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DORSET COUNTY COUNCIL JULY 2012 FLOOD INVESTIGATION REPORT

Burton Bradstock 7th July 2012 source: Wessex FM Website

January 2013

Director for Environment Miles Butler

Executive Summary

This report, which includes contributions from the Environment Agency, has been prepared by Dorset County Council as the Lead Local Flood Authority.

The predominant sources of flooding in July 2012 were surface and groundwater; these constitute 'local flooding sources'. Dorset County Council as the Lead Local Flood Authority (LLFA) has responsibility for overseeing flood risk from these sources under the Flood and Water Management Act 2010.

Many parts of Dorset experienced the worst flooding for over ten years in the period from 6th to 13th July 2012. Heavy and prolonged rainfall over the weekend of the 6th and 7th of July affected many parts of Dorset and East Devon as a large depression circulated slowly around South-West England. A number of rain gauges registered over 100mm on the Friday and Saturday (four times the month's average). Between April and June more than double the average rainfall had been recorded and the rain therefore fell on already saturated ground.

The intense torrential rain caused flash flooding to rapid response catchments to the west of Dorset on Saturday morning (6th July). Subsequently, larger catchments were affected into Sunday and Monday as flood waters passed through the systems on the Rivers Frome and Stour. When the peak flow on the River Stour passed through Bournemouth in the early hours of Tuesday 10th July the impact of the rainfall five days earlier was considered to be over. However, the rapid rise in groundwater levels, particularly in West Dorset, led to groundwater flooding to properties and roads. This was still happening up to two weeks later.

In addition to the physical damage from overland flows, surface runoff and extreme river flows, the rainfall event triggered landslips on the coast at Eype and Lyme Regis and inland at Beaminster Tunnel, resulting in three fatalities in total. Many roads were damaged by flash flooding and a number of communities were cut off by floodwaters. These factors made response difficult for emergency services and local authority partners.

The forecast for this heavy rainfall in relation to the South West generally, and Dorset in particular, had varied over the course of Friday 6th July. However, there was no significant cause for concern amongst professional partners involved in flood response in advance of the weekend. In the event all low confidence rainfall predicted maxima were exceeded. Totals for the week exceeded 150mm at Friar Waddon near Weymouth and Eggardon Hill (four miles East of Bridport) had the most intense recorded rainfall of 115mm in 38 hours (a return period of 1 in 80 years).

In parts of West Dorset a 12m increase in groundwater levels was recorded in the days after the heavy rainfall. More than 40 properties flooded from surface and groundwater sources along the South Winterbourne which flows through Winterbourne Abbas, Winterbourne Steepleton and Martinstown. Levels remained high for two weeks and also lead to a number of road closures. Wessex Water was still having to pump and tanker away foul water inundated with groundwater from the network in areas around Dorchester during September.

The Environment Agency issued 12 flood alerts, 26 flood warnings and 1 severe flood warning to over 1,700 households and their partner organisations. Flood defences, including storage reservoirs, protected many properties from main river flooding at a number of locations. There were no significant failures or overtopping of the defences but there were instances of drainage, surface water and groundwater impacts within defended areas. As river levels rose on the Lower Stour on 9th July an emergency response plan was activated. This involved the evacuation of residents from Iford Home Park, a low-lying community of 80 properties on the outskirts of Bournemouth.

The principal means of communication between the Bournemouth, Dorset and Poole Local Resilience Forum members during the incident was via the Flood Advisory Service Teleconference (FASTCON) facility. Fifteen meetings were held during the period between 20:00 on 6th July and 20:00 on the 9th July.

The flood event caused over 270 properties and 18 holiday caravans to be internally flooded across the county in some 71 communities. The communities with the largest internal flooding property count include Bridport, Martinstown, Winterbourne Abbas and Winterbourne Steepleton. Dorset County Council as the Lead Local Flood Authority and the Environment Agency held seven flood clinics across West Dorset to gather information. The data collected will be used in carrying out individual investigations and developing potential scheme options.

CONTENTS

1 RAINFALL

1.1 Scope

This section gives details relating to the rainfall that occurred. Antecedent conditions are summarised along with details of Flood Guidance Statements, Heavy Rainfall Alerts and uncertainty in forecasting. Details of recorded rainfall totals are presented with an assessment of return periods.

1.2 Antecedent Conditions

Many parts of Dorset experienced fluvial, surface water and groundwater flooding after heavy and prolonged rainfall on Friday 6th and Saturday 7th July 2012. Prior to this heavy rainfall event Dorset had received higher than average rainfall for the proceeding months, with the period April to June receiving more than double the long term average (see table below). By the end of June the river catchments were all saturated, with many winterbournes running at a time of year when they would normally be dry.

(mm)	April	May	June	July	Totals
Average Total	49.4	46.4	45.3	37.1	178.2
2012 Totals	156.4	33.2	128.8	136.7	455.1

Table 1.1: Long term average and 2012 rainfall totals for Dorset

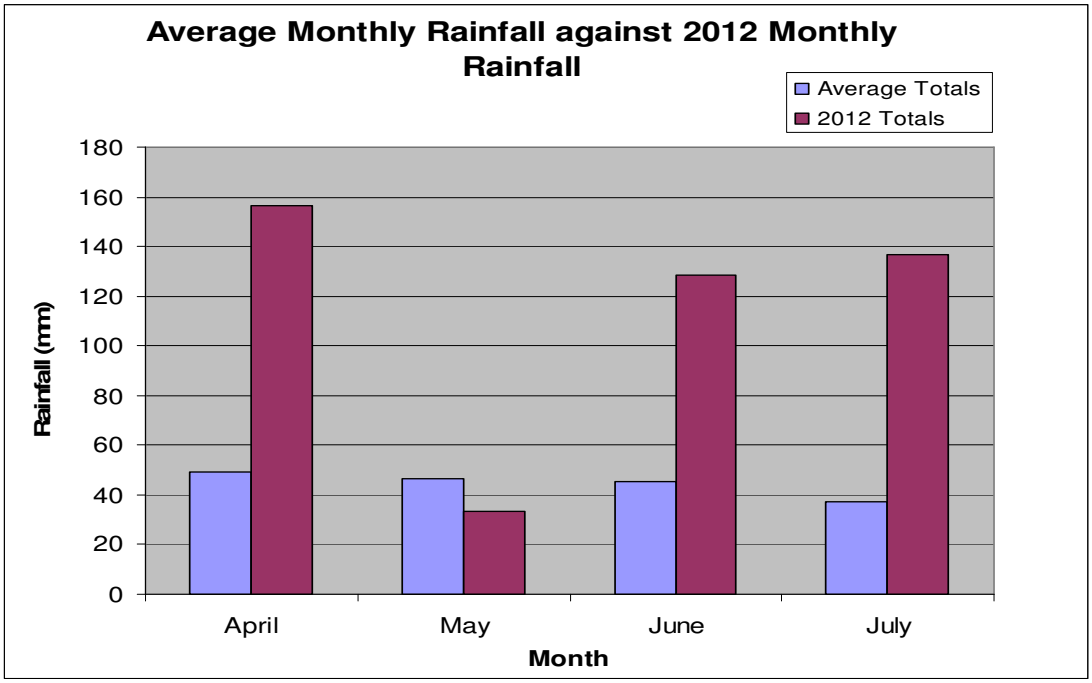


Figure 1.1: Graph of average rainfall plotted against 2012 figures (July figure is up to and including rainfall on Monday 16th July)

The Soil Moisture Deficit at 06:00 on 4th July indicated that although it had previously been very wet, there was still capacity to absorb some rain in the soil. However by 8th July at 06:00 there was little to no capacity left in the areas most heavily affected by flooding.

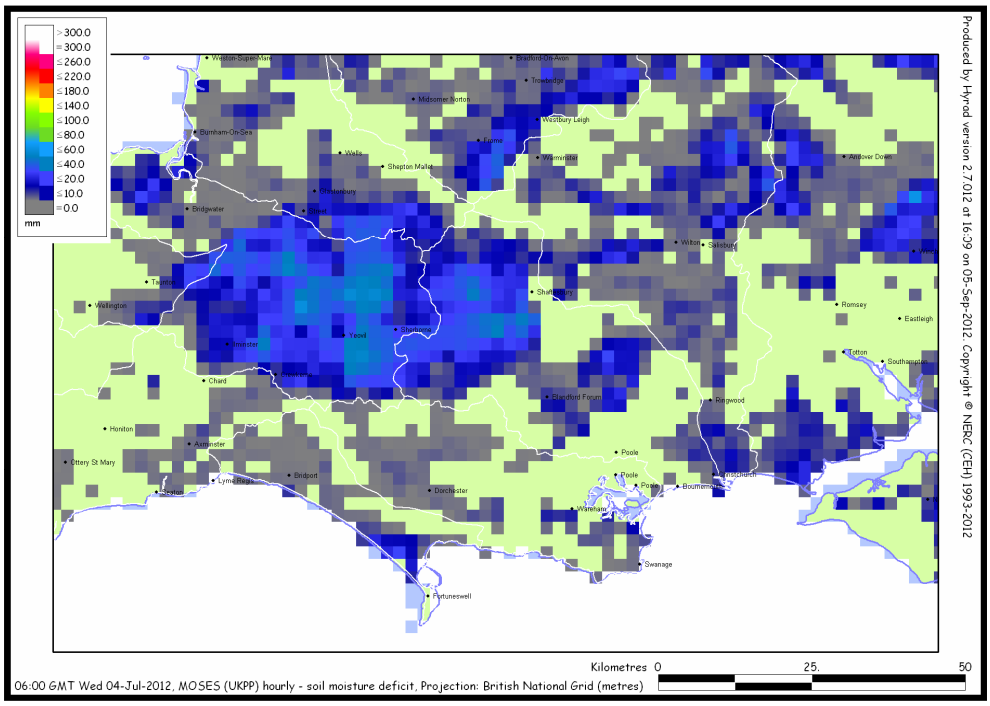


Figure 1.2. Median Soil Moisture Deficit 06:00 4th July 2012.

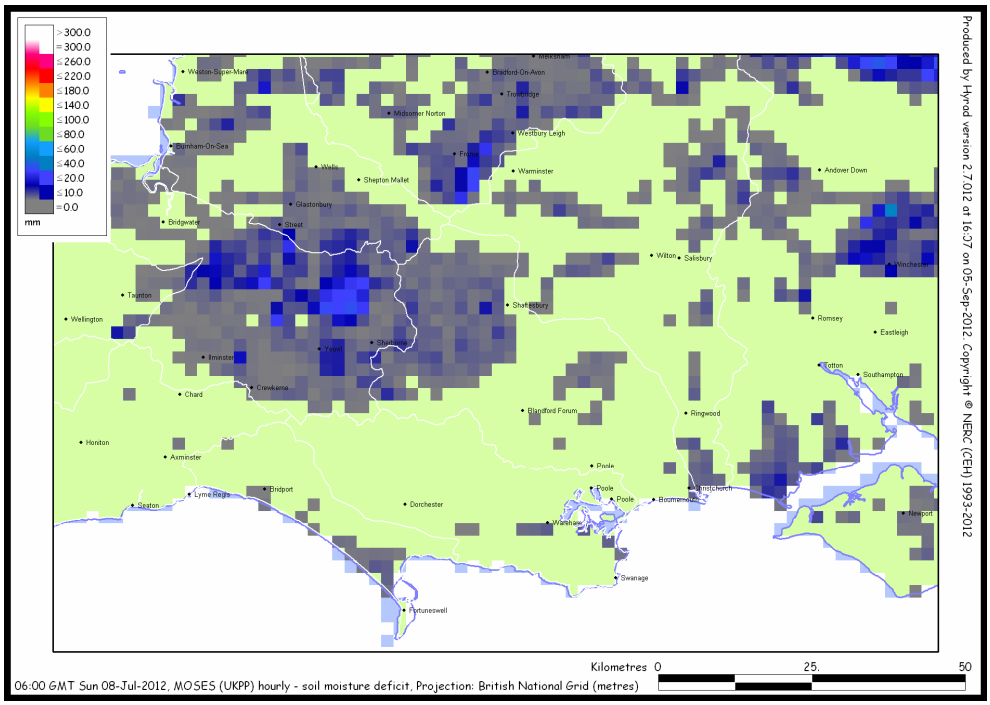


Figure 1.3. Median Soil Moisture Deficit 06:00 8th July 2012.

1.3 Flood Guidance Statements

Daily Flood Guidance Statements (FGS) are issued by the Flood Forecasting Centre run jointly by the Met Office and the Environment Agency. These are an assessment of daily flood risk normally issued at 10:30 each morning but updated as necessary. The rapidly changing shading of the FGS, especially on the 6th and 7th July indicates that there was a great deal of uncertainty amongst forecasters regarding the location and intensity of rainfall. Indeed, the weather system predicted to affect Wales, the Midlands and the North East shifted to the South West. This made it very difficult for the Environment Agency to forecast where the greatest impacts would be and hence caused difficulty in targeting where to issue Flood Alerts from forecasts, prior to the onset of rain. Although guidance statements and Heavy Rainfall Alerts are shared with professional partners, the absence of certainty over location and intensity meant that little preparation for the event was possible during normal working hours. The first FASTCON was held at 20:00 on 6th July with advice shared on moderate impacts expected based on medium confidence levels of 30mm falling within 6 hours. However, Flood Alerts and Flood Warnings were issued in good time as and when required.

Date and issue time	Flood Guidance Shading for Dorset					Source of Flood Risk
Tuesday 3rd July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Wednesday 4th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Thursday 5th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Friday 6th July 09:00	Day 1	Day 2	Day 3	Day 4	Day 5	None
Friday 6th July 12:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Friday 6th July 16:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Friday 6th July 18:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Friday 6th July 23:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Saturday 7th July 09:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Saturday 7th July 15:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Saturday 7th July 19:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Sunday 8th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Monday 9th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River
Monday 9th July 16:00	Day 1	Day 2	Day 3	Day 4	Day 5	River
Tuesday 10th July 08:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Tuesday 10th July 15:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Wednesday 11th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Wednesday 11th July 14:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface
Thursday 12th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface/Groundwater
Thursday 12th July 15:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface/Groundwater
Friday 13th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface/Groundwater
Saturday 14th July 09:00	Day 1	Day 2	Day 3	Day 4	Day 5	River/Surface/Groundwater
Sunday 15th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	Groundwater
Monday 16th July 10:30	Day 1	Day 2	Day 3	Day 4	Day 5	Groundwater

Table 1.2. Flood Guidance Statement shading for Dorset between 3rd and 16th July. The shading of the boxes indicate level of flood risk: Green = very low, Yellow = low, Amber = medium, Red = high.

On 3rd July, the forecast for the 5th onwards indicated very heavy rain showers with some torrential downpours for the South West, Wales and the North East giving a LOW risk of surface water and/or river flooding. The FGS stated that if confidence increased as to the locations of higher rainfall amounts and intensities, there was the potential to increase the risk to MEDIUM (significant disruption) for more localised areas.

On 4th July, the risk from surface water and river flooding was increased to MEDIUM for the North East of England for Friday 6th, whilst the risk was reduced to VERY LOW for Dorset for the period 4th July to 8th July.

On the morning of 5th July, the MEDIUM risk of significant disruption from river and surface water flooding on the 6th July was extended to include Eastern England and the Midlands. The risk of river and surface water flooding was increased to LOW for the South West, including Dorset for Saturday 7th July, as a further area of locally heavy rain was forecast to transfer across Southwest England.

Three further FGS were issued throughout Thursday 5th July, but these did not change the risk for Dorset, but did extend the MEDIUM risk further across the Midlands into Wales.

Early on 6th July, the forecast for that day was for heavy and persistent rain in parts of eastern, central and northern England along with central and north Wales, with a HIGH risk of river and surface water flooding in the south Pennines and north east Midlands with SEVERE impacts expected if the worst of the rainfall was there.

The FGS was still shaded yellow (LOW risk) for Cornwall, Devon and Somerset as further heavy rain was forecast and some minor river flooding impacts were expected in the evening of the 6th and into the 7th (Saturday), however Dorset was shaded green (VERY LOW risk) for the whole five day outlook period. By 12:00 on 6th July, the forecast had changed, with heavy rain now indicated to move into the Southwest overnight on the 6th with some very heavy bursts possible feeding in from the Southwest during Saturday (7th). This brought the likelihood of significant disruption up to MEDIUM for Cornwall and Devon and LOW for Dorset and Somerset.

By 16:00 on 6th July, the MEDIUM risk of significant disruption had been extended to include Somerset and Dorset for the remainder of 6th July, with a LOW risk for 7th July. This was due to a low probability that the highest totals from torrential downpours could be further east into Somerset and Dorset.

The FGS was changed again at 18:30 on 6th July. This was due to further persistent, heavy rain forecast to affect parts of southwest England, heavy enough to cause severe disruption from surface water flooding and river flooding. At this time the FGS was increased to indicate HIGH flood risk in Devon and Cornwall for Saturday (7th). As there was still a risk of severe disruption across Dorset, although risk forecast to be slightly lower, Dorset was considered MEDIUM risk for 7th July.

On the morning of 7th July the FGS shading remained the same as the previous evening with Dorset at MEDIUM risk of severe disruption for that day, with the situation improving to VERY LOW risk from Sunday 8th.

By 15:00 on the afternoon of 7th July and with the River Bride on Severe Flood Warning, the FGS indicated a HIGH flood risk in Dorset as severe disruption was

occurring there. The rain was continuing to move eastwards and there remained a MEDIUM risk of surface water and river flooding in Bournemouth and Poole.

On the evening of 7th July, the river flood risk in Dorset had reduced to MEDIUM for the remainder of that day (Saturday 7th) and was maintained as MEDIUM for Sunday (8th) as river levels were yet to peak in the larger rivers.

On 8th and 9th July the FGS indicated a LOW risk of river flooding for Dorset due to residual flood risk from the remaining high river flows, with VERY LOW for the following days. However there was further wet weather due on 12th and 13th July and this brought the river and surface water flood risk up to LOW again for these days.

In the afternoon of 9th July, the river flood risk for Dorset was increased to MEDIUM due to the continuing flood risk along the River Stour, with significant disruption expected that day.

Tuesday 10th July saw the risk reduce to LOW for Dorset for that day as river levels started to peak on the Stour. The LOW risk for river and surface water flooding for 12th and 13th July remained. This was extended in the afternoon of 10th July to include 11th July due to heavy showers affecting the region. The groundwater flood risk in Dorset was beginning to be noted by the text in the FGS from this date. The LOW risk for river and surface water flooding remained for the period 11th July to 14th July on the 11th July morning FGS, due to the Flood Warning remaining in force on the River Stour in Dorset and forecast rain spreading across southern UK from Thursday 12th July. The FGS was updated in the afternoon as a line of heavy showers on the south coast had developed which were forecast to remain into the evening, bringing a MEDIUM risk of significant impacts in Dorset due primarily to surface water flooding and fast responding watercourses. From Thursday 12th July through to Monday 16th July the FGS remained yellow for LOW risk of flooding from a combination of ongoing groundwater flooding in Dorset and further bands of rain showers.

1.4 Heavy Rainfall Alerts

Heavy Rainfall Alerts are issued by the Flood Forecasting Centre to indicate when rainfall intensities of the following threshold are expected: (i) 10mm (or more) in 1 hour (or less), 30mm (or more) in 6 hours (or less) and 40mm (or more) in 12 hours (or less). A level of confidence is also assigned to the forecast rainfall.

Heavy Rainfall Alerts – Dorset						
Issue Date	Issue Time	Effective Date & Time (GMT)	10mm /1hr	30mm/6 hr	40mm/12hr	Event Max
05/07/2012	05:42:00	00:00 05/07/12 to 22:00 05/07/12	M			18
06/07/2012	04:12:00	12:00 06/07/12 to 12:00 07/07/12	M	M		35
06/07/2012	08:48:00	12:00 06/07/12 to 12:00 07/07/12	M	M		45
06/07/2012	10:16:00	12:00 06/07/12 to 12:00 07/07/12	M	M		45
06/07/2012	18:46:00	12:00 06/07/12 to 18:00 07/07/12	M	M	L	45
07/07/2012	21:52:00	16:00 07/07/12 to 04:00 08/07/12	H	L	L	40
08/07/2012	05:45:00	10:00 08/07/12 to 16:00 08/07/12	M			16
08/07/2012	17:50:00	16:00 08/07/12 to 21:00 08/07/12	M			10
09/07/2012	10:23:00	12:00 09/07/12 to 22:00 09/07/12	M			24
10/07/2012	18:19:00	22:00 10/07/12 to 21:00 11/07/12	M	L		33
11/07/2012	06:22:00	06:00 11/07/12 to 21:00 11/07/12	M	M		30
11/07/2012	17:56:00	04:00 12/07/12 to 00:00 13/07/12		M		32
13/07/2012	07:28:00	11:00 13/12/12 to 00:00 14/07/12	M			20
14/07/2012	05:35:00	06:00 14/07/12 to 15:00 14/07/12	H			16
14/07/2012	06:09:00	11:00 14/07/12 to 22:00 14/07/12	L			14

Table 1.3. Heavy Rainfall Alerts issued by the Flood Forecasting Centre covering Dorset between 4th July and 16th July

1.5 Rainfall radar

The images below are rainfall accumulations from the HYRAD radar network over a 24 hour period (areas coloured white are the greatest accumulations).

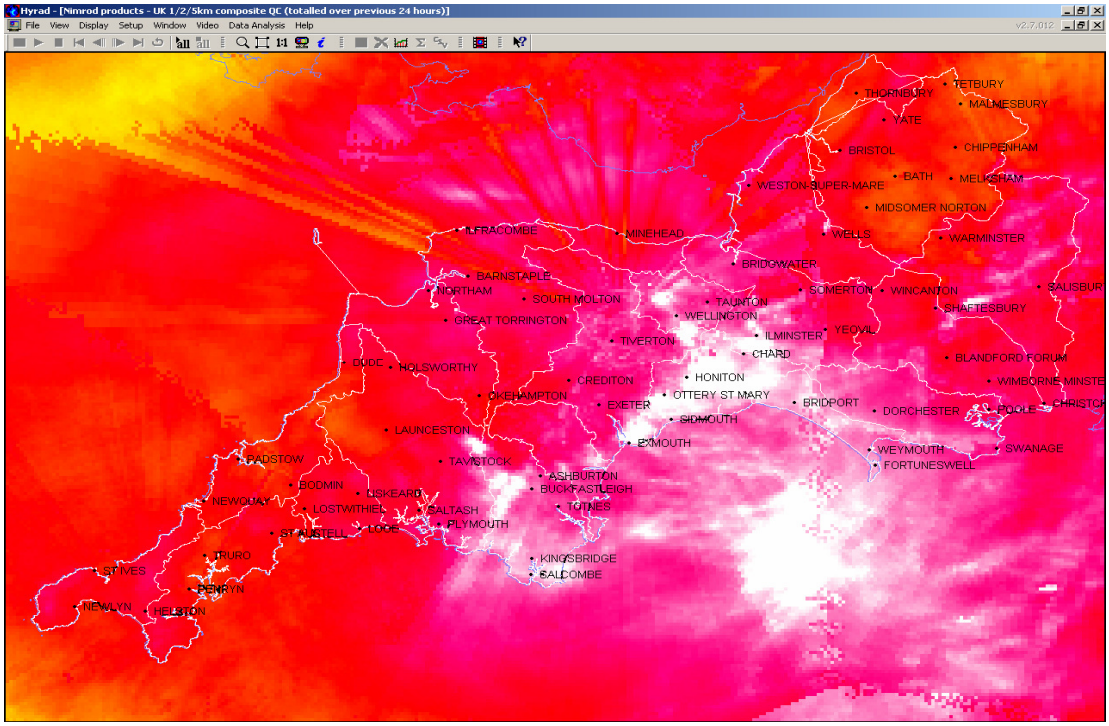


Figure 1.4. Rainfall accumulations over the 24 hour period of 6th-7th July

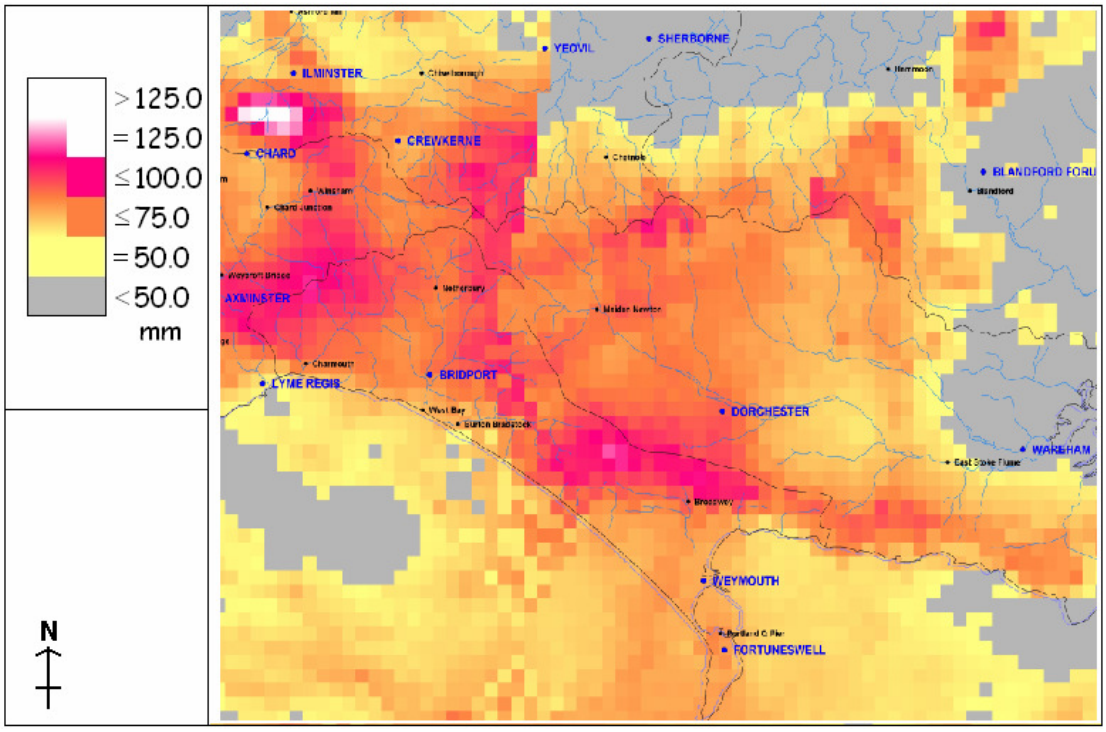


Figure 1.5. Rainfall accumulations over Dorset: 6th and 7th July 2012

1.6 Recorded rainfall

Between Wednesday 4th and Monday 16th July rain gauges across Dorset recorded levels of more than 100mm, with local figures in excess of 160mm (see Fig. 1.6). West Dorset and the upper Stour received the higher rainfall totals but significant amounts of rain fell across the whole county. This represented more than four times the average monthly rainfall expected for Dorset in July falling in less than two weeks, with a significant portion of this total coming on the 6th and 7th.

Due to the rainfall in the proceeding three months this rain fell on already saturated ground, the result was a rapid rise in river levels, groundwater and ponding of surface water in many places. Many watercourses reacted very quickly to the rainfall with the Char, Brit, Asker, Bride and Upper Stour (and tributaries) rising sharply. Two heavier periods of rainfall, one late on the 6th and one during the 7th, are clearly visible on river gauges across West Dorset.

The weather front responsible for the intense rainfall was an occluded front which rotated very slowly as it tracked south west across the country. Initially it was forecast to miss Dorset and Devon but the forecast was updated on the morning of Friday 6th July as its path changed. The rain was heaviest on West Dorset and Devon as the leading edge of the frontal system rotated over the area. It had previously passed over other parts of Dorset relatively quickly depositing more modest rainfall totals.

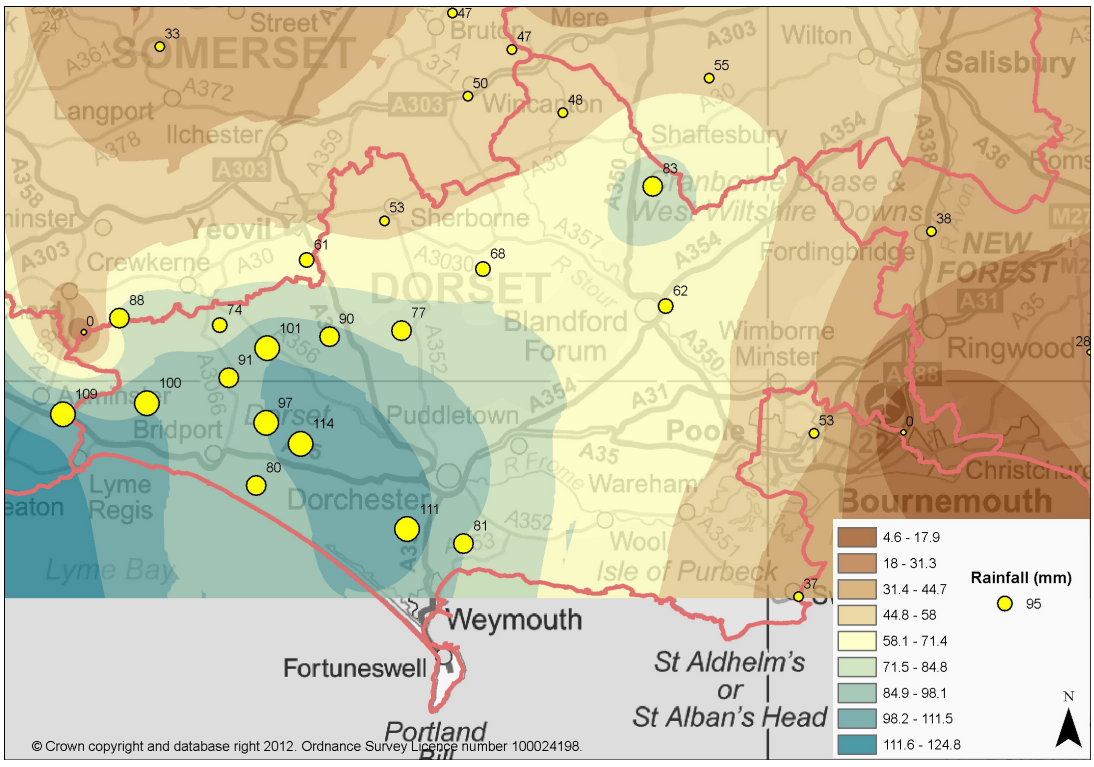


Figure 1.6. Rainfall totals for the 6th and 7th July 2012

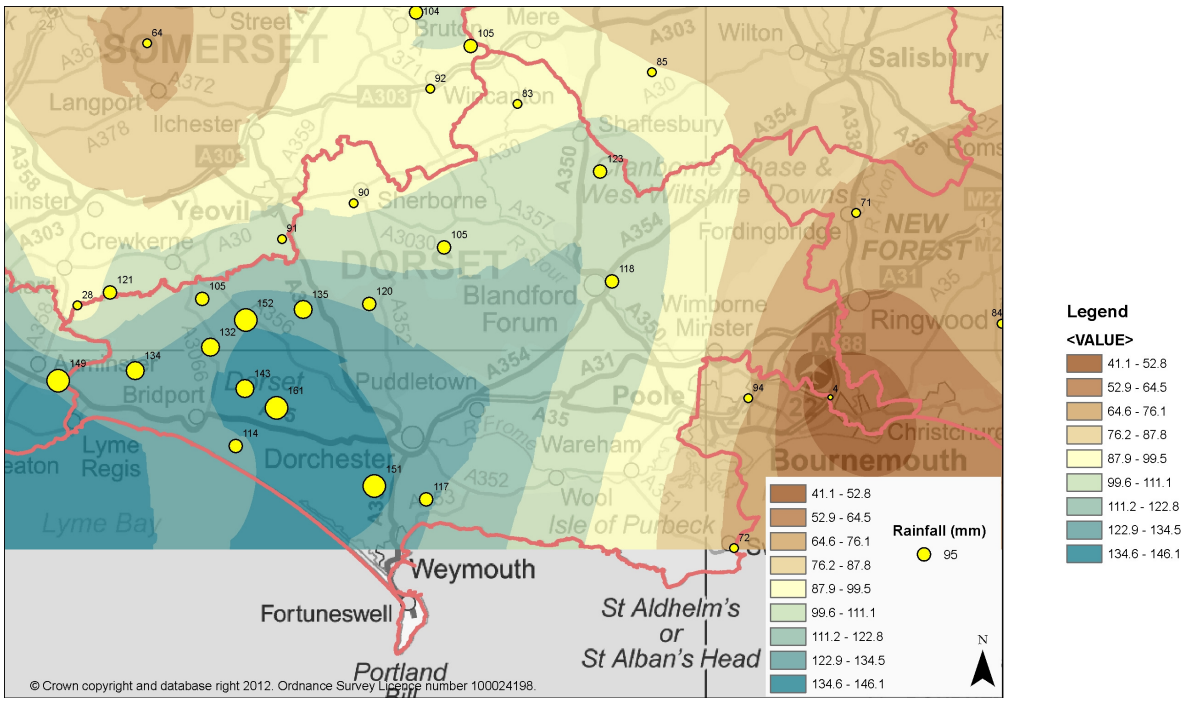


Figure 1.7. Rainfall totals between the 4th and 16th July 2012

For the rain gauges located within the flooded areas, the rarity of the rainfall totals have been assessed using the Flood Estimation Handbook (V3.0) and are shown in Table 1.4. The return period is based on the totals and duration that would be considered the main runoff generating period between the 6th and 8th July.

Rain Gauge	Time Period	Rainfall (mm)	Duration (Hrs)	Return Period (years)
Raymonds Hill	Friday 6th July 14:00 - Saturday 7th July 22:00	109.2	32	65
Uplyme	Friday 6th July 15:00 - Saturday 7th July 22:00	70.6	31	12
Evershot	Friday 6th July 14:15 - Sunday 8th July 03:15	92	37	22
Telegraph Hill	Friday 6th July 13:30 - Sunday 8th July 05:15	79.2	40.25	10
Tollerdown	Friday 6th July 12:30 - Sunday 8th July 02:45	103.6	38.25	30
Beaminster Coombe Farm	Friday 6th July 12:30 - Saturday 7th July 23:30	90.8	35	21
Powerstock	Friday 6th July 12:45 - Sunday 8th July 04:30	98.4	39.75	34
Eggardon Hill	Friday 6th July 13:15 - Sunday 8th July 03:45	114.8	38.5	80
Bredy Farm	Friday 6th July 13:15 - Saturday 7th July 23:00	80.4	33.75	18
Marshwood Lodgehouse Farm	Friday 6th July 14:15 - Saturday 7th July 22:00	100	31.75	30
Friar Waddon	Friday 6th July 13:30 - Sunday 8th July 01:45	111.2	36.25	46
Sutton Poyntz	Friday 6th July 13:30 - Sunday 8th July 00:15	81.4	34.75	13
Kings Stag	Friday 6th July 12:15 - Sunday 8th July 02:15	69.6	38	6
Black Lane	Friday 6th July 13:15 - Sunday 8th July 01:30	64	35.75	7
Swanage	Friday 6th July 10:45 - Saturday 7th July 21:00	36.6	34.25	1
Alderney	Friday 6th July 12:00 - Sunday 8th July 03:45	55.2	39.75	3
Holdenhurst	Friday 6th July 12:15 - Sunday 8th July 04:30	41	40.25	1
Compton Abbas	Friday 6th July 11:00 - Sunday 8th July 01:45	TBR blocked during this period		
Wincanton	Friday 6th July 13:45 - Sunday 8th July 05:15	53.8	39.5	3
Gillingham	Friday 6th July 11:15 - Sunday 8th July 01:30	50.8	39.25	3
East Mills	Friday 6th July 12:30 - Sunday 8th July 01:45	38.4	38.5	1
Tisbury	Friday 6th July 10:30 - Sunday 8th July 06:30	57.2	44	1

Table 1.4. Return periods for rainfall totals 6th – 7th July (note return periods from Flood Estimation Handbook CD-ROM v3.0)

The rainfall from the 1st /2nd to the 4th July was also significant and would have considerably wetted the catchments up. When these rainfall totals are included with those from the 6th to 8th July the overall rainfall rarity at 14 of the rain gauges were increased, some significantly (see Eggardon Hill, Tollerdown and Powerstock). See Table 1.5.

Rain Gauge	Time Period	Rainfall (mm)	Duration (Hrs)	Return Period (years)
Raymonds Hill	Sunday 1st July 22:45 - Saturday 7th July 22:00	151.4	143.25	56
Uplyme	Sunday 1st July 22:30 - Saturday 7th July 22:00	110.6	143.5	15
Evershot	Sunday 1st July 23:30 - Sunday 8th July 16:15	140.2	161	27
Telegraph Hill	Sunday 1st July 23:45 - Sunday 8th July 16:45	129	161	19
Tollerdown	Sunday 1st July 23:00 - Sunday 8th July 02:45	169.2	147.75	85
Beaminster Coombe Farm	Sunday 1st July 23:00 - Sunday 8th July 02:30	142.8	147.5	46
Powerstock	Monday 2nd July 01:30 - Sunday 8th July 04:30	148.2	147	80
Eggardon Hill	Monday 2nd July 03:15 - Sunday 8th July 04:00	178	144.5	251
Bredy Farm	Monday 2nd July 03:15 - Sunday 8th July 03:00	117.4	143.75	28
Marshwood Lodgehouse Farm	Sunday 1st July 23:00 - Saturday 7th July 23:45	136.8	144.75	22
Friar Waddon	Monday 2nd July 03:15 - Sunday 8th July 01:45	155.4	142.5	47
Sutton Poyntz	Monday 2nd July 14:15 - Sunday 8th July 07:30	112.8	137.25	9
Kings Stag	Monday 2nd July 03:30 - Sunday 8th July 05:30	93.2	146	4
Black Lane	Monday 2nd July 05:30 - Sunday 8th July 06:15	95	144.75	5
Swanage	Monday 2nd July 05:15 - Sunday 8th July 03:00	70.8	141.75	1
Alderney	Monday 2nd July 05:30 - Sunday 8th July 03:45	94.6	142.25	6
Holdenhurst	Monday 2nd July 05:30 - Sunday 8th July 04:30	75.2	143	2
Compton Abbas	Monday 2nd July 05:15 - Sunday 8th July 06:45	TBR blocked during this period		
Wincanton	Monday 2nd July 06:30 - Sunday 8th July 05:15	74	142.75	3
Gillingham	Monday 2nd July 04:15 - Sunday 8th July 06:30	80.4	146.5	5.5
East Mills	Monday 2nd July 05:45 - Sunday 8th July 04:30	73	143	2
Tisbury	Monday 2nd July 18:30 - Sunday 8th July 06:30	77	132	3

Table 1.5. Return periods for rainfall totals 1st – 8th July (note return periods from Flood Estimation Handbook CD-ROM v3.0)

2 ENVIRONMENT AGENCY FLOOD ALERTS AND WARNINGS

The first Flood Warning was issued at 04:27 on Saturday 7th July for the River Char in West Dorset; by Friday 20th July the Flood Warning for the Lower Frome was still in force. Across Dorset approximately 1700 properties received fluvial and groundwater flood alerts and warnings.

Warning Level	Number	Number of properties receiving warning
Severe Flood Warning	1	39
Flood Warning	26	1250
Flood Alert	12	426

Table 2.1. Total number of Alerts and Warnings issued by the Environment Agency:

FA / FW	Area	Date Issued	Time issued
FA	West Dorset Rivers and Streams	06/07/2012	19:07
FA	Upper Frome and Tributaries	06/07/2012	19:22
FA	Lower Frome and Tributaries	06/07/2012	19:26
FW	River Char at Charmouth	07/07/2012	04:27
FW	River Bride from Long Bredy to Burton Bradstock	07/07/2012	08:31
FW	River Asker from Askerwell to Bradpole	07/07/2012	08:50
FW	River Brit at Newtown and Southgate Old Mill Beaminster	07/07/2012	09:14
FW	Mangerton River from Powerstock to Bradpole	07/07/2012	09:36
FW	River Wey from Upwey to Weymouth	07/07/2012	09:54
FW	River Brit at Riverside and George Street, West Bay	07/07/2012	10:08
FW	Rive Bride at Burton Bradstock	07/07/2012	10:44
FW	River Brit at Netherbury	07/07/2012	10:59
FW	River Brit at Beaminster	07/07/2012	11:06
FA	Purbeck Rivers and Streams	07/07/2012	11:13
SFW	River Bride at Burton Bradstock	07/07/2012	11:57
FW	Upper Frome from Maiden Newton to Dorchester	07/07/2012	12:02
FW	River Brit at Skiling Playing Fields and West Bay Road Nursery	07/07/2012	12:19
FA	Poole Harbour	07/07/2012	12:31
FA	Middle Stour and Tributaries	07/07/2012	15:05
FW	Lower Frome from East Stoke to Wareham	07/07/2012	18:09
FW	West Bay Harbour	07/07/2012	19:02
FW	Upper Frome at Dorchester	07/07/2012	23:21
FA	Upper Stour and Tributaries	08/07/2012	00:16
FW	Middle Stour from Sturminster Newton to Sturminster Marshall	08/07/2012	00:34

FW	Shreen Water from Colesbrook to Bay Bridge	08/07/2012	03:57
FA	Lower Stour and Tributaries	08/07/2012	06:59
FA	River Nadder and Tributaries	08/07/2012	07:09
FW	Lower Stour from Sturminster Marshall to Christchurch	08/07/2012	09:20
FW	Lower Frome from Dorchester to East Stoke	08/07/2012	18:17
FW	Lower Stour at Redhill and Wheatplot Homes Sites	09/07/2012	01:24
FW	Lower Stour at Stour Park Homes	09/07/2012	04:44
FW	Lower Stour at Iford Bridge Home Park	09/07/2012	15:09
FW	River Wey from Upwey to Weymouth	12/07/2012	18:01
FW	Poole Harbour at Wareham		
FA	Wylye Valley		
FW	Brixton Deverill to Warminster		
FW	Warminster to Wilton		
FA	Groundwater Cranborne Chase		
FA	Groundwater West Dorset		

Table 2.2. Details of the time that the Flood Alerts and Warnings were issued

3 IMPACT OF FLOODING

3.1 Introduction

Data was collected from a wide variety of sources (including telephone calls and on-line reporting) by the Environment Agency, Local Authorities and Dorset County Council. In addition, a number of flood clinics were organised and run in partnership between the Environment Agency and Dorset County Council at strategic locations across Dorset. These were particularly useful in collecting good reliable data and are highlighted below:

Location	Date
Winterbourne Abbas/Martinstown	1 August
Bridport	8 August
Maiden Newton	15 August
Dorchester	21 August
Melplash Show	23 August
Weymouth (Park District)	4 September
Charmouth/Lyme Regis	6 September

Table 3.1.Location and date of flood clinics

The hub locations above gave personal contact to over 300No. residents who had the opportunity to share their experiences and obtain information and support. Some meetings were also attended by Wessex Water, Dorset Fire & Rescue Service and the relevant Local Authority.

Over 70 communities were affected by flooding and these are listed in Appendix 1. It is worth noting that a degree of under reporting by as much as twenty percent is

likely. The following sections highlight those which experienced significant numbers of property flooding and can be investigated. Only a brief summary of the information collected is noted.

3.2 Lyme Regis

A total of 12No. properties experienced internal flooding, including Uplyme which is within Devon County Council's area of responsibility. Internal flood depths of 250mm and external flooding of up to 300mm were reported. The primary source of flooding was from the main river Lin.

3.3 Bridport

A total of 33No. properties experienced internal flooding. Main areas of concern were West Allington, South Street and St. Swithin's Road. Internal flood depths in excess of 100mm were reported and external flooding depths of 400mm quoted. The main source of flooding was surface water with the local drainage infrastructure unable to cope with run-off. The main river flood defences prevented river flooding but local drainage had difficulty discharging into rivers due to the high water levels within the elevated defended river reaches. Waves created by moving vehicles further increased the flood impacts.

3.4 Burton Bradstock

A total of 10No. properties experienced internal flooding; flood depths of up to 1200mm on the highway were reported. Surface water from the hills to the North flowed towards properties in Barrowfield Close and down Gauges Lane to the West of the village. Shipton Lane to the North East also experienced surface water flooding from the same hills leading to the highway drainage being inundated. The flow from Shipton Lane combined with the flow down Gauges Lane caused flooding within the village centre with internal flooding in Middle Street and Shadrach. Excess surface water from the East also significantly disrupted traffic movement along the B3157 coast road and further compounded the river Bride leat flooding in High Street. The sewerage system was generally overwhelmed.

3.5 Dorchester

A total of 13No. properties experienced internal flooding. The Mill Stream overtopped downstream of Prince's Bridge (London Road) and affected properties in Mill Street / River Crescent. The Mill Stream is a tributary of the River Frome and is also designated as a main river. Flows are diverted from the river channel at the Hangman's Gate flow control structure, Northernhay before rejoining the river channel south of Prince's Bridge adjacent to Lubbecke Way. Some water leaves the Mill Stream, north of London Road but other surface water inputs occur from other drainage outlets along the route. Residents reported:

- Concerns about the maintenance of the channel, particularly de-silting and weed clearance adjacent to Prince's Bridge.
- Operation of the control sluices at Hangman's Gate.
- Sewerage flooding in Mill Street and London Road.
- Flooding in Kings Road.

Surface water flooding to highways also occurred with local highway drainage being unable to cope with the high volume of run-off.

3.6 Maiden Newton

A total of 19No. properties experienced internal flooding mainly in Dorchester Road and Whitehall. Flood depths between 70 and 700mm were reported. The main source of flooding was from the main river Frome with surface water unable to discharge into the river due to the high water levels. The depth of the flood alleviation channel, sluice gate operation and the Mill House were raised as issues of concern. Flooding also occurred when the local drainage system overflowed onto roads which then transported water to low spots.

3.7 Winterbourne Abbas, Winterbourne Steepleton and Martinstown

A total of 42No. properties experienced internal flooding and the A35 trunk road was closed for an extended period. The source of flooding was initially surface water with the South Winterbourne watercourse unable to cope with the high rate of surface water flow input. However, the main impact was from the groundwater source, with the local watercourse unable to cope with the high rate of flow input, with groundwater also entering properties directly from within. This resulted in extensive flooding over a prolonged period (up to two weeks). Internal flood depths of up to 150mm and external flood depths of up to 500mm were reported. Reports of Chlorine 'smells' in the flood water at Winterbourne Abbas were investigated but no evidence was found to support potable mains water input. Traffic diversions on the main arterial road network also compounded the flood impacts along the B3159, with further problems generated by traffic proceeding unnecessarily quickly generating bow waves.

3.8 The Park District, Weymouth

A total of 7No. properties experienced internal flooding. Flooding was spatially quite diverse with surface water inputs being the primary source. The Park District is drained solely via a combined sewerage network under the operational control of Wessex Water. All drainage including sewage, roof and highway is gravity drained via the combined sewerage system to the Radipole Sewer Pumping Station on Weymouth Way. From here it is pumped for treatment at the Weymouth Wastewater Treatment Works at Wyke Regis.

Internal flooding up to 200mm and external flooding up to 600mm were reported. Residents reported that the water levels within their property sewer inspection chambers came very close to overtopping. There were also reports of sewer levels suddenly dropping for no explained reason.

4 RESPONSIBILITIES

4.1 Key Responsibilities

Risk Management Authorities (RMA's) in Dorset all have their own roles and responsibilities. Table 4.1 summarises the RMA's, relevant flood risk management functions for each of the RMAs, the different sources of flooding and responsibilities.

Flood Source	Environment Agency	Lead Local Flood Authority	District Council	Water company	Highways authority
RIVERS :					
Main river*	✔				
Ordinary watercourse**		✔	✔		
SURFACE RUNOFF:					
Surface water		✔			
Surface water on highway					✔
OTHER:					
Sewer flooding				✔	
The sea	✔				
Groundwater		✔			
Reservoirs	✔				

Table 4.1.Summary of responsibilities

* A Main River is a river that has been designated as such by the Environment Agency. These tend to be the larger arterial watercourses that are considered to pose a significant flood risk.
**Ordinary watercourses include all rivers and streams not designated as a Main River and all ditches, drains, cuts, culverts, dikes, sluices, sewers (other than public sewers) and passages, through which water flows.

All RMAs have a duty to co-operate and to share information in relation to their flood risk management functions.

The general RMA responsibilities in relation to flood risk and surface water management are outlined below.

4.2 The Environment Agency

The Environment Agency is responsible for managing the risk from the sea, main rivers and reservoirs. It has a strategic overview role for all flood risk management and also provides a flood warning service throughout England and Wales in areas at risk of flooding from main rivers or the sea.

4.3 Dorset County Council

Dorset County Council as the Lead Local Flood Authority is responsible for overseeing the flood risk from ordinary watercourses, groundwater and surface water runoff. It is also responsible for consenting works on ordinary watercourses and enforcing the removal of any unlawful structure or obstruction within the watercourse. It must ensure that a flood investigation is carried out by the relevant authority and that the results are published.

4.4 Local District Councils

Local District Councils are classified as land drainage authorities with powers under the Land Drainage Act, such as the implementation and maintenance of flood defences on ordinary watercourses. They also have powers under the Public Health Act to ensure the removal of any blockage within an Ordinary watercourse that is considered a nuisance. As a planning authority they are responsible for the preparation of development plans and making decisions based on planning policy. The strategic flood risk assessment tool is used to support this area of activity.

4.5 Highways Authorities

Dorset County Council as the Highway Authority is responsible for draining rainfall falling on the highway, including maintaining gullies and culverts to ensure effective highway drainage.
The Highways Agency is responsible for managing and maintaining trunk roads across England. The trunk roads in Dorset are the A35 between the Devon border and Bere Regis and the A31 from Bere Regis to the Hampshire border. They also have responsibility for a short length of the A303 north of Gillingham.

4.6 Water Companies

Wessex Water and South West Water are both water and sewerage companies, responsible for the provision of foul and combined water sewerage across Dorset. South West Water only covers the far west of the County.

4.7 Land/Property Owners

Land/Property Owners that have a watercourse in or adjacent to their land have riparian responsibilities on that watercourse. This means the landowner must:

- Let water flow through their land without any obstruction, pollution or diversion which affects the rights of others.
- Accept flood flows through their land, even if these are caused by inadequate capacity downstream.
- Keep the banks clear of anything that could cause an obstruction and increase flood risk, either on their land or downstream if it is washed away.
- Maintain the bed and banks of the watercourse and the trees and shrubs growing on the banks and should also clear any litter or debris from the channel and banks, even if it did not come from their land.
- Keep any structures, such as culverts, trash screens, weirs and mill gates, clear of debris.

5 RECOMMENDATIONS

Responsible authority	Recommended action	Timescale for response required
Dorset County Council as a Highway Authority	To complete investigations into reported events of inadequate maintenance of the highway drainage infrastructure which prevent systems operating to design capacity.	Date 4 months from the publication of this report
Connect as operators of the A35 trunk road and as contractors to the Highways Agency	To complete investigations into reported events of inadequate maintenance of the highway drainage infrastructure which prevent systems operating to design capacity.	Date 4 months from the publication of this report
Environment Agency	1. To complete a problem identification study analysis (including recommendations) into all sources of flooding across affected communities.	Date 12 months from the publication of this report
	2. To undertake a review of the Bridport flood alleviation scheme (including modelling review) to assess areas benefiting from defences and impact on surface water drainage. Identification of options for improvement.	Date 18 months from the publication of this report
	3. To undertake a review of the main river flood risks at Maiden Newton. To include hydrology, modelling, maintenance and flood warning review. Identification of options for improvement.	Date 18 months from the publication of this report
	4. To undertake a review of the main river flood risks at Lyme Regis including modelling update.	Date 30 months from the publication of this report
	5. To undertake a review of the main river and surface water inputs on the Mill Stream at Dorchester. To include hydrology, modelling and options for improvement.	Date 18 months from the publication of this report
Dorset County Council as the Lead Local Flood Authority	1. To work with West Dorset District Council to refine their Defra grant in aid medium term plan bid application for the Burton Bradstock flood alleviation scheme.	Date 6 months from the publication of this report
	2. To undertake a consultant review of flooding mechanisms and recommendations for flood impact reduction along the South Winterbourne (Winterbourne Abbas, Winterbourne Steepleton and Martinstown).	Date 4 months from the publication of this report
	3. To seek applications from all internally flooded households and obtain funding for property level protection surveys.	Date 3 months from the publication of this report
Wessex Water as a flood risk management authority	1. To investigate operation of combined sewerage network in the Park District, Weymouth. To include analysis of past problems (blockages, etc) and interaction between operation of sewer pumping station and gravity drainage within the district. To assess need for full analysis including sewer record survey, cctv sewer condition survey and modelling.	Date 4 months from the publication of this report

	2. To investigate operation of combined sewerage and surface water network in Lanehouse Rocks Road, Weymouth. To include identification / improvements to 'pinch points' and separation of surface water drainage from the combined sewers.	Date 6 months from the publication of this report
	3. To ascertain extent of surface water infiltration to the sewerage network at Winterbourne Steepleton and Martinstown. To include potential manhole raising to fields west of Lower Rew.	Date 6 months from the publication of this report

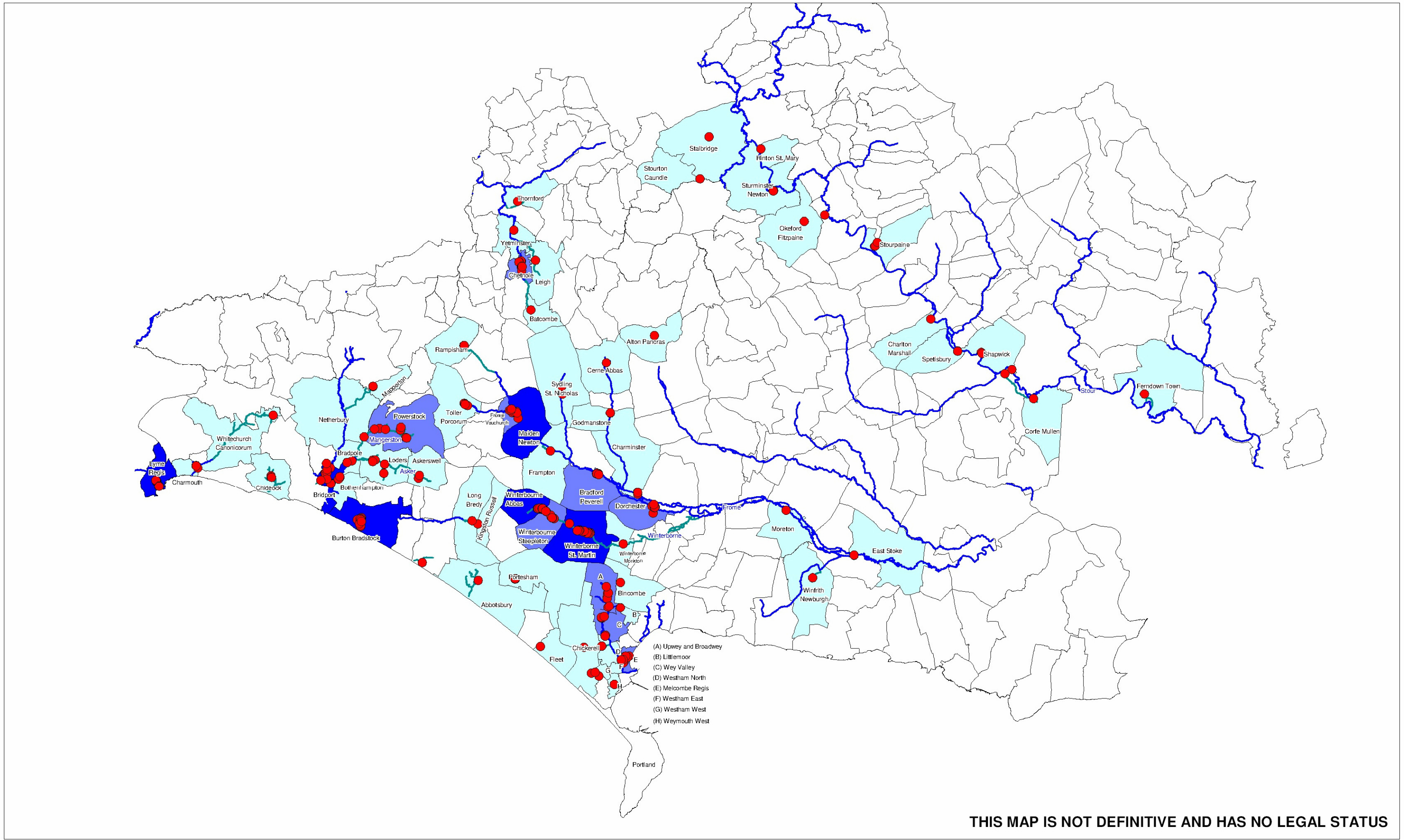
Table 5.1. Recommended actions for the relevant RMA and timescale for a response required.

APPENDIX 1 Summary table of total internal flooding incidents in communities

Community	Number of properties flooded
Abbotsbury	1
Alton Pancras	1
Askerswell	3
Batcombe	1
Beaminster	2
Bincombe	1
Bradford Peverell	7
Bradpole	2
Bridport	33
Broadwey	4
Burton Bradstock	10
Cerne Abbas	1
Charlton Marshall	1
Charmouth	3
Chetnole	9
Chickerell	3
Chideock	4
Dorchester	13
Duntish	1
Fleet	1
Frampton	1
Frome Vauchurch	2
Godmanstone	2
Hammoon	1
Hampreston	1
Hinton St. Mary	1
Leigh	1
Loders	3
Long Bredy	2
Lower Burton	3
Lyme Regis	12
Maiden Newton	19
Mapperton	2
Martinstown	20
Moreton	1
Nettlecombe	2
Okeford Fitzpaine	1
Portesham	5
Powerstock	2
Rampisham	2
Shapwick	3
Spetisbury	1
Stalbridge	1
Stourpaine	6
Stourton Caundle	1
Sturminster Marshall	1
Sturminster Newton	4
Sydling St Nicholas	3
Thornford	1
Toller Porcorum	4
Uploders	4
West Bexington	1
West Milton	4
Weymouth	1
Wimborne	1
Winfrith Newburgh	1
Winterborne Monkton	2
Winterbourne Abbas	14
Winterbourne Steepleton	8
Wool	2
Yetminster	1
Weymouth - Kestrel View	3
Weymouth - East of Radipole Lake	3
Weymouth - Park District	7
Weymouth - Southill	2
Weymouth - Overbury Close	1
Weymouth - Radipole Lane	3
Weymouth - Lydwell Close	1
Weymouth - Nottington	6
Weymouth - Upwey	5

Total Number of Properties Flooded	279

APPENDIX 2 Map of total internal flooding across Dorset



Internal Flooding Map

Key
- Internal Property Flooding
- Main Rivers
- Ordinary Watercourses

Internal Flooding Count
Total per Parish or Weymouth Ward
- Less than 5
- 5 to 10
- greater than 10

Ref:
Date: 17/10/2012
Scale 1:250000
Drawn By:
Cent X: 373404
Cent Y: 96882

GEOGRAPHICAL INFORMATION SYSTEMS
DORSET County Council