

Monmouthshire County Council

Flood and Water Management Act 2010

Section 19 Flood Investigation Report

Mayhill, Monmouth

February 2020

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Version Control

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Working Draft	D J Harris (Senior Engineer)	R.Price (Project Engineer)	M.Hand (Head of Placemaking, Housing, Highways and Flooding)	October 2021

1. Executive Summary

In accordance with Section 19 of the Flood and Water Management Act 2010 Monmouthshire County Council (MCC) has a duty as Lead Local Flood Authority to investigate flooding within its area, insofar as it considers it necessary or appropriate. This report has been prepared specifically for the purpose of meeting the requirements of Section 19 of the Flood & Water Act. It provides a factual account of the flood event that occurred over the period of 16th to 20th February 2020, peaking on 18th February 2020 at Mayhill, Monmouth.

On Tuesday the 18th February 2020 Monmouth suffered severe flooding from the River Wye, reaching levels higher than any previous events. The river rose to the level of 7.146m (18.314m AOD) on the Natural Resources Wales river gauge located just upstream of the Wye Bridge. The existing flood defences to the main part of the Town on the west of the river prevented any significant flooding. However, the east side is undefended and flooded to depths over 1.5m. The east side area, known as Mayhill, was affected badly including the Riverside Park. This comprises a residential park of some thirty properties and is a mix of parkhomes and caravans. Twenty of the Riverside Park properties had internal flooding, a further six had external flooding with damage to sheds, outhouses etc. Wyebridge Cottages close to the bridge were also flooded. On the business and commercial element some thirty businesses were affected, many of which had possessions in storage at the industrial units, with many others surrounded by floodwater. In addition, a further two residential properties along Redbrook Road were flooded internally.

As the River Wye rises relatively slowly due to its very large catchment, the area started to flood late on Sunday 16th February, peaking on Tuesday 18th February and not clearing until Thursday 20th February. The extended period added to the distress and damage as well as disrupting travel to Gloucester, the Forest of Dean and Chepstow.

Both the Rivers Monnow and Wye are designated as main rivers for which Natural Resources Wales (NRW) is the Risk Management Authority. Decisions on whether to evacuate residents, particularly at Riverside Park, are made by the multi-agency Emergency Response Team (ERT) with this decision led by Gwent Police. The decision depends on several factors including NRW forecasts of river levels, time of day and resource availability within each organisation. There is a multi-agency arrangement in place that informs how liaison between NRW, Emergency Services and Monmouthshire CC is to take place and what each organisation's role is. In this event, occupants of the Riverside Park were evacuated to temporary accommodation provided by the Local Authority where required. It is important to note that other parts of the Town were flooded from the River Monnow at the same time: these locations are not covered by this report. The Dŵr Cymru Welsh Water (DCWW) Water Treatment Plant at Mayhill was also flooded by the event and some 7,400 properties were affected by the loss of water supply. Supplies were maintained via a substantial fleet of Tankers bringing clean water and injecting these into the distribution system. Where needed, bottled water supplies were provided and delivered by DCWW. The damage to the plant was minimised by DCWW staff building a temporary sandbag wall around the boundary of the site. Supplies from the treatment plant were restored by the 28th February, some 11 days after the flood event. Western Power advised that the adjacent Electricity Sub Station was not affected, but, for health and safety purposes, the electricity supply to the flooded Riverside Park and DCWW Treatment Plant was isolated by removing the fuses at the request of the Emergency Services.

Monmouthshire CC staff were on site over the flood period, assisting residents and business as well as collecting information on who was affected and where flooding took place. Other agencies on site included DCWW, NRW, Gwent Police, South Wales Fire Service, Welsh

Ambulance Service and Mountain Rescue Teams. All made a significant contribution to minimising the flood damage and assisting in evacuation of residents.

The report has identified a number of recommendations and actions to avoid or minimise the impact of any future flood events which can be found in Section 9.

2. Introduction

2.1 Purpose of Investigation

On Saturday the 15th and Sunday the 16th February 2020 Wales and Monmouthshire were impacted by a significant weather event, known as Storm Dennis. This resulted in heavy and prolonged rainfall in the northern parts of the county and upper catchments of many ordinary watercourses and main rivers, including the Rivers Usk, Monnow and Wye. On Tuesday the 18th February the River Wye at Monmouth reached its peak of 7.146m, Gauge Level (18.314m AOD) the highest level ever recorded.

This led to widespread flooding in parts of the town that are undefended, notably the areas east (left bank) of the river known as Mayhill which includes the Riverside Park, Redbrook Road and Hadnock Road. Residential properties, substantial business and commercial premises, water treatment plant and electricity substation are also located in this area. Residents of the Riverside Park were evacuated to safety, in accordance with the existing multi-agency Emergency Plan for this site, until the flood levels abated. This report will focus on the flooding at Mayhill area and the Riverside Park, Monmouth.

The reason behind Monmouthshire County Council's (MCC) investigation is in response to the duties of the local authority in regard to Section 19 of the Flood and Water Management Act 2010, which states:

- (1) On becoming aware of a flood in its area, a Lead Local Flood Authority must, to the extent that it considers it necessary or appropriate, investigate:
 - (a) Which risk management authorities have relevant flood risk management functions, and
 - (b) Whether each of those risk management authorities has exercised, or is proposing to exercise, those functions in response to the flood.
- (2) Where an authority carries out an investigation under subsection (1) it must:
 - (a) Publish the results of its investigation, and
 - (b) Notify any relevant risk management authorities.

2.2 Site Location

The historic town of Monmouth sits to the north east of the County and takes its name from the River Monnow which flows through the town then joins the River Wye on the east side of the town some 700m south of the River Wye bridge. The River Trothy also joins the River Wye here but further south of the town.

It is a busy and popular town with the A40 Trunk Road passing through north-south and from the east side the A466 road from Chepstow and the A4136 road to and from Gloucester joining the A40 by a bridge over the River Wye. Its population in the 2011 census was 10,500.

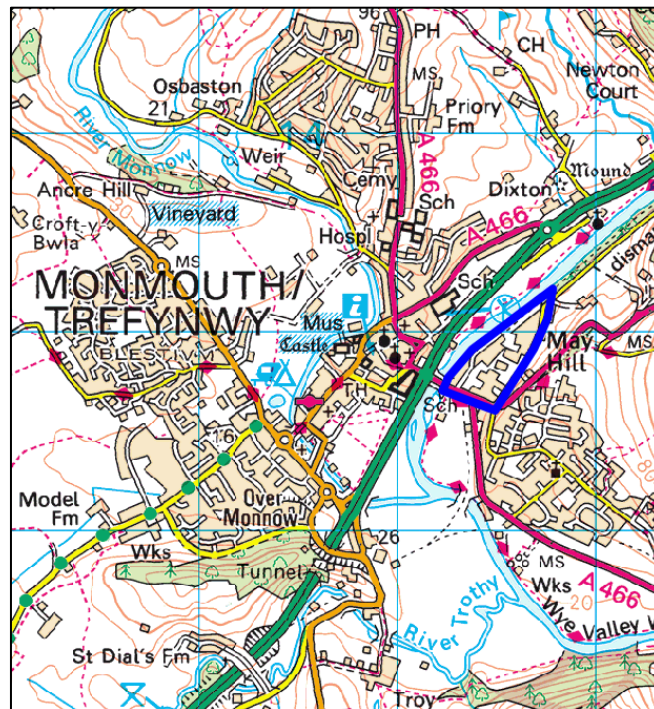


Figure 1: Location Plan showing the Mayhill area outlined and the Rivers Wye, Monnow and Trothy.

The area of investigation is the Mayhill area east of the River Wye to Hadnock Road and south to the A466 Redbrook Road.

The source of the River Wye is in mid Wales on Plynlimon Mountain. It then flows south to Builth Wells, then onto Hay on Wye. From there it turns North and then East around the Black Mountains to Hereford where the River Lugg joins it before it turns south to Ross on Wye. It then continues south to Monmouth where the River Monnow and the River Trothy join it, and then down to Chepstow where it discharges into the Severn Estuary. All these Rivers are categorised as Main Rivers and therefore Natural Resources Wales (previously Environment Agency Wales) is the relevant Risk Management Authority.

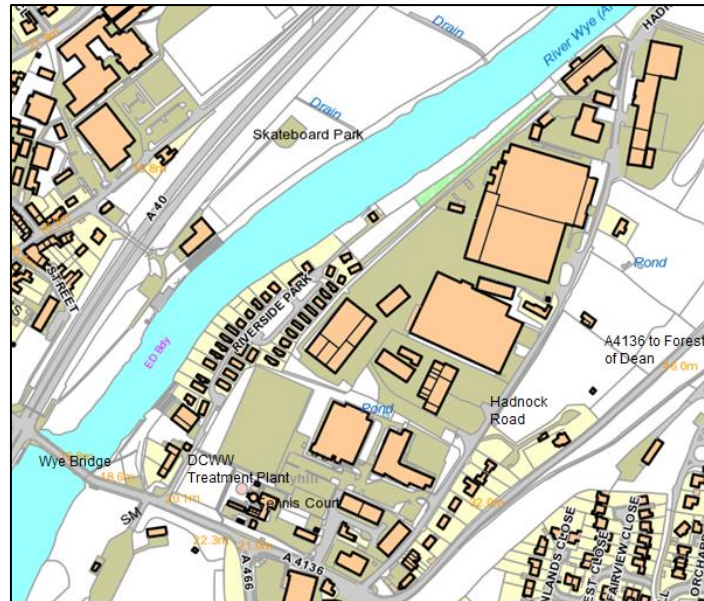


Figure 2: Plan showing the extent of the Mayhill area with Riverside Park along the east bank of the River.

There is a range of properties in the Mayhill area including the residential park, some individual residential properties, commercial and business properties, a preparatory school, sports complex, supermarket, water treatment plant, etc. The ground levels rise gently as the site extends eastward up to Hadnock Road and then rises steeply to the A4136 road to Gloucester and the Forest of Dean. The residential park known as Riverside, is next to the River Wye and is an area where the former Pontypool, Monmouth and Ross section of the Great Western Railway ran which opened in 1874 and closed in 1959. The area was raised and levelled to construct the railway. The former Mayhill Station was located towards the south of the area. The OS map from late 1800s below, gives more detail of the site. It is interesting to note that it was a commercial and business area at that time, but now more extensive.

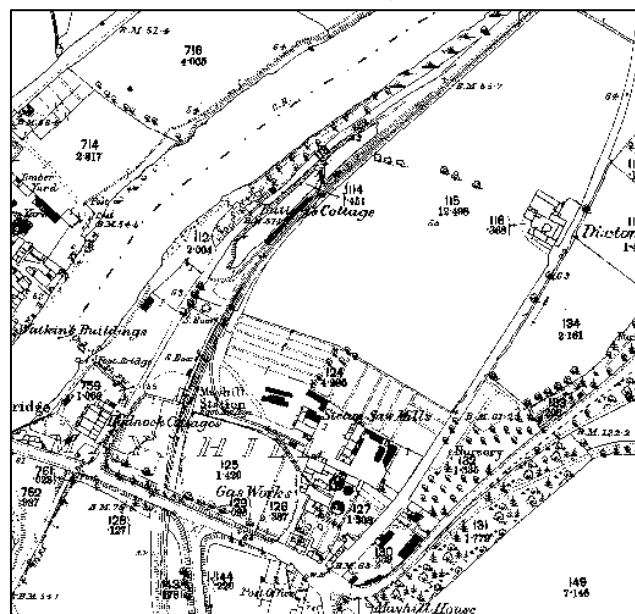


Figure 3: Extract of the OS Map for Mayhill from the late 1800s

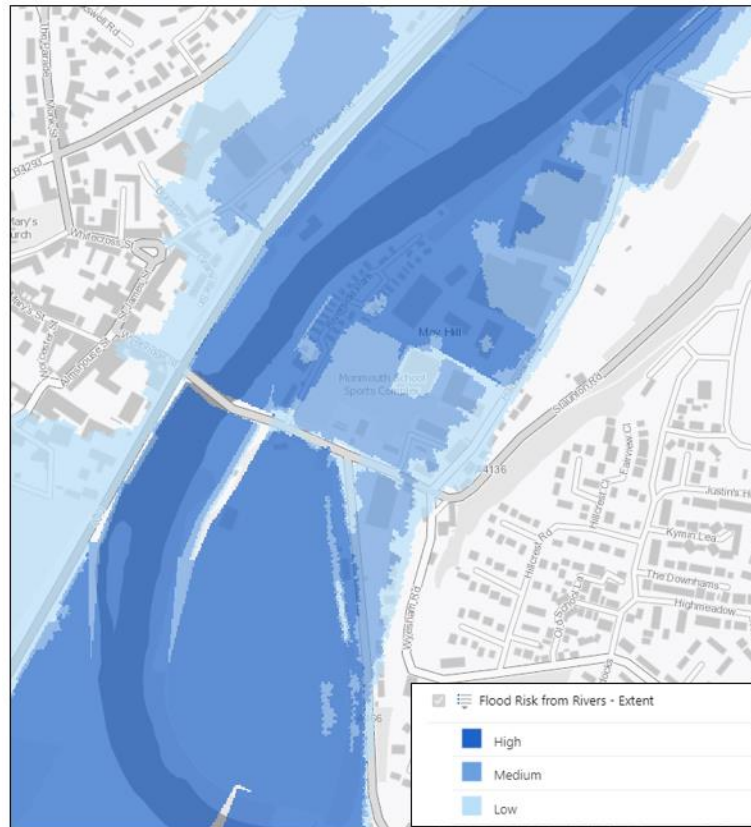


Figure 4: Extract of the NRW Flood Risk Assessment Map Showing the Extent at Risk of Flooding from Rivers

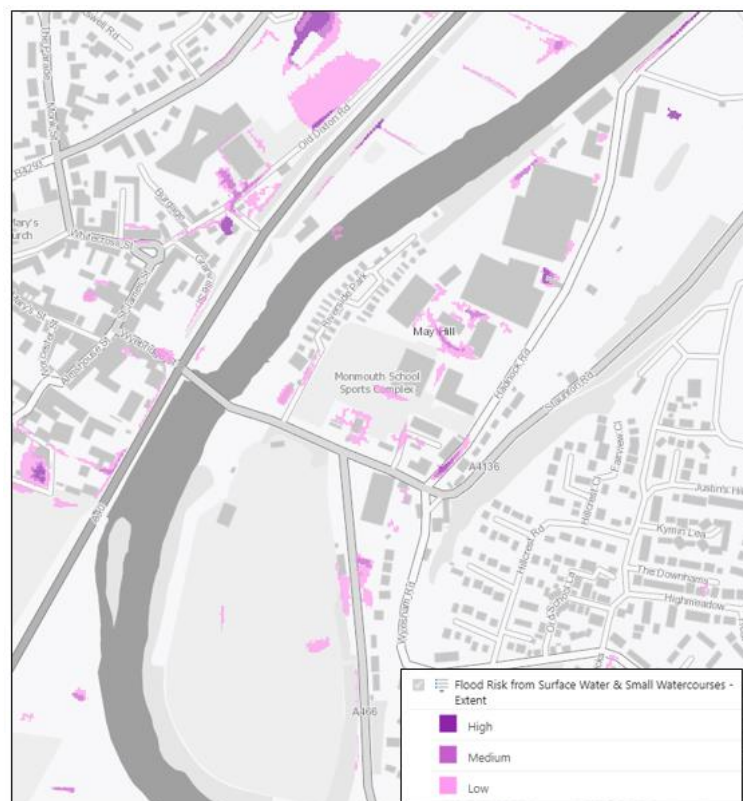


Figure 5: Extract from Natural Resources Wales Flood Map showing Risk of Flooding from Surface Water and Small Watercourses

2.3 Investigation Evidence

To support the investigation a range of qualitative and quantitative evidence has been gathered from numerous sources, the summary of which are listed below:

- Residents – photos, statements, written correspondence
- Surveys – drainage surveys and site inspections
- Met Office Data – Weather warnings and reviews
- Natural Resources Wales – rain and river gauges
- DCWW records and information
- Western Power information
- Monmouthshire County Council – rain gauges, asset database & Flood Risk Management Plan and historic records
- Historic reports

Flooding History

3.1 Previous Flood Incidents

There is a long history of flooding at Monmouth and one of those that is in living memory was in 1947. After very heavy snow fall there was a rapid thaw and flooding occurred across the UK, including Monmouth. The photograph below shows the depth of water which was in Drybridge Street and shows a child being evacuated from the upper bedroom window.



Photo 1: Flooding of Drybridge Street, 1947

In December 1979, the main rivers in Monmouthshire, the rivers Wye, Monnow and Usk, broke their banks in many places in particular; Monmouth and Mayhill, Skenfrith, Usk town and Abergavenny causing significant flooding and damage to property. In Monmouth, both the lower part of the town and Mayhill suffered very significant flooding and damage to property. Following this event, a series of flood defences were constructed by Natural Resources Wales'

predecessor organisations, to improve the flood protection to the area. At that time Mayhill was not included. It is understood that at that time it did not meet the cost benefit threshold required, particularly considering the demands across Wales.

Date	Flood Level (m AOD)	Source
December 1992	16.88	MCC
October 1998	17.19	NRW
October 2000	17.59	MCC
December 2000	17.58	NRW
December 2000	17.61	NRW
4 February 2002	17.67	NRW – Previous Highest
February 2002	17.59	NRW
July 2005	16.37	MCC
January 2008	16.42	MCC

Table 1: Previous Flood Events with Levels

Since the flood defences were constructed in the late 1980s there have been a further number of significant floods that affected the Mayhill area. The table above sets out those dates and the river levels for each event.

There have been no significant works to the Mayhill area since the defences to Monmouth were built in the late 1980's but a multi-agency Evacuation Plan for Riverside Park area was developed to support the residents in times of significant floods.

3.2 Flood Incident

On the morning of Saturday, the 15th February 2020, the Met Office issued a Yellow Warning for heavy rain for most of Wales with an Amber warning covering parts of South Wales and the eastern edge of Monmouthshire. Heavy and persistent rain fell across much of South Wales during Saturday 15th February and overnight into Sunday 16th as part of Storm Dennis. On the Sunday 16th February the Met Office issued a red warning for rain across parts of South Wales and Monmouthshire where there was a risk of major and widespread flooding. A multi-agency telecom exchange was held between partner agencies as set out in the Riverside Park Flood Arrangements, due to the concerns for Riverside Park.

Following this persistent period of heavy rain, levels in the River Monnow rose rapidly during Saturday the 15th and increased significantly overnight, peaking on Sunday mid-day the 16th, at 6.385m gauge level (17.64m AOD), its highest ever at that time. This high flow increased the already high levels in the River Wye that then peaked at 2.30pm on the 16th at 5.907m gauge level (17.16m AOD). This reflects the rapid impact on the River Monnow to the rainfall and the relational impact it has on the River Wye.



Photo 2: Showing the Wye Bridge looking east to Mayhill.

Flood levels then dropped in both rivers, but by Monday the 17th the River Wye started to rise again in line with the flood water from its large catchment leading to a peak on Tuesday the 18th February to a highest ever level of 7.146m gauge level (18.314m AOD). This also influenced the River Monnow and it rose to 6.385m gauge level (17.641m AOD), its highest ever. This again reflects the relationship between the two rivers. Table 1 below shows the times and levels reached and the gauge diagrams show the levels and impact

River	Sunday 16 th Feb 1st Peaks			Tuesday 18 th Feb 2nd Peaks		
	Time	Gauge Level	AOD Level	Time	Gauge Level	AOD Level
Wye	2.30pm	5.907m	17.163m	8.30am	7.146m	18.314m
Monnow	12.15pm	6.385m	17.641m	9.45am	6.579m	17.747m

Table 2: Flood Levels with Time, Gauge and AOD Data for the Two Peaks

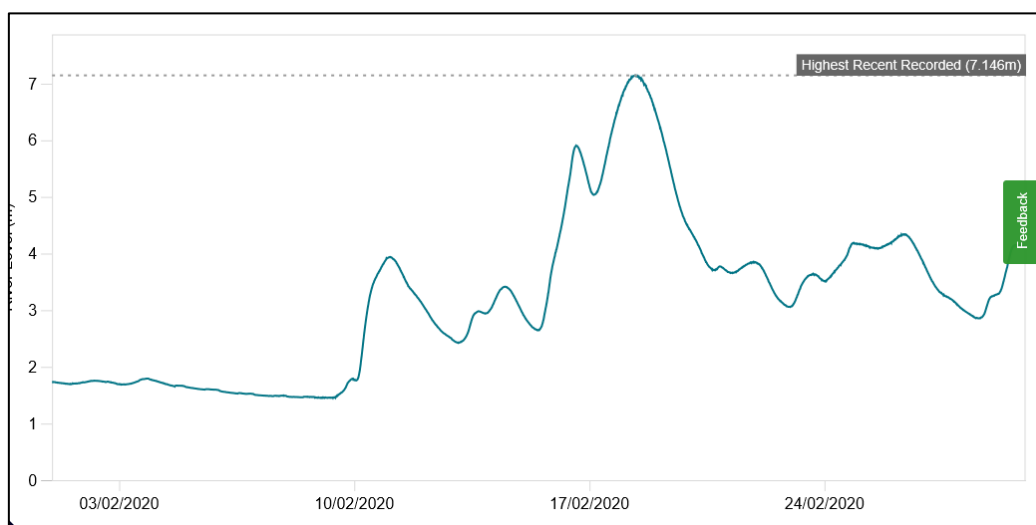


Figure 6: River Wye Gauge Readings for February 2020

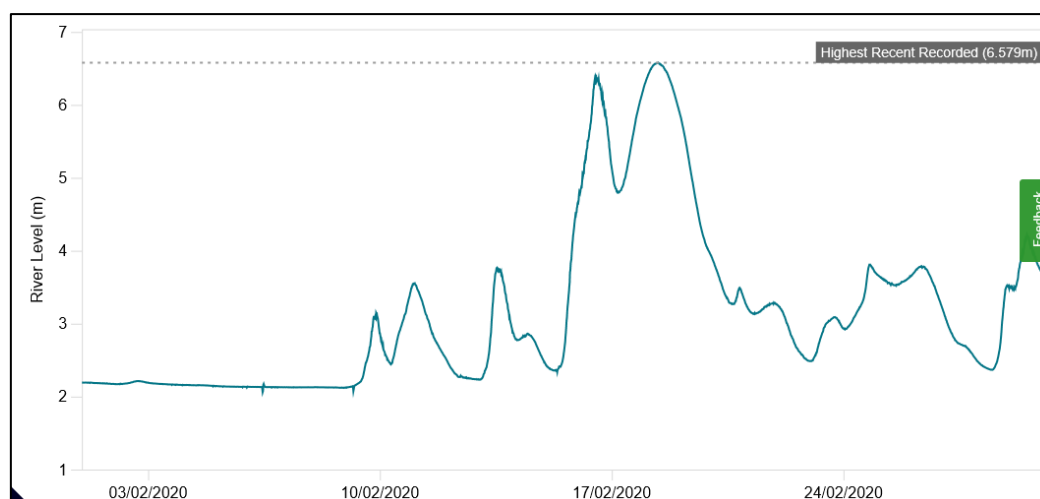


Figure 7: River Monnow Gauge Readings for February 2020

The Mayhill area is undefended unlike the west side of the river, so is at risk of flooding when the River Wye rises above the trigger level of 5.2 metres gauge level (equivalent to 16.4m AOD). Riverside Park is vulnerable due to its location on the floodplain adjacent to the River Wye. Many of the Park residents are elderly. There is a mix of parkhomes and static caravans, some of which are raised above ground where residents can become trapped. A multi-agency site specific Emergency Plan is in place to consider evacuation once river levels rise to, or are forecast to exceed, the 5.5m gauge level. Putting the plan into action is a multi-agency decision led by Gwent Police in discussion with MCC and informed by available information including flood forecast data from Natural Resources Wales.

Peak flood flows in the River Wye at Monmouth are complex. The River Wye has a large catchment and river levels rise slowly so it can take from approximately 14 to 26 hours for the peak to reach Monmouth from Hereford and several days after the rainfall event. Monitoring of levels at Hereford and Ross on Wye and flow volumes are used by NRW to forecast the level of the peak and when it will reach Monmouth, but these are a range of levels as each flood is different. In addition, the River Monnow joins the River Wye just below the bridge. This has a smaller catchment and flood levels rise quickly and generally peak within hours of the rainfall event. However, if further rainfall occurs both can peak at around the same time, increasing levels in both. Because the confluence of the two rivers is so close to Mayhill, both can influence the flood risk. As can be seen, forecasting the time and level of a River Wye flood event at Monmouth with any accuracy is challenging and decisions may need be made on a cautionary basis.

The ground level in the Mayhill area is roughly equivalent to 5.6m on the river gauge level on the river bank (16.9m AOD) rising to around 6.0 m gauge level on the east side of the caravan park (17.3m AOD). The ground then rises gently as it goes further east to around 7.9m gauge level (19.2m AOD) at Hadnock Road, a gradient of around 1:120. Floodwater depths become shallower across the area as you travel eastward. Wyebridge Cottages near the bridge and riverbank are the lowest in the area at about 4.8m gauge level (around 16.1m AOD) and generally flood first. On Sunday 16th February a decision was made by Monmouthshire County Council to put Shire Hall, Monmouth on standby as a Rest Centre for residents from Riverside Park should it be needed.

As described above, river levels are monitored by NRW and they provide advice and guidance on the predicted river levels and peak flow timings at Monmouth. For the River Wye there are gauges at Ross on Wye and Hereford which are used to estimate the height and time of the flood peaks using historic levels as a predictor (however the Ross on Wye gauge failed to record levels above 4.76m between 16th to 20th February). Typically, during a flood event, NRW will liaise with Monmouthshire CC and discuss whether there is likely to be a need to instigate the multi-agency plan. If forecasts suggest that the 5.2m gauge level threshold at Monmouth will be exceeded the activation of the Emergency Plan is considered. On this occasion the early forecasts seemed to imply the flood peak would be unlikely to exceed the 5.5m gauge level and therefore only cause limited flooding. As the flood levels in the river rose, the amount of debris brought down the river grew, including tree trunks and larger debris. This added to the flood levels as the debris was blocking parts of the arches of the Wye Bridge and when the river level rose over the 6m gauge level (17.168m AOD) a decision was made by Monmouthshire County Council, as Highway Authority, to close the bridge to traffic and pedestrians as the bridge was itself in danger of structural damage. However, the flood levels at Monmouth continued to rise and a decision to evacuate Riverside Park was made at noon on the 17th and other residents and businesses in the area warned. Residents who agreed to leave were taken to the Rest Centre and accommodated overnight, others went to stay with family and friends. The Rest Centre stayed open for 5 days and accommodated 48 residents and one dog.

On the 17th February DCWW received information through the Flood Forecasting Centre that flood levels would be high and decided to evacuate the Mayhill Treatment Works. They arranged to sandbag the perimeter to minimise the impact on the works. At the same time, they established a tanker arrangement of up to 55 tankers at the peak to inject clean water supplies into the distribution network to maintain supplies as far as possible. With some 7400 properties affected there was also a need to provide bottled water to some and this was done through stations set up with partner agencies. Support to vulnerable residents, care homes and the local hospital were prioritised. DCWW was able to restore access to the Treatment Works late on the 18th February as flood levels reduced. Clearance of silt etc. continued and the Treatment Works was back in operation on the 28th February. This was a duration of some 11 days and highlights the significant impact the floods created to so many.

As the flood levels rose the floodwater spread across the Mayhill area, the school playing field and into Redbook Road via a gap in the old railway embankment. This flow path is shown in Figure 8 below.

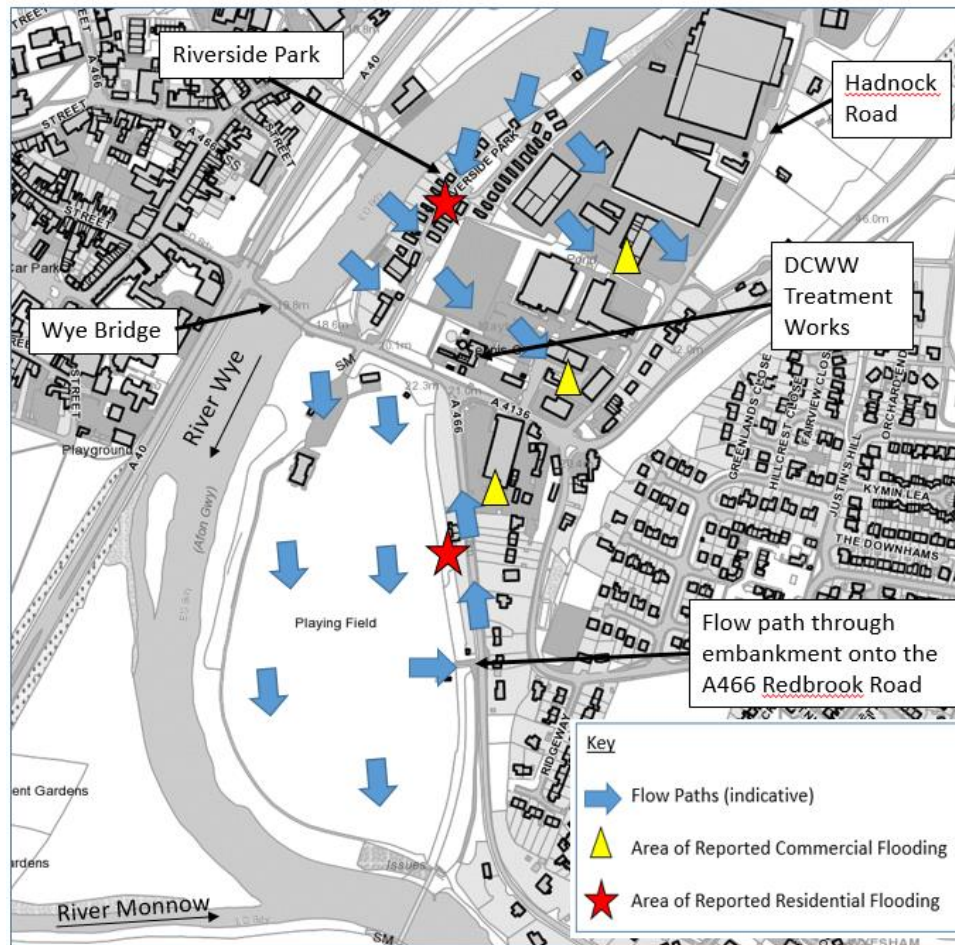


Figure 8: Indicative Flow Paths and Flood Extents Based on Anecdotal Evidence Provided to the Lead Local Flood Authority

As the floodwater spread across the Mayhill area, twenty of the caravans and parkhomes at Riverside Park were flooded internally and six flooded externally with damage to outbuildings. Wyebidge Cottages were also flooded. In terms of commercial and business properties some sixteen were directly flooded and several more surrounded by floodwater. One business that rents out large containers to small local businesses including builders, plumbers and food establishments had ten of these containers flooded, seriously affecting those businesses that rent them. A total of thirty businesses were reported to have been impacted by the flooding.

Western Power advised that the adjacent Electricity Sub Station was not affected, but electricity supplies to the flooded Riverside Park and DCWW Treatment Plant were isolated by removing the fuses at the request of the Emergency Services.

A number of properties owned by the Monmouth Boys School including the rowing club house, the sports complex and their astro turf playing ground were also badly affected.



Photo 3: The Welsh Water Mayhill Water Treatment Plant



Photos 4 & 5: Flooding of the Industrial Estate Area

Other businesses affected included a dental practice, Kwik-Fit tyre and brake establishment, an MOT centre, a flower transport business and a self-storage business with many personal items flood damaged.



Photos 6 & 7: Left - Flooding to Riverside Park Access, Right - Flooding of Wyebriidge Cottages, Courtesy of Gloucestershire Live.

South of the River Wye Bridge are other facilities including the Monmouth Boys School playing fields, sports complex, two properties on Redbrook Road and other buildings that were also flooded. Photo 8 below shows the flood extent across the school playing fields and buildings



Photo 8: The view downstream of Wye Bridge showing the flooding of the Monmouth Boys School Playing Fields, sports complex and buildings

The A466 Redbrook Road on the eastern side of the Wye Bridge was also flooded during this period. The flooding was of sufficient depth to prevent traffic use. The closure meant that travel to the Forest of Dean, Chepstow and Monmouth itself was severely restricted for residents who live in the Wyesham area, causing considerable difficulties over the four days of the flood.



Photos 9 and 10: Showing the flooding on the A466 Redbrook Road

Along the A466 Redbrook Road, the old railway embankment runs parallel to the road. There is a break in the bank for an access onto the Monmouth Boys School playing fields where the flood levels were such that water came through and over the sandbagging and flooded Redbrook Road and local areas. This included a number of residential properties as well as the car park of the Lidl store.



Photo 11: Flooding along Redbrook Road, Courtesy of Gloucestershire Live



Photo 12: Flooding off Hadnock Road and the Industrial Estate



Photo 13: Mountain Rescue assisting Residents on Redbrook Road.

Following the peak of the event, water levels gradually dropped and cleared by Thursday 20th February. A Riverside Park residents meeting was held to discuss clean up issues at the Park and the general clear up could commence. By Monday the 24th it was established that one caravan was uninhabitable, all caravans had been cleared of contaminated waste, 8 residents were still in B&B, 3 were staying at Wetherspoons and one resident was staying at Monnow Vale.

3.3 Rainfall Analysis

During February 2020, Wales experienced several noteworthy rainfall events on the back of a very wet autumn and winter period. The named storms, Ciara, Dennis and Jorge, affected Wales within a period of just four weeks, with record rainfall and river flows causing some of the most significant flooding impacts in Wales since the 1970's.

February 2020 was the wettest February on record in Wales and the UK as well as the fifth wettest month ever recorded.

A Met Office review of the Storm Dennis is included in Appendix A of this report.

Storm Dennis

Storm Dennis was the fourth named storm of the 2019/2020 season and occurred only a week after the heavy rainfall from Storm Ciara. Dennis brought strong winds and heavy rain across the UK from 15th February to 17th February.

Weather impacts from Storm Jorge were in general less severe than from storms Ciara and Dennis, but flooding problems continued in the aftermath of these earlier storms and as a result of further rain falling on already saturated ground. The railway line between Cardiff and Swansea was closed and there were reports of further localised flooding. The M4 in west Wales was closed due to strong winds. Flooding problems from the exceptionally wet February continued across all parts of the UK.

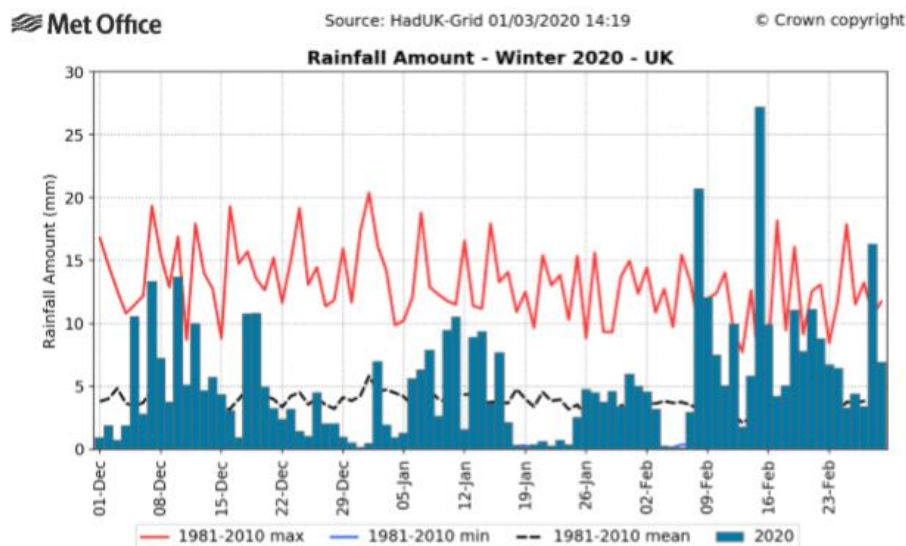


Figure 9: Met Office Rainfall Data December 2019 to February 2020.

This also shows daily rainfall totals through February 2020, with particularly wet days from Ciara (8th), Dennis (15th) and Jorge (28th).

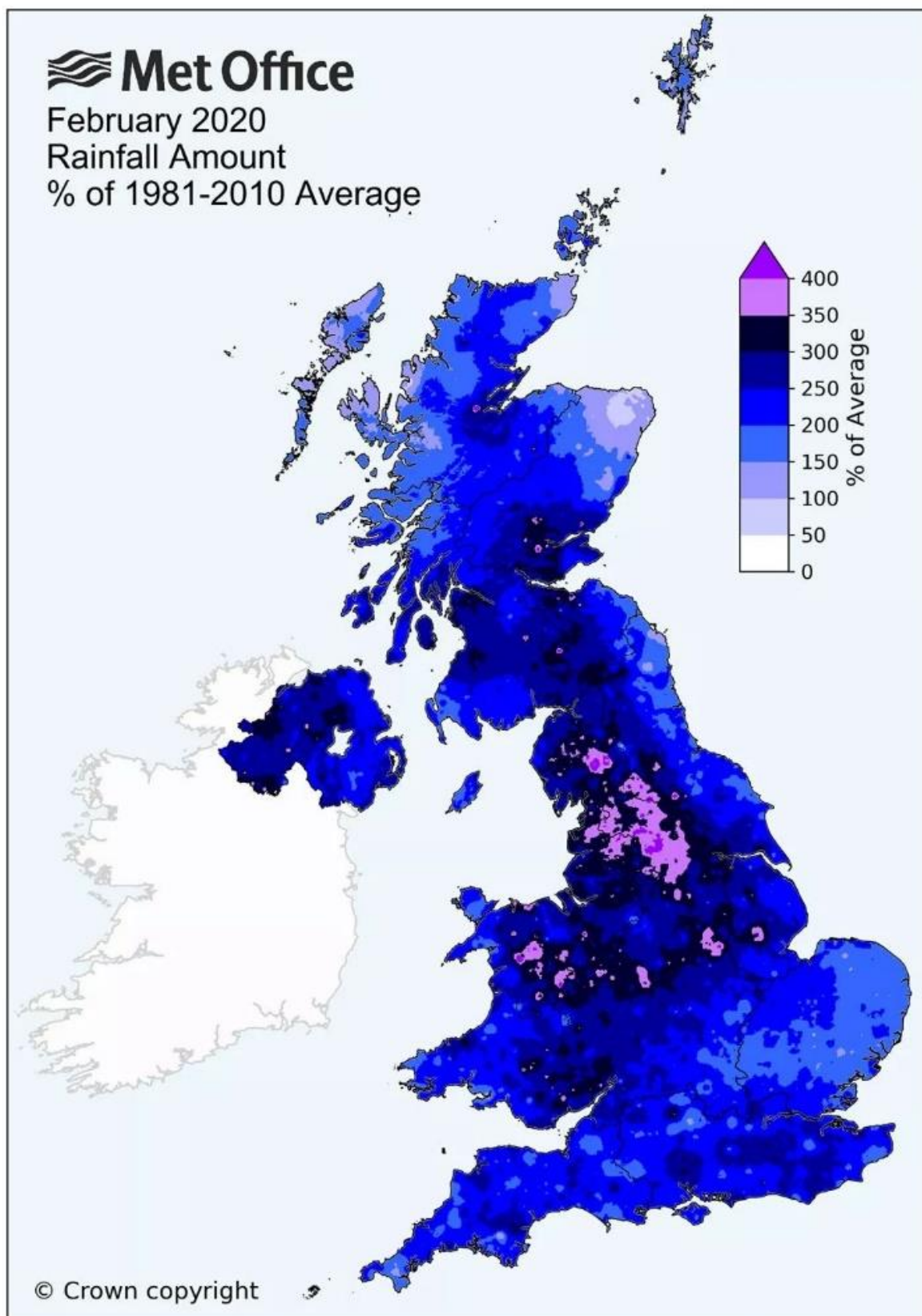


Figure 10: Rainfall Data for February 2020

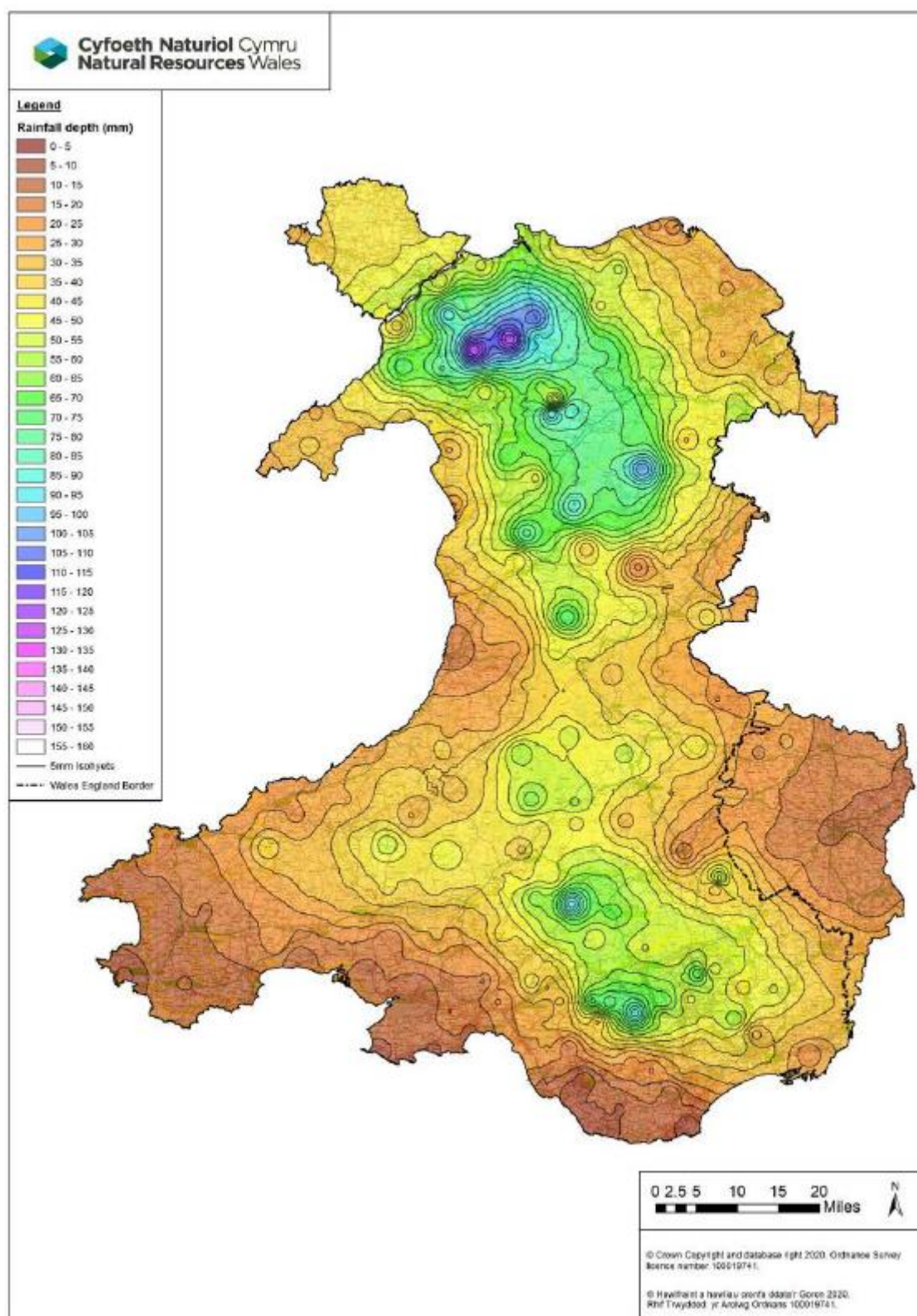


Figure 11: Rainfall Isohyet Map showing rainfall over a 48-hour period during Storm Ciara (produced by NRW).

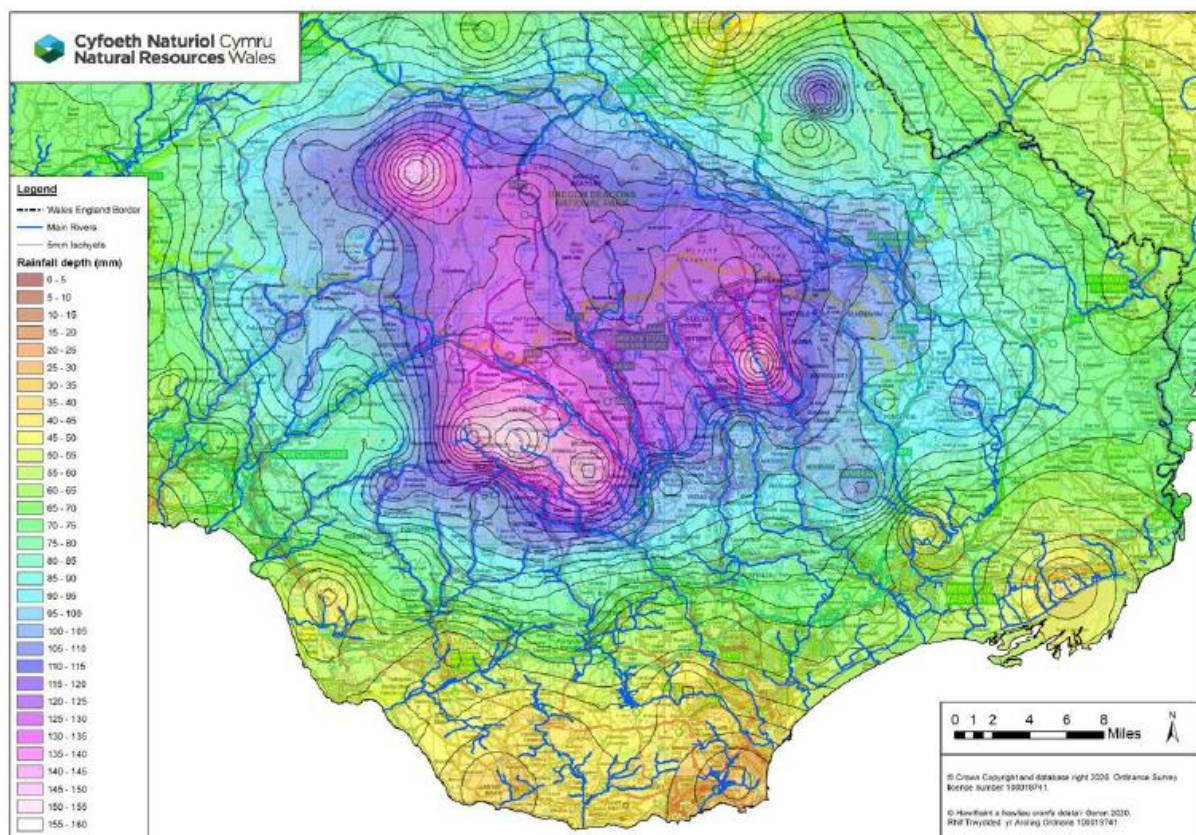


Figure 12: Rainfall Isohyet Map showing rainfall over a 48-hour period during Storm Dennis in South Wales (produced by NRW).

4 Mechanisms of Flooding

4.1 Fluvial Flooding

The flooding mechanisms at Monmouth are well known by many local residents, NRW and MCC. The main town, which is on the west side of the River Wye has defences constructed in the late 1980s, protecting the town of flooding from the Rivers Wye and Monnow with defences providing a 1:100yr standard of protection when they were constructed. The Mayhill area, which is on the east side of the River Wye, is un-defended.

As described above there is a strong relationship of flooding from both rivers due to the confluence of the River Monnow and River Wye, which is some 700m downstream of the Wye Bridge. Peak flows in the Monnow cause raised levels in the Wye and vice versa, which can lead to two flood peaks approximately two days apart, with the Monnow peak occurring first.

Much of the Mayhill area is below the peak levels in the River Wye and as such much of the area floods. As the river levels rise the flood extends eastwards across the Mayhill area towards Hadnock Road and Redbrook Road. This may take several days and several more after the flood peaks, a period of up to 5 days.

As can be seen from Figure 4 above, the Mayhill area is at risk of flooding and the extent shown is very close to the actual event on 18th February 2020.

South of the Wye Bridge are the Monmouth Boys School sports pitches, pavilion and storage buildings etc. which suffered significant flooding. On the east side of these pitches runs the A466 Redbrook Road, approximately north / south, parallel to the disused railway embankment which acts as a flood defence and generally restricts the flooding to the area east of the A466. There is however a break in the embankment for access to the playing fields from the A466. Consideration needs to be given to sealing this off to higher levels during flood events, either temporarily or permanently, to prevent the A466 and residential properties being flooded, as even the sandbagging in the access was exceeded by the very high flood levels.

A number of masonry arches beneath the road on the Mayhill side are used as storage and have higher ground on the downstream side. Clearing these may improve conveyance of flood waters as these are likely to have been originally intended as flood relief arches. Consideration should be given to investigating whether these could be cleared and whether it would improve flows.

4.2 Land Drainage

There are no known land drainage features in the Mayhill area which may have added to the flooding event covered by this report.

4.3 Surface Water Drainage

Within the Mayhill area there is a system of highway drainage where individual or groups of highway gullies collect highway run off and connect to a culvert that passes through the Mayhill industrial site and discharges into the Wye via a flapped outfall adjacent to the rowing club. This can back up and flood the lower lying areas but generally by the time of peak flow in the River Wye local rainfall has cleared.

4.4 Foul Water Drainage

Given the scale of the flood event it is possible that flood waters may have interacted with some foul sewers in the area, however there were no reports of any notable impacts.

5 Rights and Responsibilities of Risk Management Authorities

5.1 Lead Local Flood Authority

Under the Flood and Water Management Act 2010, Monmouthshire County Council (MCC) has been established as the Lead Local Flood Risk Authority (LLFA) for its administrative area.

As defined in the Flood and Water Management Act 2010, MCC is responsible for 'Managing' what is termed, its 'local flood risk'. This includes the risk of flooding from ordinary watercourses, surface runoff and groundwater.

Local Authorities have always had certain responsibilities in relation to ordinary watercourses, and in practice most Local Authorities took the lead in dealing with surface water flooding incidents prior to the changes contained within the Flood and Water Management 2010.

The Flood and Water Management Act 2010 places a number of statutory duties on Local Authorities in their new role as LLFAs including:

- The preparation of local flood risk management strategies;
- A duty to comply with the National Strategy;
- To co-operate with other authorities, including sharing data;
- A duty to investigate all flooding within its area, insofar as a LLFA consider it necessary or appropriate;
- A duty to maintain a register of structures and features likely to affect flood risk;
- A duty to contribute to sustainable development; and
- Consenting powers on ordinary watercourses.

In addition to these, each LLFA has a number of permissive powers. These are powers that allow them to undertake certain activities to manage flood risk, they are discretionary and include:

- Powers to request information;
- Powers to designate certain structures or features that affect flood or coastal erosion risk;
- The expansion of powers to undertake works to include broader risk management actions; and
- The ability to cause flooding or coastal erosion under certain conditions.

LLFA's in Wales have also taken on the role of the SuDS Adopting and Approving Body in relation to sustainable drainage systems as of the 7th January 2019. In this role, they are responsible for both approving the original design of the SuDS, and adopting and maintaining the finished system, in accordance with Welsh Government's National Standards for Sustainable Drainage.

The function of the LLFA during and after the flooding at Mayhill included a range of Response and Recovery functions:

- Officers investigated the initial flooding and have produced this report, in line with Section 19, FWMA 2010.
- Officers contacted residents affected by flooding to offer support and advice to assist in the recovery following the event.
- Officers coordinated the response to the flooding with Emergency Services

- Asset information collected during the flood event has been incorporated into the LLFA Asset Register.

5.2 Natural Resources Wales

Under the Flood and Water Management Act 2010 and the Water Resources Act 1991, NRW has discretionary powers to manage the risk of flooding from main rivers and the sea. They are also recognised as a coastal erosion risk management authority under the Coast Protection Act 1949.

Their strategic oversight role is about having a Wales-wide understanding of all sources of flooding, coastal erosion and the risks associated with them, on a consistent basis across Wales to help inform the RMAs and the public.

NRW is the internal drainage board, or carries out the functions of the internal drainage board, for the Internal Drainage Districts (IDDs) in Wales. It is granted powers under the Land Drainage Act 1991 to carry out works to manage the risk of flooding from ordinary watercourses and to regulate obstructions to ordinary watercourses within the IDD boundary. Their main role is the management of water levels in ordinary watercourses for land drainage purposes, including flood risk management. The Mayhill area falls with the Internal Drainage District, which is shown as the blue highlighted below.

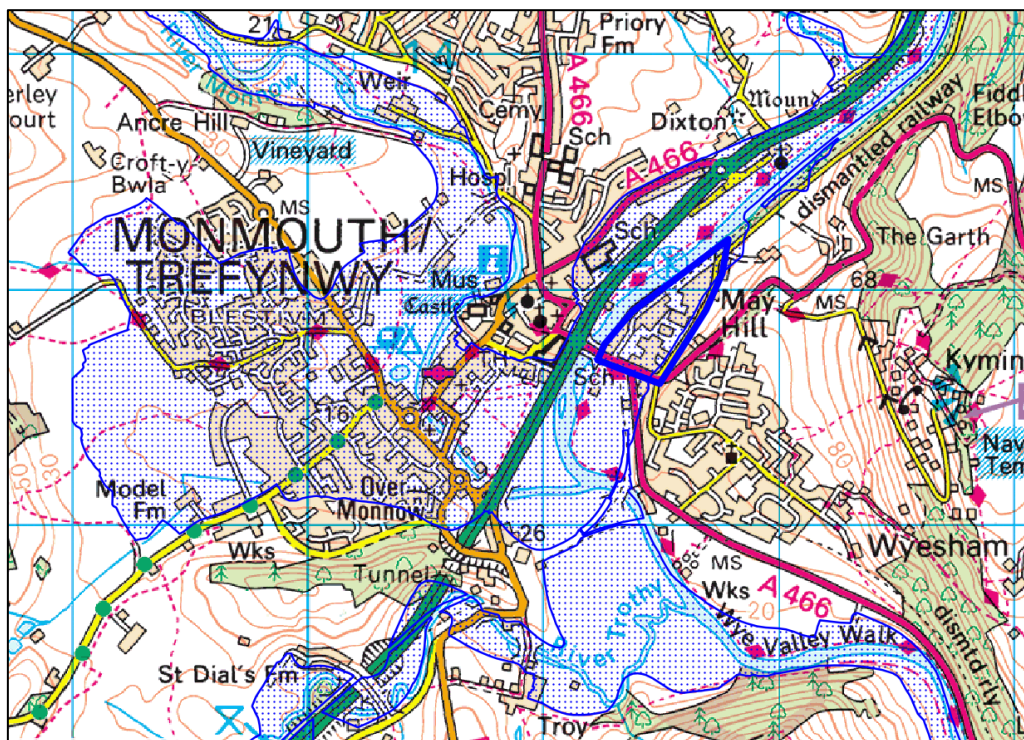


Figure 13: Area of Internal District Highlighted in Blue

5.3 Water / Sewerage Company

Sewerage Undertakers are responsible for maintaining the public sewerage systems, including adopted sewers carrying surface water run-off.

In flood conditions, the sewer systems can often become overloaded with a mixture of floodwater and sewage leading to overflow and flooding. Sewage Undertakers are responsible for the removal of surface water where it enters into their sewerage system. Where there is frequent and severe sewer flooding, Sewerage Undertakers are required to address this through their capital investment plans which are regulated by Ofwat. To prevent further flooding, water and sewer companies have a responsibility to: monitor the levels; prevent overloading sewer systems; maintain and repair drainage pipes as necessary. At this site DCWW has a major Water Treatment Plant which was seriously flooded and clean water supplies to some 7400 properties were affected. DCWW overcame this by providing a tanker fleet of up to 55 tankers to cover the supply situation. It was some 11 days before the Plant was back in full operation.

5.4 Network Rail

Network Rail has an operational responsibility as a riparian owner and is required to undertake regular maintenance of all assets that pose a risk to flooding. This investigation has not identified any assets or infrastructure belonging to Network Rail that may have contributed to the flood event.

5.5 Highway Authority

The Highway Authority is responsible for ensuring the highway is clear of obstructions and has a drainage system that controls the surface water that falls onto the highway.

Monmouthshire County Council is the Highways Authority for all highways in Monmouthshire apart from Trunk Roads which are managed by the Welsh Government. Highways Authorities are also Risk Management Authorities in their own right according to the Flood and Water Management Act 2010 and must adhere to all the responsibilities of Risk Management Authorities.

Under the Highways Act 1980, the Highways Authority has a duty to maintain the highway. This includes ensuring that highway surface water drainage systems are clear and free from blockages.

5.6 Riparian Landowners

Riparian owners, householders and business owners are responsible for maintaining private drainage assets and these are usually minor drains, ditches, watercourses, pipes, culverts and bridges.

Riparian Landowners are legally responsible under common law for the maintenance of the land generally up to the centreline of any watercourse adjacent to their property. This includes the maintenance of the bed, banks and any boundary features e.g. vegetated strips such as hedging, with routine clearance of debris and/or blockages.

This does not mean that the owner must remove all debris from the watercourse, but it does require the owner to maintain as far as it does not pose a risk or 'nuisance' to a neighbour. Any works to modify the watercourse by the landowner must first be passed through the relevant Risk Management Authority, Lead Local Flood Authority (LLFA) or NRW.

5.7 Residents and Property Owners

Residents and property owners are responsible for the maintenance and operation of drainage assets and connecting pipework falling within their ownership. They are also responsible for the protection of their own properties against flooding. Where safe to do so, they should take measures to protect themselves and their property from flooding. Residents and property owners have the right to defend their property as long as they do not subsequently increase the risk of flooding to other properties.

6 Permissive Powers of Risk Management Authorities

Natural Resources Wales has permissive powers under the Flood and Water Management Act 2010 and Water Resources Act 1991 to carry out works to manage the risk of flooding from main rivers. These discretionary powers include the ability to undertake works to clear watercourses, as well as developing and implementing flood alleviation schemes when justifiable.

MCC also have permissive powers under the Land Drainage Act 1991 on ordinary watercourses and also have the role as Lead Local Flood Authority (LLFA) to investigate and report on flood events in their area.

7 Flood Alleviation Scheme / Drainage Improvements

There are no known schemes or improvements currently planned by MCC or NRW.

In December 1979, the main rivers in Monmouthshire, the River Wye, River Monnow and River Usk, broke their banks in many places, in particular; Monmouth and Mayhill, Skenfrith, Usk town and Abergavenny causing significant flooding and damage to property. In Monmouth, both the lower part of the town and Mayhill suffered very significant flooding and damage to property. Following this event, a series of flood defences were constructed by Natural Resources Wales' predecessor organisations, to improve the flood protection to the area. At that time Mayhill was not included. It is understood that at that time it did not meet the cost benefit threshold required, particularly considering the demands across Wales.

Following the February 2020 flood event DCWW completed a risk assessment in September 2020 to support decision making regarding any future flood protection measures for their treatment works. At the time of writing this report, no decision has been communicated as to if any works are planned.

8 Conclusion

The investigation has identified that the flooding that affected the Mayhill area of Monmouth was the result of prolonged and significant rainfall occurring in the preceding days to the River Wye peaking on 18th February 2020.

The River Wye overtopped the undefended left bank resulting in significant flooding within Mayhill to residential properties, commercial premises and significant infrastructure. The event caused widespread damage and required the emergency evacuation of local residents.

The Mayhill area is at present an undefended area and as such, floods in the River Wye exceeding approximately 5.2m will continue to flood the wider area. This particular flood was the highest ever recorded and therefore extended further and caused more damage than those previous experienced. With climate change it is likely that the occurrence of such floods will become more frequent and therefore it may well be considered an appropriate time to re-assess the cost / benefit of developing a flood prevention scheme.

It is not just the damage caused and the disruption to residents, businesses, etc., but also the cost to the multiple bodies and agencies involved in the operational response to such an event. These include: Natural Resources Wales, Dŵr Cymru Welsh Water, Gwent Police, South Wales Fire Service, Monmouthshire County Council, Monmouth Town Council, Wales Ambulance Service, Mountain Rescue and various community support services. There is also the short-term temporary housing of residents and some long term for 6 to 12 months, the resources in clearing up and disposing of the debris safely, damaged private and commercial property, and the repair of damage to roads and flood assets, made particularly difficult whilst operating within the coronavirus pandemic and with limited budgets and resources.

9 Recommendations

In accordance with Section 19 of the Flood and Water Management Act 2010, as Lead Local Flood Authority, Monmouthshire County Council has investigated this flood event and identified which Risk Management Authorities have relevant flood risk management functions. As a result of the findings of this investigation and discussions with residents and other Authorities, the following recommendations have been made.

Reference	Recommendation	Responsible Risk Management Authority(s)
MH1	Undertake an Initial Assessment of options to reduce flood risk from the River Wye using current Welsh Government FCERM Business Case Guidance.	NRW
MH2	In order to ensure the former railway embankment is not altered in such a way that could increase flood risk, consideration should be given by the Risk Management Authority to formally designating the embankment as a structure or feature that serves a flood risk management purpose using powers under the Flood and Water Management Act 2010.	NRW
MH3	Consider the requirement and location of a local sandbag store (and other equipment) which could be easily accessed by local residents.	MCC/NRW
MH4	Investigate the feasibility of a bank / ramp or flood gate at the access to the Monmouth Boys School playing fields through the former railway embankment, to prevent flood water reaching Redbrook Road. Consideration should also be given to the structural integrity of the railway embankment when performing as an informal flood defence.	NRW/MCC
MH5	Consideration should be given to improving the resilience to the Welsh Water Treatment Plant and associated infrastructure to ensure supplies are unaffected during similar future flood events.	DCWW
MH6	Consider installing a remote camera for monitoring flood levels and debris collecting at the Wye Bridge.	MCC
MH7	Consider development of the current hydraulic modelling to improve understanding of the interaction between the River Wye and River Monnow and flood forecasting.	NRW
MH8	Consider undertaking a detailed topographical survey to establish a better understanding of the ground levels, thresholds and trigger levels to aid the emergency response, particularly at Riverside Park.	MCC/NRW
MH9	Inspect and consider if any stored material below the masonry arches that support the A466 adjacent to the Boys School playing fields could impede out of bank flows and increase flood risk. Discuss with asset owners as necessary.	NRW/MCC
MH10	Review gauges on the River Wye upstream of Monmouth to facilitate recording of levels during extreme flood events (the Ross on Wye gauge failed to record levels >4.76m during Storm Dennis).	NRW

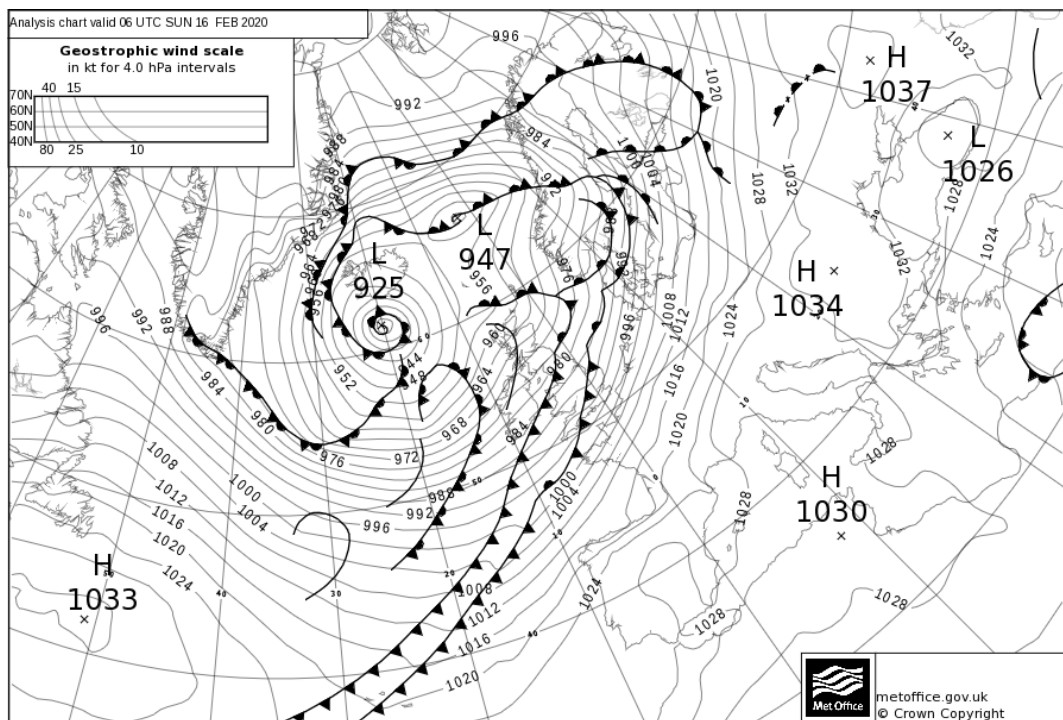
10 Useful Links and Contacts

- Monmouthshire County Council Flood Pages:
www.monmouthshire.gov.uk/flood-risk-management
- Natural Resources Wales:
www.naturalresources.wales/flooding
- Welsh Government:
www.gov.wales/flooding-coastal-erosion
- Blue Pages
www.bluepages.org.uk
- Flood Re (Insurance):
www.floodre.co.uk

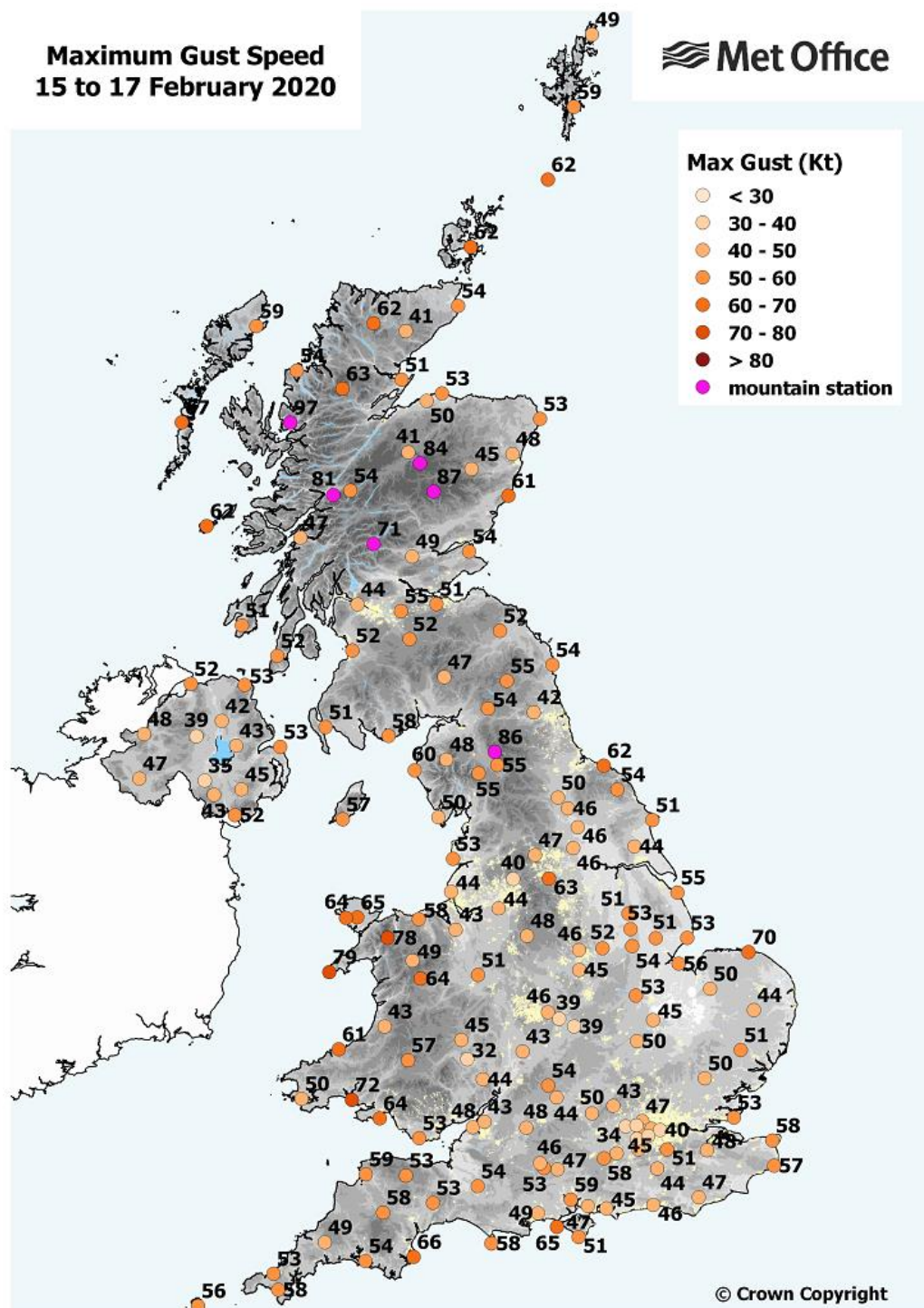
Appendix A – Met Office Report



The analysis chart at 06 UTC 16 February 2020 (24 hours later) shows storm Dennis as the large area of low pressure still dominating the north Atlantic with rain-bearing fronts and strong winds sweeping across the UK.

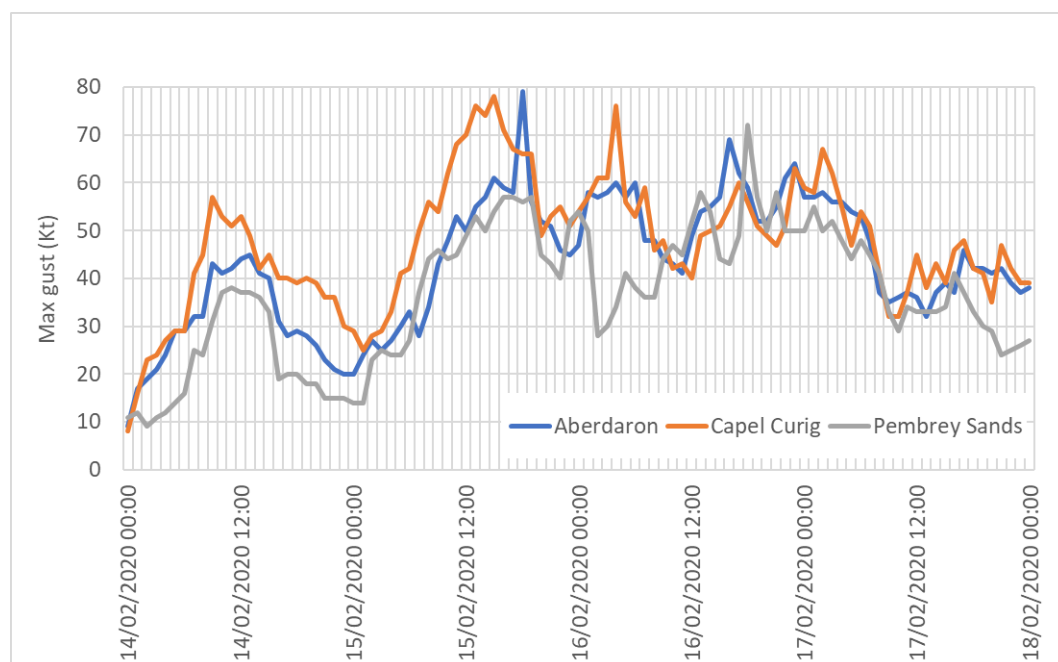


The map below shows maximum gust speeds from storm Dennis. Winds were comparable to storm Ciara, gusting at over 50 Kt (58 mph) across the UK and over 60 Kt (69 mph) around exposed coastlines. In total over 20 stations recorded gusts exceeding 60 Kt. The highest gusts were 79 Kt (91 mph) at Aberdaron, Llyn Peninsula, 78 Kt (90 mph) at Capel Curig, Conwy, 72 Kt (83 mph) at Pembrey Sands, Dyfed and 70 Kt (81 mph) at Weybourne, Norfolk. Wind speeds reached around 100 mph across the tops of the Pennines and Scottish mountains.

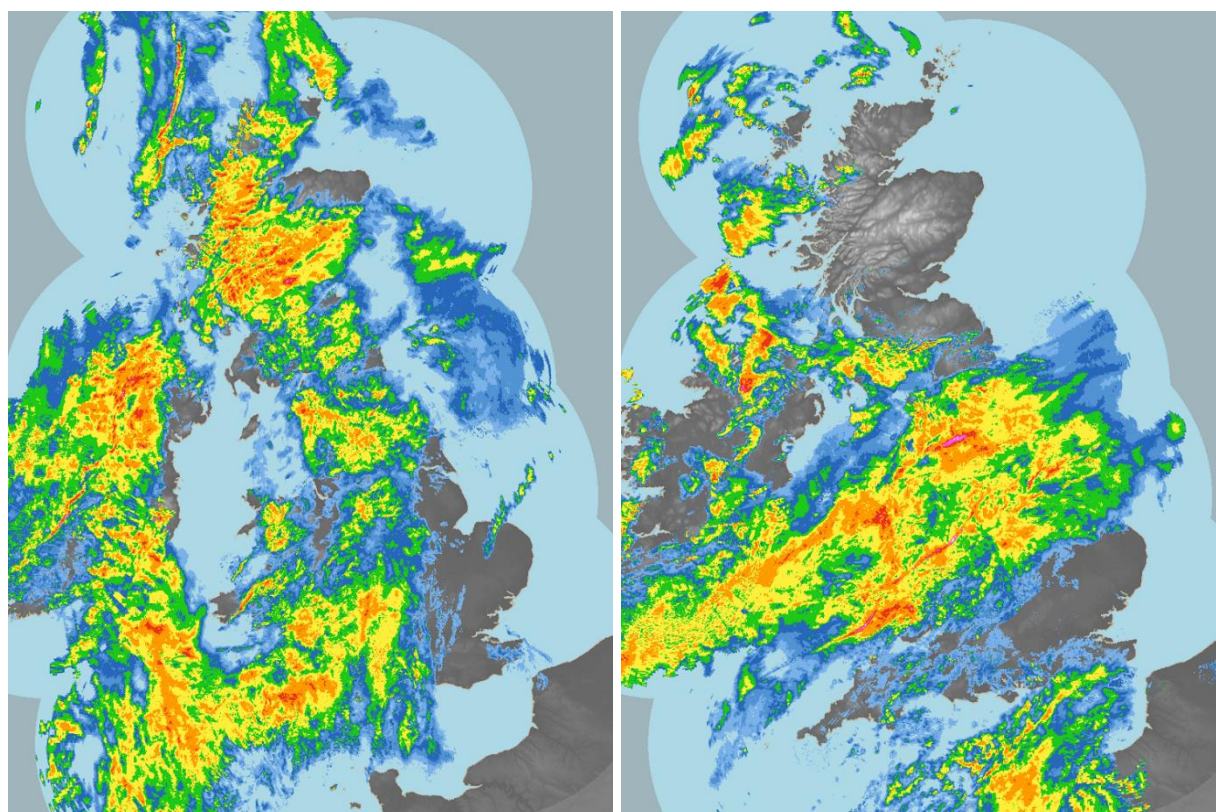


In terms of wind speeds, this was a notable although not exceptional storm for the time of year. However, one feature of storm Dennis was the persistence of the strong winds across the UK for several days, with the low pressure centre to the north-west slow to clear. The strongest winds on 15th to 16th were across England and Wales, transferring to Scotland on the 17th as the low's centre finally pulled away east toward Norway. The chart below shows hourly maximum gust speeds for three stations in Wales – Aberdaron, Capel Curig and Pembrey Sands – all three being

exposed locations. Hourly maximum gust speeds reached 50 Kt during the morning of the 15th and remained mostly above 50 Kt until the morning of the 17th – being sustained at this level for around two days.



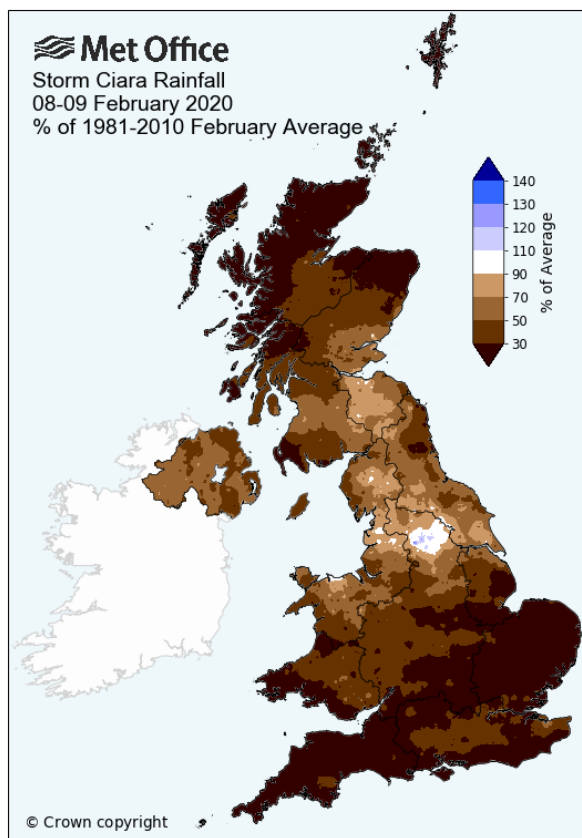
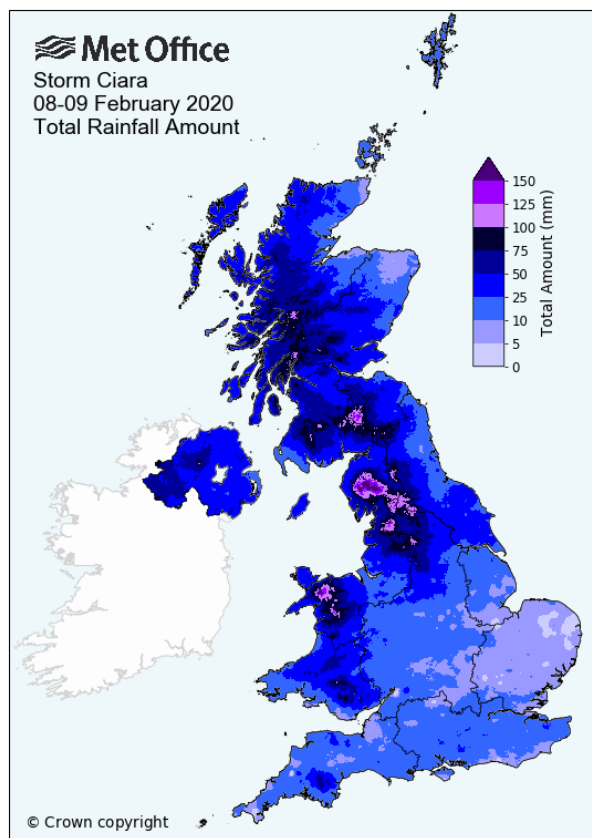
The rain-radar images at 12 UTC 15th and 00 UTC 16th February 2020 show the heavy and persistent rainfall from storm Dennis with the fronts sweeping across the UK.



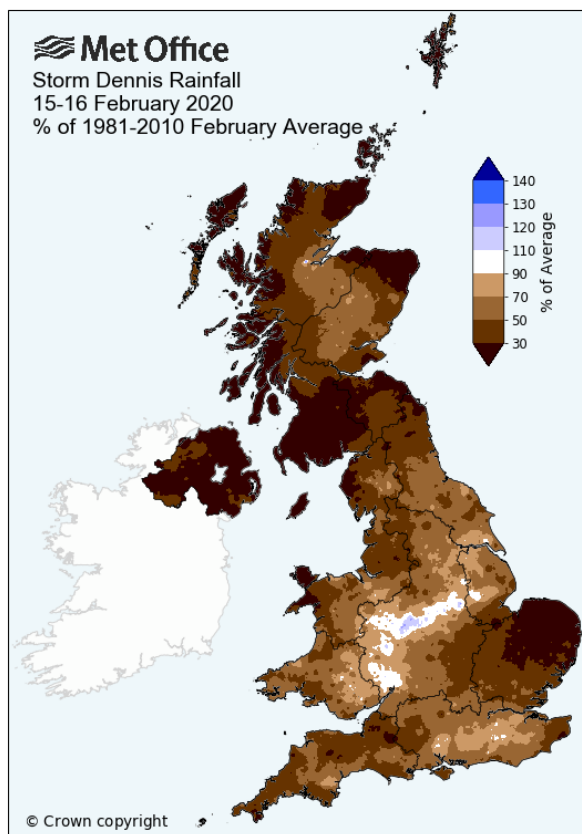
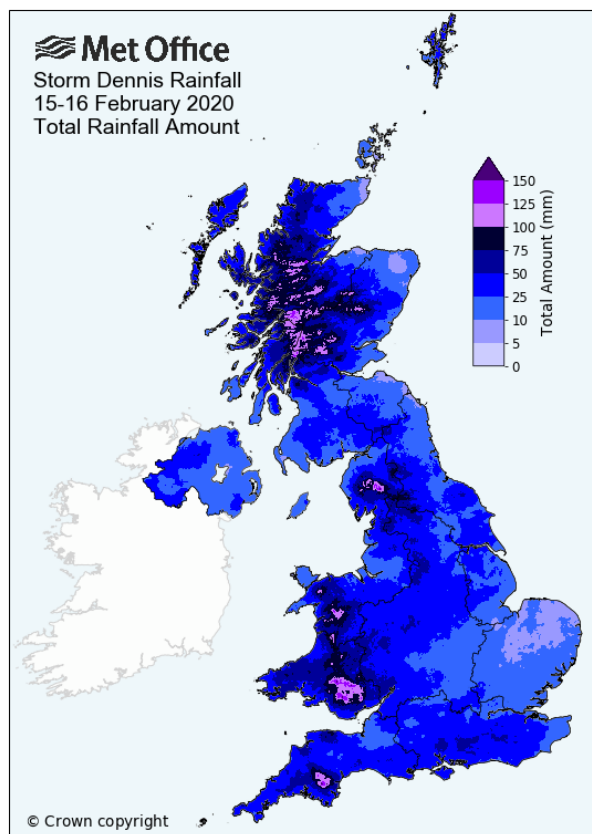
The map below shows rainfall totals for a) storm Ciara and b) storm Dennis, as actuals and % of 1981-2010 February long-term average. Storm Dennis brought 50 to 100mm or more of rain across the high ground of Dartmoor, parts of Wales, the Lake District and Highlands. 100 to 150mm of rain fell across parts of the Brecon Beacons and south Wales valleys. More than the February whole-month average rain fell for the rain-days 15-16 February (09 UTC 15th to 09 UTC 17th) across parts of the west and north Midlands.

Storm Ciara one week earlier brought 100mm+ of rain across the high ground of Snowdonia, the Lake District and parts of the Pennines. More than the February whole-month average rain fell for the rain-days 8 to 9 February (09 UTC 8th to 09 UTC 10th) across parts of the south Pennines

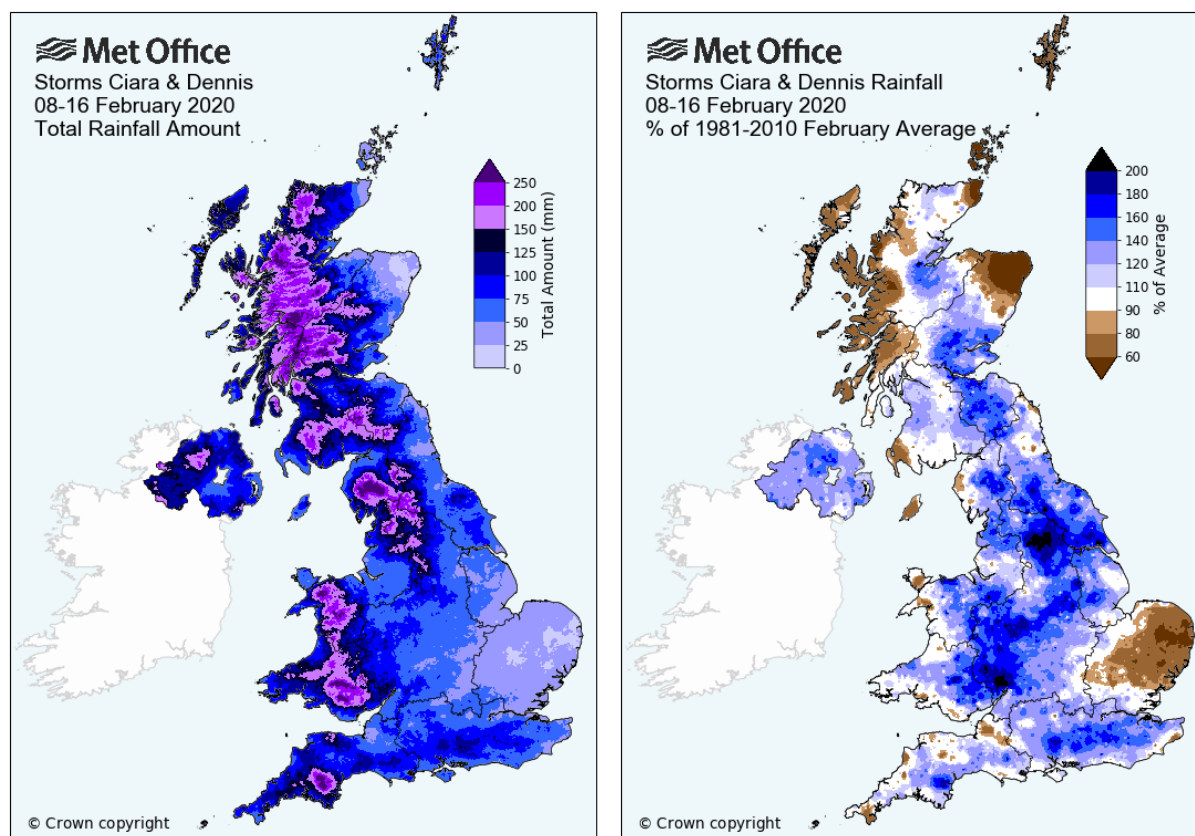
a) – storm Ciara rainfall



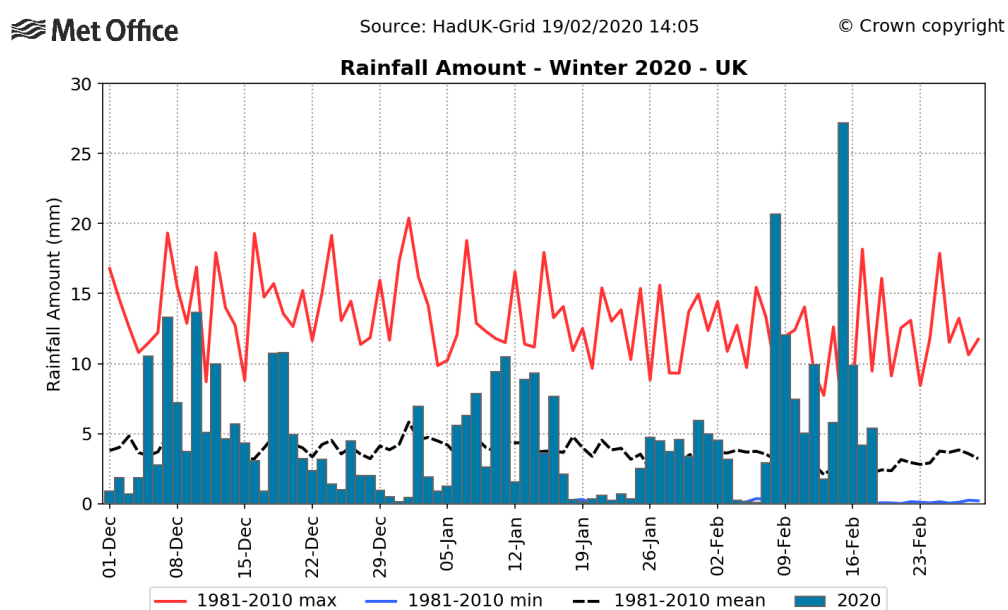
b) – storm Dennis rainfall



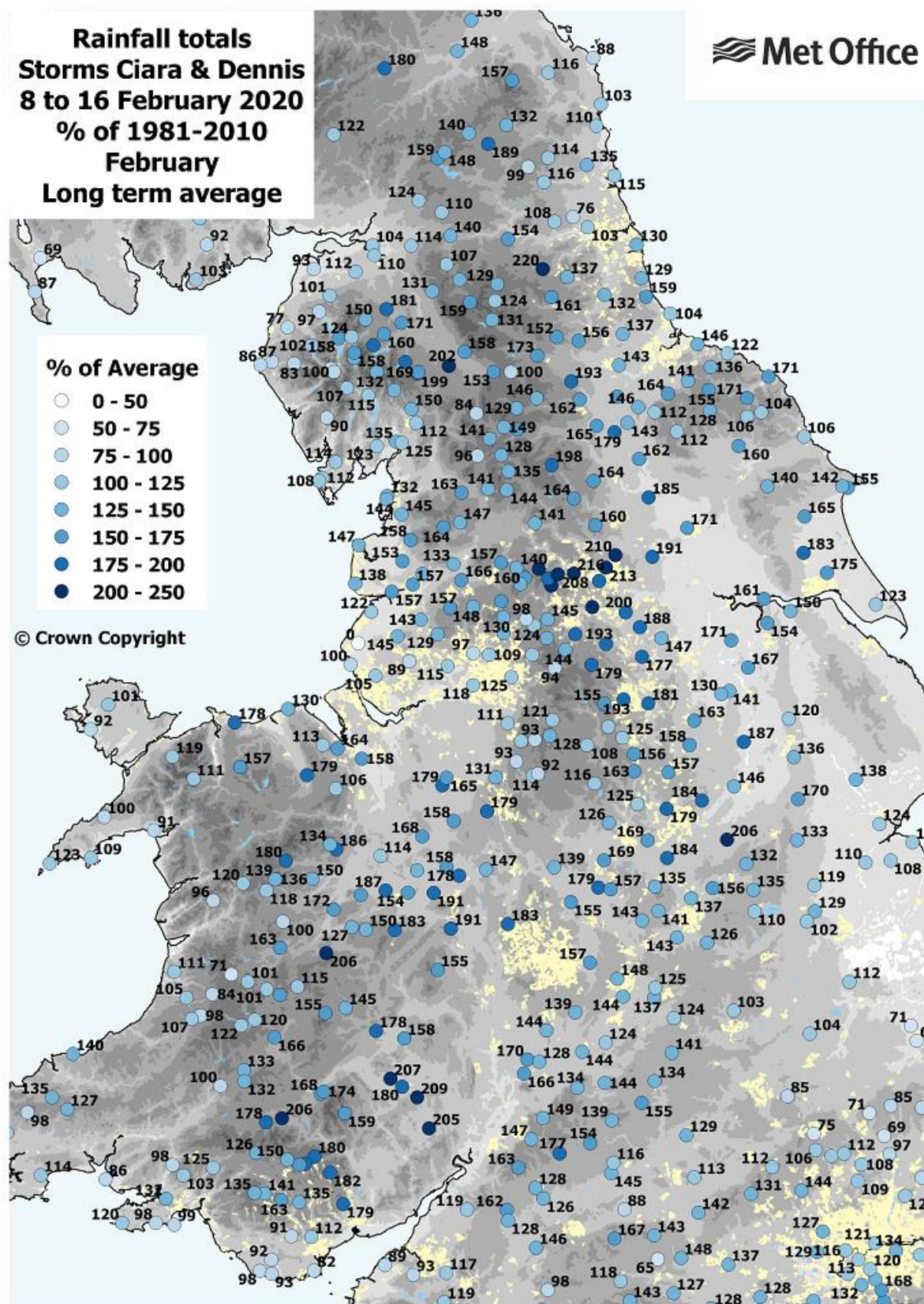
The maps below show how much rain fell across the UK overall for the 9-day period from 8th to 16th February, including both storms Ciara and Dennis. Over 100mm of rain fell across many western parts of the UK through this period with 150 to 250mm or more across the high ground of Dartmoor, Wales, northern England, Southern Uplands, West Highlands and parts of Northern Ireland. Most of the UK received the February whole-month average rainfall over this 9-day period, with around 150% fairly widely across east Wales, the West Midlands and a swathe of the Pennines through to Edinburgh and over 200% locally in the Pennines and parts of Gloucestershire and Herefordshire.



The chart below shows UK areal-average rainfall totals for each day of winter 2020 so far (1 December 2019 to 18 February 2020), with the exceptionally wet days of 8 and 15 February associated with storms Ciara and Dennis.



The map below shows rainfall totals at individual stations for storms Ciara and Dennis combined as % of 1981-2010 February long term average.



Author: Mike Kendon, Met Office National Climate Information Centre

Last updated 20/02/2020

Appendix B – Additional Flood Photos



Photo 12: View of high water levels upstream of Wye Bridge, courtesy of ITV News



Photo 13: Debris build up on the upstream side of Wye Bridge as a result of the flood event



Photo 14: A466 Redbrook road looking south, Lidl car park visible on the left, From Gloucestershire Live



Photo 15: A466 Redbrook Road adjacent to Lidl's car park, From Gloucestershire Live



Photo 16: View across Monmouth Boys School sports pitches with the main river channel in the distance and pavilion building on the right



Photo 17: View from Wye Bridge looking downstream to the Monmouth Boys School sports pavilion



Photo 18: Banner erected by Monmouth Chamber of Commerce thanking some of those involved in the response to the flood event