood Warning Dissemination

The Agency was directed to formalise its arrangements for flood warning, with effect from September 1996. The introduction of effective systems to issue warnings direct to the public has been the highest flood warning priority.

The Agency's Flood Warnings will be of the following types and standards;

a) General flood warnings to the Public covering a number of locations at risk of flooding. General warnings will;

- indicate the current or forecast conditions which give rise to the possibility of flooding.
- be issued at any time, but those issued during the day will be of most value.
- be disseminated via the media and the Agency's Floodcall service.

b) Specific flood warnings to the Public covering locations where currently a detailed service can be offered. Specific flood warnings will;

- aim to give a minimum of 2 hours warning;
- identify where flooding is likely;
- identify the time flooding is likely;
- indicate the risk to public safety.
- be disseminated via direct contact methods appropriate to the situation (e.g Wardens, AVM, Sirens, loudhailers)
- be disseminated via the media and Floodcall

c) All warnings will be also be disseminated to the Local Authorities and Emergency Services. In addition the extent and type of the flooding will be indicated by means of a colour code, Yellow, Amber, Red. A "standby" message will be issued to Local Authorities and Emergency Services to provide an early alert of possible flooding when time permits. At any location where the Agency believe that flooding will impact on a significant number of people this will be indicated directly to the Local Authorities and Emergency Services in order that local emergency plans made be initiated. Such warnings will be coded "Major Red."

d) Specific Operational warnings will be issued internal to the Agency and to external operators where actions are required to mitigate or control flood waters. A target minimum warning period will be specified.

The Agency will improve the successful receipt of warnings, where a specific warning scheme exists.

A programme of improvements will over a period increase the number of locations where specific details can be given.

The areas provided with a specific flood warning service, and the Agency flood warning procedures, are described in Dissemination Plans which are available for inspection at Agency offices.

2.3 Flood Forecasting

Flood warning presumes an ability to forecast. This means predicting the occurrence of river and tidal floods with reasonable reliability, accuracy and forecast lead time.

River level and tidal measurements provide the main basis for forecasting, but may not give sufficient warning on the upper reaches of small, steep catchments. The Agency uses a variety of data, services and models, from weather forecasts to sophisticated rainfall, flow and tidal computer systems, to help it make forecasts on which warnings are based.

A key standard is the warning lead time provided to people at risk before the onset of flooding, since this determines how much damage can be avoided. The Agency sets this as a level of service against which performance can be measured.

~~"Prior warning will be provided (two hours in general) to people living in designated flood risk areas where a flood forecasting facility exists and where lead times enable us to do so."~~ *Environment Agency's Customer Charter*

The Meteorological Office, Storm Tide Warning Service provides forecasts of sea level and wave conditions on which the Agency's tidal flood warnings are based.

2.4 Flood Detection

Flood detection or prevailing conditions data needs are determined by flood forecasting and monitoring requirements.

A significant element of the cost of the flood warning service is for remote sensing systems to measure rainfall, water level, flow, wind etc. The criteria for issuing warnings, and forecasting models, rely upon quantitative information which is and will be provided through telemetry systems for the foreseeable future.

Detection systems need to be maintained and upgraded. This is not just replacement, but means taking advantage of new methods and technology, and opportunities to harmonize across the Agency.

The Agency will make improvements in order of priority and not all properties at risk from flooding will necessarily, or immediately, justify a flood warning service.

The Agency will seek to improve and extend the flood warning network.

3 KEY ISSUES AND OBJECTIVES

3.1 The Existing Flood Warning Service (Baseline)

In March 1996 a Direction from MAFF required that, from 1 September 1996, the Agency would take the lead in providing warning of the danger of flooding. For the first time this gave a national perspective to flood warning.

While new arrangements have been introduced in a nationally consistent way, there is otherwise a significant inherited diversity of systems, methods and service coverage across England and Wales. Therefore a baseline survey was undertaken in February 1997 as a first step towards identifying these regional differences.

- The Agency will set nationally consistent and achievable standards for flood warning.

3.2 Major Incidents

A major incident is a ~~rare flood event (generally with a probability of 2% or less in any year)~~ which is where the impact on people and property is large. The event may be severe enough to cause overtopping or failure of defences or to affect properties which have ~~not flooded before~~ low likelihood of flooding.

Public safety is the main concern in a major incident and the Agency liaises directly with Local Authority Emergency Planning departments and the Emergency Services. Special arrangements for flood warning may apply.

- The Agency will advise Local Authorities about significant urban flood risks and encourage the preparation of Major Incident Plans.

3.3 Public Awareness

Research has shown how important it is that people at risk are aware of what to do when a flood warning is issued and are able to respond effectively. This means ensuring that the public, particularly in flood risk areas, are kept informed and are alert to the actions they can take to reduce the effects of flooding on themselves and their property.

The methods used to communicate flood warnings and ensure effective response will be reviewed in the light of experience.

- The Agency will undertake regular independent surveys of public awareness to measure ability to respond effectively to warnings.

3.4 Resources

Flood Warning is funded through executive regional and local Flood Defence Committees and with MAFF/WO Grant Aid for capital investment. All expenditure needs to be planned and taken through the approval process as flood warning will be competing with the other regional and national demands.

Since regions are at different levels of investment in flood warning systems it must be recognised that some will have to invest significantly more than others in order to achieve the standards over the planned period. Where appropriate, alternative or shared financing, e.g. Public Private Partnership, will be investigated.

The provision of a flood warning service for England and Wales relies on a relatively small number of people (about 80) undertaking core activities to maintain and improve the service. To operate the 24 hour-a-day standby rotas with people who are familiar with the systems requires significantly more personnel (approximately 400), and to respond operationally requires further people who are aware of how to deal with flood conditions.

The maintenance, operation and development of the flood warning service depends upon people with expertise and experience. The Agency must retain and develop sufficient staff to provide viable units, with a clear management structure, funding and remit to provide the service.

- The Agency will identify, efficiently manage, and seek to provide adequate financial and manpower resources.

3.5 Improvements & Extension of the Service

Any improvement or extension to the flood warning service should be subject to systematic appraisal. The Flood Warning Levels of Service Studies (FWLOSS) have been researched and developed to ensure that proposals reduce the risk to life, are cost effective and meet required standards. The methodology can be consistently applied across regions and can help to prioritise proposals for improvement.

- The Agency will develop and adopt best national practice to appraise need using the FWLOSS approach, and draw up programmes of improvement in each region.

3.6 Telemetry and Instrumentation

The Agency has developed an Information System (IS) Business strategy which takes account of telemetry systems. This will ensure that all future systems meet harmonisation criteria, and that existing systems gradually converge.

Telemetry issues are not only concerned with the type, but also the optimum amount of telemetry to provide the best overall performance. The equipment is required to be

particularly robust and reliable, and may be managed as part of wider Agency systems.

The Agency's National Telemetry Group may advise the need to plan significant infrastructure investment in coming years. Telemetry investment decisions have significant capital and revenue implications and must be justified with the benefit of a robust methodology.

- The Flood Warning Strategic Board will influence and be advised by the Agency's National Telemetry Group.

3.7 Large Raised Reservoirs

All large raised reservoirs, greater than 25,000 cubic metres, must be registered under the Reservoirs Act 1975. Best practice recommends that Reservoir Failure Inundation Plans be drawn up, which include downstream inundation maps and emergency measures.

- The Agency will review its ability to issue warnings for its own reservoirs (operated mainly for flood detention) and other sites where Inundation Plans are in place.

3.8 Climate Change

Climate change may affect the risk of flooding, through rising sea levels and more extreme weather.

- The Agency will monitor the effects of climate change and review flood warning needs.

3.9 Sustainable Development

Flood warning is not a substitute for an adequate standard of flood defence. However new development should avoid being at risk of flooding, or increasing the risk elsewhere, and to this end the Agency is a statutory consultee of Planning Authorities and issues Consents to work affecting watercourses.

The construction and maintenance of flood warning installations is subject to the same environmental considerations as other Agency activities.

- The Agency will seek to guide new development away from flood risk areas and to improve and sustain the environment through its own activity.

3.10 Links to other Flood Defence Projects

Flood warning is related to other initiatives, including:

- Geographical Information Systems (GIS) + 'Addresspoint' technology
- Identification of Flood Risk Areas, Section 105 Surveys (re. Circular 30/92 'Development and Flood Risk')
- Flood Defence Management Manual and System (FDMM/S)

(including asset and level of service surveys)

- The Flood Warning Strategic Board will maintain links with other related projects.

3.11 Research & Development (R&D)

The Agency funds a separate programme of R&D to support its flood warning activity. Proposals for research, working where possible with others, should be planned to meet identified targets.

- The Agency will maintain the programme of proposals for research and development to meet identified needs.

3.12 Performance

Since the timing and distribution of floods is subject to nature it makes sense to aggregate performance over England and Wales to provide an overall measurement which can be compared year by year. Key measures include whether warnings were received, and whether action to avoid damage was taken. Public awareness, or preparedness to deal with a flood, should similarly be assessed.

Performance by the Agency in these respects is best assessed by independent survey of those flooded, and the summary results made public. Operational Performance Measures (OPMs) are being developed to present these findings in a meaningful way for comparison and monitoring purposes.

- The Agency will regularly seek the experience of a sample of people who have been flooded within designated warning areas, and will regularly publish our performance.

4 PRIORITIES

- 4.1 The highest priority for the Agency is to maintain and provide the existing flood warning service as described in Flood Warning Dissemination Plans.

- 4.2 The priorities for improvement and extension to the service are ~~where the likelihood of flooding is high (a 2% chance or higher of flooding each year) in order of risk to human life and land use, namely:~~

- ~~— High, then medium density urban;~~
- ~~— Low density urban or rural with limited numbers of properties;~~
- ~~— Agricultural land with stock;~~
- ~~— Other property and assets including transport and utilities;~~

~~where it is technically possible to provide a flood warning which is far enough in advance of flooding to justify the cost of the service~~ considered to two ways, locations where risk to life is high and locations where the combination of likelihood and impact (damage) is high. These priorities should be established through the a systematic Flood Warning Levels of Service method of appraisal. The service will be restricted to those areas where it is technically possible to provide a flood warning..

~~A flood warning service for the coast and defined Main River will generally rank higher priority than for ordinary watercourses.~~

- 4.3 The priority for Major Incident Plans is where the impact on people and property is large and public safety is high the main concern. Urban areas protected by flood defences which could fail or be overtopped should receive higher attention than (otherwise similar) unprotected areas. The Agency will encourage and work with Local Authorities, according to this ranking.
- 4.4 All regions rely on weather services from the Met. Office and elsewhere. A national project has been started to review the range of services provided, identify best practice and recommend options for improvement. Completion of this project is a priority.
- 4.5 Weather radar has become a valuable tool for flood warning (and other Agency) purposes but has not yet been widely used for quantitative forecasting. The network of radar sites has evolved through partnership between regions and the Met. Office. The network is in need of investment, which will need to be justified, and this will have significant funding implications.

Management of weather radar on a national basis will provide the most efficient means of maintaining and improving this service and the development of a business plan is a priority.

- 4.6 Tidal floods result from extreme combinations of tide, weather induced surge and wave conditions. Effects are generally widespread, although with local variation. The Agency receives forecasts of wave and tide levels from the national Storm Tide Warning Service.

Tidal flood forecasting developments are best managed within a national forum and a review to identify improvements has been started. Completion of this review is a priority.

5 FLOOD WARNING BUSINESS PLAN

This Strategy provides the overall framework for development of the flood warning service, for the five years to March 2002, through:

- national standards, priorities and a consistent approach
- regional delivery within a nationally managed framework
- realistic targets which recognize regional and area differences
- collective procurement and funding of common services, where appropriate
- shared best practice and harmonisation through convergence
- links to functional and corporate planning processes

5.1 The Business Planning Process

The Strategy is delivered through a Business Plan. This is not a fixed document, but will be reviewed and adjusted in the light of the latest knowledge. The Flood Warning Strategic Board will ensure consultation with internal and external interest groups and will seek wide consensus for the Plan.

The Plan needs to recognize the ongoing upkeep and operational activities, which are required to maintain the core flood warning service. These activities are cyclical and are generally revenue funded. In future some of the bought-in services will be collectively managed and funding will need to be separately identified.

Regions should develop and maintain their own Flood Warning Programmes which complement the National Plan. Hence regional programmes should ensure that nationally agreed targets are met and will need to include collectively managed costs and their own regional costs.

All funding is provided by regions and must be planned and justified. This will have to compete with other regional and national demands. The Corporate Plan process is of particular importance since this provides confirmation of business support and the mechanism to arrange funding. A year-on-year increase in the proportion of properties receiving a prior warning of flooding is one of the Agency's principal Ten Point Action Plan targets.

The Agency's Flood Warning Strategic Board will review the Business Plan each year and revise its activity and cost programmes as priorities require. The Plan will be recommended to the Agency's Flood Defence Managers Group where it will be considered alongside other Strategic Plans and national requirements.

22 April 1998

Final Draft

APPENDICES

Appendix 1	The Business Plan, including:
	<ul style="list-style-type: none">• National and Regional Roles• Collectively Funded Items• Framework Programme• Monitoring
Appendix 2	R&D Programme
Appendix 3	Glossary of Terms
Appendix 4	Legislation

APPENDIX 1

FLOOD WARNING STRATEGY FOR ENGLAND AND WALES

BUSINESS PLAN

Introduction

The Business Plan provides the overall framework for all regions to work within, in order to meet the project targets by March 2002. The policies and priorities are set out in the Environment Agency's "Flood Warning Strategy for England and Wales 1997/98 to 2001/2".

National and Regional Roles

The National Flood Warning Strategic Board for England and Wales takes the lead role in determining policy, while the National Flood Warning Implementation Team, with representatives from all regions and the various floodwarning subject sub groups, ensures the implementation in a consistent way across the country to the agreed timetable.

Regions are responsible for drawing up their own programmes which fit in with the national framework, obtaining the resources required and implementing their programme. Regions have their own flood warning action groups which oversee the carrying out of the work and also pass regional issues up to the national groups.

Collectively Funded Items

Where it is efficient to do so, some items will be managed on a national lead basis with a small group taking responsibility for procuring the service for all regions. The funding for these collectively purchased items will be agreed to an appropriate method. The items which are currently being funded in this way or are considered appropriate for the future are:

- Automatic Voice Messaging
- Floodcall (Recorded Message System)
- Public Opinion Surveys
- Public Awareness Campaign
- Weather Radar
- Weather Services
- Tidal Forecasting

Framework Programme

A national strategic framework programme has been drawn up which sets out the main headings and sub-headings on which it is expected that progress will have to be made by all regions. This will form the basis for regions to allocate the appropriate resources to meet the overall targets and milestone measures. Extra resources totalling £1.74m per annum have been approved by the Agency Board, MAFF and RFDCs (Regional Flood Defence Committees) to reach the level of service required in order to gain the £20m annual benefits.

Monitoring

Reviews of performance will be undertaken by independent external Public Awareness surveys after each significant flooding event has occurred and also an annual report produced. Ongoing internal performance measures will be operated and action initiated at any time to improve performance from information derived from both these sources.

Draft

APPENDIX 2

FLOOD WARNING STRATEGY FOR ENGLAND AND WALES

R & D PROGRAMME

ONGOING PROJECTS

97/98 98/9 99/00 00/01 01/02

Hyrex

✓

Snowmelt

✓

GANDOLF

✓

PROPOSED NEW STARTS

Comparison of forecasting models

✓

✓

Hyrex

✓

Antecedent conditions*

✓

✓

✓

Warning and forecasting benefits (phase 2)

✓

✓

✓

South and West coast surges (scoping)

✓

FUTURE PROPOSALS

Hyrex

✓

Forecasting extreme estuary levels

✓

✓

✓

South and West coast surges (phase 2)

✓

✓

✓

Out of bank models - Phase 1

✓

✓

- Phase 2

✓

Flood Warning System Performance Methodology

✓

✓

Optimal rain gauge and river level networks*

✓

✓

*Possibility for joint funding with Water Resources

APPENDIX 3

FLOOD WARNING STRATEGY FOR ENGLAND AND WALES

GLOSSARY OF TERMS

Dissemination	The act of issuing warnings including both directed and broadcast warnings.
Flood Warning Dissemination Plans	Written records describing the arrangements in place to provide flood warnings. These are available for inspection at Agency offices.
Flood Defence	<p>This term may be used to describe the overall function comprising flood warning, maintenance, improvement, and regulation. It includes water level management and land drainage.</p> <p>The term can also be used to specifically refer to works or natural features which protect against or alleviate flooding, such as flood banks, walls or flood relief channels.</p>
Lead time	The period between the first expectation of flooding and its occurrence. The lead time for the public is less than for the Agency by the time it takes to formulate and issue the flood warning. The Agency seeks to provide at least two hours warning where possible.
MAFF	The Ministry of Agriculture, Fisheries and Food. This Government department has responsibility for flood defence and, in particular, provides policy, guidance and funding.
Major Incident	<p>The Agency definition of major incident relates to the levels of resources deployed and of public interest. The term is therefore not restricted to flooding but includes, for example, pollution.</p> <p>In this context it means a rare flooding event, where public safety is the main concern and flood warning is part of a wider response involving emergency services event where the impact on people and property is large and public safety is the main concern. Such events are severe enough to cause overtopping or failure of defences, or to affect properties which are at low risk of flooding (generally less than 2% in any year.) Special contingency plans may have been prepared Flood warning will be part of a wider response involving emergency services. Such events are severe enough to cause overtopping or failure of defences, or to affect properties which are at low risk of flooding. Special contingency plans may have been prepared.</p>
Risk	Risk can mean the combined likelihood and impact of flooding. It is commonly used to describe only the likelihood, in terms of

probability or return period. An event which may be expected to occur, or be exceeded, on average every 20 years has a return period of 20 years which is equivalent to a probability of occurrence of 5% in any one year.

Telemetry

Literally remote measurement but used to describe field equipment which collects data, such as rainfall and river level, and communicates with office based systems.

APPENDIX 4

FLOOD WARNING STRATEGY FOR ENGLAND AND WALES

LEGISLATION

Reference may be made to the **Water Resources Act 1991 (WRA)** and to the **Environment Act 1995 (EA)** for the main flood defence legislation. In particular, with reference to flood warning:

Section 105 of the WRA requires the Agency to "exercise a general supervision over all matters relating to flood defence"

- Section 148 of the WRA describes arrangements for the Minister (MAFF) to make grants towards the cost of flood warning systems
- Section 166 of the WRA provides the powers to carry out works for the purpose of providing a flood warning system.
- Section 2 of the EA Act transferred the functions in the WRA to the Agency.
- Section 40 of the EA Act entitles the Minister (MAFF) to give directions to the Agency

Reference may also be made to:

- MAFF policy on flood defence, including flood warning, in their **Strategy for Flood and Coastal Defence in England and Wales**.
- The **Direction** from MAFF relating to flood warning dated 5 March 1996.

APPENDIX 2 - NATIONAL PERFORMANCE SPECIFICATION FOR FLOOD WARNING DISSEMINATION

Note: Additional Text is highlighted thus xxxxxxxxxx

1.0 NATIONAL PERFORMANCE SPECIFICATION

1.1 Roles and Responsibilities:

- The EA will ensure flood warnings are delivered to target standards, to the Police, Local Authorities, Gatekeepers, the Media, the Public, Industry/Commerce and landowners in known flood risk locations.
- The EA will deliver warnings directly itself or indirectly via Emergency Authorities, Agencies, Media, Cascade Chains, or other appropriate indirect means.

1.2 Use of Colour Codes:

- The meaning of colour codes for fluvial, tidal and coastal events will follow consistent interpretations across England and Wales. The revised meanings will be incorporated into all Flood Warning Dissemination Plans.
- The colour code warning will be used to make the Police and Local Authorities aware of the predicted impact of the flood event and the predicted nature of its effects.
- For media broadcasts colour codes will be used but warnings will focus on when and where property flooding will occur.

See Colour code specification - detailed meanings are given on Tables 6-9.

1.3 Warning Dissemination Standards:

- A warning system for all known flood risk areas where forecasting is reasonably practicable will be defined and incorporated in the Flood Warning Dissemination Plan.
- Flood Warnings will be disseminated from Dissemination Centres of viable size, and providing adequate resources and support to meet targets.
- The Agency's Flood Warnings will be of the following types and standards;
 - a) General flood warnings to the Public covering a number of locations at risk of flooding. General warnings will;
 - indicate the current or forecast conditions which give rise to the possibility of flooding.
 - be issued at any time, but those issued during the day will be of most value.
 - be disseminated via the media and the Agency's Floodcall service.

b) Specific flood warnings to the Public covering locations where currently a detailed service can be offered. Specific flood warnings will;

- aim to give a minimum of 2 hours warning.
- identify where flooding is likely,
- identify the time flooding is likely,
- indicate the risk to public safety.
- be disseminated via direct contact methods appropriate to the situation (e.g Wardens, AVM, Sirens, loudhailers)
- be disseminated via the media and Floodcall

c) All warnings will be also be disseminated to the Local Authorities and Emergency Services. In addition the extent and type of the flooding will be indicated by means of a colour code, Yellow, Amber, Red. A "standby" message will be issued to Local Authorities and Emergency Services to provide an early alert of possible flooding when time permits. At any location where the Agency believe that flooding will impact on a significant number of people this will be indicated directly to the Local Authorities and Emergency Services in order that local emergency plans made be initiated. Such warnings will be coded "Major Red."

d) Specific Operational warnings will be issued internal to the Agency and to external operators where actions are required to mitigate or control flood waters. A target minimum warning period will be specified:

- Target standards for the receipt of warnings before flooding occurs for all properties in known flood risk areas will be set. For locations covered by specific warnings the Agency will look to a long term target of 80% receipt of warnings before flooding.
- The minimum warning system for all known flood risk areas will consist of
 - i) A broadcast system such as local radio/TV broadcasts and Floodcall
 - ii) at least one alert/hook system primarily automatic voice messaging.

The type of alert/hook mechanism used at any location shall be defined taking into account the impact and nature of the effects of flooding. The use of multiple alert/hook systems will be considered, as necessary, to ensure target compliance.

- The alert/hook systems will be used to enable property owners in flood risk areas to receive updated warning information via the media or Floodcall.
- Implementation of target standards and objectives will be phased up to the year 2001/02

1.4 Format and Content of Warnings:

1.4.1 To the Police/Emergency Authorities (Generally by FAX):

- All colour phase warnings will have a nationally consistent EA meaning as in the *Colour code specification - Tables 6-9.*

- Minimum Information content;
Colour code
Time and Date of issue
General situation
General Area at Risk
Specific Areas affected (Specific Warnings Only)
Time when Specific Areas will be affected (Specific Warnings Only)
Additional information such as time of high tide, time to peak etc. (Specific Warnings Only)
Tel. No. & Address of EA Office

- All colour phase warnings will adopt the format and general style as set out in Warning Message Specification - Tables 10-12

- Although FAX messages can to a large extent be prepared before an event the ability to amend in real time must be provided for.

1.4.2 To the Media:(Generally by FAX):

- Warnings to the Media will focus on property flooding.
- Warnings will include reference to colour phases but will focus on areas affected and impacts. Word pictures of the likely conditions are helpful. The language should be persuasive to take action.

- Minimum Information content;
Colour code
Time and Date of issue
General situation
General Area at Risk
Specific Areas affected (Specific Warnings Only)
Time when Specific Areas will be affected (Specific Warnings Only)
Additional information such as time of high tide, time to peak etc. (Specific Warnings Only)
Information on Media sources and Floodcall
Advice on personal safety and care for others
Tel. No. & Address of EA Office

- All colour phase warnings will adopt the format and general style as set out in Warning Message Specification - Tables 13-16.
- Media warnings will be in plain english easy-read style and will include update (new warnings), summary (all warnings in force) and cancel (cancelled warning) versions.
- Although FAX messages can to a large extent be prepared before an event the ability to amend in real time must be provided for.

1.4.3 Alerts via AVM (Voice messages)

- Voice message from the AVM will have a primary use as an alert/hook mechanism.
- Minimum Information content;
Environment Agency Flood Warning
Colour code
Area at risk
Further information Floodcall 0645 881188
- Further information may be given at Regional discretion, however longer messages will reduce the AVM performance.
- Examples of good practice in AVM scripts are given in the Warning Message Specification.

1.4.4 Broadcast Information via Floodcall

- Floodcall provides a National information base covering all warnings currently in force. The Agency will ensure that Floodcall messages are placed on the system without delay and are regularly updated.
- Minimum Information requirements; (*from Floodcall User Guide*)
- Use of the Floodcall system should follow the guidance set out in the Floodcall User Guide.

1.5 Media Dissemination Standards:

The target standards set out below will be included in all agreements with radio stations broadcasting flood warnings.

- Radio Stations will broadcast update, summary and cancel warnings.
- Update warnings will be broadcast immediately received, if requested by the Environment Agency, interrupting programmes if necessary.
- Summary warnings will be provided and broadcast regularly at times and frequencies agreed between the EA and Radio Station to be consistent with the severity of the event and the number of warnings in force.
- Warnings will be broadcast as provided by Environment Agency.
- The Radio Station will be geared to provide a 24-hour, 365 day service.
- Contact numbers (working and silent hours) shall be provided and updated along with fax numbers etc. to ensure rapid and effective contact.
- The Radio Station will record the time an update warning is broadcast. This will be used after a flooding event to monitor the time delay from EA initiation of warning to Radio Station Broadcast.
- The Radio Station and EA will co-operate to supply/broadcast any additional relevant information.

1.6 Managing Feedback from the Public:

- All Flood Warning Dissemination centres will provide an infrastructure to manage feedback from the public at all times in line with Customer Charter standards.
- Feedback from the Public will be filtered and directed to appropriate recipients both within and external to the EA.
- The specific infrastructure required will be determined by Regions but must account for:
 - i) provision of effective links between relevant internal EA activity centres and external agencies;
 - ii) staff and communications systems designed to meet workloads and standards;
 - iii) the preference for operational delivery at Area level.

1.7 Procedures

- Regions/Areas will follow the June 1997 National Dissemination Plan template and a National Major Incident Plan Model in the preparation and updating of such plans. Plans must be developed in consultation and agreement with the Local Authorities and Emergency Services. Note: A Major Incident Plan Model is yet to be developed - an example from South West Region is included as Appendix 4.2
- Regions/Areas will set up clearly documented procedures to cover all aspects of the Flood Warning Dissemination activity and which shall be linked to the details in the Dissemination Plan and the Major Incident Plan.
- In particular, these procedures will define:
 - i) roles and responsibility for EA staff involved in warning dissemination and their inter-relationship with EA staff engaged on other related activities and external agencies involved;
 - ii) robust systems to record dissemination activity including:
 - warning issued and confirmed logs
 - radio/media broadcast logs
 - voice recording of Warnings and Dissemination teams
 - Log books for all staff involved in Warning and Dissemination
 - Contemporaneous notes of telephone calls, and other actions and responses by Warning and Dissemination staff both internal and external to the EA

- iii) action by Warning and Dissemination managers to ensure effective upward reporting of key information.
- Regions/Areas will appoint a nominated officer whose responsibility it will be to update procedures and collate, verify and store all flood event log information and to enable a clear audit trail of actions.
- Regions/Areas will undertake a review of procedure compliance and effectiveness following all events.
- Regions/Areas will undertake regular exercises to test procedures and systems.

1.8 Monitoring Performance

- Performance of Dissemination Centres against set targets for receipt of warnings will be assessed. OPM's for flood warnings are set out in Flood Warning Performance Monitoring Targets for 2001 and OPM (May 1997)
- The performance assessment will be undertaken in accordance with a nationally consistent specification.

1.9 Control of Documentation

- All Key Flood Warning Emergency documents shall be controlled and a nominated officer (document controller) appointed to ensure they are always accurate and up to date and managed in a professional manner. Dissemination Plans shall be Quality Assured in accordance with specific QA procedures. Draft QA procedures are included as Appendix 4.1
- A code of practice for document control procedures shall be implemented in line with Quality Assurance Standard BS 5750. North East Region's Code of Practice for Controlled Documents shall be used.
- Key Flood Warning Emergency documents shall include:
 - i) Agency emergency procedure manuals;
 - ii) Agency emergency directories;
 - iii) Agency contingency emergency plans;
 - iv) Agency Flood Warning Dissemination Plans;
 - v) relevant external emergency plans.
- The documents will define the roles, responsibilities, procedures and actions for all interested parties including document owners, controllers, holders and users.

LIST OF DETAILED SPECIFICATIONS

1. Colour Codes

Table 6 - Meaning of colour phase warnings (River, Tidal and Coastal)
Tables 7, 8 and 9 - Internal detailed guidance on the use of colour phase warnings
(Note: above tables are taken from Flood Warning Dissemination Project Report, 1996 (Andy Baxendale))

2. Flood Warning Messages

Fax Warning format - Tables 10 - 16

(Note: above tables are taken from Flood Warning Dissemination Project Report, 1996 (Andy Baxendale))

AVM Messages - draft guidance appended.

Floodcall - Extract from draft Floodcall user guide appended.

3. Flood Warning Performance Monitoring & OPM's

Paper dated 12 May 1997 appended

4. Model Dissemination Plan

National Standard Dissemination Plan template dated June 1997. (Not appended to this document)

5. Model Major Incident Plan

A Major Incident Plan Model is yet to be developed - an example from South West Region is included as Appendix 4.2

6. Quality Assurance Procedures

Draft procedures included as Appendix 3.1

7. Document Control

North East Region's Code of Practice (not appended)

draft

TABLE 6

GUIDANCE (External)

MEANING OF COLOUR PHASE WARNINGS (RIVER, TIDAL AND COASTAL)

COLOUR PHASE	UNDEFENDED AREAS		DEFENDED AREAS	
	PREDICTED IMPACT	AFFECTING	PREDICTED IMPACT	AFFECTING
YELLOW	LOW	Roads Agricultural Land	LOW	No effects
AMBER	MEDIUM	Roads Agricultural Land Isolated Properties	MEDIUM	Roads, agricultural land and some properties affected by seepage or backing up of rivers or drains; or Roads, agricultural land and many properties at risk from bank/defence failure and/or some overtopping
RED	HIGH	Roads Agricultural land Many properties	HIGH	Roads, agricultural land and large numbers of properties affected by bank/defence failure or overtopping

NOTE: Colour Phase warnings represent EA forecasts and are principally for use by emergency authorities. Defended/undefended areas and areas at risk of flooding are identified in Flood Plans. Public and others will be warned of specific road, land or property flooding in their area.

TABLE 7

GUIDANCE (Internal)

INTERNAL DETAILED GUIDANCE ON THE USE OF COLOUR PHASE WARNINGS

COLOUR PHASE	UNDEFENDED AREAS	DEFENDED AREAS
YELLOW	<p>General</p> <p>A low impact flooding event with no impact on public safety. Some minor flooding to low lying roads and agricultural land.</p> <p>Specific impacts detailed in Flood Warnings.</p>	<p>General</p> <p>A low impact flooding event with no impact on public safety.</p> <p>Some minor flooding to roads and agricultural land.</p> <p>Specific impacts detailed in Flood Warning.</p>
	<p>Coastal</p> <p>Tidal warning issued - STWS.</p> <p>Wind and waves will cause some spray overtopping in coastal areas.</p>	<p>Coastal</p> <p>Tidal warning issued - STWS.</p> <p>Some spray may be blown over beaches, seawalls and defences.</p>
	<p>Tidal</p> <p>Tidal warning issued - STWS.</p> <p>High tide levels affecting some low lying areas. Some windblown spray.</p>	<p>Tidal</p> <p>Tidal warning issued - STWS.</p> <p>Tidal levels will be contained within defences but there may be some spray, minor seepages, water backing up rivers and drains.</p>
	<p>River</p> <p>Recent rainfall leading to rising river levels. Levels contained within banks except in low lying valley areas.</p>	<p>River</p> <p>Recent Rainfall leading to rising river levels. Levels will be contained within the defences but there may be minor seepages, water backing up rivers and drains.</p>

TABLE 8

GUIDANCE (Internal)

INTERNAL DETAILED GUIDANCE ON THE USE OF COLOUR PHASE WARNINGS

COLOUR PHASE	UNDEFENDED AREAS	DEFENDED AREAS
AMBER	<p>General</p> <p>A medium impact flooding event with some impact on public safety in high risk properties, and impacts on roads and considerable areas of agricultural land. Rivers are likely to overtop banks and waves are likely to overtop seawalls and beaches.</p> <p>Specific impacts detailed in Flood Warnings</p>	<p>General</p> <p>A generally low impact flooding event but with some impacts on high risk properties and roads. In some situations there may be a developing risk of local overtopping or breaching of defences.</p> <p>Specific impacts detailed in Flood Warnings.</p>
	<p>Coastal</p> <p>Tidal Warning issued - STWS.</p> <p>Significant waves and windblown spray will cause flooding in high risk coastal areas.</p>	<p>Coastal</p> <p>Tidal warning issued - STWS.</p> <p>Defences under pressure from wave action. Wave and spray overtopping in high risk areas.</p> <p>If conditions deteriorate there will be a risk of local breaches.</p>
	<p>Tidal</p> <p>Tidal warning issued.</p> <p>High tide levels will cause flooding in high risk areas.</p>	<p>Tidal</p> <p>Tidal warning issued.</p> <p>High tide levels will put defences under pressure. There may be some seepages, local overtopping, water backing up rivers and drains. If conditions deteriorate there will be a risk of local breaches.</p>
	<p>River</p> <p>Rainfall leading to rivers overtopping banks and flooding low lying areas and floodplains.</p>	<p>River</p> <p>Rainfall leading to high river levels putting defences under pressure. There may be some seepages, local overtopping, water backing up rivers and drains. If conditions deteriorate or persist over extended periods there will be a risk of local breaches.</p>

TABLE 9

GUIDANCE (Internal)

INTERNAL DETAILED GUIDANCE ON THE USE OF COLOUR PHASE WARNINGS

COLOUR PHASE	UNDEFENDED AREAS	DEFENDED AREAS
RED	<p>General</p> <p>A high impact flooding event with significant impact on public safety and severe disruption in some cases.</p> <p>Many properties, roads and large areas of agricultural land affected.</p> <p>Widespread flooding from rivers, tides, sea.</p> <p>Impacts detailed in flood warnings.</p>	<p>General</p> <p>A high impact flooding event with significant impact on public safety and severe disruption in some cases.</p> <p>Many properties and roads affected.</p> <p>Severe pressure on defences. Significant overtopping and/or a number of breaches.</p> <p>Impacts detailed in Flood Warnings.</p>
	<p>Coastal</p> <p>Tidal warning issued - STWS.</p> <p>Dangerous sea conditions.</p> <p>Widespread coastal flooding.</p>	<p>Coastal</p> <p>Tidal warning issued - STWS.</p> <p>Dangerous sea conditions.</p> <p>Significant overtopping and/or a number of breaches.</p>
	<p>Tidal</p> <p>Tidal warning issued - STWS.</p> <p>Dangerous conditions.</p> <p>Widespread tidal inundation.</p>	<p>Tidal</p> <p>Tidal warning issued - STWS.</p> <p>Significant overtopping and/or a number of breaches.</p>
	<p>River</p> <p>Widespread overtopping of rivers.</p>	<p>River</p> <p>Significant overtopping of defences and/or a number of breaches.</p>

POLICE/EMERGENCY AUTHORITY WARNING

YELLOW FLOOD WARNING

RIVER FLOODING

LOGO

Issued by the Environment Agency

At: 01.00hrs

On: 02/11/96

E A

ENVIRONMENT
AGENCY
ANGLIAN REGION

GENERAL SITUATION:

River levels are rising but are not expected to overtop banks.
Some flooding to low lying roads and agricultural land is
expected.

Aqua House
Harvey Street
Lincoln
LN1 1TFTel: 01522 513100
Fax: 01522 512927

AREAS AT RISK OF FLOODING:

River(s): River Welland and its tributaries
Reach/Zone: Risk Area 10E

Fax transmission
to: Lincs Police
Fax No: 01522 512222

SPECIFIC AREAS AFFECTED:

(Time from warning is 0hrs unless stated).

- The A151 near to the West Glen at Corby Glen.
- A minor road near to the East Glen at Braceborough.

Originator:
M Pettifor
Control Room Manager
Location: Lincoln

ADDITIONAL INFORMATION:

- Further rainfall is/is not forecast and conditions are likely
to deteriorate/improve.
- The Flood Control Room at Lincoln is open.
- For clarification or a situation report please refer to the
Flood Control Room at Lincoln (Tel. (01522) 513100).

If you do not receive
fax correctly please
telephone us
immediately on

Tel No. 01522 513100

Warning No. 016

POLICE/EMERGENCY AUTHORITY WARNING

AMBER FLOOD WARNING

TIDAL FLOODING

LOGO

Issued by the Environment Agency

At: 15.00hrs

On: 01/09/96

E A

ENVIRONMENT
AGENCY
ANGLIAN REGION

GENERAL SITUATION:

A warning has/has not been issued by STWS. High tide levels will put defence under pressure. If conditions deteriorate there may be a developing risk of local overtopping or breaching of defences affecting high risk properties and roads.

There may be some impact on public safety in affected areas.

Aqua House
Harvey Street
Lincoln
LN1 1TFTel: 01522 513100
Fax: 01522 512927

GENERAL AREAS AT RISK OF FLOODING:

River(s): Tidal River Nene in Cambridgeshire
Reach/Zone: Risk Areas 12D

Fax transmission
to: Lincs Police
Fax No: 01522 512222

SPECIFIC AREAS AFFECTED:

(Time from warning is 0hrs unless stated)

Originator:
M Pertifor
Control Room Manager
Location: Lincoln

ADDITIONAL INFORMATION:

- High tide is at 18.00 hrs
- The Flood Control Room at Lincoln is open.
- For clarification or a situation report, please refer to the Flood Control Room at Lincoln (Tel. 01522 513100).

If you do not receive
fax correctly please
telephone us
immediately on

Tel No. 01522 513100

Warning No. 016

POLICE/EMERGENCY AUTHORITY WARNING

RED FLOOD WARNING

COASTAL FLOODING

LOGO

Issued by the Environment Agency

E A

At: 16.00hrs

On: 01/09/96

ENVIRONMENT
AGENCY
ANGLIAN REGION

GENERAL SITUATION:

A warning has/has not been issued by STWS. Dangerous sea conditions are developing and there is a serious risk of flooding to many properties and roads. There will be significant impacts on public safety in affected areas.

Aqua House
Harvey Street
Lincoln
LN1 1TFTel: 01522 513100
Fax: 01522 512927

GENERAL AREAS AT RISK OF FLOODING:

Section(s): East Coast of Lincolnshire north of the Wash
Reach/Zone: Risk Areas 12D

Fax transmission
to: Lincs Police
Fax No: 01522 512222

SPECIFIC AREAS AFFECTED:

(Time from warning is 0hrs unless stated)

- Low lying properties in Saltfleet village
- The whole of Trusthorpe, Mablethorpe and Sutton on Sea

Originator:
M Pettifor
Control Room Manager
Location: LincolnIf you do not receive fax
correctly please telephone
us immediately on

ADDITIONAL INFORMATION:

- High tide is at 18.00 hrs
- The Flood Control Room at Lincoln is open.
- For clarification or a situation report, please refer to the Flood Control Room at Lincoln (Tel. 01522 513100).

Tel No. 01522 513100

Warning No. 016

TABLE 13 URGENT FLOOD WARNING FAX

MEDIA WARNING

**THIS IS A YELLOW FLOOD WARNING
OF FLOOD RISKS TO
ROADS AND FARMLAND**

**ISSUED BY THE
ENVIRONMENT AGENCY**

At: 01.00hrs

On: 02/11/96

There is a risk of flooding from heavy rainfall and high river levels.

The general areas affected by this warning are the River Welland and its tributaries in Lincolnshire.

The specific areas affected by this warning are:

- **The A151 near to the West Glen at Corby Glen.**
- **A minor road near to the East Glen at Braceborough.**

Additional Information (select as appropriate):

- **Further rainfall is/is not forecast and conditions are likely to deteriorate/improve.**
- **In addition to the areas at risk detailed, some localised flooding problems may result from surface run-off in urban areas and blocked culverts in small drains and dykes.**
- **For the latest information on flood warnings in your area, listen to (local radio station) or telephone 0990 123456**

LOGO

E A

**ENVIRONMENT
AGENCY
ANGLIAN REGION**

**Aqua House
Harvey Street
Lincoln
LN1 1TF**

**Tel: 01522 513100
Fax: 01522 512927**

**Fax transmission
to: Lincs FM
Fax No: 01522
513333**

**Originator:
Diane Shaw
Communications
Room Manager
Location: Lincoln**

**If you do not receive
fax correctly please
telephone us
immediately on**

Tel No. 01522 513100

**For general media
enquiries Tel. 01733
371811**

Warning No. 016

TABLE 14 URGENT FLOOD WARNING FAX

MEDIA WARNING

THIS IS AN AMBER FLOOD WARNING
OF FLOOD RISKS TO
HIGH RISK PROPERTIES
ROADS AND FARMLAND

LOGO

ISSUED BY THE
ENVIRONMENT AGENCY

E A

ENVIRONMENT
AGENCY
ANGLIAN REGION

At: 12.00hrs

On: 01/09/96

There is a risk of flooding from high tide levels and some local overtopping of defences and seepage is possible.

Aqua House
Harvey Street
Lincoln
LN1 1TF

The general areas affected by this warning are the Tidal River Nene in Cambridgeshire.

Tel: 01522 513100
Fax: 01522 512927

The specific areas affected by this warning are:

Fax transmission
to: Lincs FM
Fax No: 01522
513333

Originator:
Diane Shaw
Communications
Room Manager
Location: Lincoln

If you do not receive
fax correctly please
telephone us
immediately on

Additional Information (select as appropriate):

Tel No. 01522 513100

- High tide is at 18.00hrs.
- In addition to the areas at risk detailed, some localised flooding problems may result from surface water backing up in urban areas and seepage through defences.
- For the latest information on flood warnings in your area, listen to (local radio station) or telephone 0990 123456.
- Residents of property at risk should monitor conditions locally, listen to local radio for updated information and take action to protect their family and property.

For general media
enquiries Tel. 01733
371811

Warning No. 016

TABLE 15 URGENT FLOOD WARNING FAX

MEDIA WARNING

**THIS IS A RED FLOOD WARNING
OF FLOOD RISKS TO
MANY PROPERTIES, ROADS
AND LARGE AREAS OF FARMLAND**

**ISSUED BY THE
ENVIRONMENT AGENCY**

At: 16.00hrs

On: 01/09/96

LOGO

E A

**ENVIRONMENT
AGENCY
ANGLIAN REGION**

**There is a serious risk of flooding from high tide levels
accompanied by high waves and strong winds.**

**The general area affected by this warning is the East
Coast of Lincolnshire north of the Wash.**

The specific areas affected by this warning are:

- Low lying properties in Saltfleet village
- The whole of Trusthorpe, Mablethorpe and Sutton
on Sea

Aqua House
Harvey Street
Lincoln
LN1 1TF

Tel: 01522 513100
Fax: 01522 512927

Fax transmission
to: Lincs FM
Fax No: 01522
513333

Originator:
Diane Shaw
Communications
Room Manager
Location: Lincoln

If you do not receive
fax correctly please
telephone us
immediately on

Additional Information (select as appropriate):

- High tide is at 18.00hrs.
- In addition to the areas at risk detailed, some localised
flooding problems may result from surface water backing
up in urban areas.
- For the latest information on flood warnings in your area,
listen to (local radio station) or telephone 0990 123456.

Tel No. 01522 513100

For general media
enquiries Tel. 01733
371811

Warning No. 016

TABLE 16 URGENT FLOOD WARNING FAX

SUMMARY MEDIA WARNING

THIS IS A SUMMARY OF ALL FLOOD WARNINGS CURRENTLY IN FORCE

ISSUED BY THE
ENVIRONMENT AGENCY

LOGO

E A

At: 12.00hrs

On: 01/09/96

ENVIRONMENT
AGENCY
ANGLIAN REGION

There are risks of flooding from rainfall and high river levels.

Aqua House
Harvey Street
Lincoln
LN1 1TF

The general areas affected are the River Welland and its tributaries in Lincolnshire

Tel: 01522 513100
Fax: 01522 512927

Specific warnings for properties are:

•
•

Specific warnings for road and farmland flooding are:

•
•

Fax transmission
to: Lincs FM
Fax No: 01522
513333

Flood warnings in the following areas have been cancelled:

•
•

Originator:
Diane Shaw
Communications
Room Manager
Location: Lincoln

Additional Information (select as appropriate):

- High tide is at 18.00hrs.
- Further rainfall is/is not forecast and conditions are likely to deteriorate/improve.
- In addition to the areas at risk detailed, some localised flooding problems may result from surface run-off in urban areas and blocked culverts in small drains and dykes.
- Residents of property at risk should monitor conditions locally, listen to local radio for updated information and take action to protect their family and property.

If you do not receive
fax correctly please
telephone us
immediately on

Tel No. 01522 513100

For general media
enquiries Tel. 01733
371811

Warning No. 016

Automatic Voice Messaging System

Voice Messages - recommended minimum content

"This is a recorded message from the Environment Agency Flood Control Room at _____. A flood warning has been issued for your area. Please listen to local radio for further information or dial our Floodcall telephone information service on 0645 881188.

I repeat:

This is a recorded message from the Environment Agency Flood Control Room at _____.
A flood warning has been issued for your area. Please listen to local radio for further information or dial our Floodcall telephone information service on 0645 881188."

FLOODCALL MESSAGE BOX FORMAT

1	<p>This is the current flooding information for</p> <p><i>The Aire including the Keighley area and Allerton Bywater, and the Calder including Mytholmroyd and Wakefield.</i></p>
2	<p>Recorded Information</p> <p>Flood Information Message National Guidelines -</p> <p>To be added at time of flood. You may wish to group together rivers and/or coastal areas. The following information must be included:</p> <ul style="list-style-type: none">• Information on all locations mentioned in the title even if it says no flooding or normal conditions for some.• Time information issued and estimated time of onset of flooding.• Locations.• Colour of warning(s) issued.• When an update may be expected - either include time of frequency. (Note content of Part 3 below). <p>(NB message must state that this is flooding information and not flooding warning).</p> <p>You may also include some or all of the following:</p> <ul style="list-style-type: none">• Outlook.• Level at specified locations.• Roads flooded.• Property locations likely to flood.• Any other special areas likely to flood.• Any other useful information (even if flood warnings have not been issued).
3	<p>The situation may have changed since the last update of this recording. As well as this service, you should listen to the local radio as a further source of information and updates. These recordings will be updated regularly when there are warnings in force.</p>

FLOOD WARNING PERFORMANCE MONITORING

TARGETS FOR 2001 AND OPMs

Factors in achieving the benefits of flood warning

MAFF in their publication *Project Assessment Guide Note for Flood Defence and Coastal Protection* identified four principal factors which determine how effective a dissemination system is in achieving the benefits of flood warning, as shown in Table 1. A number of separate studies were used to estimate the performance of flood warning in England and Wales prior to September 1996¹. As part of the justification for the investment by the Agency in flood warning, improvement targets were set for success rates for each factor to be achieved by 2001. These targets are shown in Table 1.

Table 1. Flood Warning - Past Performance and Future Targets

Factors Affecting Flood Warning Effectiveness	Target Performance (by 2001)		Performance Measure	
	Perfor mance	Cumulative Impact	Direct	Indirect
Awareness of Warning <i>Property flooded and aware of warning before flooding.</i>	80%	80%	OPM 1	OPM3
Available to respond <i>Property flooded and available to get to property</i>	80%	64%		
Able to respond <i>Property flooded and physically able to mitigate property damage</i>	95%	61%		
Effectively respond <i>Property flooded and takes effective action to mitigate property damage</i>	85%	52%		
Overall effect		52%	OPM 2	

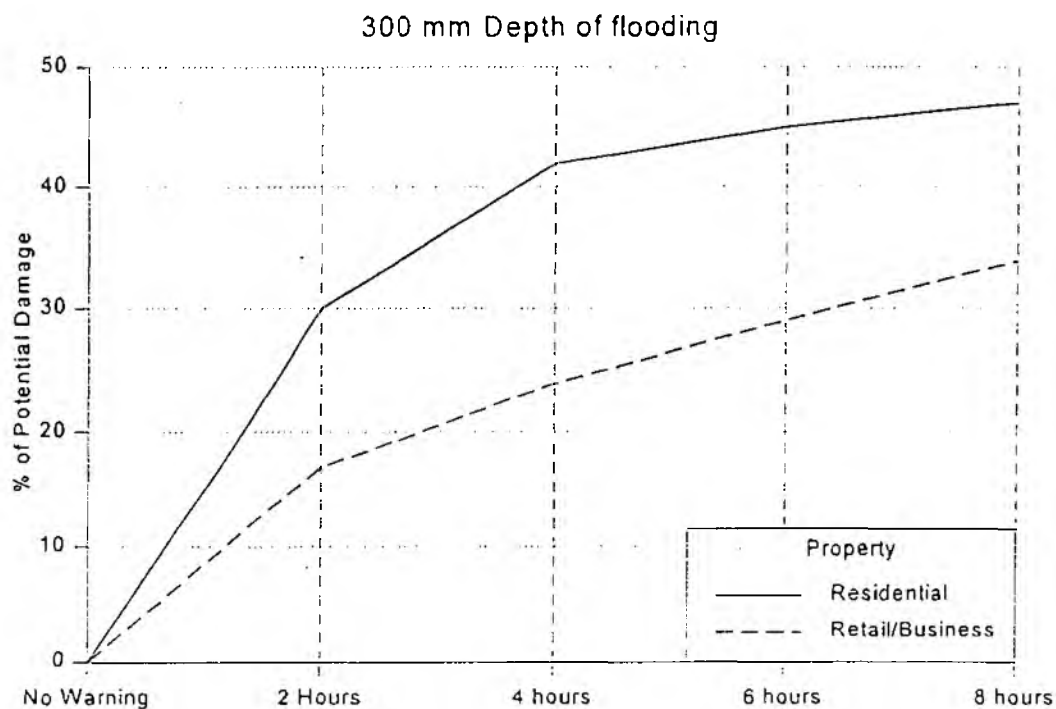
Flood Warning Lead Time

The time between receiving the warning and the onset of flooding is also a key factor in achieving flood warning benefits. Research has shown that it is the initial first few hours of lead time in which most of the damage is mitigated. The Environment Agency's *Customer Charter*

(May 1996) has the following standard.

“A prior warning will be provided (2 hours in general) to people living in designated flood risk areas where a flood forecasting facility exists and where lead times enable us to do so.”

Damage reduction with Lead Time



Graph 1 (R&D Note 463)

Performance Monitoring Approach

The approach adopted for the monitoring of flood warning performance was that it should be externally measured. The success in achieving the benefits of flood warning is reliant on recipients taking action and therefore the Agency should ask the people affected.

Using a Public Opinion Survey contractor post flood events surveys will be carried out. Three key factors for properties flooded will be looked for from these surveys.

- Were the occupants aware of a flood warning before flooding occurred ? - OPM 1
- Was action taken to mitigate damage and reduce personal risk ? - OPM 2

- What was the time between the warning and the flooding ? - LEAD TIME

As Public awareness of flood risk, flood warning systems and taking appropriate actions are key to successful flood warning the survey also covers general flood warning awareness and that in flood risk areas - OPM 3

An annual report will be produced giving the results from these surveys. Although a Regional analysis will be given the surveys are set up to be representative of England and Wales and therefore give an accurate national performance. The Agency are committed to publishing our national performance against Customer Charter Standards in its Annual Report.

The lead time achieved will be reported in the Public Opinion Surveys and can be set against the Customer Charter Standard on a location by location basis. The 2 hour standard has not been included in OPM 1 for the following reasons:

- Graph 1 shows that even half an hour of warning could give 10% reduction in damage and of course could be vital to personal safety. Any warning before flooding is useful and should not be considered a failure.
- In small or rapid response catchment it may be appropriate to set a local standard of less than two hours. In large catchments and in tidal situation the Agency would wish to do better than a 2 hours warning.

OPM 1 therefore includes all warnings received before the onset of flooding. As the Agency are trying to realise the benefits from Flood Warning, OPM 1 also includes all warnings from any source. As long as a warning has been issued and people become aware of the imminent risk in some way the result is the same.

It is also important that the Agency takes a look internally so that we have an understanding of factors that are important in delivering the service to the Public. There are clear advantages in collecting information in a standard way. A report form has been prepared which collects information on five key areas.

- The Scale of the flood event in terms of geography and properties flooded.
- The Accuracy of Warnings in terms of the colour code.
- The Timeliness of the Warning in terms of lead time.
- The Human Resources employed
- The Performance of National Systems (AVM and Floodcall)

These Flood Event Summary Reports will allow on a National and Regional basis the collect of statistics such as number of warning issued, number of properties flooded and manpower employed.

By examining the accuracy and timeliness of warnings the Agency can ensure that staff focus on the key issues of forecasting the impact of flooding and issuing the warning in sufficient time.

The report will be also prepared as a Microsoft Access Database which will be issued to all regions. Periodically the Databases will be collated National and an annual report produced.

FLOOD WARNING OPMs

OPM 1 :

Number of properties receiving a flood warning and flooded

Number of properties flooded

Long Term Target = 80%

Definitions:

- 1 OPM applies only to those areas identified in a Dissemination Plan which receive a flood warning service.
- 2 Warnings can be received from any source, formal or informal
- 3 Warnings must be received before the onset of flooding
- 4 Flooding from sources other than a Main River or a watercourse specified in a Dissemination Plan should not be included.
- 5 Properties flooded are those where flood water enters property and damage occurs. Previous OPMs for flood warning have used damage starting at 0.15 m below floor level.
- 6 "Properties" include, domestic buildings, commercial, industrial, and recreational buildings. Any building which has been flooded and where the occupiers could reasonably expect to have received a warning should be included

In addition where specific non property warnings have been included in a Dissemination Plan and there is a clear measurement of when that warning has been fulfilled they can be included as a equivalent to a property. Unless such specific warning are committed to, roads, gardens, agricultural or recreational land should not be included.

OPM 2:

Number of properties which were flooded and where effective action was taken

Number of properties flooded

Long Term Target = 52%

Definitions:

- 1 Definitions for OPM 1 apply
- 2 Effective action will be measured against the advice given in the Agency's Flood Warning Information leaflet *What to do if your property is at risk*.
- 3 Where in doubt action can be considered effective if it either
 - a) Reduces the risk to the health of individuals
 - b) Reduces the potential for flood damage
- 4 All Properties where effective action was taken should be counted irrespective of whether a warning was received.

OPM 3:

Number of people surveyed in "At Risk" areas aware of flood warning arrangements

Number of people surveyed in "At Risk" areas

No long term target

Definitions

1. "At Risk" areas are the 45 areas identified as part of the Public Opinion Survey Contract.
2. Awareness of flood warning arrangements will be measured against those identified in the local Flood Warning Information leaflet for that area.
3. People will be counted as being aware of the Flood Warning Arrangements if they know at least one valid route by which they could receive or obtain flood warnings.
4. Number of people surveyed are the number of people successfully interviewed under the Public Opinion Survey contract.

FLOOD EVENT SUMMARY REPORT

SCALE OF EVENT						
REGION			North East			
Agency Areas Affected			Dales, Ridings			
FW Local Leaflet Areas Affected (include reference number)			Mythomroyd (NE 4545), Wakefield (NE 4546) Sheffield (NE 4548)			
No of Properties Flooded ¹ (whole event)			45	Approx Estimate	✓	
				Based on Survey		
ACCURACY OF WARNING						
		Approx no of properties at risk	Actual scale of event ²			
Warning	Total		Red	Amber	Yellow	No Flooding
Red	5		3	2		
Amber	6		1	3	2	
Yellow	7				5	2
No Warning					2	
TIMELINESS OF WARNING						
		Estimated Time From Issue of Warning to Onset of Flooding ³				
Warning	Total	Post Flood	<2 Hours	2-4 Hours	>4 Hours	
Red	5			1	4	
Amber	6	1	1	3	1	
Yellow	7		2	3	2	

HUMAN RESOURCES				
WARNING ¹	Total Man Hours	Total People Involved	Period of Involvement (Dates)	
Monitor Forecasting Warning Dissemination	288 hrs	36	3/1/97 6/1/97	
Any other comments on manpower				
NATIONAL SYSTEMS MONITORING				
AVM Warnings (Voice ,fax, pager using AVM)	No of Recipients Targeted	No of "Successful" Calls ⁵	Failures Cause	Period Off Line
	300	250	Software and Leeds AVM	2 hrs
Floodcall	No. of message boxes updated ⁶	No. of public calls to message boxes ⁷	Failures Cause	Period Off Line
	9	90	-	-
Any other comments on systems				

NOTES:

The Report should be prepared on all significant flood events - for guidance 3 Amber Warnings or One Red Warning. In general it should be completed on the basis of the best estimate made by EA staff.

¹ Properties flooded are those where flood water enters property and damage occurs. As a guide Middlesex Benefit tables shows damage starting at 0.15 m below floor level. "Properties" include, domestic buildings, commercial, industrial, and recreational buildings. Any building which has been flooded and where the occupiers could reasonable expect to have received a warning should be included. In addition where specific non property warnings have been included in a Dissemination Plan and there is

a clear measurement of when that warning has been fulfilled they can be included as a equivalent to a property. Unless such specific warning are committed to, roads, gardens, agricultural or recreational land should not be included.

² The definitions of Yellow, Amber and Red warnings given in the national flood warning leaflet should be used.

³ The onset of flooding is the time estimate by E.A staff at which the first property in a target group is actually flooded with damage occurring.

⁴ For the purpose of this analysis all office based activities related to the issuing of flood warnings should be included. Staff wholly involved with the control of Operations and other field staff should not be included. Office based staff involved with both Warning and Operational activities should be included with one that take the most of their time
⁵ Successful calls are those listed by the AVM as "Successful" and include both answered and acknowledged calls.

⁶ Message Boxes should be counted as being updated if they are used during an event. They should not be counted each time revised information is placed in a box.

⁷ The total number of call from the public who successfully accessed a message box.

Send to J Neat within 2 weeks.

APPENDIX 3 - LEVEL OF SERVICE STUDIES

APPENDIX 3.1 FLOOD WARNING LEVELS OF SERVICE APPROACH - BY MARK TINNION AND LINDA AUCOTT JUNE 1997

1. WHAT IS A 'LEVELS OF SERVICE' APPROACH?

1.1 The Agency's Flood Defence Management Manual defines it as:

"An approach through which the degree to which the Agency's customers should benefit from flood defence operations and works can be defined."

1.2 It is an approach through which:

- a target standard (or level) of service can be set
- the current standard (or level) of service can be measured/recorded

2. WHY IS A 'LEVELS OF SERVICE APPROACH' USEFUL?

2.1 The Agency essentially offers an external 'service', the adequacy of which, compared to a target/standard can be recorded. The extent to which the current level of service does not meet the target/standard level of service then provides the basis for a strategy with clear objectives of the work required.

2.2 As any work required will be thus clearly linked to the fundamental principle of improving the Agency's level of service, it provides the basis for the business case justification of the work required. In fact, it provides the basis for the business case justification for all supporting work/systems/services, e.g. telemetry, modelling, weather radar.

2.3 The adoption of a target/standard level of service provides a consistent and non-subjective target, which, when met, will mean a consistent level of service is offered by the Agency wherever the approach is adopted. For example, if the approach is adopted across a Region, each Area will have the same target levels of service. Irrespective of their 'starting point'- their current level of service (which might be different across the region), the achievement of the target level of service will mean that a consistent level of service is then offered throughout the Region. Adoption of the approach nationally has the same potential benefits.

3. WHAT IS INVOLVED?

3.1 Target/standard level(s) of service need to be adopted (see 4 below)

3.2 A Flood Warning Level of Service Survey (FWLOSS) of all flood risk areas/reaches (over time) to determine the current levels of service. Although this might be phased, the survey should cover all flood risk areas/reaches on both main and non-main river.

The criteria for measurement of the current level of service clearly depend on the criteria for the target LoS (see 5)

- 3.3 An assessment of the costs and benefits of options to deliver the target/standard LoS
- 3.4 Development of a prioritised programme of work needed to raise current LoS to the target/standard LoS

4. TARGET/STANDARD LEVELS of SERVICE

- 4.1 The principle used in other areas of the Agency's work, is that a target LoS is based on an assessment of the 'value' of achieving that target. This is often referred to (particularly by MAFF PAGN) as an indicative SoS, which is currently based on land use criteria.

The preferred solution however, might deliver a LoS in excess of this target where it has a greater incremental benefit cost ratio.

- 4.2 The general principle behind a target level of service appears to be, quite understandably, a level of service which yields greatest potential ratio of benefit to cost.

- 4.3 The potential benefits of flood warning depend principally on the warning time given. In practice, however, actual benefits have been shown to be only a small proportion of the potential. This shortfall arises because potential benefits are affected by the following four factors in order to arrive at expected benefits:

Factor R - Awareness/penetration of warning - the proportion of property reached by the warning.

Factor V - Availability to respond - the proportion of properties for which someone is able to respond to the warning.

Factor A - ability to respond - the proportion physically able to respond.

Factor E - Effectiveness/willingness to respond - the proportion able/willing to respond effectively.

The actual benefit calculation can be shown as $FDA = P \times R \times V \times A \times E$, where FDA is the Actual flood damage avoided, and P is the Potential flood damage avoided.

- 4.4 Targets can therefore be set for each of the four 'reducing' factors. Research carried out to date (R&D Note 463) suggests that whilst benefits increase as lead time increases, there is a limit which is probably dependent upon the catchment response characteristics and the corresponding technical ability to produce an 'accurate' warning. Reasonable targets for each of these factors, for three different catchment response characteristics were therefore proposed:

4.5 Catchments with $T_p < 3$ hrs.

Factor	Target
Lead Time	2 hrs
Awareness of Warning (R)	70%
Available to Respond (V)	55%
Able to Respond (A)	95%
Effectively Respond (E)	85%
Cumulative Total	31%

4.6 Catchments with T_p 3 to 9 hrs.:

Factor	Target
Lead Time	4 hrs
Awareness of Warning (R)	80%
Available to Respond (V)	65%
Able to Respond (A)	95%
Effectively Respond (E)	85%
Cumulative Total	42%

4.7 Catchments with $T_p > 9$ hrs.:

Factor	Target
Lead Time	6 hrs
Awareness of Warning (R)	90%
Available to Respond (V)	80%
Able to Respond (A)	95%
Effectively Respond (E)	85%
Cumulative Total	58%

4.8 As a general concept - it appears the aim should be to issue a warning with the greatest lead time possible provided that the warning remains accurate. At present, this limit is perceived at 2 hrs lead time; the stated target LoS in the Customer Charter.

- 4.9 To simplify the process, it may be better to adopt one set of targets; if this is done the best option would appear to be the 'mid-range catchment' targets as set out in 4.6 above.
- 4.10 However, these targets have a cumulative effect of only 42% of warnings issued actually result in action to avoid damage. It may be desirable to set more challenging targets that have a cumulative effect of greater than 50%.
- 4.11 The following table shows the adopted target values for September 2001.

FLOOD WARNING - PERFORMANCE TARGETS	
Factor	2001 Target
Awareness of Warning (R)	80%
Available to Respond (V)	80%
Able to Respond (A)	95%
Effectively Respond (E)	85%
Overall Effectiveness of Warning System $R \times V \times A \times E$	52%

5. LEVELS OF SERVICE CRITERIA

- 5.1 Having set target levels of service, it is now possible to suggest the criteria for surveying the current levels of service:
- 5.2 Surveys will measure, for each flood warning reach/zone the following criteria:

Lead time - affects Factors R and V; the Timeliness of the warning
Forecasting accuracy - affects Factor E; the Accuracy of the warning
Public awareness - affects Factors V, A and E; }
Dissemination methods - affect Factor R ; } the Reliability of the warning

These factors have been referred to as the A R T of flood warning.

6. OUTPUT AND PERFORMANCE MEASURES

Output and Performance Measures are composite 'external' levels of service measures which provide assessments of the of the Agency's level of service, as perceived by the public: they will be determined by post event and other surveys.

Mark Tinnion
Linda Aucott
June 1997

APPENDIX 3.2 - FLOOD WARNING - LEVELS OF SERVICE APPROACH

Details of Methodology Used in North East Region

1. INTRODUCTION

Section 5 of the paper 'Flood Warning - Levels of Service Approach' can be developed further to illustrate the basis of the methodology used to conduct the FWLOSS and draw up a programme of work in North East Region.

2. BASIS AND TIMING OF FWLOSS APPROACH

- 2.1 The basis of the methodology was to carry out a survey of all flood risk zones (including non-main river and areas without an existing flood warning service) to determine the current level of service in each flood risk area. Where there is no existing warning, then the current level of service is clearly zero.
- 2.2 For all flood risk areas therefore, the approach was simply to consider:
 - a) Is there an existing warning for this flood risk area ? (If not then LoS is zero)
 - b) If there is, what is the current level of service?
- 2.3 The FWLOSS was carried out principally as a desk-top exercise using all available sources of data, and the knowledge of local catchment engineers. All flood risk areas were considered at the same time.

3. FACTORS TO BE CONSIDERED IN ASSESSING CURRENT LEVELS OF SERVICE

- 3.1 Considering the target levels of service, and the underlying fundamental principle that the general aim of the warning service is to increase the *actual* benefits of the flood warning by a) increasing the potential benefits of a warning, and b) increasing the factors that 'reduce' the potential benefits to the actual benefits, it was possible to establish the basic criteria for the survey of the current levels of service, as follows:
- 3.2 *Potential benefits* will be increased principally by improving the Lead Time of a warning
- 3.3 '*Reducing*' factors will be increased by improving the:

Factor	Increased through improving
R	Lead Time and Dissemination Method
V	Lead Time and Public Awareness
A	Public Awareness
E	Public Awareness and Accuracy

(NOTE: For effective action (E) to be taken, research indicates that the public have to know what to do, and be willing to do it. The willingness to act is affected by the accuracy of the warnings received over time.)

4. SUMMARY OF FACTORS TO BE CONSIDERED

The survey therefore considered, for each flood warning reach/zone:

4.1 Lead time (T)

As set out above, the *lead time* with which a warning is issued affects:

- a) the potential benefits
- b) Factor R (the penetration of a warning)
- c) Factor V (the availability of people to receive the warning)

4.2 Accuracy (A)

The *accuracy* of a warning issued affects

- a) Factor E (the effective action taken)

4.3 Reliability (R)

The reliability of the warning can be considered as comprising two further elements:

4.3.1 The state of *public awareness* where a warning is issued affects

- a) Factor V (the availability of people to receive the warning)
- b) Factor A (the [physical] ability of people to respond)
- c) Factor E (the effective action taken)

4.3.2 The *dissemination method* used to issue the warning/alert affects

- a) Factor R (the penetration of a warning)

4.4 NOTE: These factors have been referred to as the A R T of flood warning.

5. FWLOSS METHODOLOGY

5.1 Survey of All Flood Risk Zones

A 'Survey' of all known flood risk areas was made, to collect the data set out in Appendix A. (Example catchment from survey)

NOTES ON APPENDIX A / SURVEY DETAILS

Column	Notes
B	Most appropriate FDMS reach reference(s)
F & G	Property and HE data from FDMS, calculated by 'manually' combining reach data as appropriate for the flood risk areas
H	If the flood risk area has an existing flood warning service, the survey went on to assess the current level of service offered (Appendix B)
J	Work required was firstly prioritised broadly according to the following criteria: Existing warning needing improvement to bring it up to target LoS Phase B New warning to main river defended flood risk area Phase C New warning to main river undefended flood risk area Phase D New warning to non main river Phase E
K	Any other relevant info., particularly estimate of return period of onset of flooding (from FDMS) for approximate cost-benefit assessment.

5.2 Further Prioritisation

Within the broad prioritisation of work set out above, work required was further prioritised through an assessment of costs and benefits.

5.2.1 Costs

An estimate of the costs of setting up a new warning was made from the menu of costs attached as Appendix C. These were derived from experience of similar projects in recent years.

5.2.2 Benefits

An estimate of the benefits of adding a new warning was made thus:

- From FDMS (or other), an estimate of Annual Average Damage (AAD) was made.
NOTE: If approximate HE and return period data are known, AAD can be estimated pursuant to FDMM section xx, using an appropriate value of D*.
- The **potential** annual benefit from introducing a new warning was taken as 29% AAD (from National FW Dissemination Project Business Case)
- The **actual** annual benefit was taken as 73% (a factor from NFWDP Business Case reflecting potential inaccuracies in warning), then 52% (sum of the reducing factors [OPM2]) of the potential benefit.
- Thus, the annual benefit of introducing a new warning was taken as

$$AAD \times 0.29 \times 0.73 \times 0.52$$

- e) Costs and benefits were annualised over 10 years to estimate Net Present Value.

5.3 Further Survey of Existing Warnings

Where a flood warning service exists, further information was collected (as set out in Appendix B) to allow an assessment of the current level of service provided by the warning.

(NOTE: This assessment is based on ERLOS principles, extended to take account of the post-ERLOS changes to flood warning dissemination arrangements).

NOTES ON APPENDIX B / SURVEY DETAILS

Column	Notes
C & D	Classification pursuant to Duncan Reed, 1984. Referred to in R&D 463. Target lead times from R&D 463. Fast - catchment time to peak < 3 hrs, target lead time 2 hrs Medium - catchment time to peak 3 to 9 hrs, target lead time 4 hrs Slow - catchment time to peak > 9 hrs, target lead time 6 hrs. (NB All tidal warnings considered 'slow') The assessment made in the survey will be verified or otherwise as actual post-event data from any risk area is collected.
E&F	Is the alert system used the best for the flood risk area? Some guidance on suitable alert systems for certain characteristics of a flood risk area is given in an 'Implementation of Technology' report prepared by the National Technology Sub-Group dated 10th October 1995
G&H	For Amber and Red warnings: Are there sufficient no. of radio stations receiving the warning to ensure the 'blanket' broadcast desired? Does the warning go to Teletext? Are there too many such that it is difficult to control updates/cancellations, particularly Teletext? Is the (red) warning of such significance that it should be sent to BBC national weather centre for dissemination on national weather forecast broadcasts? For Yellow warnings: Do those warning of road flooding go to AA Roadwatch?
J&K	Is Floodcall set-up for the risk zone OK? Has the quickdial number for the area been published? Is it well known? Is the Floodcall no. & quickdial number referred to in the corresponding alert system? Is a standard script available for the recording? Will this provide as much information as is known to the public?
L & M	Is the local leaflet / information sheet OK? Does it clearly describe the means by which the public will receive a warning? Does it include reference to all media outlets and frequencies etc.? Does it include reference to Floodcall and quickdial no.? Does it clearly set out what the public should do when a warning is received?
N&P	Is the means of dissemination of the warning adequately described in a Dissemination Plan? Are the other agencies (Police/LAs) content with the means/description? If a member of the public in the flood risk zone looked at the Plan, could he/she find out how he/she would receive a warning.
Q	Does the warning specify the degree of risk? Is wording consistent with the colour code of the warning? (NB collorary with 16). Is wording consistent with other warnings? Will the description of risk be understood by the recipient (media/public)?
R	How specific is the warning to a particular flood risk area? Does it in reality cover more than one risk area? Does it specify areas at risk in terms recognisable by recipient (media/public)?

S	Does the warning 'fit-in' with the accepted national definitions of colour codings?
T	If all criteria are judged to be satisfactory, then no further work is considered necessary at this time

5.4 Post Event Survey Data

Data from the various post-event surveys will be used to add to and 'update' the FWLOSS survey:

5.4.1 Accuracy

Data collected will be analysed using the matrix approach set out in the OPM paper and proposed Flood Event Summary Report (12 May 1997). This will yield statistics on actual conditions vs. forecast conditions, from which a 'measure' of accuracy of a warning will be derived, using the approach proposed in Midlands Region (Tim Harrison). Data will also be collected (internally) of actual level/flow vs. forecast level/flow at appropriate lead times before onset of flooding to support the analysis and measure of 'accuracy'.

5.4.2 Timeliness

As suggested above, the FWLOSS has allowed a judgement as to whether a warning is likely to be issued with adequate lead time; this can only ultimately be verified following a flood event in which the warning was issued. Post event survey data will therefore be used to update the FWLOSS in this respect.

Mark Tinnion
8 September 1998

APPENDIX A - SURVEY OF FLOOD RISK ZONES

FLOOD RISK AREAS									
A	B	C	D	E	F	G	H	J	K
Location	Area Reference (pursuant to EDMIS)	Watercourse	Type flag M - main river N - non main T - tidal/sea	Type flag D - defended U - undefended	No. properties in flood risk area	No. HEs in flood risk area	Covered by Existing warning?	Work for Phase 2 (pursuant to Regional Plan)	Action Required / Comments
RIVER DON CATCHMENT									
DRONFIELD	265.02	Drone	M	U	46	300	Y	B	New scheme programmed for 98/99
ESKTHOLME	253.01	Went	M	D	13	16	Y	B	A number of farms and banks at risk, protected to 30yr
SYKEHOUSE	253.01	Went	M	D	10	10	Y	B	A number of farms and banks at risk, protected to 30yr
WHITTINGTON	265.01	Drone	M	D			Y	B	Main road, industrial and domestic properties protected to 30 years
DONCASTER	252.06	Don	M	D			Y	B	Defended to 1 in 100 yr std.
GOOLE	252.01	Don	M	D	8000	10000	N	C	Newly completed capital scheme protecting Port and town to 100 year
CARCROFT	255.02	Ea Beck	M	D	60	750	N	C	Numerous houses, industrial premises and roads at risk Protected to 50 years.
ARKSEY	252.06	Don	M	D	200	350	N	C	Several towns and villages are at risk in extreme events >100yrs
CHESTERFIELD	262.08	Rother	M	D	45	200	N	C	45 properties defended to 30 year standard
DUTCH RIVER - Left Bank	252.01	Don	M	D	50	100	N	C	Many isolated properties and villages at risk > 100yrs
STAINFORTH	252.04	Don	M	D	40	50	N	C	Many isolated properties and villages at risk > 100yrs
KILLAMARSH	262.04	Rother	M	D	1	40	N	C	Large works at risk
SPROTBOROUGH	252.08	Don	M	D	3	10	N	C	Pub, 2 houses and a road at risk, protected to 10 years?
KILNHURST	252.1	Don	M	D	5	5	N	C	School and isolated houses at risk - protected to 7 year
DONCASTER (Marshgate)	252.07	Don	M	U	12	300	N	D	Many industrial premises at risk, protected to 50 years
BLACKBURN - Arthur Lees works	260.01	Bleekbn Brook	M	U	1	200	N	D	Large steelworks at risk
Grange Hill Lane	260.01	Bleekbn Brook	M	U	2	200	N	D	2 large industrial premises at risk. New telemetry station 1998
Elsing Road	260.01	Bleekbn Brook	M	U	4	150	N	D	4 industrial premises at risk
MARKHAM - Buttermilk Lane	263.01/02	Doe Lea	M	U	3	90	N	D	Flooding at bridge. Industrial works at risk
ROTHERHAM - Firth Rixson Rings	252.12	Don	M	U	1	50	N	D	Steelworks at risk, and main road plus industrial premises
Hasland Road	262.08	Rother	M	U	3	40	N	D	3 properties and a road at risk
WOODHOUSE - Strv	262.02	Rother	M	U	1	15	N	D	STW at risk
Low Farm	253.06	Went	M	U	12	12	N	D	Main road and 12 buildings at risk
HIGH GREEN - Station Road	260.02	Bleekbn Brook	M	U	10	10	N	D	10 houses at risk
SHEFFIELD - Nursery Street	252.14	Don	M	U	3	10	N	D	Main road and isolated properties at risk

FLOOD RISK AREAS									
A	B	C	D	E	F	G	H	J	K
Location	Area Reference (pursuant to FDMS)	Watercourse	Type flag M - main river N - non main T - tidal/sea	Type flag D - defended U - undefended	No. properties in flood risk area	No. HEs in flood risk area	Covered by Existing warning?	Work for Phase ? (pursuant to Regional Plan)	Action Required / Comments
WENTBRIDGE	253.06	Went	M	U	5	5	N	D	5 properties at risk. Mining scheme in progress for 98/99
WHISTON - Whiston Brook	262.01	Rother	N	U	18	25	N	E	18 houses and a road at risk. known flooding problem

APPENDIX B - EXISTING FLOOD WARNINGS

EXISTING FLOOD WARNINGS																		
A	B	C	D	E	F	G	H	J	K	L	M	N	P	Q	R	S	T	V
Warning Ref. No.	Flood Warning Zone	Catchment Response Fast Med Slow	Average lead time to target standard?	Alert System used	Alert System OK?	Media outlets used	Media outlets OK?	FloodCall box used	FloodCall set-up OK?	Local Leaflet used	Local Leaflet OK?	Dissemin Plan	Dissemin Plan OK?	Indication of risk / certainty OK?	Degree of warning focus OK?	Colour code OK?	Overall quality OK?	Actions Required / Comments
River Don																		
RY25	Bramwith	F	N	Fax	Y	n/a	n/a	n/a	n/a					Y	Y	Y	Y	As RY23 change to include FRR lid?
RY40	Treeton	F	Y	Fax	Y	n/a	n/a	n/a	n/a					Y	Y	Y	Y	Check leaflet
RY63	Doncaster	S	Y	Fax	Y	n/a	n/a	n/a	n/a					Y	Y	Y	Y	Not necessary?
RY70	Doncaster	S	Y	Fax	Y	n/a	n/a	n/a	n/a					Y	Y	Y	Y	Distribution of leaflets
RA15	Sheffield	F	N	Fax LoudHailer	N	Hallam FM Sheffield AA & Ttext	Y	02132	N	Sheaf	N	Sheffield CC	Y	N	N	Y	Y	Create new warnings for Sheaf Screen blockage
RA23	Sykehouse	S	Y	Fax AVM	Y	Sheffield Aire FM Leeds AA & Ttext	Y	02132	Y	Sykehouse IS	Y	Doncaster MBC	Y	Y	Y	Y	Y	
RA26	Dronfield	F	N	Fax AVM	N	Hallam FM Sheffield AA & Ttext	Y	02132	N	Don	N	Derbyshire	Y	N	N	Y	N	Consider new raingauge?
RA27	Chesterfield	M	N	Fax AVM	Y	Hallam FM Sheffield AA & Ttext	Y	02132	N	Don	N	Derbyshire	Y	N	N	Y	N	
RA37	Harlington	M	Y	Fax AVM	Y	Sheffield Aire FM Leeds AA & Ttext	Y	02132	Y	Harlington IS	Y	Doncaster MBC	Y	Y	Y	Y	Y	Include farmers in AVM?
RR06	Sheffield	F	N	Fax, LJI	N	Hallam FM Sheffield AA & Ttext	Y	02132	N	Sheaf	N	Sheffield CC	Y	N	N	Y	N	Create new warnings for Sheaf Screen blockage
RR16	Doncaster	S	N	Fax LoudHailer	N	Sheffield Aire FM Leeds AA & Ttext	Y	02132	Y	Don	N	Doncaster MBC	Y	Y	Y	Y	Y	

APPENDIX 3.3 - PRIORITISATION METHODOLOGY

FACTORS

It is suggested that three factors be used in establishing the priority of improvement and expansion of the Flood Warning System.

- Risk to Life
- Probability of Flooding
- Impact of Flooding (Damages)

A straightforward methodology is required to provide a consistent approach.

Risk to Life

Fatalities during a flood arise from wide range of causes. Certain factors do create a higher risk to life.

- Land use reflecting the density of population and their vulnerability
- Proximity to a flood defence and its relative height.
- The depth and velocity of the flood waters

Property adjacent to flood defences carry a greater risk than those at a distance in that overtopping or a breach will result in flood waters arriving at a greater depth and velocity and with less warning. The flood waters generally becoming slower and shallower the further from the flood defence. This factor should therefore be treated also an alternative to the generally factor of depth and velocity of flood waters.

The methodology use a simply High, Medium, Low scoring approach to these three factors, but using only two to determine a combined score, i.e. Land Use + EITHER Proximity to a FD OR Depth/Velocity.

Probability and Impact of Flooding

A well establish approach to quantify the benefits of flood defence or the damages from flooding in terms of probability and impact of flooding is Annual Average Damages (AAD). This approach is used both in the MAFF PAGN document and in a simpler form in the Agency's Flood Defence Management Manual (FDMM). NRA R&D Note 463 *The Benefits of Flood Warning* develops this approach into a series of tables giving the AAD per property from flood warning by standard of defence and warning lead time. SW Region have used this approach to develop a full benefits analysis for a flood zone.

The calculation of actual flood warning benefits from AAD is by the application of factors relating to the limited potential for mitigation of flood damage and the effective response to flood warnings.

It is proposed that the FDMM methodology which determines a Annual Average Number of House Equivalents (AAN) is used.

Establishing Priorities

The Risk to Life Score and the AAN are independent and should be used to rank flood zones/reaches separately as part of a Flood Warning LOSS. In establishing the programme of improvements and expansions then zones/reaches showing a high risk to life should be given a early consideration.

Risk to Life

Land Use	Score	Proximity to Flood Defence	Score
Caravan and Camping sites, River based recreational sites High Density Residential	10	Property within 50m and >3m differential	10
Medium Density Residential and Commercial Centres	7	Property within 100m and >3m differential Property within 50m and 2- 3m differential	7
Industrial, Low Density Residential and Roads/Railways	3	Property within 100m and 2-3m differential Property within 50m and 1-2m differential	3

Example Score for a location

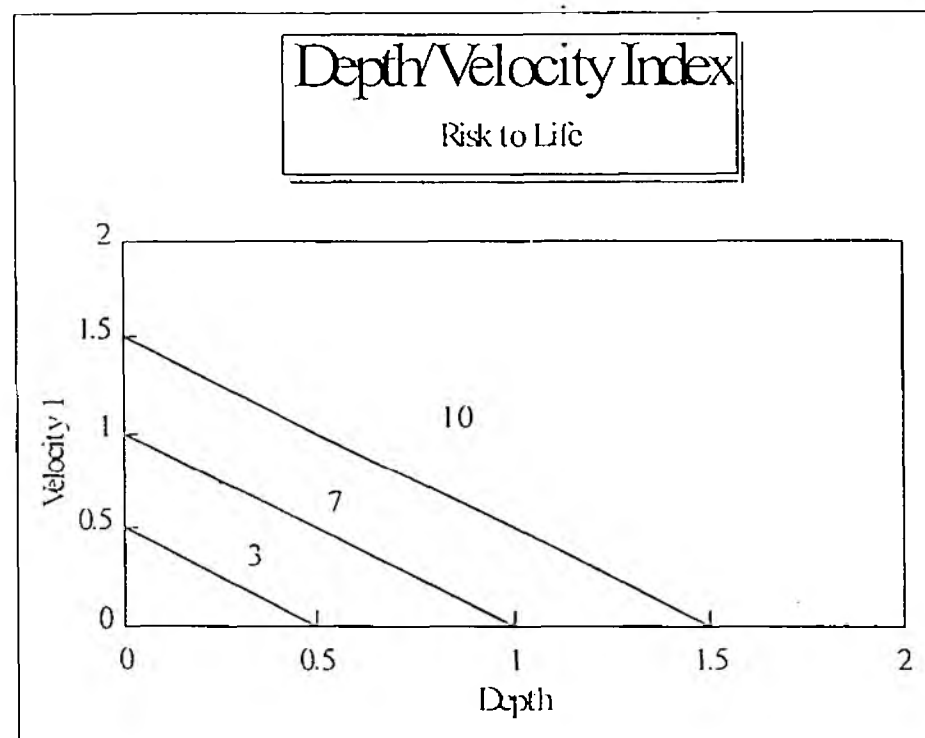
Medium Density Residential = 7

ETHER Within 2-3m high FD within 100m of Flood Defence = 3

OR 1m deep @ 0.5m/s Depth/Velocity Index = 7

Risk to life score Score = 7+7= 14

Note: DETR's Highways Economics Note No.1 gives the average value of the prevention of a fatality as £847,580. This equates to 746 House Equivalents (£1,135).



FLOOD WARNING PRIORITIES

Probability & Impact - AAN

Annual Average Damages is a measure that incorporates both the probability of a flood event and the impact. The Flood Defence Management Manual uses Annual Average Number of HE (AAN) for a reach as part of the prioritisation of maintenance works. The same methodology could be used to rank flood zones or reaches. It should be possible to use FDMS to support the calculations and provide some of the data.

EXAMPLES

Return Period	Probability	House Equivalents (HEs)	Probability Interval	Average HE flooded	Annual Average Number of HE's
Zone/Reach A - Undefended village					
2	0.5	1			
			0.4	10.5	4.2
10	0.1	20			
			0.08	21	1.68
50	0.02	22			
			0.02	22	0.44
~	0	22			
				Total AAN	6.32
Zone/Reach B - Defended town					
100	0.01	2			
			0.008	1251	10.008
500	0.002	2500			
			0.001	2550	2.55
1000	0.001	2600			
			0.001	2600	2.6
	0	2600			
				Total AAN	15.158

APPENDIX 4 - PLANS AND PROCEDURES

Appendix 4.1 Dissemination Plan Quality Assurance Procedures.

FLOOD WARNING DISSEMINATION PLANS

QUALITY ASSURANCE PROCEDURES

FIRST DRAFT - 6 AUGUST 1998

Contents:

- 1 Scope
- 2 Actions
 - 2.1 Preparation
 - 2.2 Verification
 - 2.3 Authorisation
 - 2.4 Revision
 - 2.5 Document Control
- 3 Documentation
 - Flood Warning Dissemination Plan Check List
 - Flood Warning Dissemination Plan Recipient Details and Plan Issue Register

1 SCOPE

This procedure describes the measures for the preparation, verification, issue, revision and document control for Flood Warning Dissemination Plans.

2 ACTIONS

2.1 Preparation

The plan is to be prepared by an Officer nominated (Originator) by the designated plan owner. The Originator will have detail knowledge of the local flood warning dissemination arrangements.

The Originator will then carry out the preparation, draft control and self checking by completion of the Flood Warning Dissemination Plan Check List.

The latest National Flood Warning Dissemination Plan Template shall be used to prepare the plan. Any significant amendments, additions or omissions shall be recorded on the check list.

2.2 Verification

The plan is to be checked by an officer nominated (Checker) by the designated plan owner. The Checker will need sufficient knowledge of the local flood warning dissemination arrangements to undertake a check of the arrangements detailed in the plan as well as identifying any typographical and presentation errors. The Checker shall not also be the Originator.

The Checker will review the plan and indicate any comments or amendments to be actioned by the originator. This process will continue until the checker is satisfied and has signed the Flood Warning Dissemination Plan Check List.

2.3 Authorisation

The designated Plan Owner shall review the Plan in general terms to confirm the suitability of the arrangements detailed therein. The owner shall refer to the check list to confirm that all of the checks have been completed and that he/she agrees to any significant amendment, additions or omissions to the National Flood Warning Dissemination Plan Template.

If the owner is not satisfied, the plan is returned to the Originator for amendment and re-checking.

When the owner is satisfied he/she signs the Flood Warning Dissemination Plan check list.

2.4 Revision

2.4.1 Minor Amendments

The originator shall undertake any minor revisions (typographical errors, out of sequence, contents etc) and re-issue the plan (or part of it) with the same Edition Number to all registered recipients. The re-issued plan shall be accompanied by detail instructions and the amendment shall be recorded on the plan amendment list contained in the plan.

The originator shall update the master copy and mark the relevant page(s) "superseded" or similar, with a reference to the amendment number. Superseded pages shall be filed appropriately for record purposes and the master copy of the plan amended accordingly, including any copy held in digital form.

2.4.2 Major Revisions

Where revisions are sufficiently extensive, the Originator shall designate new Editions sequentially as Edition 2, Edition 3 etc.

Any New Edition shall be subject to the preparation, verification and authorisation procedures, and a new Flood Warning Dissemination Plan check list shall be completed.

The new plan shall be issued to all registered recipients with an instruction to destroy or supersede the previous Edition.

The Originator shall mark the original master copy as "superseded" or similar and file appropriately for record purposes.

2.5 Document Control

The originator shall prepare and maintain the Plan Distribution List contained in the Plan.

The originator shall issue numbered copies of new Editions or amendments to the recipients on the Plan Distribution List. Each issue shall be recorded on the Recipient Details and Plan Issue Register and Plan Amendment List as necessary.

A completed copy of the Recipient Details and Plan Issue Register shall be forwarded to the recipient to enable them to sign and return as confirmation of receipt. Signed copies shall be retained on file by the originator as a record of receipt. Recipients that do not return a signed copy shall be asked to confirm receipt verbally and acknowledgement recorded on the Register by the Originator.

FLOOD WARNING DISSEMINATION PLAN CHECK LIST



ENVIRONMENT
AGENCY

PLAN AREA:

REF NO:

REGION:

EDITION NO:

AREA:

ISSUE DATE:

FORMAT

NOTE: THE TEMPLATE VERSION AND ANY SIGNIFICANT AMENDMENTS/ADDITIONS:

Tick

Check title page is correct

Check header details are correct

Check footer details are correct

Check local insertions have been made correctly

SECTION 3

PARAGRAPH

CHECK DESCRIPTION

Tick

3.4.2

Is a location map included?

Are the Flood Warning Location Names and reference numbers correct?

3.5.1 (b)

List of organisations included and correct?

(c)

List of TV and Radio Stations included and correct?

(d)

List of Areas by Warning Method included and correct?

3.5.2

Local Dissemination Arrangements included and correct?

SECTION 4

PARAGRAPH

CHECK FOR EACH LOCATION

Tick

4.2

Flood Warning location title correct?

4.2.1

Description of Flood Warning location includes extent, place names and reference to map.

4.2.2

Risk of flooding to include a summary of risk, historical flooding details, flood defences, lead time and a completed schedule of warnings.

4.2.3

Dissemination tables complete, check for each category of warning: Contact Details, Quickdial code, Dissemination method boxes and stand down message description.

4.2.4

Warning location maps, check that the standard map template has been used, the title information is correct, the map has been checked and the scale is appropriate.

APPENDICES		
APPENDIX	CHECK DESCRIPTION	Tick
1	Local details inserted.	
2	Dissemination system schematic.	
3	Links to other emergency plans schematic.	
4	List of leaflets and leaflets included.	
5	Fax warning examples included for each category of warning.	
6	Supplementary plan details.	
7	Example local AVM message included	
8	Examples of local floodcall messages included and a list of local quick dial codes.	
9	Plan distribution list complete.	
10	Plan amendment list updated.	
-	Check other local optional appendices (these should be inserted before the Plan distribution and amendment lists).	

PREPARATION		
FLOOD WARNING DISSEMINATION PLAN PREPARED AND SELF CHECKED BY:		
NAME:	SIGNED:	DATE:

VERIFICATION		
I have checked the plan and confirm that it has been satisfactorily completed.		
NAME:	SIGNED:	DATE:

AUTHORISATION		
To be completed for all Plans by the designated plan owner.		
I confirm that I have reviewed the plan and authorise it for publication.		
NAME:	SIGNED:	DATE:

Page A4.6

Appendix 4.2 Example Major Incident Plan

PLAN "SIGN UP PAGE"

SIGNATORIES TO THE PLAN

CIRCULATION - COPY HOLDERS

PLAN MAINTENANCE ARRANGEMENTS

COPY FOR
REVISION

final draft

MAJOR INCIDENT PLAN
FOR
FLOODING
IN
SALISBURY & WEST HARNHAM

MAJOR INCIDENT PLAN FOR FLOODING IN
SALISBURY AND WEST HARNHAM

INDEX

1)	Index	Page 1
2)	Glossary of abbreviations used	" 2
3)	Executive summary	" 3
4)	Introduction	" 4
5)	Organisations involved and their responsibilities	" 4
6)	The risk	" 5
7)	The defences	" 6
8)	Predicting flooding	" 6
9)	Flood warnings	" 7
10)	Activation of the plan	" 8
11)	Control & co-ordination arrangements	" 9
12)	Stand down arrangements	" 9
13)	Follow up action	" 9
appendix	1	Catchment map
"	2	Floodplain map
"	3	Media message
"	4	Loud Hailer message
"	5	Major Flood Warning leaflet
"	6	Location map for emergency centre
"	7	Health & Safety - working in flood water

2.

GLOSSARY OF ABBREVIATIONS USED IN THE PLAN

SDC	Salisbury District Council
WCC EP	Wiltshire County Council Emergency Planning Section
EA	Environment Agency
WFB	Wiltshire Fire Brigade
WA&PS	Wiltshire Ambulance & Paramedic Service
AVM	Automatic Voice Messaging - the method by which groups of people at risk of flooding are sent a recorded warning message over the telephone
LH	Loud Hailers
LHO	Loud Hailer Operator
FWDO	EA Flood Warning Duty Officer
Policy Director	The Policy Director (Community Services) of SDC

MAJOR INCIDENT PLAN FOR FLOODING IN SALISBURY & WEST HARNHAM

3. Executive summary

- 3.1 The plan will come into force when the Environment Agency issue a "Red- Major Flood Warning" for Salisbury and West Harnham"
- 3.2 On receipt of the above warning, the Policy Director will arrange for the Emergency Centre at Bourne Hill to be established.
- 3.3 The S DC will 'phone the following and ask them to send a Liaison Officer to the Emergency Centre:
 - WCC EP
 - WFB
 - EA
 - Any of the Utilities considered to be appropriate

Wiltshire Police may send a Liaison Officer to the Emergency Centre but may set up their own server and maintain contact from there.
- 3.4 The Policy Director will assume overall control of the incident.
- 3.5 Warnings to the public will be co-ordinated by the EA and will include AVM, LH messages and leaflet drops. The media will be kept fully briefed and the public will be advised to tune in to local radio to keep updated.
- 3.6 The SDC and the EA will have gangs checking water courses for blockages and signs of weakness in river banks or defences.
- 3.7 SDC will investigate any Environmental Health problems which may arise as a result of the flooding.
- 3.8 Sandbagging of property will be carried out by S DC where this is likely to be effective.
- 3.9 The Police, in consultation with the SDC will decide whether evacuation of the public is necessary.
- 3.10 If evacuation is considered to be necessary, the Policy Director will request that Wiltshire County Council arrange for Rest Centres to be established in accordance with arrangements in the "County of Wiltshire Procedures in Emergency Guide".
- 3.11 SDC will arrange transport for the evacuees, where this is needed.
- 3.12 The Policy Director will arrange for records of actions and accounts to be kept.
- 3.13 Following the event, the Policy Director will arrange a de-brief of all participants.

4. Introduction

- 4.1 The Major Incident Plan for Flooding in Salisbury and West Harnham is the next stage up from the Flood Warning Dissemination Plan for Wiltshire issued by the EA to cover the arrangements in place to issue warnings in the event of flooding.
- 4.2 This plan describes how a major flood, which would only be expected to occur in exceptional circumstances, will be dealt with.
- 4.3 The primary aim of the plan is to safeguard the general public from the effects of a major flooding emergency.
- 4.4 There is in existence a WCC Plan and a SDC plan for dealing with major disasters. This plan links into those and information available in them is not duplicated here.

5. Organisations involved

The principal organisations involved in the production of the plan, and who would implement it should the need arise, are:

5.1 Wiltshire Police

Responsibilities:

- Co-ordinate the actions of the Emergency Services.
- Save life, in conjunction with other emergency services.
- Evacuate people from property at risk if necessary
- Collate and disseminate casualty information.
- Identify victims.
- In consultation with SDC, the EA and the relevant Utilities, advise people when it is safe to return to their homes

5.2 The Environment Agency

Responsibilities:

- Predict flooding from statutory main rivers.
- Issue flood warnings to the other organisations involved and ensure that the public at risk are warned.
- Carry out certain operational actions to attempt to prevent, postpone or minimise the effects of flooding.
- Monitor the situation and advise other organisations

They also have responsibilities in connection with pollution and waste disposal problems which could also be a consequence of major flooding.

5.3 Salisbury District Council

Responsibilities:

- Take overall control of the emergency
- Give emergency assistance to prevent flooding of property (where possible).
- Clear blocked watercourses etc where necessary (other than main river).
- Provide transport if large numbers of people have to be evacuated.
- Deal with any environmental health issues.
- Supply sandbags where appropriate.

5.4 Wiltshire County Council

Responsibilities:

- Arrange emergency feeding and temporary accommodation for people who have been evacuated.
- Maintain safe conditions on the road, including putting flood warning signs on the highway.
- Clear blockages on highway drainage systems.
- Make available suitable properties for Emergency Rest Centres.

5.5 Other organisations with a role to play include:

- Wiltshire Fire Brigade, who would carry out rescues and use their equipment and personnel to assist the population as appropriate.
- Wessex Water Company who would, if necessary, deal with problems caused by their recovery plants being overwhelmed; repair burst water or sewage mains; provide tankered drinking water.
- Electricity, Gas and Telecommunication Companies who would carry out repairs to, or provide emergency replacement for, any of their services which had been damaged - where this is possible.

6. The risk

- 6.1 Salisbury is at the confluence of two separate watercourses, the rivers Avon and Nadder.
- 6.2 The conditions likely to give rise to flooding are a combination of prolonged periods of heavy rain in the catchment, particularly in the winter when the ground is saturated.
- 6.3 The build-up of flood water in the catchment is likely to be slow, giving perhaps 24 or more hours notice of the likelihood of conditions giving rise to concern.
- 6.4 The rise of water in Salisbury itself would be gradual (except on a frozen catchment when it would be very fast). There are no defences to overtop so the water would keep encroaching farther into the flood plain. Plenty of advance warning would be given.
- 6.5 West Harnham would be put at risk either from overtopping, or breach, of the floodbank or river bank. Advance warning could be given for overtopping, but if a breach occurred

it would be with little or no warning.

- 6.6 The area which could be affected in a major event is shown on the floodplain map at appendix 2. The build up, based on general flooding affecting all catchments equally, will be:

- Mainly agricultural land
- Centre of Salisbury
- Overtopping of West Hamham defences

Where localised, torrential rain occurs - as can happen during thunderstorm activity - the above sequence will not necessarily apply.

- 6.7 The area at risk comprises a mixture of property types, principally residential but with a significant number of commercial premises. The number of properties at risk is:

- | | |
|------------------------------|--|
| • West Hamham | 221 Private dwellings |
| • Ashley Road / Avon Terrace | 55 Properties, mainly residential but with about 10 commercial premises, including several in the motor trade |
| • Central Salisbury | 779 properties, mostly residential but with a significant number of commercial and retail premises, St. Mary's cathedral, two museums and numerous important listed buildings. |

- 6.8 It should be noted that an event severe enough to cause major flooding in Salisbury and West Hamham may well have caused problems elsewhere in the SDC area which might have an effect on access and available resources. Other possible trouble spots are:

- The Upper Avon Valley
- Tisbury
- Wilton
- Downton

7. The defences

- 7.1 The Flood Alleviation schemes in the Salisbury area consist mainly of raised embankments protecting Wilton and West Hamham from flooding up to a 1:100 year event.
- 7.2 The natural contours of the ground prevent most of the Centre of Salisbury from flooding except in an event of 1:100 years or more

8. Predicting flooding

- 8.1 Flood predictions are made by the EA in their 24-hour Regional Flood Warning Office in Exeter.

8.2 The elements which the EA monitor are:

- River levels and River flows - monitored remotely by telemetry from Flood Warning Stations at:

-River Wylye -	Brixton Deverill Norton Bavant South Newton
-River Nadder -	Tisbury Wilton
-River Avon -	Upavon West Upavon East Amesbury Salisbury

- Actual rainfall - monitored remotely from rain gauges throughout the catchment.
- Predicted rainfall - by monitoring weather radar and studying Met Office forecasts.
- The soil moisture deficit in the catchment (ie the amount of rain the catchment can absorb before becoming saturated). This information is provided by the Met Office.

8.3 The EA have sets of criteria for each catchment indicating the combination of the above circumstances which are likely to give rise to flooding. When the relevant criteria are reached, warnings are issued.

9. Flood warnings

- 9.1 Flood Warnings are issued by the EA from their 24-hour Regional Flood Warning Office in Exeter.
- 9.2 There are three levels of flood warning normally used by the EA - Yellow, Amber and Red. The meaning of each is given in the Flood Warning Dissemination Plan previously referred to.
- 9.3 A Red Flood Warning ^{may} will be in force for Salisbury and West Hamham before this plan comes into force, in accordance with the Flood Warning Dissemination Plan for Wiltshire.
- 9.4 The warning which would give rise to the implementation of this plan would be a "Red-Major Flood Warning for Salisbury and West Hamham."
- 9.5 Red-Major Flood Warnings would be sent by FAX to:
- Wiltshire Police.
 - Salisbury District Council
 - Wiltshire Fire Brigade

- Wiltshire County Emergency Planning Section
- Wiltshire Ambulance and Paramedic Service.

These would be followed by a 'phone call

9.6 The following radio stations would be asked to broadcast the message at appendix 3:

- BBC Wiltshire Sound- 103.5 FM
- Spire FM - 102 FM
- GWR - 102.2 FM
- BBC Radio Solent - 96.1 FM
- 2CR - 102.3 FM
- Wessex FM - 97.2 FM

9.7 Flood warnings to the public at risk would be by a variety of methods:

Many of the public at risk in West Hamham receive Red Flood Warnings via the AVM. There is also a Flood Warden scheme in operation where volunteer residents undertake to alert neighbours to the danger of flooding. They would be informed of a Red-Major Flood Warning in the same way.

Some residents in The Close, in Salisbury receive a Red Warning via AVM

Public notification of a Red-Major Flood Warning in Salisbury would be by Loud Hailers and leaflet drops. The deployment of loud hailer vehicles and the delivery of leaflets would be co-ordinated by the EA from the Emergency Centre at Bourne Hill. The EA would provide Loud Hailer vehicles but the Police may also call on other providers, using their usual procedures for summoning assistance. (The loud hailer message to be used is at appendix 4)

A supply of leaflets is held by the EA and would be taken to the Emergency Centre by their Liaison Officer - as would the loud hailer message. The leaflets, as well as warning the population of the likelihood of flooding, give them advice on actions they can take to prepare for a flood. (The leaflet to be used is at appendix 5.)

10. Activation of the plan

- 10.1 This plan would come into effect when the EA issues a Red-Major Flood Warning for Salisbury and West Hamham, or earlier if the SDC or the Police think it wise to do so. They would include, on the Red-Major Flood Warning referred to above, the wording "Major Incident Plan should be invoked"
- 10.1 Conditions may be such that, although the criteria for a Red-Major Flood Warning have not been reached, the EA feel that it is almost certain that they will be. In this case they will send a supplementary message to the Red Flood Warning, which would already have been sent, stating that a Red-Major Flood Warning is very likely.
- 10.2 On receiving either of the messages above, S DC will open up the Emergency Centre at

Bourne Hill (location map at appendix 6). They will 'phone the following organisations and ask them to send a Liason Officer:

- Wiltshire County Emergency Planning Dept.
- Environment Agency
- Wiltshire Fire and Rescue Service.
- The Utilities, as appropriate.

Wiltshire Police may also attend the Emergency Centre, but may decide to operate from a server elsewhere and maintain close contact with the Emergency Centre.

11. Control and co-ordination arrangements

- 11.1 The Policy Director will assume overall control of the emergency. This will include the co-ordination of joint press releases.
- 11.2 Resources arriving in the area (eg Loud hailer vehicles) should report to the Emergency Centre to get their instructions.
- 11.3 If the Police and SDC, after getting advice from the EA, believe that it is necessary to evacuate people, they will:
 - Set up Rest Centres in accordance with the County of Wiltshire Procedures in Emergency Guide
 - Carry out the evacuation.

12. Stand down

- 12.1 Should the predicted flooding not take place, or when it has stopped and is unlikely to recur, the E A will issue a "Stand Down to Amber" message to the relevant organisations and over the media. This means that the situation will not get any worse and should soon start to improve. A further "Stand down to Yellow" will be issued as the conditions start getting back to normal.
- 12.2 The degree to which other organisations can stand down on receipt of this message will vary according to their responsibilities. The Local Authorities are likely to be fully involved for some considerable time afterwards.

13 Follow-up action

- 13.1 It is important during and after the emergency to keep people informed about what is happening and the action which is being taken. Regular media releases will be co-ordinated by the Policy Director. Rest Centre Managers should be kept briefed so that they can inform evacuees at their centre.
- 13.2 Maintain action and financial records.

- 13.3 Investigate flooding and record information on flood levels. This should be co-ordinated between the EA and the SDC - partly to utilise staff effectively and partly to avoid the flood victims having to answer the same questions from more than one organisation. The resultant information will be collated and put into a report by the EA
- 13.4 Repair, or advise riparian landowners to repair, damaged watercourses.
- 13.5 Each organisation should hold its own debrief, then attend one called by the Policy Director to evaluate the effectiveness of the plan, or of the way the provisions in the plan were carried out.

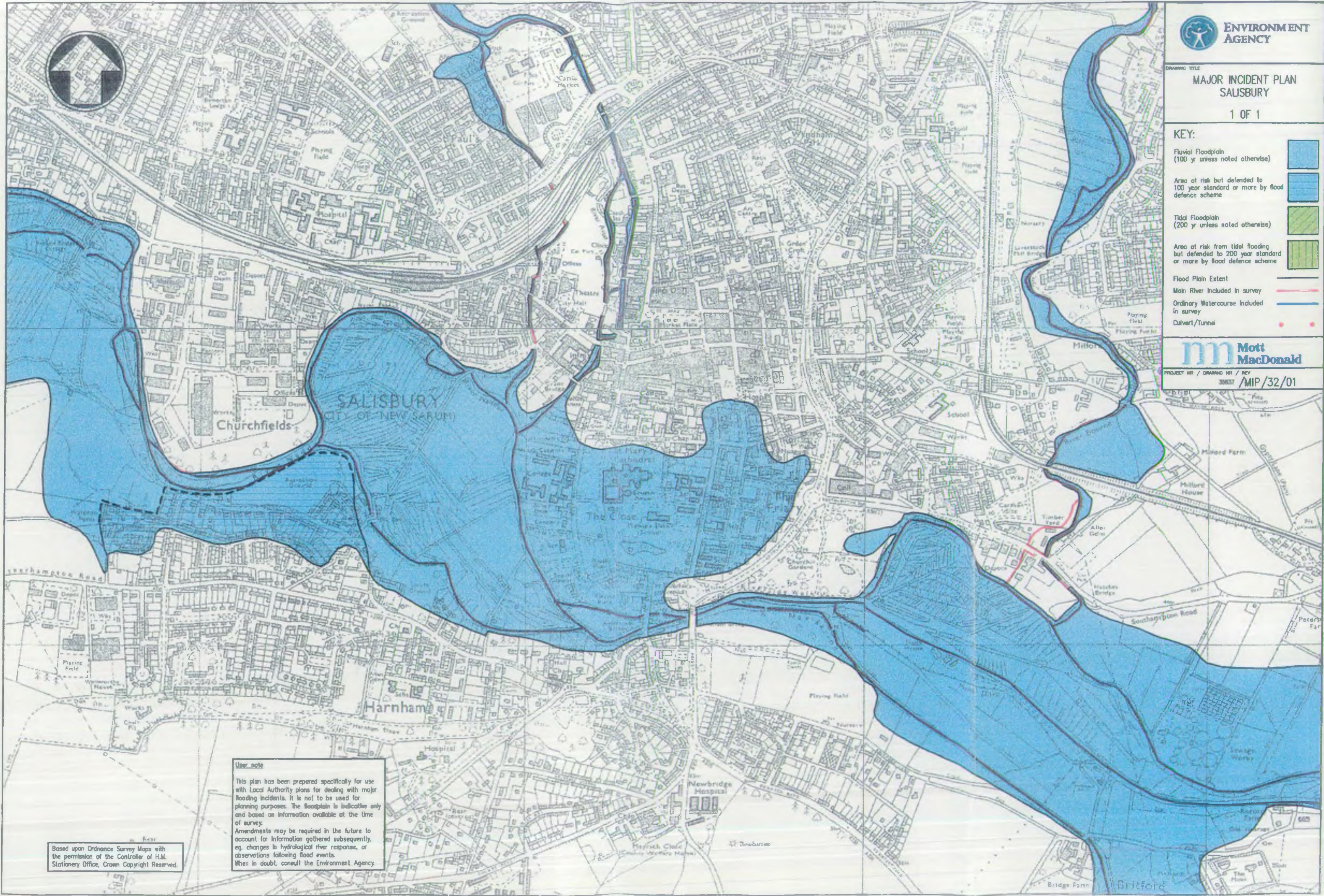


**MAJOR INCIDENT PLAN
SALISBURY**
1 OF 1

- KEY:**
- Fluvial Floodplain (100 yr unless noted otherwise)
 - Area at risk but defended to 100 year standard or more by flood defence scheme
 - Tidal Floodplain (200 yr unless noted otherwise)
 - Area at risk from tidal flooding but defended to 200 year standard or more by flood defence scheme
 - Flood Plain Extent
 - Main River Included in survey
 - Ordinary Watercourse Included in survey
 - Culvert/Tunnel

Mott MacDonald

PROJECT NR / DRAWING NR / REV
35637 / MIP / 32 / 01



User note

This plan has been prepared specifically for use with Local Authority plans for dealing with major flooding incidents. It is not to be used for planning purposes. The floodplain is indicative only and based on information available at the time of survey.

Amendments may be required in the future to account for information gathered subsequently, eg. changes in hydrological river response, or observations following flood events.

When in doubt, consult the Environment Agency.

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HAMPSHIRE AVON CATCHMENT

SHOWING REACHES



MEDIA RELEASE

To: BBC Wiltshire Sound; Spire FM; GWR; BBC Radio Solent; 2CR; Wessex FM.

THE ENVIRONMENT AGENCY has issued a RED-MAJOR FLOOD WARNING for SALISBURY AND WEST HARNHAM

serious flooding is likely in the following areas:

THE CONSTABLE WAY AND MIDDLE STREET AREA OF WEST HARHAM.

CENTRAL SALISBURY BETWEEN THE RIVER AVON AND THE FRIARY LANE/ BROWN STREET AREA, INCLUDING CATHEDRAL CLOSE AND EXETER STREET.

THE MILL ROAD AREA OF SALISBURY AND THE ASHLEY ROAD / AVON TERRACE AREAS OF SALISBURY

The flooding is likely to start occurring at about.....o' clock am / pm* today / tomorrow*. (* delete as appropriate)

PEOPLE LIVING IN THIS AREA ARE ADVISED TO MOVE THEMSELVES, THEIR PETS AND VALUABLE ITEMS TO AN UPPER FLOOR WHERE POSSIBLE.

They should take the following items with them:

- WARM CLOTHES
- FOOD AND DRINK
- TORCH AND SPARE BATTERIES
- RADIO (BATTERY OPERATED IF POSSIBLE)

For people who wish to leave their property the Local Authorities will be setting up **TEMPORARY REST CENTRES**. The location of these will be announced over Local Radio.

- You should **SWITCH OFF GAS AND ELECTRICITY** supplies when flooding is imminent or if evacuating your property.
- You are asked to **CHECK ON YOUR NEIGHBOURS**, particularly if they are old or infirm.
- **YOU SHOULD STAY TUNED IN TO LOCAL RADIO TO BE KEPT IN TOUCH WITH DEVELOPMENTS**

APPENDIX 4

LOUD HAILER MESSAGE

(LOUD HAILER MESSAGES ARE SOLELY TO ALERT THE PUBLIC TO THE FACT THAT A FLOOD WARNING IS IN FORCE, AND TO ADVISE THEM TO TUNE IN TO LOCAL RADIO.

ATTEMPTING TO PASS INVOLVED MESSAGES WOULD BE A WASTE OF TIME IN THE WET AND WINDY CONDITIONS LIKELY TO PREVAIL AT THE TIME OF A FLOOD)

Date.....Time.....

FOR USE AT SALISBURY & WEST HARNHAM

MESSAGE

"ATTENTION, ATTENTION: THIS IS AN ENVIRONMENT AGENCY FLOOD WARNING

A RED MAJOR FLOOD WARNING HAS BEEN ISSUED FOR SALISBURY AND WEST HARNHAM.

THIS AREA IS AT RISK

FLOODING IS LIKELY TO START AT ABOUT*.....O' CLOCK *AM / PM
*TODAY / TOMORROW

(* Delete/Insert as appropriate)

YOU ARE ADVISED TO PROTECT YOUR PROPERTY AND TO TUNE IN TO YOUR LOCAL RADIO STATION FOR FURTHER INFORMATION"

**APPENDIX 5 - LOCATION MAP TO BE
PROVIDED**

**APPENDIX 6 - FLOOD WARNING
LEAFLET TO BE PROVIDED**

HEALTH AND SAFETY - WORKING IN FLOOD WATER

Everyone dealing with a flooding incident must obey the Health and Safety guidelines in force in their particular organisation. However, operating in flood water can bring dangers which are not normally encountered in peoples' everyday working environment. The following guidance is offered as a supplement to normal practice: it is not necessarily exhaustive and individuals must make their own assessments of the risk facing them.

Dangers

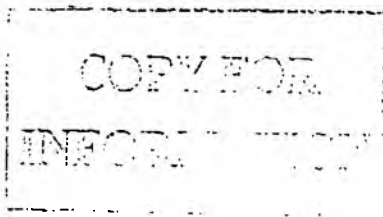
- Shallow, ponded water can cover ditches, manholes, access hatches to basements etc. Covers to manholes and access hatches are frequently lifted off by the power of the water, leaving a deep hole into which the unsuspecting can fall or drive.
- Flowing water can exert strong, lateral forces and will typically build up on the upstream side to a height half as high again as the flowing depth.
- Tidal conditions are particularly dangerous. Wave action is probably responsible for more deaths than any other factor in these situations. Swell waves can be quite unpredictable and an exceptional wave can appear without any warning.
- Flood water may be contaminated. There may be overflows from Sewage Treatment Plants, or the water may have been contaminated with chemicals from industrial or agricultural premises.
- Water will conduct electricity. If the power has not been turned off there is a possibility of electric shock. One indication of the presence of live electricity in flood water is a sensation of vibration. If you experience this you should withdraw.

Questions to consider

- Is it absolutely necessary? What purpose will be served by entering the water?
- Do you need to visit the site at the peak of the flood, or could it wait until the waters start to recede.
- How deep is it? Is the level rising or falling?
- How fast is the flow?
- Does your organisation have rules about working in flood water and are you qualified to enter?
- Do you have the necessary equipment to enter water - eg Lifejacket, Wading Stick, Reflective Clothing, Torch etc?
- Should you have someone with you?

Procedures

- Let someone know where you are and what you're doing.
- Wear protective clothing, including gloves.
- Proceed with caution, testing the ground in front of you with your wading stick.
- If you feel the water tugging at you, retreat to safer ground.
- If you suspect that there is live electricity present, withdraw. One sign of an electrical short circuit in flood water can be a tingling or vibrating sensation.
- Don't drive into flood water unless you absolutely must. If it is essential, use a suitable vehicle, eg an off-road, diesel engined model. Even then, drive with extreme caution and retreat if the water starts to get too deep. Remember, a vehicle passing through water creates a bow wave which can flood premises or other vehicles which might otherwise have been alright.



Salisbury & West Harnham Flood Plan

Environment Agency Action Checklist

FLOOD WARNING DUTY OFFICER

- 1) When a Red Flood Warning is in force for the River Avon and/or Nadder and conditions are such that a Major Incident is a real possibility, inform the Regional Base Controller that the Chief Executive of Salisbury District Council should be informed.
- 2) When the criteria are reached for a Red-Major Flood Warning for the Rivers Avon and/or Nadder at Salisbury
 - Send Red-Major Flood Warning Fax message by Auto-Fax.
 - Fax Red-Major Flood Warning manually to Incident (Silver) Control at the SDC Emergency Centre at Bourne Hill, Salisbury

(Fax message attached - Fax number will be available through Liaison Officer at Silver Control)
 - Send AVM Red-Major Flood Warning messages
 - Instruct EA Liaison Officer at Incident Control to deploy Loud Hailer Vehicles to issue messages and distribute leaflets.
- 3) Continue to send copies of all relevant messages to Incident Control.
- 4) Arrange for "Floodcall" to be updated
- 5) Keep PR informed

Note

You should read the Executive Summary in the Major Incident Plan for Flooding in Salisbury / West Harnham, and make yourself aware of the content of the Action Checklists for Regional Base Controller, Liaison Officer, Loud Hailer Operators and Area Base Controller.

COPY FOR

INFORMATION

Salisbury & West Harnham Flood Plan

Environment Agency Action Checklist

E.A. REGIONAL BASE CONTROLLER

- 1) When a Red Flood Warning is in force for the River Avon and/or Nadder, and conditions are such that a major incident is a real possibility, the FWDO will inform you that the Chief Executive of Salisbury District Council should be informed.

Read the Executive Summary in the Major Incident Plan for Flooding in Salisbury
(Immediately following these check lists).

- 2) Advise the Chief Executive of Salisbury District Council that the implementation of the Major Incident Plan for Flooding in Salisbury should be considered .
(Number and message attached)
- 3) Ensure that confirmation of this message is sent to SDC.
(Fax Message and numbers attached)
- 4) Make yourself aware of the content of the Action Checklists for Duty Flood Warning Officer, EA Liaison Officer, Loud Hailer Operators and Area Base Controller.
- 5) Request the ABC to send Liaison Officer to the Emergency Control Centre at Bourne Hill, Salisbury with the box file marked "Major Incident Plan for Flooding in Salisbury". In the event of it not being possible for Area to find a LO, arrange to send one from Region.
(The file is in the Flood Warning Section, with a duplicate set in the South Wessex Area Incident Room, and contains: a copy of the plan; a location map for the Emergency Control; the loud-hailer message to be broadcast ; leaflets to be put through doors of property in the risk area.; a Floodplain Map for the area at risk)
- 6) Arrange for two Loud Hailer vehicles to be sent to Emergency Control.
(Arrange through South Wessex ABC. In the event of problems, refer to the "Loud Hailer Mobilisation" file. The EA Liaison Officer or the Police will co-ordinate issue of warnings)
- 7) Maintain close contact with the Liaison Officer.
(He/She will contact you on arrival at the Emergency Control to give contact number)
- 8) Maintain separate log of actions and decisions relating to the Salisbury Major Incident plan from the time the initial meeting is called.

COPY FOR
RECORDATION

Salisbury & West Harnham Flood Plan

Environment Agency Action Checklist

E.A. LIAISON OFFICER

On instructions from Area or Regional Base Controller

- 1) Collect "Major Incident Plan for Flooding in Salisbury" box file from Area Incident Room or Regional Flood Warning Section

(The box file contains: a copy of the plan; a location map for the Emergency Control; the loud-hailer message to be broadcast together with zone maps; leaflets to be put through doors of property in the risk area; a map of the floodplain.)

- 2) Familiarise yourself with the current situation on the Rivers Avon and Nadder.
(Discuss with ABC or FWDO before leaving)

- 3) Go to the Salisbury DC Emergency Control, Bourne Hill, Salisbury.

(Location map in box file)

- 4) Contact the Exeter Flood Warning Office from the Emergency Control to confirm contact 'phone no.

- 5) Advise Police and Local Authorities of developing situation.

- 7) Deploy Loud Hailer vehicles to warn the public when instructed by the FWDO.

(Issue leaflets to loud hailer operators for distribution when messages have been broadcast.)

- 8) Keep the Flood Warning Office advised of actions on the ground.

- 9) Maintain a record of decisions made and actions taken in relation to the flooding.

Salisbury & West Harnham Flood Plan

Environment Agency Action Checklist

LOUD HAILER OPERATORS

- 1) Collect Loud Hailers as advised by South Wessex Area Base Controller.
(The closest ones are kept in Bishopsdown or East Mills Depots, or the Area Incident Room. You will be advised if they have to be fetched from somewhere else).
- 2) Collect the "Salisbury & West Harnham Flood" envelope from the "Loud Hailer" file where the loud hailers are kept or the Area Incident Room"
(This envelope contains: a location map for the Emergency Centre; the loud hailer messages to be broadcast; a Salisbury street map covering the flood risk area)
- 3) Go to the Emergency Centre at Bourne Hill, Salisbury to meet the EA Liaison Officer.
- 4) Broadcast message on instructions from the EA Liaison Officer or Police. They will give you the message to be broadcast *(if different from the one in the envelope)*, together with which zones to cover.
- 5) Post leaflets through the doors in the risk area as instructed by the EA Liaison Officer
(The leaflets will be given to you by the EA Liaison Officer)
- 6) Report back to the Liaison Officer when you have completed the tasks or if you have a problem.

Salisbury & West Harnham Flood Plan

Environment Agency Action Checklist

AREA BASE CONTROLLER

- 1) When a Red Flood Warning is in force for the River Avon and/or Nadder, and conditions are such that a major incident is a real possibility, the FWDO will inform you that the Chief Executive of Salisbury District Council should be informed.

Read the Executive Summary in the Major Incident Plan for Flooding in Salisbury (Immediately following these check lists).

- 2) On request from the RBC, send a Liaison Officer to the Emergency Control Centre at Bourne Hill, Salisbury with the box file marked "Major Incident Plan for Flooding in Salisbury". In the event of it not being possible to find a LO, request RBC to arrange to send one from Region.

(The file is in the South Wessex Area Incident Room, with a duplicate set in the Regional Flood Warning Section, and contains a copy of the plan; a location map for the Emergency Control; the loud-hailer message to be broadcast ; leaflets to be put through doors of property in the risk area.; a Floodplain Map for the area at risk)

- 3) Send two Loud Hailer vehicles to Emergency Control at Bourne Hill, Salisbury, with the envelope marked "Major Incident Plan for Flooding in Salisbury & West Harnham". This will be found near the Loud Hailer and includes a map of the location of the Emergency Control.

- 4) Maintain close contact with the Liaison Officer.

(He/She will contact you on arrival at the Emergency Control to give contact number)

- 5) Maintain separate log of actions and decisions relating to the Salisbury Major Incident plan from the time the initial meeting is called.

APPENDIX 5 - BIBLIOGRAPHY

LIST OF DOCUMENTS

- 1 EASTER FLOODS
 - 1.1 Draft Project Brief: EFFECTIVE FLOOD WARNING DISSEMINATION (Construction and Delivery of Messages): June 1998
 - 1.2 Easter Floods 1998: Preliminary Assessment by the Independent Review Team. Report to the Board of the Environment Agency. Peter Bye & Michael Horner, 31 May 1998
 - 1.3 Memo from Dr Geoff Mance to Bryan Utteridge - Detailing follow up to Easter Floods 11 June 1998
 - 1.4 Thames Region - Regional Flood Defence Committee Paper - Easter 1998 Flooding 14 May 1998
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 - 1.6 Report on Flooding Incident in Agency Wales Area, 9 - 11 April 1998
 - 1.7 Easter Floods 1998 - A Preliminary Assessment by the Environment Agency. Report to the Minister of Agriculture Fisheries and Food April 1998
 - 1.8 Anglian Region Response to Preliminary Findings of the Independent Review - Draft 1 4 June 1998
- 2 STANDARDS OF SERVICE
 - 2.1 The Flood Warning Strategy for England and Wales, 1997-8 to 2001-2 - Final Draft, 22 April 1998
 - 2.2 Flood Warning Dissemination Project, Report, Andy Baxendale Andy Baxendale, February 1996
 - 2.3 Flood Warning Dissemination Project, Project Initiation Document David Pelleymounter, 1 February 1996
 - 2.4 National Flood Dissemination Project, Review of National Implementation, Report to Quality Review Group John B Chatterton, November 1996
 - 2.5 Flood Warning - A Levels of Service Approach M Tinnion & L Aucott, June 1997
 - 2.6 South West Region, Flood Warning: Levels of Service Study Core Report. March 1997
 - 2.7 Project Appraisal Guidance Notes, (PAGN) MAFF, 1993
 - 2.8 An Action Plan for Flood Defence Environment Agency, January 1998
 - 2.9 Emergency Response Levels of Service, Flood Defence Managers Group, FD(93)60 Flood Defence Manager (Thames), 1993
 - 2.10 A Strategic Approach to Flood Warning and Levels of Service Linda Aucott, Tim Wood and Steve Magenis, 1997?

- 2.11 Strategy for Flood and Coastal Defence in England and Wales
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- 2.12 Extract from the Memorandum Relating to Flood Defence Grants
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- 2.14 R&D Note 106 - Flood Defence Emergency Response Levels of Service
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3 EFFECTIVENESS OF WARNING METHODS

- 3.1 Flood Warning: Baseline Survey
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- 3.2 Flood Warning Dissemination: Survey Among at Risk Population in Norfolk
BMRB, August 1997
- 3.3 Flood Warning Dissemination: Report on Public Awareness Surveys (1997)
BMRB, October 1997
- 3.4 Flood Warning Dissemination: Topline Report (1997/98 Post Event Surveys)
BMRB, May 1998
- 3.5 Flood Warning Dissemination: Report on 1998 & 1997 Public Awareness Surveys - draft
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- 3.6 Report of Review of Specification - Flood Warning Dissemination - Public Awareness Surveys -
Dennis Parker, March 1998

4 DISSEMINATION PLANS AND OTHER DOCUMENTATION

- 4.1 National Standard Dissemination Plan Template
June 1997
- 4.2 Code of Practice for Controlled Documents
NRA Northumbria and Yorkshire Region, 30 October 1995
- 4.3 Welsh Region - Draft Dissemination Plan for North Wales Police Force Area
22 April 1996
- 4.4 Flood Warning Leaflet
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- 4.5 Retrofitting for Floods
South Australia State Emergency Service
- 4.6 Director General's Newsletter
New South Wales Flood Planning Project, June 1994
- 4.7 ABC Radio Emergency Plan in Regional Victoria
August 1994
- 4.8 Flood Warning Management Plan for Tasmania
Flood Warning Consultative Committee, March 1991
- 4.9 Australian Counter Disaster Handbook - Volume 1

Emergency Management Australia, 1993

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4.11 Effective flood Warning the Australian Way
Lindsay Pickles, 1994

4.12 South West Region, Typical Major Incident Plan and accompanying PID/SOD documentation.
1997/98

4.13 Australian Flood Warning Information
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Collated by John Neat, 19 February 1997

4.19 Dissemination Plan Sub Group Sign Off Paper
Dissemination Plan Sub Group, 26 June 1997

APPENDIX 6 - PROJECT BRIEF & PRODUCT DESCRIPTIONS

EFFECTIVE FLOOD WARNING DISSEMINATION (CONSTRUCTION AND DELIVERY OF MESSAGES)

<u>Project Champion</u>	Dr David P F King, RGM Midlands
<u>Project Executive</u>	Dr Brian Waters, RWM Midlands
<u>Project Manager</u>	David Pelleymounter, Area FD & WR Manager, NE
<u>Project Team</u>	
	Jonathan Croft, Team Leader FW, NW
	Russell Burton, Team Leader FW, Midlands
	Doug Whitfield, Engineer FW, NE

OUTCOMES

PRODUCT	KEY ISSUES
A statement of the Agency's policy covering the implementation and operation of Flood Warnings systems	Permissive powers Ministerial Directive
A statement of standard of service for Flood Warning Systems.	the probability of flood damage the impact of flood damage the limitations in forecasting the response time of the catchment
A common approach to undertaking flood warning levels of service surveys	Accuracy Timeless Reliability Coverage Approach to extensions to service
A model dissemination plan and a compliance assessment.	Linked to Public Awareness material Linked to LA Emergency Plans
A costed implementation plan with clear milestones and reporting procedures.	A documented record of what has been agreed under change control. Clear lines of accountability for ownership of the process and implementation.

PROCESS

A lot of good work has been done but the Interim Report recommends: (numbers refer to the original Report)

- The proposals associated with the 1997-2001 flood warning strategy should be reviewed in the light of the Easter experience.
- Implementation of the original or modified strategy plans should be brought forward if relevant to correcting weaknesses in the issue of warnings at Easter.
- Some existing documentation would benefit from simplification and clarification and also presentation in accordance with a common format.
- The relevance of procedures to the current organisational arrangements for local authorities (unitary and two tier) should be appraised and updated if required.
- Procedures to achieve the required standards of performance should be subject to quality assurance, so that:
 - the correctness of original documentation is verified before implementation;
 - restrictions are imposed on the individuals authorised to change documentation;

- changes are recorded;
- changes are properly implemented;
- all documentation is changed simultaneously;
- auditing ensures adherence to the foregoing.

For areas known to be at risk from main river flooding, achieving more connections to the AVM and maintaining or introducing flood wardens, would seem to be the best course of action.

For defended areas where the defences are old and their integrity has been questioned, such as Northampton, the provision of direct warnings should be considered.

More emphasis should be given to testing the whole warning process with realistic extreme event scenarios.

Consideration should be given to approaches used in other developed countries, where flood risks are more severe and public education and dissemination methods are possibly better developed as a consequence:

These recommendations need to be considered and an Agency response prepared which either accepts them and outlines plans to implement the appropriate actions OR gives reasons why the Agency intends not to implement any one.

The detailed process of review is proposed along the following lines:

1. Review standard of service policies for flood warning (eg 1:50/1:100)

Collect current statements of policy and processes to implement. *Are they national and consistent? Are they followed? Are they adequately related to risk?*

Review appropriateness in light of Easter floods. *Are changes needed?*

Produce revised policy, if required, with cost implications.

QA in the light of Interim Report and statements made in public. *Sign off by FDFWB/FDSB/OMT.*

Document under change control.

2. Review effectiveness of warning methods (AVM, Flood call, use of media, etc)

Collect current statements of policy and practice and plans to implement. *Is there national consistency of approach? Are there problems in implementation?*

Review methods and plans in light of Easter floods. *Did they work as expected? What problems were encountered and how could they be overcome? How could we improve the service and at what cost? Should we increase the pace of implementation?*

Produce statement of "best practice" with cost implications.

QA in the light of Interim Report and statements made in public. *Sign off by FDFWB/FDSB/OMT.*

Document under change control.

3. Review dissemination plans and other documentation

Collect model dissemination plans. Review how implemented in regions. *Is there national consistency? Do they work? How have changes brought about improvements? Are they relevant to new organisational arrangements for local authorities?*

Review model and local plans in light of Easter floods. *What new problems came to light? How can we further improve?*

Revise model to produce "best practice" with cost implications.

QA in light of Interim Report and statements made in public. *Sign off by FDFWB/FDSB/OMT.*

Apply same principles to other documents and plans.

Document under change control.

4. Extend warning system using most appropriate methods

Promulgate 1-3 as best practice. *Documentation under change control. Ownership of process clearly established and principles of IMS applied.*

Regions and areas implement changes. *Costs identified and RFDC sign up. Timescales and milestones in place. QA process in place to monitor implementation and long term consistency.*

Test in exercises. *Agree frequency of tests, involvement of other agencies, reporting methods.*

Apply in practice. *General review after floods. Ensure best practice updated. Any changes under documentation control.*

Ensure output fed into Public Awareness.

Each of the above 1-3 will be treated as an element of the work with a Team Member responsible for collecting the information and preparing it for collective consideration under the guidance of the Project Manager. The collective outputs will be incorporated into element 4, which the Project Manager will be responsible for taking forward.

RESOURCES

It is proposed to utilise existing expertise from those directly involved and from within the National Flood Warning Implementation Team and the Flood Defence Flood Warning Board to carry out this process. This will have the benefits of speed and use of existing expertise. However it will require an approach to the reviews with an open mind and the realisation that the Agency will have to be seen as having responded to events and the Report in a positive and constructive way. Quality Assurance will be applied from within the groups and externally. This could involve a member of the Independent Review Team.

At this stage, without knowledge of the extent of the problem and the likely changes needed, it is difficult to estimate the effort. If Team Members can devote significant time to their elements over a short timescale, it is estimated that the bulk of the detailed work should be achievable with 5-10 days each. This assumes that there is a good basis and documentation to work with. The Project Manager will have less involvement at this stage but will need to put in the equivalent at least to take forward the final element. The team members will need to consult other Flood Defence staff for papers, views or information. Most of this should be through E-mail or telephone.

COSTS

The main cost associated with preparing a report to cover elements 1-4 will be the team staff time and the associated overheads equivalent to about 30 days. The Team will identify the costs of implementation of any changes as part of their output. Non team member costs have not been included. If consultancy is used for QA this will be an additional cost.

TIMESCALE

Subject to the resources being available and not too many problems in gaining information due to holidays, the draft report could be finished in mid July.

PRODUCT DESCRIPTION PART A

Region		Project Executive	Dr Brian Waters
Function		Project Manager	David Pelleymounter
Start year			
Project Title	Effective Flood Warning Dissemination	SoD Ref	
Product Title	Model Dissemination Plan	Code	
User Representative	Peter Kite		
Job Title	National Strategic Services Manager		

1. PURPOSE / OBJECTIVES OF PRODUCT

1. To identify best practice for Flood Warning Dissemination Plans in order to get a nationally consistent approach.
2. Methodology for assessment and compliance.

2. PRODUCT OUTLINE

Model Plan
Model Fax Formats/AVMs Scripts/Floodcall Scripts
Model link with LA Major Incident Plan and Routine Procedures
Distribution Guide
Compliance checklist/methodology

3. ENVIRONMENTAL AND QUALITY CRITERIA

Clarity, brevity, acceptability, simplicity. Must be complete but only contain material which is of use in understanding the problem and the actions required to deal with it.

4. ENVIRONMENTAL AND QUALITY REVIEW METHOD

National Flood Warning Board.

PART B (USER ACCEPTANCE)

Is the product accepted? (Yes/No)

Signed

Peter Kite

Date

On Behalf Of

National Flood Warning Service

☐ Comments attached

PART C

Is this the final or only product? (Yes/No)

If yes, then complete financial out-turn details for the project and submit to PAB Secretary

Original Authorised Cost (£K)	Initial Authorised Cost (£K)	Actual (£K)	Variance (£K)	Explanation of Variance

PRODUCT DESCRIPTION PART A

Region		Project Executive	Dr Brian Waters
Function		Project Manager	David Pelleymounter
Start year			
Project Title	Effective Flood Warning Dissemination	SoD Ref	
Product Title	Level of Service Studies	Code	
User Representative	Peter Kite		
Job Title	National Strategic Services Manager		

1. PURPOSE / OBJECTIVES OF PRODUCT

To ensure investment in Flood Warning is directed appropriately and consistently.

2. PRODUCT OUTLINE

Model Methodology include:

- A. Include issues
 - Existing/Extension
 - Main River/Non Main River
 - Tidal/Fluvial
- B. Guidance on Appropriate Dissemination Methodology
- C. Methodology for Assessment (Accuracy, Reliability, Timing)
- D. Methodology for Prioritisation

3. ENVIRONMENTAL AND QUALITY CRITERIA

Clarity, brevity, acceptability, simplicity. Must be complete but only contain material which is of use in understanding the problem and the actions required to deal with it.

4. ENVIRONMENTAL AND QUALITY REVIEW METHOD

National Flood Warning Board.

PART B (USER ACCEPTANCE)

Is the product accepted? (Yes/No)

Signed

Peter Kite

Date

On Behalf Of

National Flood Warning Service

☐ Comments attached

PART C

Is this the final or only product? (Yes/No)

If yes, then complete financial out-turn details for the project and submit to PAB Secretary

Original Authorised Cost (£K)	Initial Authorised Cost (£K)	Actual (£K)	Variance (£K)	Explanation of Variance

PRODUCT DESCRIPTION PART A

Region		Project Executive	Dr Brian Waters
Function		Project Manager	David Pelleymounter
Start year			
Project Title	Effective Flood Warning Dissemination	SoD Ref	
Product Title	Implementation Plan	Code	
User Representative	Peter Kite		
Job Title	National Strategic Services Manager		

1. PURPOSE / OBJECTIVES OF PRODUCT

More effective flood warning dissemination on agreed timescale and resources.

2. PRODUCT OUTLINE

- a) A costed implementation plan with clear milestones and reporting procedures.
- b) Clear lines of accountability for ownership of the process and implementation.

3. ENVIRONMENTAL AND QUALITY CRITERIA

Clarity, brevity, feasibility, acceptability, simplicity. Clearly defined actions required at Regional level.

4. ENVIRONMENTAL AND QUALITY REVIEW METHOD

National Flood Warning Board.

PART B (USER ACCEPTANCE)

Is the product accepted? (Yes/No)

Signed

Peter Kite

Date

On Behalf Of

National Flood Warning Service

☐ Comments attached

PART C

Is this the final or only product? (Yes/No)

If yes, then complete financial out-turn details for the project and submit to PAB Secretary

Original Authorised Cost (£K)	Initial Authorised Cost (£K)	Actual (£K)	Variance (£K)	Explanation of Variance

PRODUCT DESCRIPTION PART A

Region		Project Executive	Dr Brian Waters
Function		Project Manager	David Pelleymounter
Start year			
Project Title	Effective Flood Warning Dissemination	SoD Ref	
Product Title	Standard of Service Policy	Code	
User Representative	Peter Kite		
Job Title	National Strategic Services Manager		

1. PURPOSE / OBJECTIVES OF PRODUCT

1. To ensure nationally consistent Flood Warning service.
2. To communicate clearly scope and role of EA with respect to Flood Warning.

2. PRODUCT OUTLINE

National policy on provision and standards for flood warning service.

3. ENVIRONMENTAL AND QUALITY CRITERIA

Clarity, brevity, feasibility, acceptability, simplicity. Clearly define at Regional level actions required.

4. ENVIRONMENTAL AND QUALITY REVIEW METHOD

National Flood Warning Board.

PART B (USER ACCEPTANCE)

Is the product accepted? (Yes/No)

Signed	Peter Kite	Date	
On Behalf Of	National Flood Warning Service	<input type="checkbox"/> Comments attached	

PART C

Is this the final or only product? (Yes/No)

If yes, then complete financial out-turn details for the project and submit to PAB Secretary

Original Authorised Cost (£K)	Initial Authorised Cost (£K)	Actual (£K)	Variance (£K)	Explanation of Variance

PRODUCT DESCRIPTION PART A

Region		Project Executive	Dr Brian Waters
Function		Project Manager	David Pelleymounter
Start year			
Project Title	Effective Flood Warning Dissemination	SoD Ref	
Product Title	Project Report	Code	
User Representative	Peter Kite		
Job Title	National Strategic Services Manager		

1. PURPOSE / OBJECTIVES OF PRODUCT

To present a report of project which:-

- A. Reviews the current situation
- B. Considers implications of Easter floods and recommendations of the Bye Interim Report.
- C. Proposes any necessary revisions to current practice.
- D. Assesses implications.

2. PRODUCT OUTLINE

A Review of Effective Flood Warning Including:-

- A. Policy and Standards of Service
- B. Levels of Service.
- C. Dissemination Plans and Associated Documentation.

3. ENVIRONMENTAL AND QUALITY CRITERIA

Clarity, brevity, acceptability, simplicity. Must be comprehensive but only contain material which is of use in understanding the problem and the actions required to deal with it.

4. ENVIRONMENTAL AND QUALITY REVIEW METHOD

National Flood Warning Board.

PART B (USER ACCEPTANCE)

Is the product accepted? (Yes/No)

Signed

Peter Kite

Date

On Behalf Of

National Flood Warning Service

☐ Comments attached

PART C

Is this the final or only product? (Yes/No)

If yes, then complete financial out-turn details for the project and submit to PAB Secretary

Original Authorised Cost (£K)	Initial Authorised Cost (£K)	Actual (£K)	Variance (£K)	Explanation of Variance

APPENDIX 7 - DISTRIBUTION LIST

Copy No.	Copy Location	Copy Holder/Location

APPENDIX 8 - DOCUMENT HISTORY

Version No.	Amenders Name	Amenders Signature	Date of Version
First Draft			22 July 1998
Second Draft			23 July 1998
Third Draft			1 September 1998
Fourth Draft			8 September 1998