EA Southern

Environment Agency Southern Region

Christmas Floods 1999 Volume Two: Appendices

Document History			
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One	19th January 2000	Russell Turner	Draft
Two	31st January 2000	Russell Turner	RMT Version

Russell Turner
Regional Flood Warning Officer
Flood Warning & Regulation
Environment Agency
Southern Region
Guildbourne House
Chatsworth Road
Worthing
BN11 1LD

Tel: 01903 832346
Fax: 01903 821863
Email: russell.turner@environment-agency.gov.uk

Volume Two

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Appendix 1 – Terms of Reference

Environment Agency Southern Region
Christmas Floods 1999 – Performance Review
Terms of Reference

1. Introduction

The weather over Christmas 1999 period caused significant flooding across Southern Region. Hundreds of homes were identified for evacuation and in excess of 100 properties were flooded. In terms of flood warning the Region made 72,000 calls with its AVM equipment - the largest direct public warning exercise since the London blitz and issued over 180 Flood Warnings. The review is intended to be short and sharp, concentrating on the successes to highlight best practice and to identify areas for improvement.

2. Purpose of the Review

The review will confirm the adequacy of existing processes and procedures for the delivery of a seamless and integrated forecasting, warning and response service. The outputs of the review will be forwarded to the national EFAG and CNFDR projects to support this work. The outputs will also provide guidance for the sites where the PA Survey(s) will be undertaken.

3. Issues

The areas of interest include:

Procedures – to include area and regional emergency incident procedures, links between the Areas, Region and Head Office. Review confidence in the Region's ability to issue timely and accurate flood warnings and confirmation of the actions taken to open and operate Incident Rooms;

Systems – to include the RTS, AVMs, Floodline, Hyrad and backup systems and the appropriate training requirements;

Internal & External Liaison – to include both internally between Areas and the Region, and the role of the RCC; and externally with the Met office, the media, emergency services and local authorities;

Emergency Forecasting, Warning and Response Roles and Responsibilities – to provide a review of the content and understanding of the various roles and responsibilities, including the Regional Duty Manager rota and the role of the RGM.

4. Process

The review will be carried out by Russell Turner from the Regional Flood Warning and Regulation Team. He will attend all of the wash-up meetings which have been arranged at Area and the Regional offices. These meetings will enable those closely involved in the work to record both success and identify opportunities for improvement.

The review will include the analysis of all data available to the Region, together with identifying further sources of information which will need to be pursued over the coming months.

The work will not duplicate the detailed Public Awareness Survey that follows the national standard post-event survey policy. This study will help to focus follow-up activity to maximise our understanding of our performance throughout this major event.

5. Audience

There are three main audiences for the report:

a) internally within the region – RMT/AMT/Water Management
b) Statutory Committees
c) National FD Manager, National FD & FW Centre / NFWITs / Director of Operations / Director of Water Management

6. Outputs

A list of recommendations will be produced targeted to those who will have responsibility to deliver them with clear timescales for delivery and a follow-up review.

7. Timescales

A first draft of the report will be produced for 19th January with a final report produced for the RMT meeting of the 28th January.

Misc\termsofr\GL/RT/04/01/2000.

Appendix 2 – Kent Area Report

KENT AREA REPORT
Christmas Floods 1999

Document History			
Version	**Date**	**Issued By**	**Status**
One	26 January 2000	Alison Baptiste	

Environment Agency
Southern Region
Kent Area
Orchard House
Endeavour Park
London Road
Addington
West Malling
Kent
ME19 5SH

Tel: 01732 875 587
Fax: 01732 875 057
Email: alison.baptiste@environment-agency.gov.uk

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SUMMARY

This report describes the fluvial and tidal event that occurred over Christmas 1999. It details the weather situation, flood warnings issued and the Agency's operational response. It shows that it was a widespread event that occurred at the most disruptive time of year. Agency staff left their festivities and responded excellently. There was a lot of field flooding and approximately 200 properties were flooded although only a handful of these were from main river. The majority of properties were flooded from surface water, ordinary and private watercourses, which were unable to cope with the flows arising from localised heavy rainfall. The high tides reduced the capacity of drainage systems in low-lying areas.

The success of the recent Floodline launch was revealed in the dramatic increase in telephone calls received by the Agency during the event. Incident room manning was doubled and quadrupled to meet the demand at peak periods.

The extent of the event put severe pressure on the Automatic Voice Message (AVM) flood warning dissemination system as 72000 warnings were issued over the period. Although the system coped it revealed the need to update it, create more capacity and establish a procedure for checking the dissemination.

Flood defence and Customer Services staff collected flood level data immediately after the event and aerial photographs were taken across the area. The information collected was of limited use due to delays in availability of staff and variances in the approach taken to collection.

The main lessons learnt were:

- Increased manning levels required to respond to calls from the public during an event.
- The need to improve and quality assure the warnings issued and disseminated.
- Standard procedures for the collection of flood event data.

1. INTRODUCTION

Spring tides and heavy over most of Kent prompted widespread flooding and damage to sea defences. The high tides and south-westerly winds caused flattened shingle banks along the south Kent coast and the north Kent tidal barriers were operated over five tides. Rainfall of between 50 and 60mmm across Kent caused flood warnings to be issued on all of Kent's rivers and the impounding reservoirs upstream of Ashford and Tonbridge impounded for four days.

2. EVENT MANAGEMENT

The prediction of spring tides over the Christmas period had initiated a higher state of alert than normal. The developing low pressure expected to track up across the region during Christmas eve gave warning to storm tides and heavy rainfall.

Operational offices were fully manned through out Christmas Eve and meetings were held to discuss and disseminate contingency plans for the short term. Additional operatives were placed on standby along the south coast and a duty roster established for the Leigh Barrier control room.

The realisation of the weather warnings was met with an unprecedented number of requests for information and advice. The Tonbridge office was designated as the Area Incident Room at 21.00 and manning levels were increased four-fold to respond to the calls from Floodline.

The operational control room at Rye was initially opened only over the tides to deal with the threat of tidal flooding, but then continued open to deal with the developing fluvial event. Operational staff worked in shifts around the clock to maintain pumps, clear debris, man barriers and repair damage to front line assets.

3. FLOOD FORECASTING

The weather conditions were as follows:

24th December 1999

Precipitation	VH amount	H confidence	0600-1200 and 1700- 0200 timing
Winds	SSW 7-8 strengthening 8-9		
Tides	Astronomical	Rye 4.0	Surge 0.19
		Sheerness 3.15	Surge -0.69

Alarms
Rain gauge and River Level – attached
Storm Tide Forecasting Service.

25th December 1999

Precipitation	M amount	M confidence	0600-0600 timing
Winds	SW 9 decreasing 6		
Tides	Astronomical	Rye 3.9	Surge 0.16
		Rye 3.9	Surge 0.4

		Sheerness 3.00	Surge –0.81
		Sheerness 3.13	Surge 0.13

Alarms
Rain gauge and River Level – attached.
Gale Warnings – SW 9 decreasing 8 soon 20:37.
Severe Weather Warning – Heavy rain expected in South east on morning of 26th December
Weather Warning Message – Rainfall totals of around 15mm expected 26th December

26th December 1999

Precipitation	L amount	H confidence	0600-0900 and 1000- 0600 timing
Winds	W 7-8 decreasing 6		
Tides	Astronomical	Rye 3.6	Surge 0.57
		Rye 3.7	Surge 0.52
		Sheerness 2.92	Surge 0.3
		Sheerness 3.13	Surge 0.3

Alarms
Rain gauge and River Level – attached
Coastal – Division 4 Alert received 08:07 and 15:53
Division 5 Alert received 08:07 and 16:31

27th December 1999

Precipitation	L amount	M confidence	1000- 2200 timing
Winds	W 4		
Tides	Astronomical	Rye 3.3	Surge 0.55
		Rye 3.4	Surge 0.33
		Sheerness 2.78	Surge 0.55
		Sheerness 2.84	Surge 0.33

Alarms
Rain gauge and River Level – see alarm report attached
Coastal – Division 4 Alert 13:26
– Division 5 Alert 07:36
Gale Warnings – SW 9 decreasing 8 soon 20:37.

4. FLOOD WARNINGS ISSUED

The following flood warnings were issued, timings of when the fluvial warnings were taken off are not shown.

24th December 1999

Zone	Reach	Yellow	Amber	Red	Downgraded
Tidal 8A	St Marys Bay to Folkestone		17:00		
Tidal8B	Dungeness to Littlestone Golf Course		17:00		
Tidal 9	Hastings to Dungeness		17:00		
Fluvial 5A3	River Tillingham	11:00	23:00		
Fluvial 5A2	River Brede	11:00	23:00		
Fluvial 5A1	Eastern Rother	11:00	23:00		
Fluvial 6A4	River Stour	18:00			
Fluvial 5B1	Hamstreet	11:00			
Fluvial 8A1	Eden and Edenbrook	13:00			
Fluvial 8A8	Rivers Teise and Lesser Teise	20:10			
Fluvial 8A9	Beult	11:30	19:40		
Fluvial 8A7	Bourne	09:20			
Fluvial 9A3	Swalecliffe Brook		23:40		
Fluvial 7A3	Darent	21:05			
Fluvial 8A5	Medway – Yalding to Allington	20:35			

25th December 1999

Zone	Reach	Yellow	Amber	Red	Downgraded
Coastal 8A	St Mary's Bay to Folkestone		08:00		
Coastal 8B	Dungeness to Littlestone Golf Course		08:00		
Coastal 9	Hastings to Dungeness		08:00		
Coastal 8A	St Mary's Bay to Folkestone		16:10		
Coastal 8B	Dungeness to Littlestone Golf Course		16:10		
Coastal 9	Hastings to Dungeness		16:10		
Coastal 10	Tidal Areas Rye and Playden	16:10			
Fluvial 8A1	Eden and Edenbrook		12:50		
Fluvial 8A2	River Medway – Forest Row to Penshurst		01:55		10:20 Yellow
Fluvial 9A2	Westbrook		00:20	01:50	
Fluvial 7A4	Darent	01:15			
Fluvial 8A3	Medway – Penshurst to A21		01:30		
Fluvial 8A8	Rivers Teise and Lesser Teise		00:40	01:30	11:45Yellow
Fluvial 9A1	Warden Bay Drain	02:00			
Fluvial 8A7	River Bourne		00:15		
Fluvial 8A4	River Medway – Tonbridge to Yalding	8:50	18:10		
Fluvial 8A5	River Medway – Yalding to Allington	08:50	18:10		
Fluvial 8A6	River Medway – Allington to Rochester	09:25			

Coastal 2	Seasalter to Higham Marsh	08:30			
Coastal 4	Swalecliffe to Whitstable	08:35			

26th December 1999

Zone	Reach	Yellow	Amber	Red	Downgraded
Coastal 8A	St Mary's Bay to Folkestone		09:00		
Coastal 8B	Dungeness to Littlestone Golf Course		09:00		
Coastal 9	Hastings to Dungeness		09:00		
Coastal 8A	St Mary's Bay to Folkestone		18:00		
Coastal 8B	Dungeness to Littlestone Golf Course		18:00		
Coastal 9	Hastings to Dungeness		18:00		
Coastal 10	Tidal Areas Rye and Playden	18:00			

5. EMERGENCY RESPONSE

24th December 1999

South East Kent

A meeting of the flood defence client staff and Direct Works was held at 10:00am to plan for the tidal event that was predicted to take place that night. As a result extra operatives were placed on stand by for the Christmas period. Shepway District Council was contacted and plans were made as to the distribution of staff and materials. Further arrangements were made as to points of contact between the two organisations should the situation deteriorate.

During the day heavy rainfall caused river levels to rise in all catchments in the district. An operational control room was established at the Rye Office

Although significant over topping and wind blown spray was reported no properties were reported to be flooded. Significant amounts of shingle were lost from the Pett Frontage and shingle was lost from Nook Beach into the entrance of the Harbour of Rye. Significant amounts of shingle were lost along the frontages at Walland, Denge and Dungeness. The hard defences along zones 8A and 8B suffered only minor damage. A meeting was held at 01:30 25th December to prioritise work for Christmas day. Operations to repair damaged defences commenced at 9:00am 25th December once early morning inspections had been carried out.

North West Kent

Heavy rainfall caused river levels to rise rapidly in all catchments in the district. An operational control room was established at Leigh which later became the Area Incident Room. Demand for information / advice from public both through Floodline and direct resulted in the Area Incident Room manning to be increased to 4 staff to manage the calls.

The Leigh Barrier was manned from 11:35 when a Preliminary Impounding Warning was issued. The second band of rain triggered alarms from 18:00 and an Impounding Warning was issued at 21:45. Flooding reports received relating to surface water and foul water

over flows at Pembury, Five Oak Green and Stick Hill. Direct Works dispatched operatives to Swalecliffe brook, Cray, Shuttle, Darent, and Medway catchment, at 20:25.

25th December 1999

South East Kent

River levels continued to rise through out the district. The Rother was overtopping in to the wet levels and was increasing in level with each tide locked period. The Royal Military Canal was increasing in level. A brief loss of power caused the West Hythe tilting weir to jam in the fully closed position. The structure was switched to manual opened fully for the duration of the event. Despite this the canal reached bank full levels but did not over top. It was decided to commission an aerial photographic survey as soon as possible.

At 6:30 the operational control room was reopened at Rye with reports coming in from those staff inspecting both tidal and fluvial defences. All pumps were working most having been inundated since the early evening of the 24th. More operatives were called in to inspect structures and rake weed from pumps and outfalls.

There were no reports of flooding to properties.

North West Kent

River levels continued to rise and Kent Police report the evacuation of Five Oak Green. The Leigh Barrier began to impound floodwater in the early hours of the morning. The initial discharge from the scheme was restricted to 40 cumecs to allow streams local to Tonbridge to discharge. Later the discharge was increased and maintained at 57 cumecs, the lowest flooding threshold flow. Leigh Barrier continued to impound floodwater reaching a peak retention of 78 % full capacity. The maximum level reached was 27.53 AODN, which represents 4.4 million cubic metres. The Ensfield Road was closed at 08:00 and Leigh Pumping Station ran intermittently through the day, with a total running time of 4.5 hrs

Navigation staff reported that Sluice Weir radial gate was not opening fully which limited the option to increase in the discharge from the Leigh Barrier.

Teams attended the Dartford Creek and Queenborough Creek Barriers in response to the divisional alert. Tides levels attained were as follows:

Time	Queenborough Creek Barrier	Dartford Creek Barrier
14:00	3.528	4.357

The following property flooding was reported:

Main river

Smarden – 1 property, Blindley Heath – 1 property
Yalding – Riverside properties and caravan site Hampstead Lane
Wateringbury – Riverside Restaurant

IDB and Ordinary Watercourses

Lamberhurst - Less than ten properties

Five Oak Green - Village centre 20-30 properties.
- Norton Way, Nr Railway Line, approximately 100 properties
Paddock Wood - approximately 50 properties
Colliers Street - 2 properties reported

26th December 1999

Two periods of heavy rain during the day raised river levels across the district. Although river levels rose sharply the levels of the previous 24 hours are not exceeded.

South East Kent

Pumping stations were still operating continuously. The floodwall at Kent ditch was breached and one of the two pumps at Dimsdale seized. Hothfield and Aldington reservoirs upstream of Ashford were filled to 60% capacity and Bethensden Road was closed during the evening as levels in the Hothfield Reservoir increased.

The levels in the Stour continued to increase and arrangements were made to open Stonar Cut on all tides from afternoon of 26th. Areas of farmland were under water, but this was mainly from ordinary and private watercourses.

There were reports of flooding to properties in the Scots Acre and Farm Lane area of Camber. The site was inspected and it was found that the access to approximately 6 properties was restricted due to floodwater. The road was flooded because of a blocked culvert on a private watercourse. This restricted access for most of the day. One property in Farm Lane Camber was flooded from surface water draining from surrounding fields.

Problems with regard to surface water flooding were also reported in Brookland, Camber and Winchelsea where large volumes of surface water affected Southern Waters sewage treatment plants. This necessitated the plant at Camber to discharge raw sewage out to sea under Agency supervision.

North West Kent

Two periods of heavy rain during the day raised river levels across the district, although the levels of the previous 24 hours are not exceeded.

The Thames Barrier closed and teams attended the Dartford Creek and Queenborough Creek Barriers on both tides, in response to the divisional alert. Tides levels attained were as follows:

Time	Queenborough Creek Barrier	Dartford Creek Barrier
02:34	3.491	4.088
15:00	3.539	4.249

There were no further reports of property flooded.

27th December 1999

South East Kent

The threat of tidal inundation had receded with the lowering tide levels and the Emergency Workforce was recycling shingle to replenish the defences from Pett to Dungeness. On inspection, Marshlands outfall was found to be completely blocked with weed. Confined space equipment was made available to start the removal of the blockage on the following out going tide.

Reports were received from Dymchurch that 20 properties were at risk with gardens and garages flooded. Sandbags were issued to ensure no properties were flooded. Water was diverted to other watercourses to reduce the threat.

North West Kent

Teams attended the Dartford Creek and Queenborough Creek Barriers on both tides, in response to the divisional alert. Tides levels attained were as follows:

Time	Queenborough Creek Barrier	Dartford Creek Barrier
03:19	3.277	3.783
16:05	3.274	3.941

There were no further reports of properties flooded.

28th December 1999 onwards

River levels started to reduce to normal levels. Work continued recycling shingle along the south coast. The storage reservoirs at Leigh, Aldington and Hothfield emptied after four days of impounding.

6. DATA COLLECTION

Although there were no standard procedures in place, flood defence and development control staff were mobilised to collect data and verify reports of flooding. They covered parts of the Swalecliffe, Medway, Rother valleys. Efforts were also made to record information outside main river however this was limited.

The information obtained was extensively secondary evidence, accumulated from observing rack lines, wet carpets on fences and reports from the Fire Brigade and other emergency services.

Aerial photography was commissioned but could not fly until 28th December 1999. Although much of the water had receded, there was still information on rack marks.

7. PUBLIC RELATIONS

The press releases from Region heightened awareness locally as messages reached the national and local television and radio. There was a high media interest and this was mostly dealt with at Region as the event covered all three areas.

The impact of the launch of Floodline was clearly identified as operational centres became overwhelmed with telephone calls. The BT operators were not in post as it was a holiday period so most callers chose to be transferred to the Regional Communications Centre. Kent calls were transferred to the Area Incident Room. Extra staff were called in to man the phones from 24th to 26th December. In general there were very few difficult calls from the public, most were extremely pleased to be able to speak to someone and obtain an update on the situation.

8. HEALTH & SAFETY

There were no issues reported regarding the operation of emergency work force. Some data collection staff lone-worked and although there were no problems, it is recommended that double manning be used for data collection. One member of staff became stranded when his car was flooded and he became involved discussions with members of the public who had been flooded which may have been difficult.

Kent resources employed

Resources 24th Dec.1999	Client	Direct Works
Personnel Deployed	10	26
Total Hours Worked	44	134

Resources 25th Dec.1999	Client	Direct Works
Personnel Deployed	10	33
Hours Worked	56	179

Resources 26th Dec.1999	Client	Direct Works
Personnel Deployed	12	36
Hours Worked	130	259

Resources 27th Dec.1999	Client	Direct Works
Personnel Deployed	6	40
Total Hours Worked	83	395

Resources 28th Dec.1999	Client	Direct Works
Personnel Deployed	7	44
Total Hours Worked	60	413

Resources 29th Dec.1999	Client	Direct Works
Personnel Deployed		30
Total Hours Worked	Normal working hours	267

Resources 30th Dec.1999	Client	Direct Works
Personnel Deployed		31
Total Hours Worked	Normal working hours	282

Resources 31st Dec.1999	Client	Direct Works
Personnel Deployed	3	32
Total Hours Worked	14	258

Resources 1st Jan. 2000	Client	Direct Works
Personnel Deployed	0	8
Total Hours Worked	0	40

Resources 2nd Jan. 2000	Client	Direct Works
Personnel Deployed	0	8
Total Hours Worked	0	54

R Resources 3rd Jan. 2000	Client	Direct Works
Personnel Deployed	0	11
Total Hours Worked	0	69
Total Hours Worked	387	2350

Pumping Hours

	PUMPING STATION	Total Pumping hours 24:12:99 to 4:1:00	m^3 Water Pumped
ROTHER	Boonshill	100.4	126000
	Blackwall East	94	118440
	Blackwall North	62	316944
	Blackwall South	103	526536
	Court Lodge	137	281124
	Craven	87	407160
	Dixter	117	240084
	Ebony	72	336960
	Heronden	167	180360
	Hexden North	147	529200
	Hexden South	69	74520
	Kent Ditch	89	182628
	Knelle	201	723600
	Maytham	90	194400
	Newbridge North	105	268380
	Newbridge South	52	39312
	Potmans Heath	121	618552
	Reading	184	940608
	Shirley Moor	142	1686960
	Woodside	88	484704
PETT			
	Dimsdale	23	16560
	Icklesham	137	443880
	Newhouse	114	508896
ROMNEY			
	Appledore	144	316224
	Bilsington	118	212400
	Greatstone	72	544320
	Jesson	108	1088640
	Warehorne	140	715680
	Willop	78	238680
WALLAND	Union	317	2282400
	Northpoint	16	17856
OTHER			
	Brack	209	124740
	Indraft	231	231
	Kitsbridge	87	125280
	Lodgeland	136	122400

Total pumped water 15,883,084 cubic meters (3,620,000,000 gallons).

Appendix 3 – Sussex Area Report

SUSSEX AREA REPORT
Christmas Floods 1999

Document History			
Version	**Date**	**Issued By**	**Status**
One	24/1/2000	D.Bonner	Flood Warning Officer

Environment Agency
Southern Region
Sussex Area
Saxon House
Little High Street
Worthing
West Sussex
BN11 1DH

Tel: 01903 215 587
Fax: 01903 215 884
Email:

Contents

1. Introduction

1.1 During the week prior to the Christmas event long term forecasts were predicting storms and high tides, it was with this in mind that the area manager wrote to the chief executives of local authorities and emergency services highlighting concerns over flooding during the Christmas period.

1.2 The Met.Office issued an update of the Storm Surge Forecast data, weather and rainfall report and meteorological directions at around 4pm on the 23rd December. Early indications showed that strong gale force winds, a high positive surge and a possibility of up to an inch of rain could occur late on Christmas Eve coinciding with the midnight high tide.

1.3 After a preliminary discussion with Sussex flood defence staff it was decided that the area incident room might be required to open the following day.

2. Event Management

2.1 On the 24th December after examining that mornings surge predictions and a meeting at 9.30 am with Sussex flood defence staff, the regional public relations manager and the Sussex area manager it was decided to open an area incident room.

2.2 It was also decided at this meeting to issue a preliminary red warning for the Sussex coast for the midnight high tide, this decision was made because of the nature of the time of year, it was felt that members of the public would be leaving work early or going away from the area.

2.3 Many interviews with local Radio stations TV and Media helped significantly to get across messages to the public.

3. Flood Forecasting

3.1 23rd December

The Met.Office issued an update of the Storm Surge Forecast data, weather and rainfall report and meteorological directions at around 4pm on the 23rd December. Early indications showed that strong gale force winds, a high positive surge and a possibility of up to an inch of rain could occur late on Christmas Eve coinciding with the midnight high tide.

3.2 24th December

The next report from the Met.Office arrived early morning on the 24th December. The information previously predicted for 36hr in advance on the 23rd was further backed up by the 00:00 hr model run, now some 24hr before the event.

3.3 The Sussex Flood Warning department in Sussex made contact with the Meteorological Office around 08:45 and inquired about their level in confidence with regards to the surge data, forecasts around .5 metre on high tide. The confidence level was considered High.

3.4 A meeting took place at 09:30 between Sussex Flood Defence, the Area Manager and Public Relations. The decision to issue a Red coastal warning for Zones 11 and 12 based on the data from the Met.Office and our own predictions using Hyrad and reliable internet weather site information was considered. Further confidence testing was then carried out. The decision to issue a provisionally Red coastal warning for Zone11 Shoreham Harbour to Hastings and Zone 12 Chichester Harbour and Shoreham Harbour was placed at approximately 11am. The message was faxed to the local authorities, emergency services and the media highlighting a potential damage to the Sussex coastline and an additional risk to those living near rivers as a result of extreme high tides and potentially heavy rainfall.

3.5 A mid-day Yellow coastal warning went out at 8am for Zones 11 and 12 on the 24th for the high tide at 12:01. In East Sussex, yellow fluvial warnings were issued around 10am for the Cuckmere River.

3.6 At around 13:20 Red warnings were issued for the Sussex coastline.

3.7 6pm on the 24th December, no flooding had been recorded from the mid-day high tide although the sea defences at Medmerry were damaged. Main areas of concern were Medmerry where 10 bulldozers were working on the beach and at Pevensey. Heavy rainfall was now starting to fall in Sussex and by 5pm the emergency services took the decision to evacuate Coast Road residents in Pevensey. At 7pm Amber warnings were issued along the Ouse on zones 4A3 to 4A6.

3.8 Heavy rainfall and strong gale force winds, gale F10 at 22:15 resulted in the first signs of sea spray topping the Sussex defences and lead to obvious concerns from members of the public. A Red warning upgrade was issued an hour later, 11pm, for the River Uck. High tide at 00:36 resulted in reports of flooding at Pevensey and Medmerry with overtopping at Worthing, Seaford, Climping and Hastings. Defences were weakened and the Red warning ceased upon tide regression.

3.9 After high tide the Western Rother responded to the heavy rainfall, an inch and a half fell since mid-day and resulted in the issuing of an Amber warning for Zones 3D1 and 3D2.

3.10 **25th December**

3.11 Between high tide and the following morning the majority of Sussex rivers had a warning issued. The Ouse was upgraded to a Red warning and the Cuckmere was also upgraded to Red. The River Arun in West Sussex had Amber warnings issued for the full stretch and at mid-day the Pulborough to Arundel section, zone 3C3, was upgraded to a Red status. The River Adur was put on Yellow alert and the zone between Upper Beeding and Shoreham was on Amber alert. The Langney Haven and the Commbe Haven in East Sussex also had an Amber warning put upon them. The Scrase bridge stream had a yellow warning on it.

3.12 The depletion of shingle along the coastline of Sussex and the further high tide expected for mid-day on the 25th December along with the positive surge led to an Amber warning being placed upon it.

3.13 Minimal rainfall was forecast for the rest of the day and Boxing Day, 26th December. Rivers remained full and some out of bank for this period.

4. Flood Warnings Issued

4.1 Summery of warnings issued

4.2 Sussex Warnings Issued between 24th December to 26th December 1999

3C1	RIVER ARUN – Horsham to Newbridge	AMBER
3C2	RIVER ARUN – Newbridge to Pulborough	AMBER
3C3	RIVER ARUN – Pulborough to Arundel	RED
3C4	RIVER ARUN – Arundel to Littlehampton	AMBER
3D1	WESTERN ROTHER – Liss to Midhurst	AMBER
3D2	WESTERN ROTHER – Midhurst to Pulborough	AMBER
3F1	RIVER ADUR – Coolham to Henfield	YELLOW
3F2	RIVER ADUR – Burgess Hill to Henfield	AMBER
3F3	RIVER ADUR – Henfield to Upper Beeding	RED
3F4	RIVER ADUR – Upper Beeding to Shoreham	AMBER
4A1	SCRASE BRIDGE STREAM	YELLOW
4A2	RIVER UCK	RED
4A3	RIVER OUSE – Lindfield to Isfield	RED
4A4	RIVER OUSE – Isfield to Barcombe	RED
4A5	RIVER OUSE – Barcombe to Lewes	RED
4A6	RIVER OUSE – Lewes to Newhaven	AMBER
4B1	CUCKMERE RIVER – Hellingly	AMBER
4B2	CUCKMERE RIVER – Hellingly to Shermans Br.	AMBER
4B3	CUCKMERE RIVER – Alfriston to Exceat Bridge	RED
4C1	LANGNEY HAVEN	AMBER
4C2	COOMBE HAVEN	AMBER

5. Emergency Response

5.1 Direct works staff worked in three main areas along the coastline, these were at Pevensey, Seaford and Selsey. Work was carried out in shifts and was tide dependent, work continued from the 24th to the 30th of December.

5.2 The following is break down of plant used at these locations:

- Pevensey frontage

  4 bulldozers and 3 shovels all hired with 3 Environment Agency drivers and 4 outside agency staff

- Seaford

  3 hired bulldozers, which consisted of 1 Environment Agency driver and 2 outside agency staff

- Selsey Medmery frontage

  13 hired bulldozers driven by 4 Environment Agency Staff and 9 outside agency staff

5.3 In total 33 direct works staff were working over the Christmas period this included sluice keepers and other essential staff.

5.4 In addition many other Sussex area staff from other departments helped out with managing the incident.

6. Data Collection

6.1 All District Councils and Emergency services in Sussex have been contacted in writing regarding collection of flooding and damage data.

6.2 Questionnaires have also been sent out to Environment Agency staff connected to the event.

6.3 At present this information is in the process of being collected and recorded. Due to a lack of experienced staff not being available due to the time of year field staff collected no actual data.

6.4 Sussex area did try to get aerial photography done but this was hampered by the availability of outside contractors again due to the Christmas period.

7. Public Relations

7.1 There was a large media interest during the Christmas storms; Sussex area gave a number of radio and press interviews totalling over 100 both locally and nationally.

8. Health & Safety

8.1 Health and Safety procedures were worked to during this event, there have been no reported accidents connected with the event.

8.2 **Conclusion**

The general feeling from outside organisations is that the Environment Agency in Sussex performed exceptionally well in getting the flood warning messages across, liaison with the emergency services and the public and its work in repairing the defences after the event.

Appendix 4 – Hampshire Area Report

HAMPSHIRE AREA REPORT
Christmas Floods 1999

Document History			
Version	**Date**	**Issued By**	**Status**
1.0	27/01/2000	T Kermode	Interim Report

Environment Agency
Southern Region
Hampshire & IOW Area
Wessex Business Park
Wessex Way
Colden Common
Winchester
Hampshire

Tel: 01983 822 986
Fax: 01983 822 985
Email:

Contents

Summary

This report documents the actions taken by the Hampshire and Isle of Wight Flood Defence Team, in response to the flooding incidents that occurred over the Christmas period 1999.

A list of warnings that were issued is included, along with forecasted data from the Storm Tide Warning Service.

Flooding details from individual locations are appended for information.

1. Introduction

1.1 Flooding incidents occurred over a three-day period, 24th December to 26th December, in Hampshire and the Isle of Wight. Approximately 50mm of rain fell in two distinct periods during the 23rd and 24th December. A further 20mm was recorded during the 26th December. The highest recorded High Water since 26th November 1924 occurred at approximately 13:15 on 26th December. The recorded level of 2.90m AOD exceeded the forecast level of 2.63m AOD by almost 0.3m (total surge above astronomical tide was +0.94m). The majority of flooding was caused by high tide levels backing up high river flows, although there were some incidents caused solely by high rainfall.

1.2 Information regarding the exact number of properties and transport networks effected by the flooding is still being determined. Information from returned questionnaires and further investigations will allow a more detailed and accurate report as to the extent of the damage.

1.3 Within Hampshire, 12 locations are known to have experienced flooding problems. The worst of these was Lymington, where initially it was reported that 20 residential properties and 3 commercial properties had flooded. Recent figures from New Forest District Council indicate that the number of properties, which were flooded within their district, was 100. This figure takes account of tidal and fluvial flooding, including flooding from ordinary watercourses. *For further details of flooding in Hampshire see Appendix 1*

1.4 On the Isle of Wight, 5 flooding locations have been reported.

1.5 The worst of these was at Ryde, Monktonmead Brook, where serious flooding occurred on 24/25th December and was attended by the fire service. This was due to a combination of the brook overflowing and directly affecting adjacent properties and the combined sewer system's overflow being shut, by the brook's high level, causing foul/surface water to back up into low lying basement or ground floor flats. Further rain fell on 26th December causing more problems to some low-lying flats. High ground water levels exacerbated the situation and made the task of pumping out properties more difficult. The most up to date report is that 65 properties have been effected.

1.6 About a 12 properties were reported to have flooded at Gurnard Luck on 24/25th December. This is a long standing problem area where old wooden holiday bungalows have been converted to all year residential use. The river became tide locked behind the tidal flaps and caused extensive flooding as the peak fluvial flow met the high surge tide.

For further detail on flooding on the Isle of Wight please see Appendix 2

2. Event Management

2.1 The Hampshire & Isle of Wight incident room was opened on 3 occasions:

Christmas Eve: Incident Room open: 11:00 to 15:00 and 17:00 to 04:30 Christmas Day
Incident Room – 4 no. staff
Flood Inspectors (Hampshire) – 13 no. staff
Direct Works – 10 (approx)
Flood Inspectors (IOW) – 2 no. staff
EA contractors (IOW) – 6 (approx)

Boxing Day: Incident Room open: 11:15 to 18:20 and 22:15 to 03:40 27th December
Incident Room – 3 no. staff
Flood Inspectors (Hampshire) – 3 no. staff
Direct Works – 10 (approx)
Flood Inspectors (IOW) – 1 no. staff
EA contractors (IOW) - 6 (approx)

2.2 Due to the scale of the flooding, staff from outside the flood defence and water resources teams were utilised to carry out the role of flood inspectors on Christmas Eve.

2.3 The Direct Works team was on site clearing grills and deploying sandbags where possible in Hampshire. On the Isle of Wight the EA contractors were carrying out the same operations.

3. Flood Forecasting

3.1 Surge forecasts were received from the Storm Tide Warning Service. The figures below are for Southampton Water.

Date	Time	Predicted	Forecast	Actual
25/12/1999	00:05	2.06mAOD	2.61mAOD	2.85mAOD
26/12/1999	01:40	1.96mAOD	2.40mAOD	2.43mAOD
26/12/1999	13:15	1.96mAOD	2.63mAOD	2.90mAOD

(Note predictions are based on ABP tide table at Southampton not EA tide tables which give less reliable predictions.)

3.2 As alarm levels were exceeded, the appropriate warnings were issued via the AVM for tidal and fluvial reaches.

4. Flood Warnings Issued

4.1 The following warnings were issued:

Fluvial

Date	Time	River	Zones	Warning
23/12/1999	09:20	Lymington	1D1	Y
23/12/1999	09:30	Lymington	1D2	Y
24/12/1999	06:10	Blackwater	1A3	Y
24/12/1999	07:00	Lymington	1D1, 1D2	Y
24/12/1999	07:45	Blackwater	1A3	Y
24/12/1999	08:35	Gurnard Luck	2C2	Y
24/12/1999	10:10	Gurnard Luck	2C2	Y
24/12/1999	10:25	Monktonmead	2C1	Y
24/12/1999	10:30	Test	1A2	A
24/12/1999	14:20	Test	1A2	R
24/12/1999	15:00	Monktonmead	1C1	A
24/12/1999	15:15	Gurnard Luck	2C2	A
24/12/1999	15:29	Danes Stream	1D3	Y
24/12/1999	16:30	Lymington	1D3	Y
24/12/1999	16:50	Lymington	1D1	A
24/12/1999	17:00	Blackwater	1A3	A
24/12/1999	20:10	Monktonmead	2C1	R
24/12/1999	20:15	Gurnard Luck	2C2	R
24/12/1999	23:40	Eastern Yar	2B1	R
24/12/1999	23:45	Monks Brook	1B3	Y
24/12/1999	00:25	Monks Brook	1B3	A
25/12/1999	00:30	Medina	2A1	A
25/12/1999	01:45	Wallington	1C1	A
25/12/1999	12:00	Eastern Yar	2B1	Y

Tidal

Date	Time	Predicted Tide	Surge Forecast	Zones	Warning
23/12/1999	23:22	1.96	+0.28	13A	Y
24/12/1999	13:20	1.98	+0.58	13A, 13B, 13C	A
25/12/1999	12:28	1.92	+0.33	13A	Y
25/12/1999	01:02	1.92	+0.44	13A	A
26/12/1999	13:17	1.96	+0.67	13A, 13B, 13C, 14A, 14B	Y
26/12/1999	13:17	1.96	+0.67	13E	A
26/12/1999	15:14	1.96	+0.67	14A, 14B	A
26/12/1999	01:55	1.8	+0.61	13A, 13C, 13D, 13E	Y
26/12/1999	01:55	1.8	+0.61	13B, 14A, 14B	A

5. Emergency Response

5.1 The Flood Defence Procedures, which are in place for the Hampshire & Isle of Wight Area, were followed. Local Authorities, the Fire Brigade and the Police put their emergency plans into operation. New Forest District Council and Isle of Wight appeared to be the most successful Local Authorities in providing a proactive response to the public. Portsmouth and Gosport authorities implemented their procedures but actual flooding appears to have been minimal. Test Valley Borough Council response was limited to the fire services who liased with our direct workforce in Romsey to alleviate flooding.

5.2 The Fire Brigade assisted at numerous locations. It would be useful if in the future, a greater communication link can be achieved between the emergency services and the Environment Agency so that the incident room is aware of the most severely hit areas. This may aid in the issuing of future warnings

6. Data Collection

6.1 All phone calls, which were received in the incident room, have been logged to enable flood locations to be identified. Questionnaires have been distributed to properties in all areas where flooding is known to have occurred. Information returned will allow a more accurate record of the events to be made.

6.2 Flood inspectors took photographs and made sketches of areas that were flooded, the depth of the water and noted properties effected. Environment Protection monitoring team surveyors have been assisting in level data collection in the critical flood areas.

7. Public Relations

7.1 Local radio and television stations were sent flood warnings via the AVM. This information was in turn broadcast to the public. The Direct Works teams were out clearing grills and knocking on doors to alert residents that a flood warning had been issued.

8. Health & Safety

8.1 No H & S incidents were reported during the flooding period. Only two staff members were working alone on the Isle of Wight, and they followed the normal 'lone worker' procedure. All other staff were in pairs over night 24/25th December. Before going on site all staff were given inspection checklists which include H & S procedures. Vehicle registrations and mobile telephone numbers were logged before leaving for site. The locations of flood inspectors and Direct Works were logged at all times.

Environment Agency Southern Region, Hants & IoW Area
Appendix 4.1

Report of Flood event 24th December to 26th December

Interim Report for Hampshire

General Conditions

- Approximately 40 to 60mm of rain fell in two distinct periods during 23rd & 24th December across the county.
- A further 14 to 20mm of rain was recorded during 26th December in two bands.
- An unusually high High Water occurred on the night of 24th December at about midnight of nearly 2.85m AOD at Southampton compared with a predicted tide of 2.61m AOD, ie a surge of +0.24m.
- The highest recorded HW since 26th November 1924 occurred at about 13:15 on 26th December of 2.90m AOD, compared to a predicted tide of 1.96m AOD, i.e. a surge of +0.94m. Storm Tide Warning Service's surge prediction was a tide of 2.63m AOD, i.e. actual tide level was nearly 300mm on top of that forecast.
- *(STWS reported that the ports where they have gauges verified their forecast as being very accurate. Southampton is not a calibration port & is not currently modelled accurately due to the unusual tidal patterns.)*
- Many warnings were sent out during the day mainly Amber but some Red for the Test.

Tadburn Lake, Romsey

- Flooding occurred in the morning at the railway line crossing with Halterworth Lane and around a house (by Crampmoor Garage) upstream of where the river passes under the railway through a twin box culvert. A foul sewer was being surcharged in the house's garden. The road by the level crossing was flooded to a depth of about 300 to 500mm of water.
- At about 10:00 the water level was up to the crest of the flood wall by Jenner Way but did not appear to be significantly overtopping the wall.
- 3 blocks of houses at the east end of Eight Acres Rd were surrounded by water. A number of garages were also flooded with up to 500mm water. The water appears to have been coming out of a ditch beside the rail embankment fed possibly from water flowing across the meadows area upstream of Eight Acres.
- Around midnight on 25th December following the second band of rain Nos 32 to 34 Jenner Way were reported to have flooded. The owner of No 34 stated that an EA employee had given them a 'Red Alert' at about 18:00 hrs, the owner appears not to have taken action at that time being under the impression that a further warning would be given. (The EA person who gave individual warnings to a number of low

lying properties confirmed that he told householders that *'they should be aware of the possibilities of flooding due to the prevailing river conditions and weather forecast'*. No commitments of further warnings were given or offers of help to move goods were made and any advice was to contact the Local Authority if assistance was required.)

- EA informed the Fire Brigade (midnight) and contacted Test Valley Borough Council concerning the situation; a fire tender subsequently assisted by pumping out No 34 which had about 300mm depth of water. No 33 also flooded within the property but No 32 may not have flooded inside. A number of garages may have been affected by excessive surface water run though it is currently unclear if the watercourse contributed to this situation.
- Between Botley Rd bridge and A31/A27 culvert 3 properties' gardens were flooded and doors were sandbagged. The river level rose to within about 2/300mm of their doorsteps but no property flooding occurred. A car park area for residents at Knatchbull Close was flooded but no properties flooded.

Romsey. Miscellaneous

- The Horse & Jockey PH and 3 or 4 cottages, by the main Romsey By-pass Rd bridge (Mainstone) crossing over the River Test, were affected by run off from an adjacent hill side, Pauncefoot Hill. EA staff reported that no river flooding had occurred. EA staff had made house to house calls earlier in the afternoon at about 14:30 and flooding is reported to have started about 15:40 *(Romsey Advertiser 31/12/99)*. The principal reasons appears to have been due to inadequate maintenance of the storm water ditches that would have allowed water in to the Test, these appear to be the responsibility of the Broadland's Estate.
- The Three Tuns and adjacent cottages suffered some flooding to basements due to the high levels in the adjacent watercourse, Fishlake. It is not thought that the river came out of bank but affected storm drainage that backed up sewers into affecting low level floors.
- Most of the properties that flooded or nearly flooded had been warned during the afternoon by an EA Direct Work foreman calling personally.

Romsey Advertiser (31/12/99) additionally reported:

- Storm water flooding of sewers affecting gardens & garages in Newlyn Walk and nearby on Cupernham Lane The Old Dairy was also affected.
- Flooding occurred north of Romsey affecting a number of roads and the railway at Dean. All cases appear to be due to excessive storm water run off.
- River Test caused extensive field flooding in the Mottisfont and Timsbury areas upstream of Romsey.

Beaulieu River

- It has been reported that 8 houses adjacent to the Beaulieu mill pond were affected by high water levels in the pond as a result of the high river flows being tide locked. Sandbags were deployed by the Beaulieu estate, however, 4 of the houses had water inside the property and an historic garage was also affected causing damage to cars being renovated. The near by Montague Arms hotel's cellars was also affected by the high water levels.
- There are 5 old wooden tidal flaps that allow tidal water into the pond but can be raised to allow the pond to be drained down. Normally the flaps can be opened by a motor, however, 2 of the flaps are inoperable but there was also a power cut to the village.
- A JCB was used to lift the flaps to allow the pond levels to reduce once the tide receded.

Lymington Flooding

- Rainfall at Brockenhurst in between 22nd and 24th December was 60.40mm, however, the majority fell in two bands on 24th of 18.2mm (am) and 26.0mm (pm), total 44.2mm on the day.

- The predicted tide was 1.09m Above Ordnance Datum (AOD); the actual recorded level was 1.99m AOD. High Water was at midnight and the second high water, (300mm lower), occurred approximately 2 hours later with ebb tide starting 3 hours after HW. This coincided with the rising river level although the peak river flow occurred after the second HW, Brockenhurst weir gauge peaked at about 2:15am, 25th Dec. (The Toll Bridge river gauge was not operational, however, the tidal gauge was working.)
- Flooding occurred due to the river overtopping upstream of the Toll Bridge on the Lymington side and flowing on to the railway. Water flowed towards the town along the railway until reaching a low point at the level crossing. Floodwater then found its way in to low points in the adjacent area, as a result Bridge Street, Waterloo Road and Webbs Chicken Factory were affected. It is estimated up to 20 houses and 2 or 3 commercial properties had water inside their properties. Depth of water seems to have been over 1m in places.
- The high tide prevented the floodwaters from the New Forest from going out to sea which effectively tide locked the fluvial flow in the reed bed area. EA staff confirmed that both gates were fully open around 1:30 to 2:00am (time of opening has not been recorded). Sewer surcharging was also evident and, due to the exceptionally high tide, contributed to the flooding.
- The new tidal defences prevented major flooding from the high surge tide. Bath Road, King's Saltern Rd and around into Quay road/Street would otherwise have flooded in addition to Bridge Street and Waterloo Road.

- The high tide was the same level as in 1989 when the old defences were breached with widespread flooding of more than 50 homes and 10 commercial properties. The new defences therefore worked well in preventing more flooding.
- If the Toll Gates had not been constructed, the high tide was at a level that it would have still backed up the high river flow and is likely to have caused similar flooding upstream of the Toll Bridge. The new tidal gates, constructed about 4 years ago, at the Toll Bridge will have allowed more water out of the river than the older gates.
- EA Direct Workforce assisted the Fire Brigade and New Forest District Council staff by redeploying sandbags originally intended for the tidal defences to the affected area.

Milford-on-Sea, Danes Stream

- Rainfall on 24th Dec was 40.4mm in two distinct bands between 2 to 6am (15.6mm) and 2 to 8pm (24.8mm). The upstream catchment was fully saturated and this resulted in the fast run off experienced.
- The flood alleviation scheme completed in 1999 appears to have worked well and significantly reduced the amount of flooding in the town from Danes Stream. The works comprise of a regulating penstock that automatically throttles the river flow when it exceeds 4 m3/sec to this rate. The excess water is held back in a reservoir upstream of the town and floods a field behind a purpose built dam. The downstream flows are monitored at a level gauge in the town (New Valley Rd bridge) and a back up level gauge situated at the High Street bridge can trigger the throttle if it records an excessive river level.
- The throttle operated at about 10am following EA staff resetting the system. A flow exceeding 4 m3/sec was recorded at 7am which occurred about 2 hours after the first band of rain ceased early in the morning. The throttle operated again at about 7pm when the flow rate reached the trigger level as a result of the second band of rain.
- Reports were received during the night 24/25th Dec from the Parish council that the river was just overtopping its banks in the park area of the town. EA staff inspected the sites and reported that the dam was filling up and no serious flooding was occurring.
- The maximum water level in the dam reached 10.6m AOD at about 2am 25th Dec which indicates a return period of around 1 in 5 to 7 year event. It is evident from the local reports that river levels were high in the town and had the dam not been in operation significant flooding of a number of properties would have occurred.
- It would appear that the Pleasure Gardens, some residential gardens and unconfirmed reports of Barnes Road having minor flooding but this is within the design parameters of the scheme. The EA's consultant will be asked to review the operation of the system and recommend if any alteration to the penstock throttle or down stream level gauge settings are required.

Tidal Areas

- All the tidal zones were on Amber alarm over the 24th to 26th Dec and staff were monitoring all the risk areas.
- Some flooding was reported in the area Ealing Tide mill over 24/25th and 26th HW's however it has not been confirmed if properties actually flooded other than the mill itself.
- Flooding under some cottages in Marchwood occurred on 26th due to the exceptional tide.
- A cottage at the tidal limit of the Itchen had water through its airbricks at the high tide on 26th Dec. In the Hamble river 6 properties were affected as well as the Yacht Club.
- Flooding occurred at Shamrock Quay near the new Itchen Bridge a few commercial properties were affected.

Totton, Calmore Canal

- A highway culvert blocked by a dumped fridge/Freezer caused severe flooding on the morning of the 24th Dec. Highways authority were quickly notified by the EA, however, their response was slow as they were unable to obtain sufficiently large plant.to clear the obstruction. EA were able to hire an excavator with sufficient reach to clear the culvert.
- About 20 houses were flooded and many more gardens were also affected.

Miscellaneous Flooding

- Flooding to the White Swan Inn occurred from the Itchen river on 24th Dec. This is not an unusual occurrence. *(Note that a recent application to extend the Inn was objected to by the agency.)*
- Flooding of roads in Keyhaven from surface water and overtopping of the Avon water, which would have been tide locked, occurred but levels were not quite high enough to affect properties (50mm below door step levels reported).
- Numerous instances of surface water and sewer flooding were reported to the Incident Room.

Summary of Warnings Issued

- Lower Test and Blackwater had Red warning.
- River Lymington, upper & lower fluvial Wallington and Monks Brook had Amber warnings.
- All Tidal areas had Amber warnings.
- Yellow warnings were also issued in advance of the above in some cases.
- River and Tidal Warnings issued during the 24th as situation developed.
- Further Tidal warnings issued for 26th, Amber for Hayling Island and all others Yellow.

I.M.H Tripp
Flood Duty Officer
(Compiled 11/01/00)

Environment Agency Southern Region, Hants & IoW Area
Appendix 4.2

Report of Flood event 24 December to 27 December

Interim Report for Isle of Wight

General Conditions

- Approximately 50mm of rain fell in two distinct periods during 24th December across the IoW.
- A further 20mm of rain was recorded during 26th December in two bands.
- An exceptionally high High Water occurred on the night of 24th December at just before midnight of nearly 2.3m AOD at Cowes compared with a predicted tide of 1.74m AOD, ie a surge of +0.5m. The surge tide at Ryde was recorded as 2.6m AOD at midnight with high water sustained for about up to 4 hours.
- An even higher HW occurred at Cowes about 13:45 on 26th December in excess of 2.3mAOD, compared to a predicted tide of 1.53m AOD at 15:14, ie a surge of +0.77m and HW brought forward by 1.5 hrs. A similar high HW was also recorded at Ryde of just over 2.6m AOD.

Gurnard Luck

- Flooding occurred at just after midnight on 25th December.
- The HW coincided with the rising levels in the river and when the two levels matched the tidal flaps closed thus tide locking the river. This caused the river level to rapidly rise a further 300mm. The graph comparing the rising tide curve with the river hydrograph illustrates this clearly. *(The flaps are required to prevent flooding from excessive high tides.)*
- At 22:30 EA staff on site at the time informed the Incident Room that levels were near to a chalet occupied by a family. IR advised that the level, currently about 1.8m AOD, may rise further and prudent to take action, eg evacuate. Maximum river level reached just over 2.1m AOD.
- About 12+ houses/chalets have been affected by flooding though only 2 so far are confirmed to have had water inside the dwellings. *(The chalets are intended for holiday use only but do have all year round residential planning permission granted by the old Medina Borough Council.)*
- Marsh Road was reported to have been covered by about 400mm of water.

Cowes

West:

- HW was contained by a sandbag wall deployed by EA contractors 4 bags high (normally 2 high is sufficient).
- An original batch of bags placed by IoW staff was taken by adjacent shops and pubs. EA were also able to assist a few shops with spare bags.
- Just before HW the wind changed to a more favourable direction which reduced wave action. No flooding of properties was reported.

East:

- The IoW's timber stop boards protecting the Esplanade/Columbine Rd area leaks badly and water was affecting the Esplanade.
- Most houses appear to have been sandbagged and no reports of property flooding have been received.

Newport, Hunny Hill

- A gang from the EA contractor had been deployed since early in the morning of 24th December to ensure that the 3no EA grills on the Lukely Brook were regularly cleared during the day.
- During the day after each period of rainfall the brook rose rapidly. Following the second period of rain the height of the river became dangerous for the contractor to gain access and clear.
- A number of calls were received from the public concerned about the brook.
- At present 2 or 3 properties have been reported as being flooded.
- One is St Cross Mill that has a vulnerable basement and has been flooded regularly in the past. There is also a channel that passes through the mill that is protected by a grill, which is the responsibility of the mill owner. This grill is not always kept clear but it is unclear if this made the situation significantly worse given the volume of water coming down the brook. Although the location is a trap for debris when levels subsided enough to gain access the EA grill was reasonably clear.
- The other properties flooded were an office block, Exchange House, and possibly an Aquarium, The Koi Carp'.
- A new retail development being constructed in the vicinity may also have been affected though this has not been confirmed to date.

Monktonmead Brook, Ryde

- 24/25th December over midnight the river reached full capacity and did slightly overspill into the Recreation Ground at Simeon St. One house reported water running past them (at 2340 on 24/12/99) out of the Rec. at the lowest point.

- Many houses were flooded from sewers being overwhelmed and the brook being high preventing free discharge of storm waters.
- The high river flow coincided with the high tide locking the brook. The land drainage pumps, which help to alleviate the locking, were working virtually as designed. One pump did trip out and EA staff quickly reset it.
- About 12 houses were flooded by the high ground water and combined sewers overflowing. 5 Fire Appliances were in attendance pumping out mainly basements.
- Further flooding to properties occurred during the 26th December following significant rainfall during the day, which brought river levels up quickly. The exceptionally high midday HW did not quite coincided with two highest river level peaks experienced.
- Again flooding has been reported during 28th.December from ground and storm water, 2 properties being affected.

Miscellaneous

- At Springvale at least one set of tide gates was not fully secured in the IoW's sea wall. EA staff informed IoW of the high tides at midday 24th December and later alerted them to recheck their gates.
- A vulnerable property at Springvale came within about 450mm of flooding.
- No flooding was reported at Freshwater although some storm water run off problems may have occurred. A gang was in attendance to check grills at the Causeway.
- No other property flooding has been reported to the EA

I.M.H Tripp
Flood Duty Officer

V1.0 Compiled 29/12/99,
V1.1 Minor Amendments 13/1/00

Appendix 5 – Emergency Response Summaries

Hampshire Area

Date	Location	Details	EA Response
24/12/2000 (??)	Railway line crossing with Halterworth Lane, Tadburn Lake, Romsey.	Flooding occurred and around 1 property, foul sewer surcharged into garden.	
10am 25/12 (??)	East end of Eight Acres Rd, Tadburn Lake, Romsey.	3 blocks of houses surrounded by water, garages flooded with 500mm water. Water appears to have come out of a ditch by railway embankment fed possibly from water flowing across meadows area upstream of eight acres.	
12am 25/12	32-34 Jenner Way, Tadburn Lake, Romsey.	Properties flooded. Owner of 34 under impression further warning would have been given. Garages also flooded by excessive surface water.	EA employee gave red warning to no. of low lying properties, no commitments of further warnings, advised to contact local authority. EA informed fire brigade who pumped out no. 34.
25-Dec	Between Botley Rd Bridge & A31/A27 culvert.	3 properties gardens flooded & doors sandbagged.	
25-Dec	Knatchbull Close, Romsey.	Car park at Knatchbull Close flooded but no properties.	

25-Dec	Horse & Jockey PH & 3-4 properties, by main Romsey by-pass Rd bridge crossing over River test	Affected by run-off from Pauncefoot Hill.	EA confirmed no river flooding & made house calls at approx. 14:30, flooding occurred at about 15:40.
25-Dec	The Three Tuns and adjacent cottages, Romsey	Some flooding top basements due to high levels in adjacent Fishlake watercourse. Thought that river affected storm drainage that backed up sewers.	Property owners warned by EA Direct work foreman in afternoon.
24/25 Dec	Newlyn Walk & The Old Dairy, Cupernham Lane, Romsey	Storm water flooding of sewers affected gardens & garages.	
24/25 Dec	North of Romsey, And railway at Dean.	Flooding due to excessive storm water run off.	
24/25 Dec	Mottisfont & Timsbury	Extensive field flooding from River test.	

24-Dec	Beaulieu Mill pond	8 houses affected, 4 flooded and a historic garage causing damage to cars being renovated.	5 old wooden tidal flaps can be opened by a motor to allow the pond to drain. 2 were inoperable & also there was a power cut to village. these are owned by the Beaulieu estate. The estate organised a JCB used to lift flaps to allow pond levels to fall once tide receded. EA did not hear about incident until afterwards. Consultants Scott wilson Kirkpatrick are looking into new design for the tidal flaps.
24-25 Dec	River overtopped upstream of Toll Bridge, Lymington.	Water on railway line then flowed towards town causing the damage below.	EA staff confirmed that gates were open 01:30 to 02:00 but high tide prevented floodwaters from going out to sea. New tidal defences prevented major flooding from high surge tide in Lymington.
24-25 Dec	Bridge St, Waterloo Rd, and Webbs Chicken Factory, Lymington.	20 houses & 2/3 commercial properties flooded, 1m depth of water in some places.	EA Direct workforce assited fire brigade and New Forest DCC staff by deploying sandbags.
24-25 Dec	Pleasure Gardens some gardens of Barnes Gardens, Milford-on-Sea.	Minor flooding, new alleviation scheme believed to have worked well & reduced flooding in town from Danes Stream.	2 operatives checked new system at 10am on 24/12 and again in the evening. Local councillor kept EA updated via fax.

24-26	Eling Tide Mill	Some flooding of mill and possibly surrounding properties and sailng club. Mostly from high tide up Solent lunchtime of 26/12.	EA have sent out questionnaires to find out what properties were flooded, awaiting results from these.
26-Dec	Marchwood	Some flooding under cottages from lunchtime high tide.	
26-Dec	Tidal limit of Itchen	A cottage had water through its airbricks.	Cottage is directly behind tide wall and flooding from the tide. Owner did not take option of going on to AVM.
26-Dec	Hamble River	6 properties & the Yacht Club near the river mouth affected.	
Night of 24/12 & lunchtime 26/12.	Shamrock Quay near new Itchen Bridge.	Flooding occurred and a few commercial properties affected.	
am 24 Dec	Totton, Calmore Canal	A dumped fridge/freezer caused severe flooding. 20houses flooded and many more gardens.	EA quickly notified Highway authority, however, their response was slow as unable to obtain large enough plant to clear obstruction. EA hired excavator to clear the culvert.
24-Dec	White Swan Inn	Flooding from River Itchen.	Inn often floods, the agency have objected to recent application to extend the Inn.

24/25 Dec	Keyhaven	Roads flooded from mainly surface water and overtopping of Avon Water which was tide-locked, not quite high enough to flood properties.	

Kent Area

Date	Location	Details	EA Response
24-Dec	Pembury, Five Oak & Green and Stick Hill	Surface Water and foul water over flows reported.	
24-Dec	Tudeley Brook & Alder Stream	Flooding reported	
24-Dec	Leigh Barrier		Barrier manned from 11:35 when Preliminary Impounding Warning was issued, one more issued at 21:45
24-Dec	Swalecliffe Brook	Brook broke from it's banks and caravan park affected.	Direct Works Operatives dispatched at 20.25
25-Dec	Upstream of Lamberhurst on River Teise	Flooding reported as river level rose through Amber Warning Threshold,as levels rose through red warning threshold further properties affected -less than 10 properties affected.	Red warning issued at 01:30

25-Dec	Five Oak Green (IDB)	Police report evacuation, 20-30 properties flooded in village centre, 100 properties Norton Way, Nr.Railway line are flooded.	IDB
25-Dec	Leigh Barrier/Ensfield Rd	Barrier began to impound floodwater shortly after midnight, reaching peak retention of 78%, max. level was 27.53 AODN (943 million gallons).	Initial discharge restricted to 40 cumecs so local streams could discharge, discharge increased & maintained at 57 cumces, the lowest flooding threshold flow.
25-Dec	Leigh Barrier/Ensfield Rd cont.	Ensfield Rd closed at 08:00, not re-opened until 28/12.	
25-Dec	Dartford Creek & Queenborough Creek barriers		Teams deployed in response to divisional alert.
25-Dec	Smarden FAS	Properties protected by FAS reported flooded but defences not overtopped.	
25-Dec	Blindley Heath	1 property flooded.	Main river
25-Dec	Yalding	Riverside properties and caravan site at Hampstead Lane flooded.	Medway yellow warning issued at 08:50 upgraded to Amber 18:10
25-Dec	Wateringbury	Riverside restaurant flooded.	Main river
25-Dec	Paddock wood	Approx. 50 properties flooded.	IDB
25-Dec	Colliers street	2 properties flooded.	IDB

Date	Location	Details	EA Response
24-Dec	A259 at Dymchurch and Pett Level Rd	Overtopping and wind-blown spray caused problems.	Repairs to Dymchurch sea wall carried out on Christmas Eve
24/25/ 26 Dec	Between Jury Gap and Denge Main Outfall	Shingle storm crest flattened and M.O.D ranges affected by overtopping floodwater.	
	Kent Ditch	Overtoppped and breached it's banks and approx. 50 hectares of arable land was inundated for five days.	
	Wet Levels	Inundated by Floodwater.	
		Hothfield/Bethersden Rd closed.	

Sussex Area

Date	Location	Details	EA Response
11am 24 Dec	Sussex Coast		Red Warning issued Shoreham Harbour to Hastings & Chichester Harbour to Shoreham.
6pm 24 Dec	Medmerry	Damage to sea defences	13 bulldozers deployed to beach.
7pm 24 Dec	Pevensey	Residents (180) of Coast Rd evacuated by emergency services.	4 Bulldozers and 3 shovels deployed.
11pm 24 Dec	Pevensey & Medmerry	Flooding reported, banks breached and damage to sea defences.	13 bulldozers working in shifts 24-30 Dec.

11pm 24 Dec	Seaford, Climping, Worthing & Hastings	Overtopping reported.	
24-Dec	Seaford	Worst damage since 1987 - 2km of frontage crest lost.	3 hired Bulldozers deployed.
25-Dec	Barcombe Mills	3 properties flooded. 2 from river, 1 from surface water.	Sluice keepers on stand-by.
25-Dec	Anchor Inn	Flooded	Sluice keepers on stand-by.
25-Dec	Uckfield Mill and garages of Millington Court.	Flooded	
24-Dec	Freshfield	1 property flooded due to surface water/ groundwater.	Lewes and Wealden District Councils to supply list of properties affected.
24-Dec	Alfriston	1 Property flooded.	
24-Dec	Cuckmere Haven	Overtopped causing erosion of cliff behind sea defences.	Repairs to be made to sea defences.
24-Dec	Eastbourne	8 properties suffered flooded basements/ gardens. 4 due to groundwater, 4 to Langney Haven coming out of bank. A plant nursery flooded to a depth of 8".	
24-Dec	Timberley Railway Bridge	U/S right bank erosion & slips, requires minor maintenance.	

25-26 Dec	Pulborough Causeway	Flooded	
26-27 Dec	Houghton Causeway	Flooded	
27-Dec	River Rd, Arundel	Flooded, police knocked on doors of30 houses.	
24-Dec	East & West branch tidal reaches	Overtopped, causing fields and floodplain to flood. Surface water contributed to flooding.	
25-26 Dec	Mock Bridge A281	Closed	
25-26 Dec	Bines Bridge	Flooded and Closed	
24-25 Dec	Shoreham & Lancing	Some damage to beach huts & shingle pushed over crest.	

Appendix 6 – Regional Rota Reports

Appendix 7 – Storm Tide Forecasting Service Report

Duty Hydrologist Report

20 – 27 December 1999

Joe Pearce

13 January 2000

Monday 20 December 1999

Hyrad was checked into the evening with two fronts travelling east across the country and expected to reach the west of the Region around 3am. The latest image when HYRAD was last checked at 10.20, was for 10.00pm. This showed that very intense rainfall which would fall over counties to the west of Hampshire would decrease in both areal extent and intensity as they moved east. No further action was taken as river levels had recovered completely from the warning levels reached in the New Forest during Saturday 18th. Further heavy rain was forecast for the night over the Region.

Tuesday 21st December 1999.

Wrote report for Region as forecast for next 7 days as part of report for operations Director leading up to year end. Extra checking of information made available from the Met Office was needed to make predictions for seven days. Outlook was OK for fluvial situation but as expected, there may be problems with Sussex tides for the end of the week with the high tides, low pressure and strong westerly winds forecast.

What snow did fall (which did not anount to much for most of the Region) melted in the north of the Region with up to 13mm recorded following the thaw in snow and raingauge mechanics in the north west. A mostly dry day in the Region with little precipitation forecast.

Wednesday 22nd December 1999

Wrote report as yesterday. Up to 5mm fell during Tuesday. Region's rivers reacted little to previous precipitation and catchments were drier than at the beginning of the week (Monday). Heavy rain forecast for the day but previous relatively dry conditions lead to little worry. Hyrad was checked and selected rainfall stations scanned using RTS at 9.15pm. Yellow warnings were placed on the Lymington River.

Thursday 23rd December 1999

Weote report as yesterday. A dry day was forecast for today and occurred in the Region during the day giving catchment runoffs a chance to recover from the approx. 15mm which fell during the previous 24 hours. An incident room was opened in Sussex to deal with high tides over the next three days. Yellow warnings were put in place along whole of southern coastline for the Region.

Friday 24th December, 1999

00.55 paged with severe weather warning from Met Office. Up to 25 mm forecast over next 24 hours on high ground, up to 20mm on low ground – valid up to 3am Xmas day. Logged in and updated HYRAD – showed no rain above 4-8mm / hr intensity in Region up to 8.00 am. With only a small patch of 4-8 mm intensity around Southampton and IoW forecast to be shortlived (gone in one hour). No problems anticipated unless heavy rain would coincide with high tides later in day.

A further heavy rainfall warning was advised at 5.00 and a request to ring Ian Tripp for advice on Hampshire catchment state especially for the Blackwater and Tadburn Lake.

Hyrad was updated and Ian was advised that the rain would stop by 7.00 but that yesterday's storms had a time to peak of 5-6 hours – I advised the level would continue to rise for several hours to come. A yellow warning was issued at this time and Ian was watching carefully to see if an amber warning was needed. I rang RCC and advised that rainfall alarms should be expected across the Region from Hyrad's forecasts.

By 6.15 Hyrad was forecasting that for the rest of the Region, (sussex and Kent), the rain would not be as intense and would move more quickly away to the SE.

9.35 Attended meeting to plan for Sussex Incident Room – advised meeting that a further 25mm of rain could be expected on top of the 10 – 20mm which had already fallen since midnight in Sussex. Red warnings were warranted on both Sussex coastal zones but Hampshire and Kent would at this point predict amber.

Following this I spoke to each of the flood defence duty officers in Hampshire and Kent to warn them of extra rain expected. Problems had been or were expected by Ian Tripp on the IoW tidelocked rivers and for Tadburn Lake at Romsey Amber warnings in whole of Lower Test were in place. In Kent and Sussex, some fluvial yellow warnings were in place but at this point FDO's were not worried despite the forecast extra rain.

I spoke to Peter Kidds in the Met Office Storm Surge Warning service at 10.45. He stated he had put out alerts for Portsmouth and Newhaven and Hampshire and Sussex were informed. At 11.00 I spoke to Gordon Smith at the Met. O. in Southamptonto confirm weather expected later in the day. He predicted a further 20mm for the Region during the day.

By the afternoon, an Area Incident Room had been set up in Saxon House. There was a meeting at 4pm which I again stated a further 25mm may be expected in the area and that the Uck Arun and Ouse were likely problem spots.

I spoke to the Met. Office at around 4.30 pm in Southampton who advised me that further rain was expected – around 17mm over the next 4 hours for Hampshire but moving East.

I spoke to Alison Rennie in Hampshire who had been called to open an incident room for fluvial flooding in Hants/IoW at 6pm with Ian Tripp. Still problems expected on middle Test, IoW rivers (esp. St Johns, Honeypots and Gurnard) with Lymington also high. I spoke the the Met. Office again at 4.30 and passed on the predictions before going home at 5pm.

I attended the Regional Incident Room in Guildbourne from 9pm. Red warnings became widespread across the Region during the evening, outstations were alarming – both rainfall and riverflow with heavy rain over the Region. The incident was proceeding too fast and the incident rooms were too busy, even to ensure contact

At approx 11.30 I spoke to the Met. Office in Southampton who advised that the high intensity rain shown on Hyrad at that time was not likely to give high totals (<5mm in next 6 hours.) I passed this message on to all incident rooms.

I gave some assistance to incident rooms where requested to look at specific areas.

I wrote a Millenium style report with Sean Key at 1am. I left the Regional incident room / RCC at 1.30 am 25 December.

25 December 1999

I reported in again to RCC at 9am 25 December. Then continued to contact met Office, and consult Hyrad together with using the RTS at home during the next few hours. Red warnings were still in place with fluvial flooding now a particular problem. There was a relatively quiet spell in terms of rainfall with small totals over the region between 6am and midnight during the day. This saw flows in many of the rivers with smaller catchments and faster runoff drop during the day. For larger catchments, there was still a rise following the high rainfall during the previous night. This was a particular problem where the high tides were still a problem – for rivers such as the Arun, levels ceased to fall between tides, even where fluvial inputs decreased as too much water was then backed up to get away between tides.

Throughout the day I used Hyrad and RTS to monitor rainfall predictions and update data for sites across the Region.

At Steve Taylor's request, I looked at the River Arun in more detail during the morning – the request was whether or not levels would soon start to fall and the warning in place could be scaled down. I told him that although fluvial flows would soon peak, in the lower reaches of the Arun towards Pallingham and in the tidal river, it may continue to rise for some time and may take a long time to fall.

I spoke to the Met Office in Southampton during the morning who confirmed that there would be little rain during the day but further fronts would ross the Region from the south west during the night. I informed the RCC and incident rooms of this.

I again spoke to Wayne Elliott at the met office at 3.45pm. He estimated at that time, accumulations of rain crossing the Region of 10 – 15mm during the night with some very heavy showers. I informed all Areas and RCC of these predictions.

17.00 I spoke to Ian Tripp. He asked me to contact Alison Rennie if possible as he proposed setting up an incident room in Hampshire at around 7am on 26th.

17.15 I spoke to Gordon Smith in the Met Office who confirmed estimated prediction of 15-20mm accumulations over the Region moving NW from northern France, hitting the region around 2am. I informed incident rooms of this.

18.30 Ian Tripp rang again asking for hydrologist support for the incident room on 26th. On Bernard Tiltman's advice I declined to go to the incident room in Hampshire on 26th. I got Andy Roberts' and Dave Brown's numbers from the RCC and tried to contact them with no success.

18.45 Alison Rennie spoke to me returning a call to her answerphone. She agreed to ring Ian Tripp to advise and to help out with incident room if needed.

21.00 Updated myself with Hyrad and RTS.

Rang Met Office at 21.30 for an update – 10mm rainfall was still expected overnight. I rang RCC, incident rooms and Ian Tripp in Hampshire to pass on message. I spoke to Simon Taylor in Sussex Incident Room at 22.00 – he stated he would take over the Regional

Hydrologist role for the night and would inform the RCC.

Further rain did fall overnight with the heaviest in East Sussex on the Lower Ouse and Cuckmere (see table below).

26 December 1999

Spoke to Rupert Clubb in Sussex Area incident room 08.30 – he asked me to attend and advise on whether warnings could be scaled down in Arun, Ouse and and Cuckmere catchments. I attended the incident room from 9am.

River levels peaked during the morning for the headwaters of streams in Sussex, but where tidal influences were seen, they were either rising or steady.

I spoke to Wayne Elliott at the Met Office in Southampton at approx 10am – latest predictions were – showers with 3 – 7 mm over the Region in the coming afternoon, some places getting up to 10mm, no rain overnight then further rain on the afternoon of the 27th. I relayed this message to all as before.

I spent the morning updating and forecasting likely changes.

At 13.30 I rang Wayne in the Met Office again for an update. He stated a warning would be coming of 5-10mm over many areas with more steady rain of 3-5mm per hour for up to 2 hours after this. Larger totals were predicted for the Isle of Wight which Ian Tripp had earlier raised concerns about. After passing this message on, I left the Incident Room at around 13.45.

Heavy rain was forecast on Hyrad when checked at home at 14.00.

Following a request from Ian Tripp I rang Alison Rennie at 14.30 to ask if she would attend a Hampshire Incident Room.

After this I spoke to Sean Key in the RCC to ask if he could get any hydrologists to take on the duty role at least later in the evening and especially for support forthe incident room in Tonbridge. Sean tried but could not contact anyone.

During the afternoon, I updated sites in Kent and Sussex.

Alison Rennie rang from the Hants Incident Room at 16.30 to state that levels at Romsey were falling. Water was rising at Gurnard but it was planned to close the incident room in half an hour.

At 6pm Rupert Clubb rang and asked for a rainfall update from the Met Office. The forecast was that it would be dry except on coastal fringe. Some rain would be seen in Sussex in 2-3 hours and would amount to 5-10mm with up to 15mm on higher ground. I passed this message to Rupert and the RCC.

I updated Hyrad at 8.20pm and it showed the predicted rain did not/would not fall. At 8.20 I phoned the Met Office again who stated that rainfall would amount to some 1-2mm overnight with the possibility of a more organised rain band on the afternoon of the 27th. I asked the

RCC to pass on this information.

Later I spoke to Alison Rennie again to say Ian Tripp wadnted to reopen the Hampshire Incident Room and left her to contact him.

Monday 27th January

9.15 I updated Hyrad showing no rain and spoke to the RCC and Andrew Davies who was there.

Later in the morning I appraised David Brown who was in the Hampshire office of the situation and the forecast.

Hydrological Analysis

Some limited analysis of the events has been carried out:

Rainfall

The most intense rain fell during the early morning of Christmas Eve in Hampshire. At Romsey, the highest intensity was a 2 hour period giving 32 mm which is just over 1 in 5 year return period. 57mm fell in 18 hours which gives around 1 in 10 year return period.

For sites on the Isle of Wight and into the Rother catchment in Sussex, just under 50mm fell in 18 hours which gives around a five year return period.

Some work has been done in looking at crude ranking of daily rainfall totals up to 9am. Using long rainfall records, sites in the Areas have been looked at:

Hampshire
Romsey compared to the Otterbourne record, the daily total to 9am has been exceeded 37 times in 108 years meaning around 1 in 3 years such a total would be expected.

Where 2 day totals are considered 201 exceedences are seen giving around 2 similar events per year.

Isle of Wight

Comparing Calbourne to Carisbrooke : for 1 day rain just over one event per year would be expected (in terms of daily totals to 9am). For 2 days, one event per year.

Sussex

Comparing Barcombe and Balcombe for 1 daya and Balcombe and Balcombe for 2 day, both totals would be expected around once per year.

Kent

Comparing Weir Wood with Cinder Hill – for one day the data show that only once in 4 years the total would be exceeded, for 2 days, higher values were seen about every 2.4 years.

At first glance, this shows that rainfall in Kent was heavier, but looking at the table below, this is not the case, it is because the rain in Kent fits better into hydrological days from 9am on one day to 9am the next whereas in the rest of the Region, events straddled these periods.

Overall, in rainfall terms, the event across the Region was widespread with many places receiving high totals between Christmas Eve and Boxing day. The table below however, gives clues to where flooding problems were experienced: the Isle of Wight, Romsey and the middle Test, the W Rother, the Arun, the Cuckmere, the Ouse and the Medway.

Flows

Only Iping Mill has been analysed. For the flow record here, the flow exceeded the previous maximum in a record of 26 years. The return period was calculated at once in 40 years.

Time up to Starting at 00.00 on 24 December 1999	06:00	12:00	18:00	00:00 25 Dec	06:00	12:00	18:00	00:00 26 Dec	06:00
Hampshire	10 – 33mm 33 at Romsey	0 – 7mm 7 on IoW	10 – 17mm mostly 16-17	7 – 13mm most on IoW	0 – 2mm	0 – 3mm	0 – 1mm	0 – 3mm	4 – 12mm most on IoW
Sussex	5 – 16mm most Arun	~3mm	10 – 16mm 16 on W Rother	8 – 19mm most L Ouse	0 – 1mm	0 – 1mm	0 – 1mm	0 – 0.6mm	7 – 18mm most L Ouse
Kent	4 – 12mm Most Upper Medway	2 – 4mm	5 – 17mm Most Upper Medway	2 – 22mm Most Upper Medway	0 – 1mm	0 – 0.8mm	0 – 1mm	0 – 0.2mm	5 – 10mm Most Upper Medway

Time up to Starting at 06.00 on 26 December 1999	12:00	18:00	00:00 27 Dec	06:00	12:00
Hampshire	0 – 0.2mm	5 – 7mm	0 – 1mm	0	0
Sussex	0 – 1mm	2 – 11mm Most Ouse/ Cuckmere	0 – 1mm	0 –0.2mm	0 – 0.2mm
Kent	0 – 1mm	1 – 5mm Most Upper Medway	0 – 1mm	0	0 – 1mm

KEY POINTS FROM RCC PERSPECTIVE

SUMMARY

Changes to systems introduced as part of or in parallel with EFAG have had a cumulative impact the workload generated during a major flooding / flood warning event.

As little flooding actually occurred, one wonders what the work involved would have been like if it had.

The key problem area was the volume of calls directed from the un-manned FLOODLINE service direct to the RCC. 1200 incoming calls were handled on Christmas Eve with a peak call rate of 110 per hour with an average duration of 1.25 minutes. This effectively tied up 2 staff just to answer the phone during those times.

The volume of calls made by the public requiring a response must be better resourced in the future.

The support received from Areas by opening their Area Incident Rooms was essential to help advise the public.

Further issues are listed below and expanded upon in following sections;

- Volume of calls from FloodLine
- Usage of RTS, handling alarms
- Usage of AVM
- Tracking of flood warnings issued
- Liaison with Areas
- Tidal Forecasting / liaison with STWS
- Role of Duty Hydrologist - observations
- RCC ergonomics

VOLUME OF CALLS FROM FLOODLINE

The number of calls received in the RCC was excessive and nearly paralysed our operations.

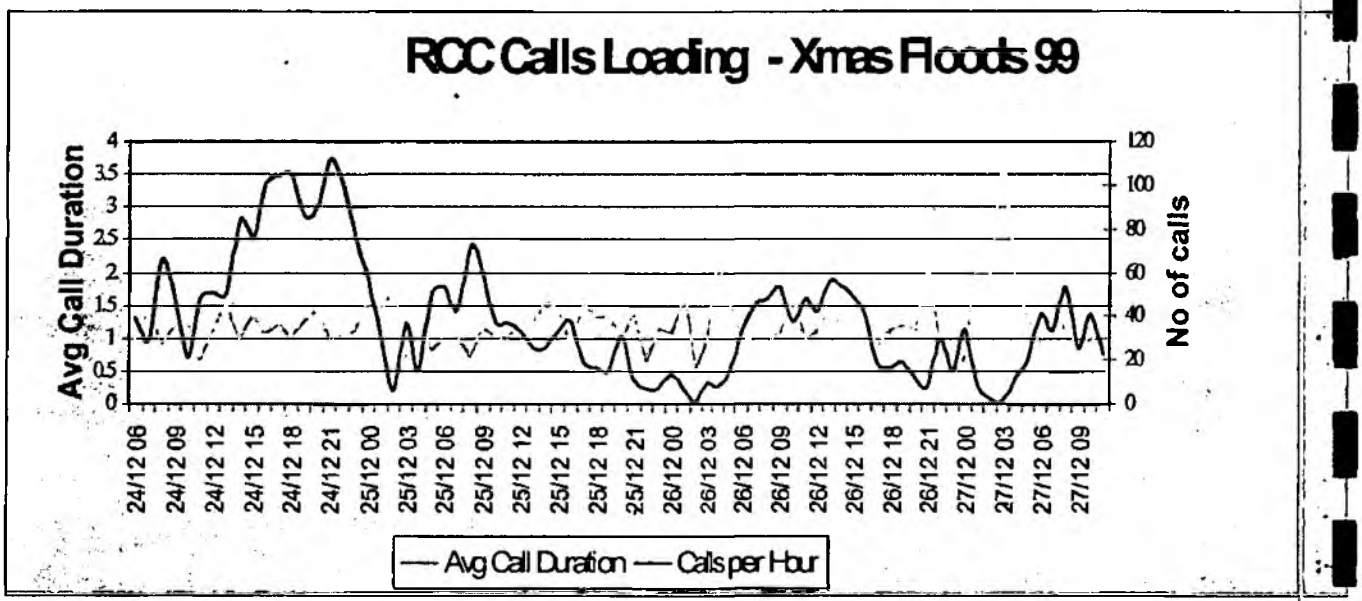
Two staff were tied up simply answering the phone for periods of several hours during the first two days of the event.

When Area Incident Rooms were open 80% of callers were simply given the public PSTN numbers for those rooms, little value was added by the RCC. This was because in general local operational knowledge was required to handle the callers.

Callers were not generally forwarded internally as I believed that this would tie up the incoming PSTN line(s) on which our 0800 807060 (Public Emergency) and 0800 252676 (Emergency Services Ex-Directory) calls are received from. Exceptions were made for what were considered operationally significant calls e.g. a mill owner requesting help removing stop boards.

Calls from the public appeared on all our lines, Public Emergency, Emergency Services and

internal extensions. CIS have investigated this and are able pin some undocumented features configured in our switch board as part of an aborted project to install the RAD. A chart with the relevant details are shown below;



This graph only shows incoming calls.

In my view current arrangements are far from satisfactory. We got many more calls than we could smoothly handle.

RECCOMENDED ACTIONS

1. More lines are added to the 0800 807060 line to allow public calls to RCC to be forwarded to Area Incident Rooms internally as people will still be using the 0800 807060 number as well as FloodLine.
2. Area and Regional Incident Rooms are allowed to elect to have FloodLine calls directed to them from BT rather than via the RCC to nominated banks of phone lines.
3. Areas and Regions put in place arrangements to deal with a large volume of calls from the public requesting information and re-assurance. Regionally consistent training packs would be useful here. This role could be carried out by staff from any function with say a day's training so that they may recognise significant calls. These staff could be sited in or adjacent to Area or Regional Incident Rooms.
4. Area and Regional Incident Rooms are beefed up with more lines, phones and automatic call routing, call recording and call logging. Also a database system to record incident details would be useful if could be deployed across the Region to aid the monitoring of an event.
5. The FloodLine number is not publicised when the BT Call Centre is shut
6. FloodLine is made a 24hr a day / 7 days a week service
7. Operation of the switchboard is changed so that additional 0800 807060 calls are NOT miss-identified as, or appear on, the ex-directory line for emergency services.
8. Arrangements to better record which areas are currently flooded are put in place, would a database with a GIS element be useful here?

USAGE OF RTS – HANDLING OF ALARMS

I can see no reasons why RTS alarms cannot be handled from Areas once Area Incident Rooms have been opened. I can also see no reason why alarms have to be forwarded by the RCC to Areas by fax.

RECCOMENDED ACTIONS

1. Sufficient training and practice is delivered to Areas so that they become confident in handling their own alarms.
2. A regionally consistent procedure is developed for handling the hand over of responsibility for handling alarms from RCC to Areas.

USAGE OF AVM

The AVM required rebooting a number of times on Christmas Eve and Christmas Day (I estimate 4 times for the Worthing server and 2-3 times for the Colden Common server). In my view it could not cope with the loading placed upon it by the coastal flood warning groups. The high priority coastal warnings being issued meant that many fluvial Yellows were queued.

The FIDOs and AVM managers remained cool and calm throughout this however, and I was very impressed by their stamina and determination to get the warnings out.

During Christmas Eve and Christmas Day I gained the impression that it was impossible for the FIDOs to record the FloodCall messages and keep up with issuing warnings.

Surefax was used rather than the AVM to issue flood warning faxs on Christmas Eve and Christmas Day.

RECCOMENDED ACTIONS

1. That two FIDOs are available for larger events (train more, double roster?).
2. That alternative means of disseminating public warnings to the Coastal zones are considered. Can we rely on the Media for these
3. That increasing the number of AVMs is considered.

TRACKING OF FLOOD WARNINGS ISSUED

By 10pm on Christmas Eve I had no idea of what flood warnings were in force. Contributory factors to this were:-

- Number of phone calls received from the public
- Volume of warnings issued
- Its not easy to interpret the warnings in force from the current FIDO logsheet
- Regional Flood Map was not updated.

It proved difficult to keep the RCC wall map and whiteboard up to date as:-

- Normally the operators do it but it was the FIDOs who were issuing the warnings.
- We ran out of markers
- Fluvial Zones are not marked on the map
- Each flood warning zone generates two faxs into the RCC, the first in the group and the last in the group. This is to allow verification that the AVM has started and finished faxing each group. However there are no procedures at the moment to deal with the faxs generated, which create a large volume of paper.

RECCOMENDED ACTIONS

1. FIDOs take on responsibility for reporting what warnings are in force at any one time once they are active in the RCC.
2. FIDOs take on responsibility for updating the RCC wall map and warnings in force whiteboard.
3. RCC will mark up the wall map with fluvial flood warning zones
4. RCC will produce a quick look up table of zones and river names
5. Devise a procedure form FIDOs and Operators to handle the storage and monitoring of flood warning faxs. Flood Warning faxes to go to Area and Regional Incident Rooms as well as the RCC.
6. A database is produced for tracking which warnings have been requested, are in force and on progress in issuing warnings. This database to be Regionally accessible.

LIASON WITH AREAS

The key issue for the RCC was the timing of the opening and closing of Area Incident Rooms as this added or subtracted major volumes of work. Clearly once an Incident Room was open this reduced dramatically the amount of time that could be spent with each caller by the RCC and thus more calls could be handled.

Each Area sets up Incident Rooms differently with detectably different roles.

- Sussex open one large one and encouraged calls to be put through and could handle a larger volume of calls as a result. From an RCC point of view this was the best arrangement.
- Hampshire have available 2 small ones, one for Flood Defence and one for EP. The Flood Defence one holds 2 staff comfortably.
- Kent opened two sites, Tonbridge and Rye and were focussed mainly on operational matters and less on taking calls from the public. In the Rye office there was no identifiable line for public calls to come in on but the Duty Officer took the plunge and advised us to give out his mobile number to the public, which I am grateful for.
- The Regional Incident Room did not prove useful, this time around, in taking work off of the RCC.

RECCOMENDED ACTIONS

1. Both Hampshire and Kent consider following the Sussex model for Area Incident Room Operation. Had the focus of the action been in either of the other two Areas I

believe that they would have found it more difficult to cope with because of their current arrangements.

1. All Incident Rooms are beefed up with actively rostered staff so they can be activated more quickly.
2. How the workload in dealing with calls from the public is shared between Region and Areas and RCC needs careful planning and some procedures developing.

TIDAL FORECASTING / LIAISON WITH MET OFFICE STFS

Prior to Christmas Eve we had asked for two sets of results from the model per day until New Years Day. STFS needed reminding to send extra results on all but one occasion. STFS staff were happy to provide additional information over the phone to colour in the forecasts, which proved very useful. I can't help thinking that better interpretation of the results could be undertaken by EA staff with some Meteorological Forecasting training.

The Tidal Forecasting procedures are carried out manually and subject to error from simple arithmetic problems.

RECCOMMENDED ACTIONS

1. Change RCC procedures to include reminder call to STFS one hour prior to the expected delivery time of additional runs.
2. Russell Turner to pass this observation to STFS.

ROLE OF DUTY HYDROLOGIST – OBSERVATIONS

Jo Pearce worked extremely hard and well. Really like other rosters there should be enough staff available to support rolling 12 or 8 hour shifts. I felt Jo was left out on a limb by the other Duty Hydrologists who all vanished for Christmas.

Some means needs to be formalised for the Duty Hydrologist to brief the Regional Incident Room periodically.

RECCOMENDED ACTIONS

1. Duty Hydrologists procedures to be modified to cope with events lasting more than 12 hours.

RCC ERGONOMICS / ORGANISATION

At present the RCC is designed around one operator working alone. When the workload increases to require 2 operators plus a supervisor and a FIDO space becomes cramped and not all systems can be easily shared including;

- Log sheets
- CENTOPS
- COMMLOG
- Information generally i.e. which incident rooms are open

Also the noise level increases dramatically as most faxes, phones and telemetry have audible

warnings.

Some of the RCC's current roles and tasks do not fit well together as most are highly re-active and of low difficulty, i.e.

- answering phones within 3 rings
- forwarding faxs to Areas
- monitoring 'at risk' workers

Whereas others require extended periods of concentration;

- Operation of the AVM
- Tidal forecasting

This causes the Operators some stress.

Currently the RCC stand by operators are trained to perform most of the roles of the operator and work alongside them as assistants. The RCC duty operator is thus in charge of the RCC.

There is no current procedure in place to call in the RCC Supervisor except on a one-off catch-as-catch-can basis to help with exceptional workloads or if some management intervention is required. It should be noted that the RCC Supervisor or REO role is not currently rostered, and that if the RCC works effectively with the Areas should not be required in during an 'event'. This only occurred during the Xmas event due to the exceptional call loading introduced by calls from the public encouraged by the media promotion of FloodLine. The current arrangements leave the RCC vulnerable as the supervisor/REO role is not rostered.

RECCOMENDED ACTIONS

1. Alternative arrangements to deal with a heavy call load from the general public are put in place so the REO is not called in to deal with those in future.
2. Review whether 2 standby operators should be rostered for any one point in time.
3. Review RCC layout and equipment.
4. Review information flow and logging in RCC
5. Move furniture in RCC to allow space for a large whiteboard to be put up.

Environment Agency – Southern Region
Flood Warning Duty Manager Report

24th – 28th December 1999.

Note:
This is a summary of the activity. A fuller report will be produced with recommendations to improve the effective delivery of flood warnings. The concept of high risk property flooding at the Amber stage is not recognised by the "at risk" public. Close co-operation and support by Sean Key and the RCC staff assisted the flood warning activity. In designing the systems and procedures for flood warning dissemination it was not considered likely that coastal and fluvial warnings would be required for all three Areas at the same time.

Friday 24th December 1999

FW Duty Manager: Martin Whiting;
FIDOs: Andrew Barnes & Sara Cropley.

Spring tides, SW gales and 25 mm rain overnight lead to coastal and fluvial warnings for all three Areas.
Warnings issued from Guildbourne House using both Worthing and Winchester AVMs.
Warnings issued remotely using Winchester AVM.
Problem with Worthing AVM, programme looping caused by "No transmission data" error associated with one cascade group, fault reported to Kingston.
Large number of warnings queued on Winchester AVM.
Thames Barrier site visited to investigate use of their AVM. Not possible as database incomplete and hardware configuration different.
Worthing AVM fixed, warnings issued remotely using Thames Barrier AVM.
Some Yellow Warnings were not issued due to the capacity of the system.
Sara Cropley issuing AVM warnings from GHSE, 09.00 – 20.00 hrs
Andrew Barnes issuing recorded messages (Floodline) from GHSE, 09.00 – 17.00 hrs and 20.00 – 04.00 hrs (25th).
Martin Whiting supporting from home 10.00 – 12.00 hrs, issuing warnings and monitoring from home, 12:00 – 18:00 hrs, issuing warnings and monitoring from Thames Barrier site, 19:00 hrs - 02.00 hrs (25th).

Saturday 25th December 1999

FW Duty Manager: Martin Whiting;
FIDOs: Andrew Barnes, Nick Berry & Glynis Tiltman

Spring tides, continuing SW gales and a further 20 mm rain overnight lead to coastal and fluvial warnings for all three Areas.
Warnings issued from Guildbourne House using both Worthing and Winchester AVMs.

Failure of Winchester AVM Manager and Engine to connect investigated by CIS Comms (Neil Wooliscroft). Fault reported to Kingston who resolved by talking through resolution with local site staff.
Nick Berry (FIDO) issuing AVM warnings and recording messages (Floodline) 07.00 – 12.00 hrs.
Martin Whiting (FWDM) issuing AVM warnings and recording messages (Floodline) 12.00 – 22.00 hrs.
Glynis Tiltman (FIDO) issuing AVM warnings and recording messages (Floodline) 22.00 – 06.00 hrs (26th).
Neil Wooliscroft (CIS) investigating LAN operation 13.00 – 15.00 hrs

Sunday 26th December 1999

FW Duty Manager: Martin Whiting;
FIDOs: Andrew Barnes, Nick Berry & Sara Cropley

Reducing Spring tides, continuing SW gales and a series of low pressure systems and full river channels, without further significant rainfall, lead to coastal and continuing fluvial warnings for all three Areas. Closure of Thames Barrier and associated Gates. Significant "underforecast" of lunchtime tide at Southampton.
Warnings issued from Guildbourne House using both Worthing and Winchester AVMs.
Number of warnings being issued led to Martin Whiting attending Colden Common site.
Failure of Winchester AVM Manager and Engine to reported to Kingston who resolved by talking through resolution with Martin Whiting on site.
Andrew Barnes (Duty FIDO) issuing AVM warnings and recording messages (Floodline) 06.00 – 14.00 hrs.
Sara Cropley (FIDO) issuing AVM warnings and recording messages (Floodline) 14.00 – 22.00 hrs.
Nick Berry (FIDO) issuing AVM warnings and recording messages (Floodline) 22.00 – 06.00 hrs (27th).
Martin Whiting supporting, issuing warnings and monitoring from home, 10:00 – 16:30 hrs, issuing warnings and monitoring from Colden Common site, 18:00 hrs - 22.30 hrs.

Monday 27th December 1999

FW Duty Manager: Russell Turner
FIDOs: Sara Cropley, Andrew Barnes & Glynis Tiltman

Decreasing tides and winds lessened coastal warnings to yellow. No further significant rainfall.

RT travelled to Winchester to monitor the AVM; Worthing AVM down as database had been deleted @ 01.00hrs on 27th. Sara Cropley issuing warnings from Winchester remotely and started standing down fluvial warnings. Checking of Winchester AVM undertaken before RT travelled to Worthing.

Sara Cropley finished duty at 14.00 hrs; with Andrew Barnes taking over. Downgrading of warnings for rivers presents an additional workload with tired staff who need rest. Decided to downgrade reds to ambers only then standdown any remaining ambers/yellows in full. This is likely to be on the 28th.

Reviewing warnings so far we have made:

72,063 calls in total – 63576 voice calls and 8487 fax calls.
35,182 calls have been answered - 30,004 voice calls and 5178 fax calls

RT spoke to Ray Kemp ahead of Ed Gallagers visit to update him of situation.
Spoke to FIDOS – GT & NB and told them to get some rest; spoke to Nick Hamilton who is available until Thursday. Spoke to Bernard Tiltman and advised of rest for FIDOs rather than training new staff. RT collating warnings issued via AVMs and surefax and identifying any not issued.

Floodline will be moved to new Y2K platform on 28th; will be used as opportunity to rerecord and check warnings in force.

Advised RCC that RT would be FIDO for evening of 27th to allow staff to rest.

Tuesday 28th December 1999

FW Duty Manager: Russell Turner
FIDO: Glynis Tiltman

Majority of warnings in force stooddown on aread / district basis by merging groups and recording new voice messages. Downgrading warnings is an area that needs reviewing as FIDOs are unsure of how issue them.

Advised by Terry Glover that new Floodline system would be introduced at 13.00hrs; GT recorded all messages on new system; left old messages on old system as these will be lost in the switch.

Pm - Floodline not switched to new system; RCC cleared all old message boxes to allow GT to record latest information on old system.

AVM warning queue not clearing – telephoned Kingston to rectify plus other issues: A:\ drive on engine not working & 'Merge groups' should be more straightforward.

RT left Worthing for home at 16.00hrs after all current standdowns issued.

GT rang to advise that Floodline numbers had been diverted to seeboard customer services; rang Terry Glover to rectify. Fixed at 18.00hrs. Arrived home at 20.45.

MW & RT / 11 January 2000

The Met.Office

FPS/2/7

South coast storm event 24 December 1999

Summary

This event appears to have a relatively low return period in terms of rainfall, surge activity and wind strength. The wave height is probably more significant especially with the southerly direction but the wind veer to SW prior to high water would have reduced the significance at the time of the highest tides. The event was forecast well in advance by STFS but the atmospheric models did underforecast the position and depth of the low.

General situation

An old low pressure system lay to the NW of Scotland in the early hours of the 24 December 1999and moved away steadily Northeastwards during the day. A potential secondary low pressure development was evident at this stage around 47N 29W. As this frontal wave approached Ireland the associated trough deepened significantly and formed a discreet low centre over Belfast at 1800 with a central pressure of 964 mb. This low continued to deepen and was 948 mb over Dundee at 0000 GMT 25 December 1999 and reached 938 mb later on Christmas Day as it moved over the North Sea.

The South coast was in a broad stable warm sector with a strengthening SW'ly flow. The cold front associated with the secondary low was at Lands End at 1800 24 December 1999 and was travelling at around 45 knots to be near Dover by 0000 25 December 1999.

Rainfall

Areas of moderate or heavy rainfall was evident within the warm sector ahead of the cold frontal system. From the limited rainfall data available the area had received a significant amount of rainfall, 150% to 210% of the monthly rainfall at Shoreham and Herstmonceux respectively. At Thorney Island 67mm fell in 96 hours which relates to a 7 year return period with 15mm falling on the 24 December.

Surge activity

The surge levels along the South coast were not excesssive with the largest recorded as 0.66 m at Portsmouth at midnight. High water at Portsmouth was at 0026 25 December 1999 at 2.71m ODN (5.44m CD) which was 0.24m above the Alert level. The gauge at Newhaven did not give any valid data between 0700 and 0100 but the forecast was for smaller residuals than Portsmouth. **Figure 1** shows the surge residual time series for the South coast.

Margins to alert threshold

The margins at high water from the astronomic tide to the predefined alert thresholds for the evening of the 24 December ranged from 0.33m at Portsmouth to 0.56m at Weymouth. Once the surge has been added to the tide the forecast levels change to 0.11m above and 0.04m below the alert threshold respectively.

Alerts

There were Alerts issued for the evening tide for the ports in **Table 1** along the South coast. All alerts were issued well in advance for all ports and slightly underforecast the final levels. Subsequent runs of the model gave slightly better forecast levels for Plymouth and Weymouth.

Port	HW Date/time	Forecast height (m) ODN	Lead time	Obs height (m) ODN	Forecast error (m)
Newlyn	24/1749	2.78	11:48	2.84	0.06
Plymouth	24/1905	2.78	13:04	2.93	0.15
Weymouth	24/2025	1.61	14:24	1.74	0.13
Bournemouth	24/2217	1.44	16:16	1.40	0.04
Portsmouth	25/0040	2.65	13:51	2.71	0.06
Newhaven	25/0037	3.98	13:48	N/a	N/a

Table 1 *Alerts issued by STFS for Divisions 6 and 7.*

Winds

The winds backed and increased ahead of the cold front and veered markedly behind it. This can be seen from the example in **Table 2** of St. Catherines Point which experienced some of the strongest winds in the area. The winds in the channel reached force 9 or 10 ahead of the front from SSW but remained a similar strength as they veered to the SW. Winds of this strength occur on a regular basis and they are often strong southerly just ahead of a frontal system. The return period of this event for wind activity would be relatively small.

ST. CATHERINES POINT

Date	Time	Mean Wind Direction	Mean Wind Speed (kn)
24/12/1999	1300	220	16
24/12/1999	1400	210	17
24/12/1999	1500	210	19
24/12/1999	1600	210	18
24/12/1999	1700	210	20
24/12/1999	1800	200	19
24/12/1999	1900	220	28
24/12/1999	2000	220	30
24/12/1999	2100	230	32
24/12/1999	2200	240	33
24/12/1999	2300	250	34
25/12/1999	0000	250	37
25/12/1999	0100	250	39
25/12/1999	0200	250	41
25/12/1999	0300	250	42
25/12/1999	0400	250	41
25/12/1999	0500	260	40
25/12/1999	0600	260	37
25/12/1999	0700	260	28
25/12/1999	0800	260	27
25/12/1999	0900	250	25

Table 2 *Strongest winds observed in the area at St. Catherines point.*

Wave activity

The wave activity associated with the force 9 to 10 winds was significant and increased from 4m at 1800 to 6.5m at the Greenwich light vessel just ahead of the cold front around midnight. The direction of the wind backed towards 190 degrees but veered towards 250 degrees after the passage of the front. The return period for significant wave activity is highly dependant on the direction of the waves. For this event as high water approached the winds veered more southwesterly and even though the strength still remained this is a much more common direction for large offshore wind waves. This wind veer

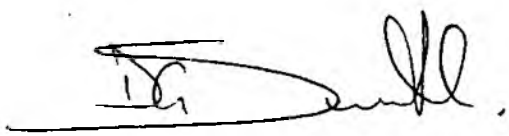
was significant (i.e. greater than 30 degrees) and would result in smaller magnitude waves. I would conclude that the waves on the rising tide would have had a more significant return period than those at high tide.

Model performance

The atmospheric models general guidance was reasonable but the low centre pressure was around 15mb to high in the model as the depression rapidly deepened over Northern Ireland. The winds were underestimated by the models in the Irish Sea and Bristol channel area but the winds in the eastern Channel were quite well forecast.

The surge model underestimated the surge in the Bristol Channel and Irish Sea quite significantly as a result of the above error. Elsewhere the results of the surge model were within normal tolerances.

The wave model forecast over 6m waves in the English Channel and the observations confirm that this was a reasonable forecast with 6.5m being observed.



Dave Smith
Manager STFS
21January 2000

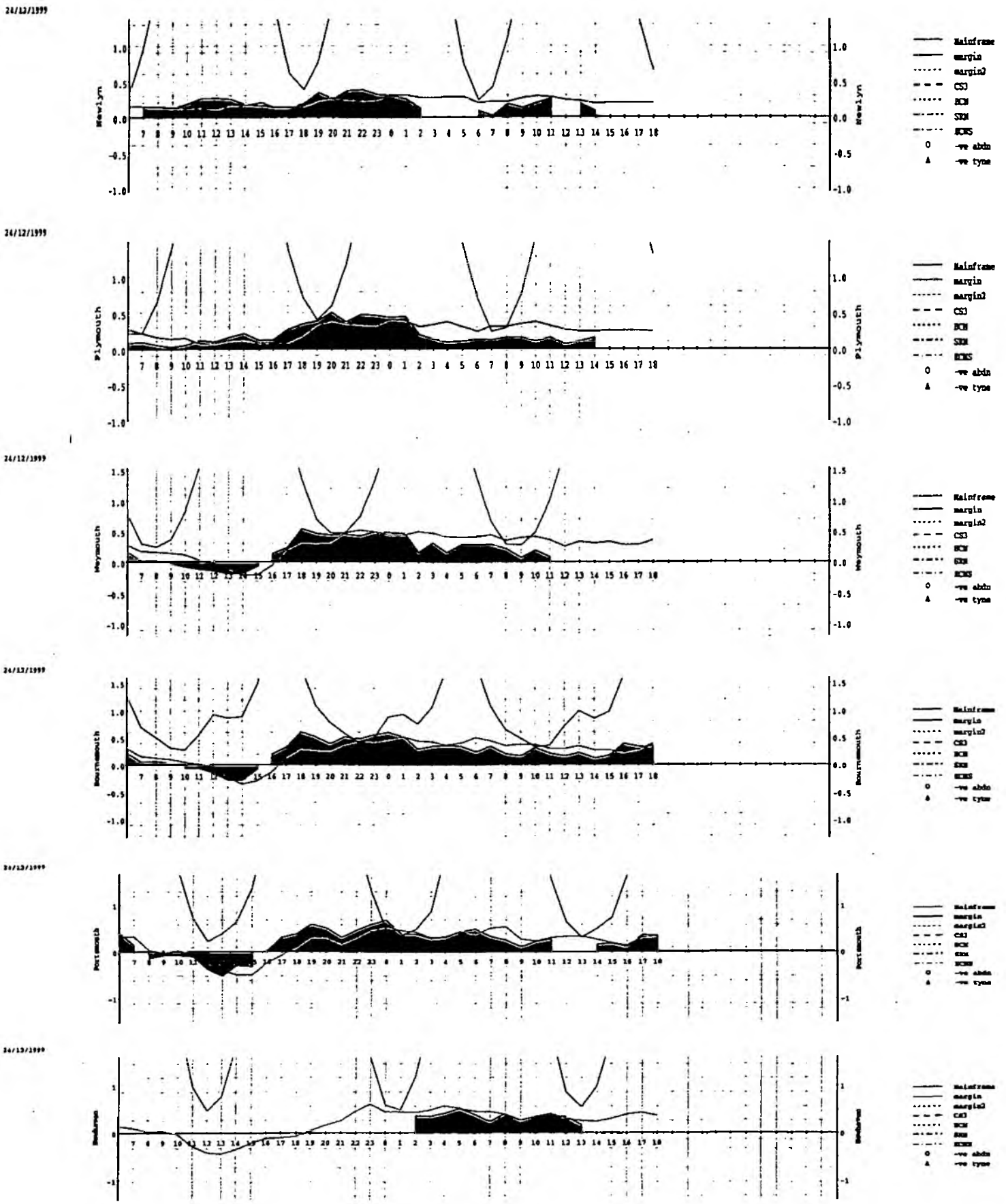


FIGURE 2. Surge residual time series.

Appendix 8 – Direct Works Report

CHRISTMAS EMERGENCY 1999
DIRECT WORKS REPORT

Regional Direct Works (DW) were called upon to provide full support from the Emergency Workforce (EWF) from varying times commencing 24 December within all Areas. The various Area 'Wash-ups' in which DW were involved only briefly dealt with the EWF response and this report is to provide an overview with how the EWF responded but to identify areas where we could improve for future events.

The report will deal with Areas of the event with general points.

Hampshire: The available EWF were so stretched on 24 December in dealing with fluvial reports and closure of gates that I became concerned on 25 December as to the requirement to call on the Fisheries section to provide additional back up ie., second or third person in Gang. Due to an oversight on 24 December having worked long hours Diesel fuel was a problem to obtain supplies on 25 December with M27 motorway service stations being called upon. The event was co-ordinated by the Direct Works duty standby officer and fortunately the event tailed off on 26th December whereby EWF gangs were on programmed patrols of grill and blockage clearance and links with Hampshire Incident Control were good.

Sussex: At 09.00 on 24 December the Sussex Incident Control was being established and Acting Area Flood Defence Manager made early contact, throughout the day of 24 December excellent preparation was made for the event. Regular meetings were held with DW and in view of the scale I made contact with outside contractors and Thames/Anglian Regions EWF in preparation of calling additional resources manpower and plant over the Christmas period. Rotas were set up in Incident Room, which included the use of DW management. The EWF along with plant contractors provided an effective response, which was well planned. The incident, which lasted several days, stretched the available EWF and again I was concerned regarding the need to provide additional resources from Fisheries etc. Plant Contractors in some cases did not have a Christmas Emergency service, which needs to be investigated in order to avoid exploitation in terms of cost. Although the event was coastal the fluvial activity was substantial further aggravated by old pumping stations ie. Upper Beeding required additional resources due to one pump having been removed prior to Christmas and second pump failing resulting in 25 December contractor attendance. An excellent response both at Selsey, Seaford and Pevensey in terms of EWF and Plant Contractors as well as support in terms of breakdown of plant and had the event been worse then undoubtedly external contractors and support from Thames and Anglian regions would have been called upon. EWF should have had better contact with DW EWF from Incident Room for the height of the event.

Kent: South Kent although late to open the Incident Room at Rye was, in my opinion, the well co-ordinated between Client and DW management in that the DW were involved in the event as it progressed. In view of the problems encountered there was positive reporting back from EWF flood patrols to incident room and clear decisions made both on 25 December following inspection and as the majority of EWF were required on 27th December the decision taken to have full working on Monday 27th and Tuesday 28th December right through week until close down on Thursday 30th there was only key operation that took place ie. Shingle movement upto 18.00 hours on 31 December with commencement of operation on Sunday 2nd January and all that week. Pumping stations performed extremely well with

hardly any failures and pumps ran continuously with the constant monitoring by EWF including the use of Appledore diesel pumps with 24 hour monitoring which are only used in major events. In the run up to the event on Christmas Eve there was some contact with client and concern as to the scale of predictions, however, the Team Leader South Kent was in contact with DW management direct when the event unfolded.

In North Kent on Christmas Eve there was concern by myself and DW standby officer as to the lack or preparation in as much that the EWF were going on Christmas Leave and very late in afternoon contract was still not satisfactory as we were aware from Sussex and South Kent that they would be required. As happened calls were received from the Incident Room at Leigh to mobilise the available EWF who responded well. EWF were being sent to locations but further information should have been provided as to what was required by the instructions. On 26th December EWF was being stretched particularly in having to respond to each barrier closure with EWF support. Supervisors were becoming concerned, however, the event tapered off. Again, contractors were used but there was no problem here of exploitation. Problems were encountered in trying to contact the Leigh Incident Control Room and the telephone contact could have been improved. The event for EWF in North Kent closed down earlier than South Kent for DW EWF.

General: I was very pleased with the response of DW and all the EWF, particularly in view of the late call on the EWF and with a large percentage of EWF not being available due to planned family celebrations for Christmas and/or being away for the period.

With the EWF numbers which were available DW managed very effectively and the use of manual employment staff as well as plant and mechanical/electrical contractors, an excellent response was provided.

If the event had gone on further contractors and resources from Thames and Anglian would have been used. The role I performed in Gold Control was extremely useful in as much I was providing a full Sussex/Kent response as it included South Kent to which I had direct communications set up by Team Leader and Agent for South Kent along with direct communication to Sussex Incident Room.

Points where we could improve:

1. Fisheries, Conservation and Navigation staff etc should be made known to DW for the EWF response and to be called upon in an emergency.
2. Use of external contractors needs to be formalised to ensure response over holiday periods with agreed rates.
3. At height of event DW to be present in the Local Area Incident Room to co-ordinate the EWF effectiveness.
4. Warnings and Press coverage to be submitted to DW management for relaying onto EWF so the appropriate staff can be informed of up to date position.
5. Communication numbers for contact with Area Incident Rooms are pre arranged in order to hand out on plastic sheets for reports back.
6. Where standby arrangements are being considered EWF is notified as early as possible in order to notify staff.
7. In preparation for an incident early notification particularly holiday periods is made to ensure that the 'available EWF' can be provided and where there is a shortfall contractor employed.

8. Remuneration is agreed in advance (where possible) and Direct Works Manager is involved.
9. Standard reports of EWF response are agreed as to manpower and plant used in events.
10. Avoid highlighting a major location as in this event all of DW EWF was involved.

NOBLE NUMBER	224
EWF ESTABLISHMENT	206
EWF IN POST	198
EWF EMPLOYED	120
CONTRACTOR SUPPORT	40

JOHN DONALDSON
DIRECT WORKS MANAGER

JFD/DW/SER/ChristmasEmergency1999
31.1.00