

Appendix 1

Denbighshire County Council Investigation into the February 2020 Floods Flood Investigation Report



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Executive Summary

On 9th February 2020, Denbighshire experienced heavy and prolonged rainfall, which led to the flooding of around 35 homes, 6 businesses and 12 caravans. The majority of the flooding was from main river sources; Natural Resources Wales (NRW), as the relevant flood risk management authority for main rivers, has carried out its own flood investigations. Natural Resources Wales' flood investigation reports are included as appendices to this overarching investigation report.

Over a two week period, three named storms affected the region, resulting in some of the highest rainfall ever recorded for the time of year. The first storm, storm Ciara, caused levels in the River Elwy, River Ceidiog, River Ystrad and River Clwyd to rise to the extent that flood water spilled out onto the flood plain, leading to flooding of property.

The main communities affected by storm Ciara on 9th February 2020 were St Asaph, Denbigh (Brookhouse), Llandrillo and Bodelwyddan. With the exception of Bodelwyddan, all of the flooding was as a consequence of high river flows in main rivers. In addition, some isolated properties near Llanynys were flooded from the River Clwyd.

1 Introduction

1.1 Background to the Flood Event

According to Natural Resources Wales, “February 2020 was one of the wettest on record for parts of North and Mid Wales. A series of successive weather fronts including storms Ciara, Dennis and Jorge, as well as heavy rainfall over the weekend of 22nd February, saw most rain gauges recording over 200% of their February Long Term Average (LTA). Several rain gauges recorded in excess of 350% of their LTA, with Bala recording 407% of its LTA (extract from “Post flood event analysis North & Mid Wales February 2020” – Natural Resources Wales, see Appendix 1). It is in this context that the flooding that affected communities in Denbighshire on 9th February must be viewed. Thankfully, there was no flooding of property as a result of storms Dennis and Jorge, however there were numerous instances of highway flooding and wind damage across the county as a result of these two storms.

1.2 Purpose of the Investigation

The purpose of this investigation report is to address the following key questions:

- Why did the flooding happen?
- How likely it is for that scale of flooding to happen again?
- What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

1.3 Legislative Context

Denbighshire County Council, as a Lead Local Flood Authority, has a duty under Section 19 of the Flood and Water Management Act to investigate flooding in its area.

The Act 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.

The main sources of flooding during the February 2020 event were the River Elwy, River Ceidiog, River Ystrad and River Clwyd. These are classified as main rivers and

the responsibility for the detailed investigation of each flood location rests with Natural Resources Wales. There were four separate locations affected by main river flooding. These ranged from large communities, such as St Asaph and Llandrillo, to individual isolated properties.

There was also some localised surface water flooding experienced at Bodelwyddan. The responsibility for the investigation of this event rests with Denbighshire County Council as the Lead Local Flood Authority.

2 The Flooding Locations

There were 5 distinct flooding locations: St Asaph, Llandrillo, Denbigh (Brookhouse), Llanynys and Bodelwyddan.

2.1 St Asaph

According to Natural Resources Wales, Storm Ciara brought high winds and torrential rain during the wettest February on record, resulting in the highest ever recorded flow at the Pont Y Gwyddel gauge station (located on the River Elwy about 17km upstream of St Asaph), higher than those observed during the November 2012 flood event.

Natural Resources Wales completed a new flood defence scheme in 2018 and has concluded that around 370 properties were protected by these defences on 9th February 2020. However, a number of homes, businesses and caravans did flood, but many of these were outside the defended area for the scheme.

There was some flooding of homes and businesses around the junction of Glascoed Road and Lower Denbigh Road. This was due to a combination of high levels in both the River Elwy and Glascoed Stream. The flooding problem appears to have been exacerbated by the unauthorised opening of a non-return valve at the outfall of the Glascoed Stream into River Elwy, which allowed backflow from the River Elwy. There were also observations of surface water flowing off agricultural land, which possibly added to the flooding problem.

Natural Resources Wales' flood investigation report is included as Appendix B of this report., or can be accessed here: <https://naturalresources.wales/about-us/our-projects/flood-scheme-projects/st-asaph-flood-scheme/flood-investigation-report-st-asaph-and-elwy-communities-2020/?lang=en>. Please note that the report's coverage includes the rural reaches of the River Elwy, including parts of Conwy County.

Considering the three key questions to be addressed by the investigation:

Why did the flooding happen?

The flooding was caused by record rainfall levels in the region which resulted in the highest ever recorded flows in the River Elwy. As a result, the St Asaph flood defences were overtopped in some locations. The same rainfall affected the Glascoed Stream, which was full beyond its capacity.

How likely it is for that scale of flooding to happen again?

The new St Asaph flood defence scheme is designed to protect against a 1 in 200 annual probability flood event. It is reasonable to conclude, therefore, that there is slightly lower than a 1 in 200 annual probability of that scale of flooding happening

again. The Glascoed Stream and culvert beneath Lower Denbigh Road was designed to protect against a 1 in 100 annual probability flood event.

What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

In its report, Natural Resources Wales makes the following recommendations:

Recommendation 1.1 - DCWW – Review performance of the underground system in the Lower St Asaph area.

Recommendation 1.2 – NRW – Work with the landowners around the Afon Elwy to maintain the flood risk management assets back to Fair condition.

Recommendation 1.3 – NRW – All photos taken during formal NRW duties (inspection, maintenance, incident response etc.) should be time and date stamped.

Recommendation 2.1 – NRW – Undertake a performance review for the 2018 St Asaph Flood Risk Management scheme.

Recommendation 2.2 – NRW – Using the hydraulic model, investigate the flow mechanisms and sensitivity of various parameters which may be impacting water levels at St Asaph STW Embankment.

Recommendation 2.3 - NRW – Consider the current incident response plans and address the resource & resilience shortfalls during such events.

Recommendation 3.1 – NRW – Review policy and procedure regarding the roles and responsibilities of flood wardens both in an incident and during normal working times.

Recommendation 4.1 – NRW – Model the effects of non-return flap operation on water levels in the Glascoed Stream.

Recommendation 4.2 – DCC – Undertake a Flood Investigation Report for all non-main river flooding in the St Asaph and Glascoed Communities.

Recommendation 5.1 – NRW – Review the published flood map data for Wigfair Isaf Community.

Recommendation 6.1 – NRW – Provide advice on Property Level Protection and Property Level Resilience measures for residential property in affected communities in the upper and middle reaches of the Afon Elwy catchment which do not benefit from a defence scheme.

Recommendation 7.1 – NRW – Investigate through computational modelling the flow mechanisms from both the Nant Barrog and Afon Elwy, impacting Llanfair Talhaiarn Community in significant flood events.

Recommendation 8.1 – Nant Mawr Caravan Park Residents - Nant Mawr Caravan Park to be directed to NRW advice and guidance for site owners and operators who have sites at flood risk.

Note: *Regarding recommendations 4.1 and 4.2, the Council will work with Natural Resources Wales to better understand the interaction between the Glascoed Stream and River Elwy during extreme flood conditions. However, it seems clear that the flood defences at this location performed as intended, but were overwhelmed due to the extreme nature of the flood event.*

Note: *Recommendation 7.1 refers to a community in Conwy County, so is not directly relevant to this report.*

2.2 Brookhouse, Denbigh

The investigation has identified that the River Ystrad overtopped its banks, causing flooding of up to 9 residential and 1 commercial property at Brookhouse Terrace. A number of properties had individual property protection, but this was only partially successful during the event.

Natural Resources Wales' flood investigation report is included as Appendix C of this report.

Considering the three key questions to be addressed by the investigation:

Why did the flooding happen?

The flooding was caused by heavy, prolonged rainfall falling on saturated ground which resulted in the River Ystrad overtopping its banks.

How likely it is for that scale of flooding to happen again?

There is insufficient information available to determine the precise scale of the event. However, NRW's flood map shows that the properties would flood in a 1 in 100 chance event.

What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

In its report, Natural Resources Wales makes the following recommendations:

1. NRW should inform residents of Brookhouse Road that are not currently registered, of the process to sign up for Flood Alerts for the Clwyd Catchment. DCC should approach residents for assistance with obtaining Individual Property Protection if not already owned.

2. NRW will continue to work closely with the community of Brookhouse to further understand flooding mechanisms and where appropriate, liaise with Denbighshire County Council to identify options for flood defence for the village.
3. NRW to consider the viability of the implementation of a river level monitoring site on the Afon Ystrad to assist in earlier warning issued to residents.
4. NRW will undertake a topographic survey of both banks of the Afon Ystrad from the weir to below Brookhouse Farm.
5. NRW will update the hydraulic modelling to take into account the findings of this 2020 flood investigation report.
6. DCC should investigate the possibility for Non-Return Valve to be added to Mill Race Drain Outfall to reduce risk of water from Afon Ystrad entering field. Home owners are advised to assess whether further flood resilience measures can be installed at their properties.
7. DCC should investigate the potential of seepage through wall on Left bank of the Ystrad from A525 to Brookhouse Mill Wall where wrack debris and evidence of pooling water were observed the day after.
8. NRW will continue to complete reactive routine maintenance on the Ystrad, review schedules and takes where appropriate and make improvements if it is determined to be viable and proportionate to the risk.

Note: *Regarding recommendations 6 And 7, the Council will liaise with Natural Resources Wales to investigate the feasibility of implementing the recommendations.*

2.3 Llanynys

Three isolated properties were affected when the River Clwyd overtopped its banks. Each property had individual property protection, which worked to varying degrees.

Considering the three key questions to be addressed by the investigation:

Why did the flooding happen?

The flooding was caused by heavy, prolonged rainfall falling on saturated ground which resulted in the River Clwyd overtopping its banks at multiple locations.

How likely it is for that scale of flooding to happen again?

Whilst no information is available regarding the severity of the flood event at this location, rainfall levels were some of the highest recorded in the Clwyd catchment for this time of year, therefore the likelihood of that scale of flooding happening again is

low. The River Clwyd has no formal flood defences at this location, which means that a flood could occur with less than a 1 in 100 chance.

What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

It is unlikely that formal flood defences would be cost effective to defend a small number of isolated properties, which already have individual property protection installed. Natural Resources Wales continues to have discussions with affected residents regarding measures that can be carried out to reduce the risk and impacts of flooding. In addition, the Council is in discussions with residents regarding possible improvements to highway drainage in the area.

2.4 Llandrillo

Heavy rainfall led to the River Ceidiog overtopping its banks, leading to the flooding of a single property. More extensive flooding was averted due to the prompt actions of local residents in diverting flood water away from properties.

Natural Resources Wales' flood investigation report is included as Appendix D of this report.

Considering the three key questions to be addressed by the investigation:

Why did the flooding happen?

The flooding occurred due to high river levels following heavy rain.

How likely it is for that scale of flooding to happen again?

Natural Resources Wales hasn't reported the severity of the flood event or the standard of protection provided by its flood defences.

What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

In its report, Natural Resources Wales makes the following recommendations:

1. Due to the extent of floodwater flowing through Llandrillo, it may be appropriate to review and update the existing flood modelling study (2008) including the underlying hydrology. This review should look at the severity of this event, the effects of structures along the system (road and foot bridges, flood relief culvert and existing defences), effectiveness of current private defences and flood warning options.
2. Following the flood modelling review, the initial assessment completed in 2009 on potential flood alleviation measures for Llandrillo should also be reviewed.

3. NRW will continue to work closely with the community of Llandrillo to further understand flooding mechanisms and where appropriate, liaise with Denbighshire County Council to identify options for flood defence for the village.

2.5 Bodelwyddan

Heavy rainfall led to an unnamed ordinary watercourse overtopping its banks, leading to the flooding of four properties. The watercourse flows across privately owned land and is partly culverted downstream.

Why did the flooding happen?

The flooding occurred due to high watercourse levels following heavy rain

How likely it is for that scale of flooding to happen again?

No information is available, however rain gauge data suggests that this was an extreme rainfall event, so the likelihood of this scale of flooding happening again at this location is low.

What improvement actions are needed to ensure flood risk in the County is appropriately managed in future?

Further investigation of the culverted sections of watercourse is recommended. This will be carried out by the Council before next winter.

3 Summary of Recommendations

St Asaph

Recommendation 1.1 - DCWW – Review performance of the underground system in the Lower St Asaph area.

Recommendation 1.2 – NRW – Work with the landowners around the Afon Elwy to maintain the flood risk management assets back to Fair condition.

Recommendation 1.3 – NRW – All photos taken during formal NRW duties (inspection, maintenance, incident response etc.) should be time and date stamped.

Recommendation 2.1 – NRW – Undertake a performance review for the 2018 St Asaph Flood Risk Management scheme.

Recommendation 2.2 – NRW – Using the hydraulic model, investigate the flow mechanisms and sensitivity of various parameters which may be impacting water levels at St Asaph STW Embankment.

Recommendation 2.3 - NRW – Consider the current incident response plans and address the resource & resilience shortfalls during such events.

Recommendation 3.1 – NRW – Review policy and procedure regarding the roles and responsibilities of flood wardens both in an incident and during normal working times.

Recommendation 4.1 – NRW – Model the effects of non-return flap operation on water levels in the Glascoed Stream.

Recommendation 4.2 – DCC – Undertake a Flood Investigation Report for all non-main river flooding in the St Asaph and Glascoed Communities.

Recommendation 5.1 – NRW – Review the published flood map data for Wigfair Isaf Community.

Recommendation 6.1 – NRW – Provide advice on Property Level Protection and Property Level Resilience measures for residential property in affected communities in the upper and middle reaches of the Afon Elwy catchment which do not benefit from a defence scheme.

Recommendation 7.1 – NRW – Investigate through computational modelling the flow mechanisms from both the Nant Barrog and Afon Elwy, impacting Llanfair Talhaiarn Community in significant flood events.

Recommendation 8.1 – Nant Mawr Caravan Park Residents - Nant Mawr Caravan Park to be directed to NRW advice and guidance for site owners and operators who have sites at flood risk.

Denbigh (Brookhouse)

1. NRW should inform residents of Brookhouse Road that are not currently registered, of the process to sign up for Flood Alerts for the Clwyd Catchment. DCC should approach residents for assistance with obtaining Individual Property Protection if not already owned.
2. NRW will continue to work closely with the community of Brookhouse to further understand flooding mechanisms and where appropriate, liaise with Denbighshire County Council to identify options for flood defence for the village.
3. NRW to consider the viability of the implementation of a river level monitoring site on the Afon Ystrad to assist in earlier warning issued to residents.
4. NRW will undertake a topographic survey of both banks of the Afon Ystrad from the weir to below Brookhouse Farm.

5. NRW will update the hydraulic modelling to take into account the findings of this 2020 flood investigation report.
6. DCC should investigate the possibility for Non-Return Valve to be added to Mill Race Drain Outfall to reduce risk of water from Afon Ystrad entering field. Home owners are advised to assess whether further flood resilience measures can be installed at their properties.
7. DCC should investigate the potential of seepage through wall on Left bank of the Ystrad from A525 to Brookhouse Mill Wall where wrack debris and evidence of pooling water were observed the day after.
8. NRW will continue to complete reactive routine maintenance on the Ystrad, review schedules and takes where appropriate and make improvements if it is determined to be viable and proportionate to the risk.

Llanynys

1. Natural Resources Wales to continue to have discussions with affected residents regarding measures that can be carried out to reduce the risk and impacts of flooding.
2. Denbighshire County Council to continue discussions with residents regarding possible improvements to highway drainage in the area.

Llandrillo

1. Due to the extent of floodwater flowing through Llandrillo, it may be appropriate to review and update the existing flood modelling study (2008) including the underlying hydrology. This review should look at the severity of this event, the effects of structures along the system (road and foot bridges, flood relief culvert and existing defences), effectiveness of current private defences and flood warning options.
2. Following the flood modelling review, the initial assessment completed in 2009 on potential flood alleviation measures for Llandrillo should also be reviewed.
3. NRW will continue to work closely with the community of Llandrillo to further understand flooding mechanisms and where appropriate, liaise with Denbighshire County Council to identify options for flood defence for the village.

Bodelwyddan

Further investigation of the culverted sections of watercourse is recommended. This will be carried out by the Council before next winter.