Flood and Water Management Act 2010

Section 19 Report

Storm Bert – Flood Investigation Area 25

October 2025

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This report should be read in its entirety.

This report has been prepared in accordance with the requirements of Section 19 of the Flood and Water Management Act 2010. The Council assumes no responsibility or liability from any person in connection with its contents or findings.

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EXECUTIVE SUMMARY

This report has been produced through the duties placed upon Rhondda Cynon Taf County Borough Council (RCTCBC) under Section 19 of the Flood and Water Management Act 2010. The Act states, “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.”.

This Section 19 investigation provides a factual report of the storm event that occurred on 23 and 24 November 2024 within the RCT area, focusing investigation on the flooding that occurred within the impacted areas of Treherbert in the Rhondda Fawr (referred to as Flood Investigation Area 25, (Figure 1)).

This report was undertaken to identify the mechanisms for flooding, establish which Risk Management Authorities have relevant flood risk management functions under the Flood and Water Management Act 2010 and ascertain if those Risk Management Authorities have undertaken or are planning to undertake actions related to those functions to reduce/alleviate the risk of flooding.

The flooding that affected RCT on 23 and 24 November 2024 was a result of an extreme rainfall event, designated by the Met Office as ‘Storm Bert’. The impact of the event at FIA 25 resulted in internal flooding to 39 properties: including 37 residential and 2 non-residential. Significant flooding to the highway throughout the investigation area also occurred.

These impacts were identified through inspections made by RCT's Flood Risk Management team during the days following the storm event, as well as information collated by residents, business owners, RCT's Public Health and Protection team, RCT's Highway and Streetcare Depot, Natural Resources Wales (NRW) and Dŵr Cymru Welsh Water (DCWW).

It has been established from the evidence gathered within this report that the primary source of flooding at FIA 25 in this incident was a result of significant overland runoff being generated from the steep hillsides above Treherbert draining to lower ground via a series of unnamed ordinary watercourses, many of which became overwhelmed with water and overtopped, impacting several properties on its course of flow.

Localised surface water accumulation was also identified as a contributing source of flooding to properties within the investigation area as a result of intense rainfall and overwhelmed drainage infrastructure.

RCTCBC as the Lead Local Flood Authority and Highway Authority has been determined as the relevant Risk Management Authority responsible for managing the ordinary watercourse, surface water and groundwater flooding that occurred in FIA 25 during Storm Bert. In response to the flooding at FIA 25, the LLFA has undertaken 14 actions and have proposed to undertake a further 6. A summary of which include:

- Carried out survey, jetting and cleansing operations to an estimated 1,152 metres of ordinary watercourse and surface water drainage network length within the investigation area.
- Engaged with riparian landowners to ensure the ordinary watercourse infrastructure is free flowing and unobstructed.
- Introduced a Community Flood Recovery Grant programme, with support from the Welsh Government, to provide financial assistance to residents subject to internal flooding during Storm Bert.

- Completed the development of an Outline Business Case, identifying the preferred option for managing the risk of ordinary watercourse and surface water flooding in the Treherbert area. Funding from the Welsh Government has been applied for to develop a Full Business Case to carry out detailed design and development of the preferred option.

The event that occurred on 23 and 24 November 2024 was extreme, and it is unlikely flooding from a similar event could be prevented entirely. It is concluded that both the LLFA and the Highway Authority have relevant flood risk management functions, and both RMAs have outlined which functions have been exercised and which are proposed to be exercised in response to the Storm Bert flooding event.

ABBREVIATIONS

CaRR – Communities at Risk Register

DCWW – Dŵr Cymru Welsh Water

FIA – Flood Investigation Area

FWMA – Flood and Water Management Act 2010

LDA - Land Drainage Authority

LFRMS – Local Flood Risk Management Strategy

LLFA – Lead Local Flood Authority

NRW – Natural Resources Wales

PFR – Property Flood Resistance / Resilience

Q – Return Period (1 in X chance of an event occurring in any given year)

RCT - Rhondda Cynon Taf

RCTCBC – Rhondda Cynon Taf County Borough Council

RMA – Risk Management Authority

SFRA – Strategic Flood Risk Assessment

TABLES AND FIGURES

1. INTRODUCTION

1.1. PURPOSE OF INVESTIGATION

On the 23 and 24th November 2024, Rhondda Cynon Taf County Borough Council (RCTCBC) was impacted by a severe weather event which was designated by the Met Office as 'Storm Bert' on 20 November 2024.

The storm resulted in widespread flooding to residential and non-residential properties within Rhondda Cynon Taf (RCT). This report will focus on Flood Investigation Area 25 (referred to as 'FIA 25' within this report) which covers parts of Treherbert village, located north of Treorchy in the Rhondda Fawr.

The purpose of RCTCBC's investigation is in response to the duties of the local authority as Lead Local Flood Authority (LLFA) in regard to Section 19 of the Flood and Water Management Act 2010 (FWMA), 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. When 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 authority".[1]

[1] Flood and Water Management Act 2010, Section 19

The purpose of the investigation is to determine which Risk Management Authorities (RMA) have relevant flood risk management functions and which functions have been exercised in response to a flood.

Current Welsh Government guidance outlined within the National Strategy for Flood and Coastal Erosion Risk Management[2] stipulate that a Section 19 report should be produced for flooding incidences where twenty or more properties experience internal flooding following a storm event. Due to the extent and impact of the event at FIA 25, the Lead Local Flood Authority (LLFA) have opted to undertake a formal Section 19 investigation for this area.

Specific details of Storm Bert, such as rainfall analysis and watercourse response, are covered within a separate overview report that covers the wider RCT area. The report is titled 'Storm Bert November 2024 – Overview Report'[3].

1.2. Site Location

The area investigated within this report (FIA 25) falls within the electoral ward of Treherbert, located in the north-western sector of the county borough (Figure 1). Treherbert is located within the catchment of the River Rhondda which flows west to east along the southern boundary of the investigation area.

The investigation area is bounded to the south by the Rhondda Fawr River, and to the north and east by steep mountain sides of Mynydd Tynewydd and a large network of ordinary watercourses which form part of the River Rhondda Fawr catchment.

[2] National Strategy for Flood and Coastal Erosion Risk Management in Wales, October 2020
[3] RCTCBC Storm Bert Overview Report, March 2025

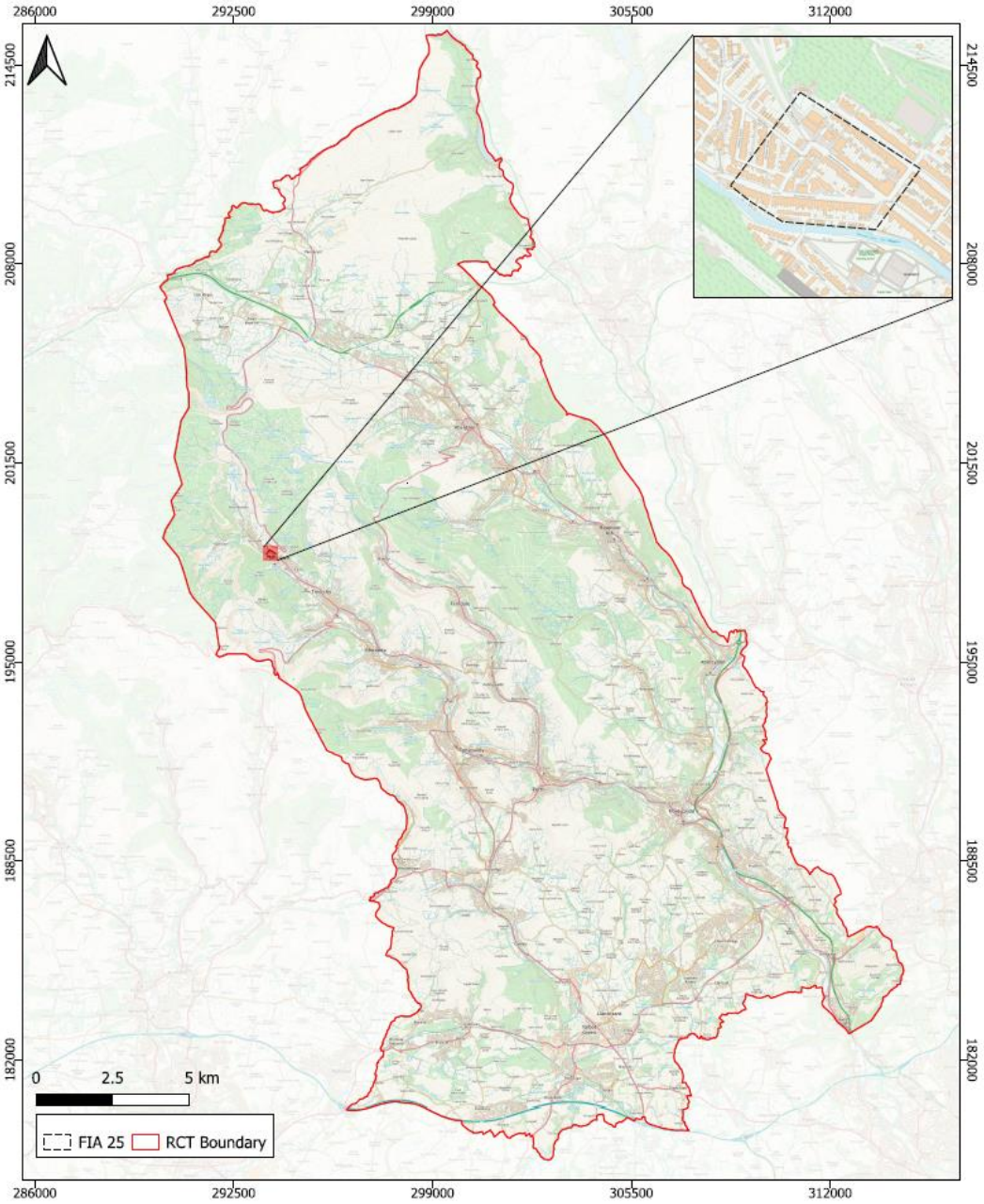

Figure 1: Location plan of FIA 25.

FIA 25 forms part of the Upper Rhondda Fawr Strategic Flood Risk Area, as defined by RCT's Local Flood Risk Management Strategy and Action Plan 2024[4]. These boundaries are based on the latest available flood risk datasets, geographical

[4] RCTCBC Local Flood Risk Management Strategy and Action Plan, March 2024

knowledge of the catchment drainage basins and local flood history to assess flood risk in RCT.

Treherbert has some of the steepest topography in RCT and as a result the highlands have remained undeveloped whilst residential development is confined to the valley floor. These steep slopes and concentrated urban development largely contribute to Treherbert's significant ordinary watercourse and surface water flood risk.

As illustrated by Natural Resources Wales's (NRW) Flood Risk Assessment Wales (FRAW) maps (Figure 2), the highest risk to people and properties within FIA 25 is broadly associated with culvert inlets, the overtopping of watercourse embankments and overland flows owing to the steep topography of the upper catchment. A low risk of main river flooding is also noted south of Dunraven Street along the flood plain of the River Rhondda.

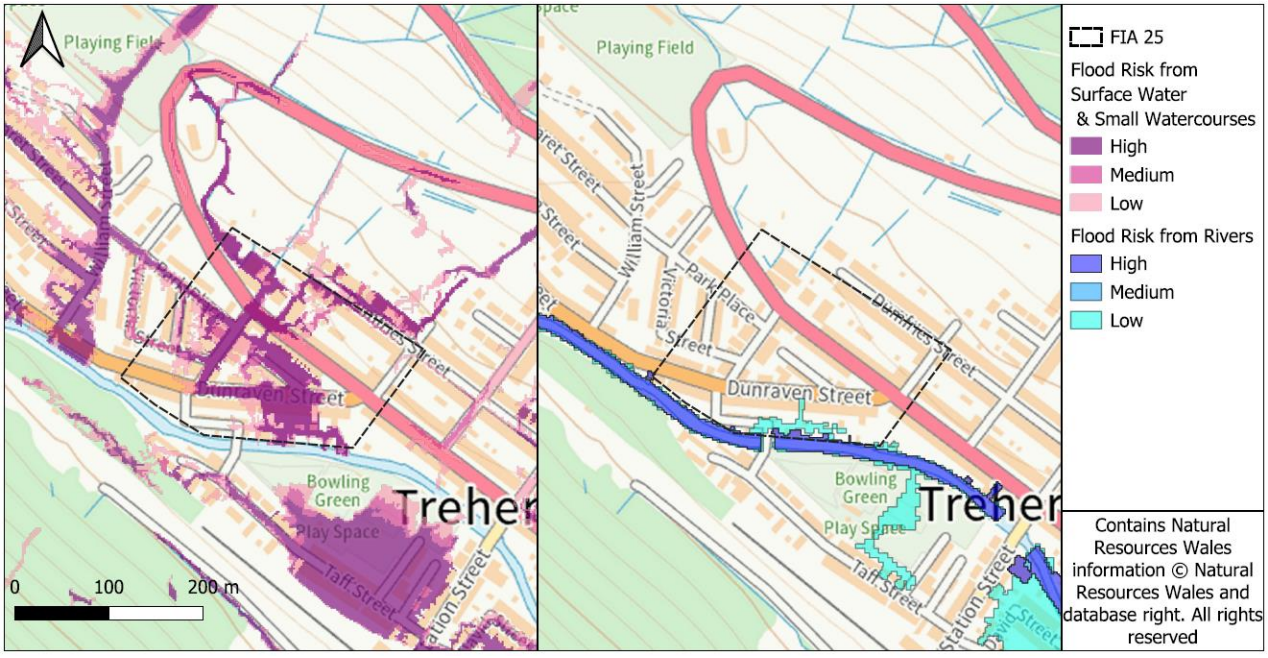

Figure 2: Natural Resources Wales's Flood Risk Assessment (FRAW) map for surface water and small watercourse, and main river flood risk at FIA 25.

The Welsh Government's Communities at Risk Register (CaRR), produced by NRW, provides a national assessment of flood risk and hazard from all sources of flooding, enabling flood risk and hazard to be ranked at a local level to identify those communities at highest risk. The national flood risk rankings for the community of Treherbert, which FIA 25 is located within, have been illustrated in Table 1 for the present day and climate change scenario (CaRR, 2024[5]).

Table 1: Surface water and ordinary watercourse, and main river (managed) flood risk ranking for the present day and climate change scenario for Treherbert according to the CaRR, 2024.

Community Name	Present Day		Climate Change Scenario (2120)	
	Surface Water & Ordinary Watercourse	Main River (Managed)	Surface Water & Ordinary Watercourse	Main River (Managed)
Treherbert	6	80	6	28

As illustrated in Table 1, the community of Treherbert is currently ranked 6th highest in Wales for surface water and ordinary watercourse flood risk. This ranking is predicted to remain at 6th position in the climate change scenario. The risk ranking for main river flood risk in Treherbert is expected to increase in the climate change scenario, placing Treherbert at 28th highest ranking community in Wales for main river flood risk in the managed (defended) scenario.

Table 2 shows the projected increase in the number of properties at risk of both surface water and ordinary watercourse, and main river flood risk in the community of Treherbert in line with climate change.

[5] Communities at Risk Register 2024 – Present Day (CaRR) | DataMapWales

Table 2: Properties at Risk from surface water and ordinary watercourse, and main river flooding in the present day and climate change scenario for Treherbert, according to the CaRR 2024.

Community Name	Properties at Risk- Present Day		Properties at Risk- Climate Change Scenario (2120)	
	Surface Water & Ordinary Watercourse	Main River (Managed)	Surface Water & Ordinary Watercourse	Main River (Managed)
Treherbert	877	201	1018	266

1.3. Drainage System

The surface water drainage systems that serve FIA 25 are that of the highway drainage network which is designed to manage the surface water within the highway, and public surface water sewer and combined sewer networks (foul and surface water) operated by Dŵr Cymru Welsh Water (DCWW).

There are also sections of open and culverted ordinary watercourses that convey flows from the hillsides above Treherbert and convey water beneath urban development towards the River Rhondda Fawr.

1.4. INVESTIGATION EVIDENCE

To support the investigation, a range of qualitative and quantitative evidence has been gathered from numerous sources, the summary of which is listed in Table 3.

Table 3: Investigative evidence gathered in preparation of this Section 19 report.

Source	Data
Residents	Photographs, videos, statements, email correspondence, public engagement survey responses
Responders' Statements	Local responders' statements
Risk Management Authority (RMA) Responses	In pursuant of Section 13 (1) of the FWMA, relevant RMAs provided RCTCBC with information to support the production of this report
CCTV Surveys	Internal surveys of the local drainage networks
Met Office Data	Weather Warning information (see FRM- Storm Bert- Overview Report)**Error! Bookmark not defined.**
Natural Resources Wales	River Level and Flood Warning Data
RCT Local Flood Risk Management Strategy and Action Plan 2024	Site specific information and data for each electoral ward in RCT
Communities at Risk Register 2024	Flood risk ranking and scores for all flood types based on community data in Wales
Envirocheck Report	A comprehensive environmental risk assessment tool used by professionals to evaluate potential hazards on a site. These reports include historical maps, flood risk assessments, geology maps and contamination screening.

1.5. PUBLIC ENGAGEMENT

Following the initial flood event that occurred on the 23 and 24 November 2024 during Storm Bert, flood risk officers from the RCT Flood Risk Management department were deployed to areas across the borough to investigate reports of internal flooding by residents. Residents were engaged with by the Flood Risk Management team to help determine the initial impacts caused by the flooding event and to investigate the potential source(s) and pathways(s) of flood water during the event. Due to the volume of calls received by RCT's Out of Hours department, visits were prioritised to those areas experiencing significant internal flooding to residential properties.

To support these investigations, a public engagement exercise was undertaken by RCTCBC between 17 March and 28 April 2025. This exercise comprised of an online survey which enabled residents who were affected by the flood event to provide further detail on how they were impacted, the source and movement of flood water within an area, how receptors were impacted as well as drawing on local knowledge to query how local conditions could have exacerbated the event. Residents were also encouraged to submit photo/video evidence of flooding to their properties. This data is useful to help the LLFA better understand and validate our assessment of the flood event to support the investigation under Section 19 of the FWMA.

Four responses to the public engagement exercise were received from individuals within FIA 25.

2. FLOODING HISTORY

2.1. PREVIOUS FLOOD INCIDENTS

Table 4 lists the previous incidences of flooding to properties within FIA 25 based on resident's accounts and available historical information held by the Council.

The most significant flooding event to have impacted FIA 25 occurred on the 15 and 16 February 2020 during Storm Dennis which internally impacted 1,498 homes and businesses across RCT, of which 21 were impacted within the investigation area, particularly along Abertonllwyd Street and Dunraven Street. Flooding was primarily attributed to the surcharging of various culverted watercourse infrastructure following intense and persistent rainfall. Further details of the flooding caused by Storm Dennis at this location can be found in the published Section 19 report titled "Storm Dennis- Flood Investigation Area RCT27 (Treherbert)"[6].

Historical flood records and residents accounts captured by RCT's Flood Risk Management officers also confirm that properties along Abertonllwyd Street have been impacted by flooding on at least two occasions prior to Storm Dennis and a further three occasions following Storm Dennis. Storm Bronagh in September 2018 and Storm Callum in October 2018 were both noted as causing flooding to properties primarily as a result of overwhelmed ordinary watercourse infrastructure. Flooding to individual properties during the storm events following Storm Dennis have been attributed to overwhelmed surface water drainage.

[6] Storm Dennis- Flood Investigation Area RCT27 (Treherbert), November 2021

Table 4: Record of historical flood events within FIA 02 prior to Storm Bert in November 2024.

Name & Date of Storm Event	Nr Receptors Impacted Internally	Streets Affected
Storm Bronagh – September 2018	13	Abertonllwyd Street
Storm Callum – October 2018	13	Abertonllwyd Street
Storm Dennis – February 2020	21	Abertonllwyd Street, Dunraven Street, Dumfries Street
Storm Jorje – February 2020	1	Abertonllwyd Street
Storm Christoph – January 2021	2	Abertonllwyd Street
Unnamed Storm – February 2021	1	Abertonllwyd Street

2.2. FLOOD INCIDENT

The flooding incident that occurred on 23 and 24 November 2024 was a result of an extreme rainfall event, designated by the Met Office as 'Storm Bert'. The rainfall event affected the majority of RCT and caused widespread flooding to communities.

Specific details of Storm Bert, such as rainfall and watercourse level analysis, are covered within a separate overview report that covers the wider RCT area, referenced 'Storm Bert November 2024 – Overview Report'[3].

The post event inspections undertaken on the days following the storm event by RCTCBC's Flood Risk Management team and RCTCBC's Public Health, Protection and Community teams identified 37 residential and 2 non-residential properties as internally flooded within FIA 25.

A summary of the source(s) and pathway(s) for flooding within FIA 25 during Storm Bert have been outlined in Table 5 and further described throughout this section.

Table 5: Summary of the source(s), pathway(s) and receptor(s) affected during Storm Bert within FIA 25.

Source	Pathway	Receptor
Intense rainfall running off the steep hillsides to the north of Treherbert draining to lower ground via a series of unnamed ordinary watercourses. A culvert inlet adjacent to a commercial premise at Abertonllwyd Street surcharged during the storm event.	Exceedance flows from the surcharged culvert inlet adjacent to the commercial premise resulted in water conveying into the commercial premise and around the property, before continuing onwards towards Abertonllwyd Street, Hill Street, Glenrhondda Court and Dunraven Street.	Exceedance flows from the surcharged culvert inlet resulted in internal flooding to 37 residential and 2 non-residential properties at Abertonllwyd Street, Dunraven Street and Hill Street.

Source	Pathway	Receptor
Intense rainfall running off the steep hillsides to the north of Treherbert draining to lower ground via a series of unnamed ordinary watercourses. Three culvert inlets located along the A4061 Rhigos Road surcharged during the storm event.	Exceedance flows from all 3 culvert inlets conveyed along the A4061 Rhigos Road towards Abertonllwyd Street and continued onwards towards Hill Street, Glenrhondda Court and Dunraven Street.	Exceedance flows from the surcharged culvert inlets contributed to the internal flooding of 37 residential and 2 non-residential properties at Abertonllwyd Street, Dunraven Street and Hill Street.
Intense rainfall and subsequent surface water runoff from the surrounding area.	Surface water was observed along several highway networks and areas of open hillside within the investigation area. This is considered to have contributed to the ordinary watercourse flooding at FIA 25.	Surface water is considered to have exacerbated the flooding experienced at many internally flooded properties throughout FIA 25 during Storm Bert.

On review of Table 5, the primary source of flooding in this incident originated from intense rainfall generating significant surface water runoff from the steep hillsides to the north and east of Treherbert draining to lower ground. This runoff was routed towards the investigation area via steep areas of hillside and ordinary watercourses, many of which became overwhelmed during Storm Bert and caused flooding to properties in the lower reaches of FIA 25.

Surface water flooding as a result of intense rainfall and overwhelmed highway drainage infrastructure was also reported by residents as a contributing source of flooding to several properties.

The infrastructure known to have surcharged and contributed to the flooding of properties, and the observed pathways of overland flooding during Storm Bert in FIA 25, have been illustrated in Figure 3.

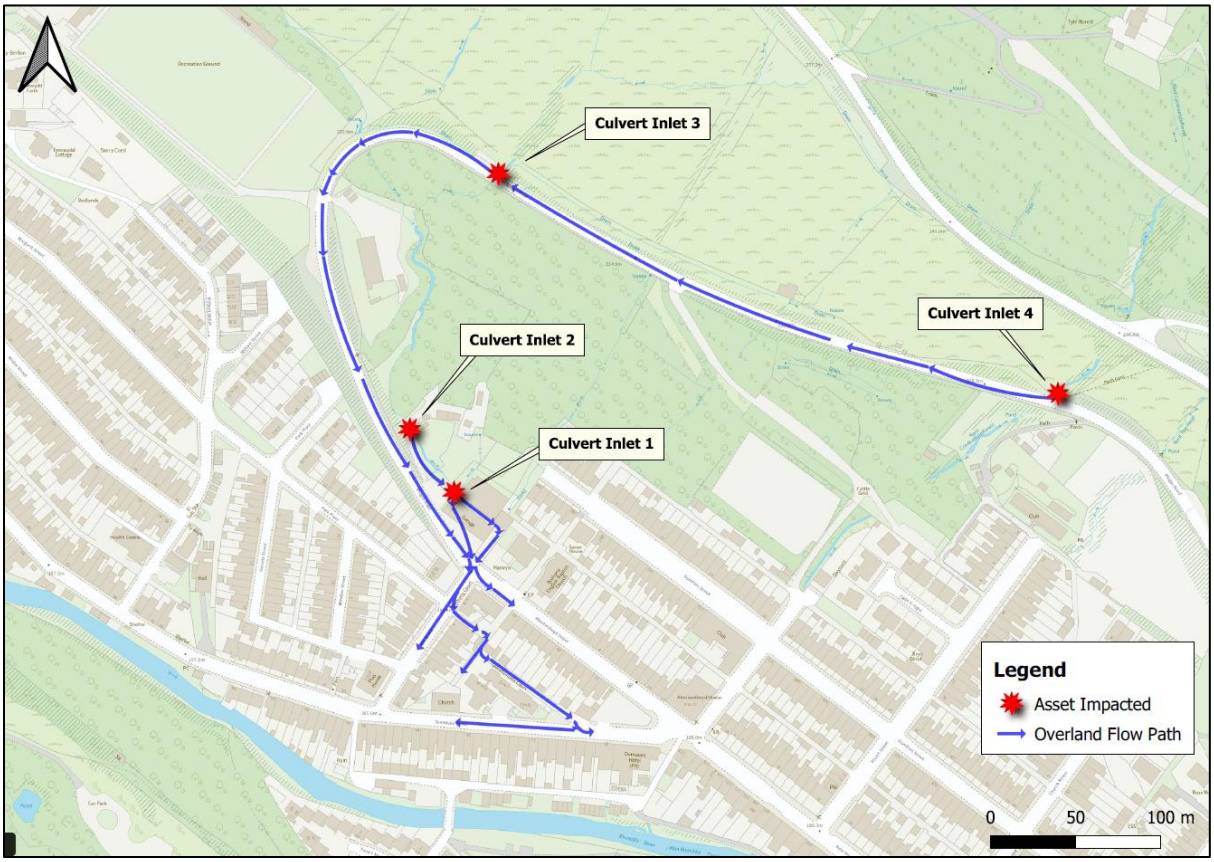

Figure 3: Observed overland flow paths and surcharging assets at FIA 25 during Storm Bert (23-24 November 2024).

Several calls were received by the Council from residents at Abertonllwyd Street, Dunraven Street and Hill Street on the morning of Sunday 24 November 2024 to report water ingress into multiple residential properties. It was confirmed by Council operatives responding to the event that a culvert inlet adjacent to a commercial property at Abertonllwyd Street (labelled ‘Culvert Inlet 1’ in Figure 3) was identified as surcharging and causing ordinary watercourse exceedance flows to convey along the highway towards properties. Upon an inspection undertaken by RCT’s Flood Risk

Management team at midday on 24 November, ‘Culvert Inlet 1’ was completely submerged and continuing to surcharge. This is illustrated in Figure 4.

Figure 4: Evidence of submerged 'Culvert Inlet 1' which surcharged during Storm Bert (captured by RCT's FRM team on 24 November 2024).

Exceedance flows from ‘Culvert Inlet 1’ resulted in water conveying through the adjacent commercial unit and around the rear of the unit, onto Abertonllwyd Street. Evidence of deposited silt and debris outside the commercial property and along the highway is shown in Figure 5, indicative of the pathways of flooding during the event.

Figure 5: Evidence of deposited silt and debris outside the impacted commercial unit at Abertonllwyd Street (captured by RCT's FRM team on 24 November 2024).

Surface water flows were also observed by on-site investigating officers as entering the investigation area from the west from Rhigos Road. CCTV footage from the commercial unit at Abertonllwyd Street (shown in Figure 6) depicts the exceedance flows from 'Culvert Inlet 1' conveying through the property, in addition to flows conveying from further up the catchment along Rhigos Road at approximately 06:00 on Sunday 24 November 2024.

An inspection of the drainage features along Rhigos Road and the hillside above the investigation area identified three culvert inlets (labelled 'Culvert Inlet 2-4' in Figure 3), located along the A4061 Rhigos Road, showing evidence of surcharging during the storm event.

Figure 6: CCTV footage showing evidence of flooding along Abertonllwyd Street at 06:05 on 24 November 2024 (image received from business owner).

'Culvert Inlet 2' situated upstream of 'Culvert Inlet 1' was observed as surcharging during post event inspections (shown in Figure 7). The inlet showed evidence of blockage caused by fly-tipping material and was still surcharging during the site visit (on 27 November 2024). This inlet is considered to have surcharged during Storm Bert. Based on the topography of the channel and surrounding area, exceedance flows from 'Culvert Inlet 2' are considered to have overtopped the inlet structure and entered the downstream channel towards 'Culvert Inlet 1', exacerbating the surcharging at this location.

Figure 7: Image of 'Culvert Inlet 2' surcharging and evidence of fly-tipping material in the surrounding area (captured by RCT's Flood Risk Management team on 27 November 2024).

Further up the A4061 Rhigos Road, ‘Culvert Inlet 3’ and ‘Culvert Inlet 4’ both showed evidence of surcharging during post event inspections. Flattened grass and deposited debris (consisting primarily of stonewash) surrounding the inlet structures was indicative of the pathway of flooding during the storm event (depicted in Figure 8). Scouring to the highway verge along Rhigos Road as a result of the mobilised debris (shown in Figure 9) was also identified during post event inspections.

The pathway of flooding from ‘Culvert Inlet 3’ and ‘4’ contributed to the flows from ‘Culvert Inlet 1’ and ‘2’ which travelled onwards towards the lower reaches of FIA 25, impacting 39 properties.

Figure 8: Evidence of flattened grass and sandbags to redirect flow at 'Culvert Inlet 3' (left) and stonewash debris in the surrounding area of ‘Culvert Inlet 4’ (captured by RCT’s Flood Risk Management team on 27 November 2024).

Figure 9: Evidence of scoring to the highway verge as a result of mobilised debris during the storm event (captured by RCT’s Flood Risk Management team on 27 November 2024).

Post event inspections and resident accounts also identified significant overland flows to be conveying down the steep areas of hillside above Rhigos Road and onto the highway network. These areas of hillside comprise of both open farmland fields and areas of woodland. According to on-site officers, overland flows conveying down the hillsides were still present at approximately 15:00 on Sunday 24 November, following the peak of the storm (depicted in Figure 10). Overland flows from the steep hillsides are considered to have contributed to the ordinary watercourse flooding conveying along Rhigos Road towards Abertonllwyd Street.

Figure 10: Surface water flows conveying overland from the steep area of hillside above Rhigos Road (image captured by a Council officer at 15:00 24 November 2024).

The combination of surface water and ordinary watercourse flows along Rhigos Road and Abertonllwyd Street conveyed towards Hill Street, where 6 residential properties were impacted internally, primarily from the front. Flood water continued its flow path towards the rear lane behind properties along Abertonllwyd Street and onwards towards Glenrhondda Court and Dunraven Street. The accumulation of surface water and ordinary watercourse flows at Dunraven Street is depicted in Figure 11 (left),

which was provided by a resident, and shows depths of up to 1 metre in height occurred in the lower regions of the investigation area.

Eighteen residential and one non-residential property at Dunraven Street were impacted by the accumulation of surface water and ordinary watercourse flows during the storm event. Thirteen residential properties along Abertonllwyd were also impacted internally as a result of this flow path and accumulation of water. Residents at Abertonllwyd Street reported 4 feet of water within the basements and rear gardens of their properties as a result of the pooling of water at Dunraven Street and the rear lane behind their properties (depicted in Figure 11 (right)).

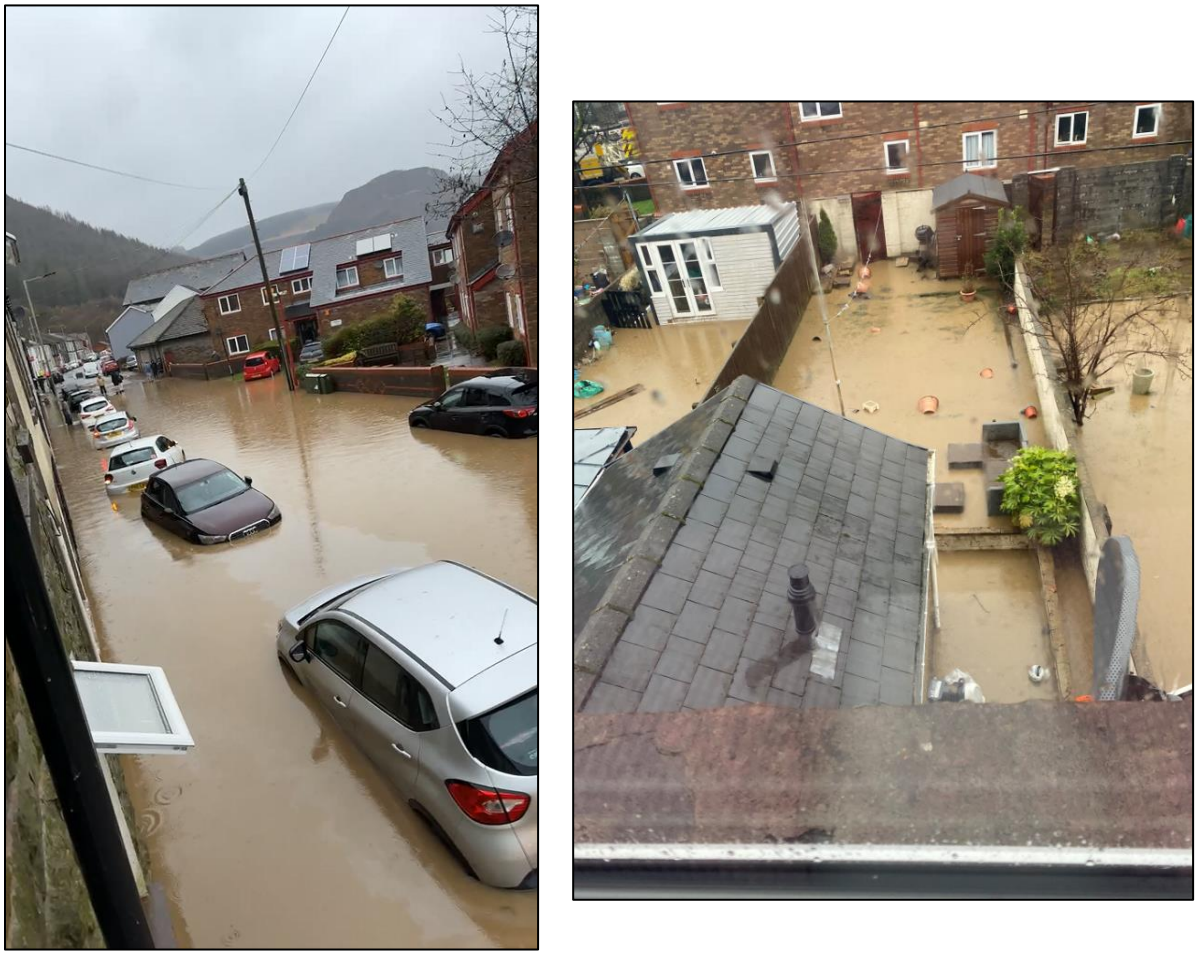

Figure 11: Image of flooding at Dunraven Street (left) and to the rear gardens and basements of properties at Abertonllwyd Street (right) during Stom Bert (images provided by residents).

Exceedance flows travelling along the highway network and depositing debris and silt were also observed by residents to have overwhelmed the highway drainage infrastructure across the investigation area, contributing to the flooding of properties.

2.3. RAINFALL ANALYSIS

See RCT's 'Storm Bert November 2024 – Overview Report'[3], for a detailed analysis of the rainfall and ordinary watercourse response.

3. POSSIBLE CAUSES

The below sections describe the possible causes of flooding that occurred within FIA 25 during Storm Bert.

3.1. CULVERT CONDITIONS

Within FIA 25 there are unnamed ordinary watercourses which drain the hillsides to the north and east of investigation area and discharge into the Rhondda Fawr River. Many of these watercourses are culverted beneath Treherbert's urban settlements. The known culverted watercourse networks present in FIA 25 are shown in Figure 12.

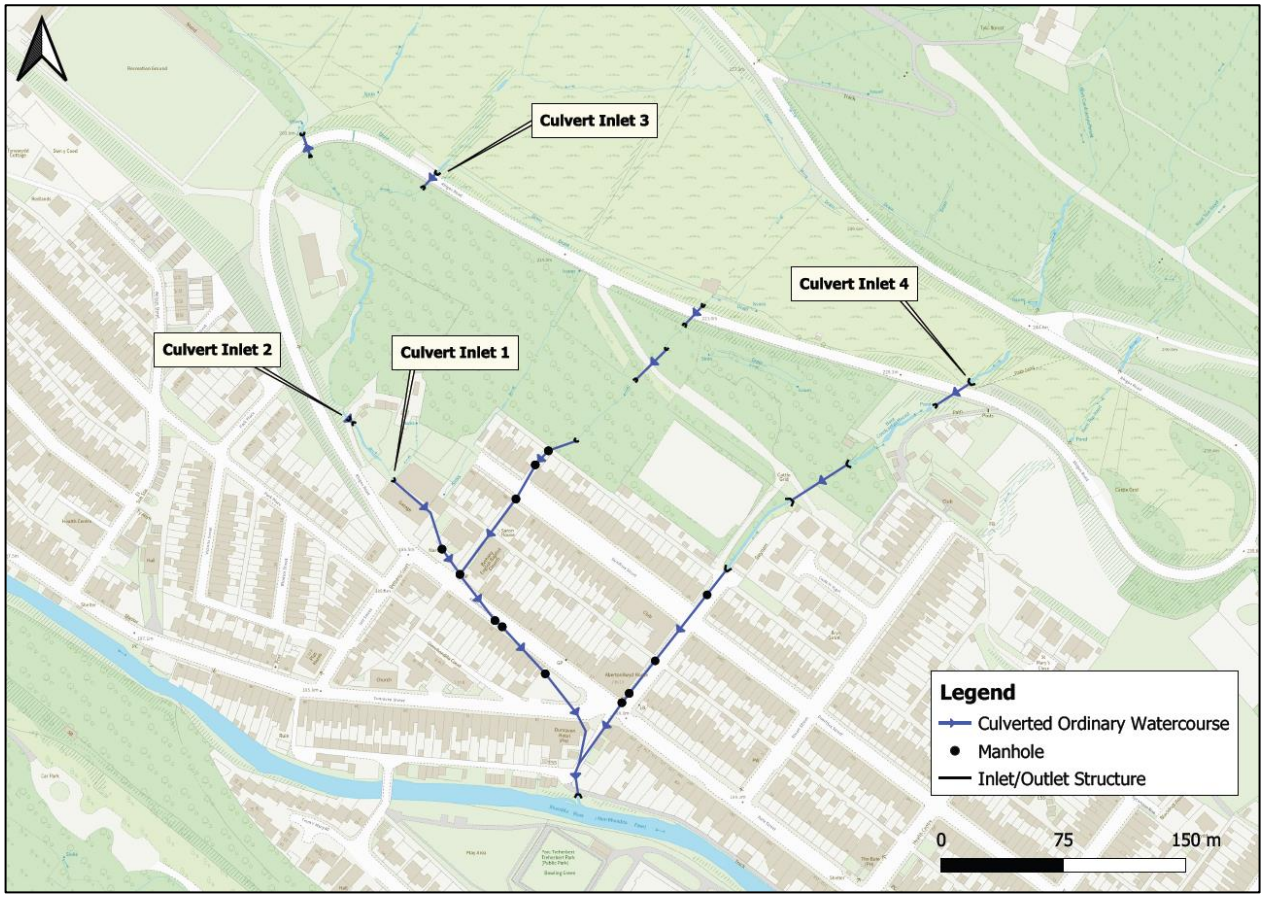

Figure 12: Culverted ordinary watercourse networks within FIA 25.

CCTV survey inspections of the culverted watercourse networks identified as possible sources of flooding have been undertaken since Storm Bert to assess their condition and help determine whether they served as a contributing factor to the flooding at FIA 25.

It should be noted that the survey reported in this section was undertaken post flood event. It's not possible to say what debris identified in the survey was mobilised and deposited as a result of the storm event and what had been deposited by previous events. As such, the following should be considered to be reflective of the asset condition at the end of the storm event and may not be necessarily reflective of the condition of the assets prior to the onset of the storm event.

As noted in Section 2.2, 'Culvert Inlet 1' was identified as the primary source of flooding to 39 properties within the investigation area. 'Culvert Inlet 1', depicted in Figure 13, is a privately owned asset and comprises of a shallow informal box structure which conveys beneath a commercial unit before entering a culvert network. 'Culvert Inlet 1' is not a traditional inlet structure and is considered inadequate to manage the flows entering the network.

Figure 13: Image of 'Culvert Inlet 1' prior to the storm event.

Defects including displaced bricks, cracks and some minor settled deposits were identified in sections of the culvert network downstream of ‘Culvert Inlet 1’ during surveying operations. These defects are considered to have impacted the culvert’s cross-sectional area to manage the ordinary watercourse flows entering the network however, the condition of the culvert network has not been determined as the primary cause of surcharge at ‘Culvert Inlet 1’. The hydraulic capacity of ‘Culvert Inlet 1’ has been deemed the primary cause of surcharge. This has been discussed in Section 3.2.

‘Culvert Inlet 2’, also identified as a privately owned asset, was identified during post event inspections to be in poor condition, with debris and fly tipping material identified within the surrounding area (as shown in Figure 7). It was reported by the Council’s Highway and Streetcare Depot that the identified fly tipping material was removed from the downstream watercourse, as opposed to the inlet structure, during the storm event. Based on the available evidence, it is considered that the identified fly tipping material influenced ‘Culvert Inlet 2’’s ability to manage flows, contributing to its surcharging, in addition to causing an obstruction to the watercourse upstream of ‘Culvert Inlet 1’.

‘Culvert Inlet 3’ showed evidence of blockage to the debris screen upstream of the inlet entrance, as shown in Figure 14. This debris consisted largely of stonewash and natural material. The entrance to the inlet is set approximately a metre lower than the debris screen and was free of obstruction during post event inspections. The blockage at the upper debris screen is considered to have contributed to the overtopping of the incoming watercourse, bypassing the inlet structure, resulting in exceedance flows conveying through a gap in the retaining wall and onwards to impact the investigation area. While the culvert network and inlet are maintained by the Council’s Highway and Streetcare department, the incoming channel and debris screen are located on privately owned land.

Figure 14: Evidence of blockage caused by stonewash to the upper debris screen associated to 'Culvert Inlet 3' (captured by RCT's Flood Risk Management team on 27 November 2024).

'Culvert Inlet 4', which conveys beneath the highway and falls under private ownership, was also assessed as being impacted by a blockage caused by mobilised debris during the storm event. Post event inspections of the inlet identified debris consisting of stonewash, silt and woody debris present along the surrounding embankments (as shown in Figure 8 above (right)). This material was removed from the inlet following emergency clearance works undertaken by the Council's Highway and Streetcare Depot during the storm event. The blockage caused by the mobilised debris is considered to have obstructed the inlet and restricted its ability to manage ordinary watercourse flows, resulting in surcharge and flooding downstream.

3.2. CULVERT CAPACITY

An assessment of the hydraulic capacity of the culverted watercourse networks identified as sources of flooding within FIA 25 during Storm Bert has been undertaken to ascertain its current standard of protection in free-flowing conditions. The results of the inlet capacity assessments are summarised in Table 6 below (refer to Figure 12 for culvert labels).

Table 6: Culvert inlet capacity assessment results which indicate the current standard of protection of the culvert networks in free-flowing condition in FIA 05.

Culvert Network	Current Standard of Protection – Free Flowing
Culvert Inlet 1	<Q2 (50% AEP)
Culvert Inlet 2	<Q2 (50% AEP)
Culvert Inlet 3	<Q100 (1% AEP) + 40% climate change
Culvert Inlet 4	<Q100 (1% AEP) + 40% climate change

The results infer that the drainage infrastructure associated to 'Culvert Inlet 1' and '2' does not provide an adequate standard of protection, as defined by CIRIA C786F[7]. On review of the culvert capacity assessment, it is considered that both inlets surcharged primarily due to hydraulic overload. It is also considered that the debris identified and removed by Council operatives downstream of 'Culvert Inlet 2' contributed to the surcharging at this location.

'Culvert Inlet 3' and '4' are assessed as having a standard of protection up to 1 in 100 annual probability flood event (Q100) plus 40% climate change allowance. This is in accordance with current design standards, as defined by CIRIA C786F. On review of

[7] CIRIA Culvert, Screen and Outfall Manual (C786F)

the condition of both inlets post storm event, it is considered that the blockages identified at both structures reduced the capacity of both inlets to manage the flow of water, resulting in their overtopping.

3.3. ORDINARY WATERCOURSE CONDITIONS

Several sections of open watercourses which drain the steep hillsides to the north and east of FIA 25 are identified to flow through the investigation area and discharge into the River Rhondda Fawr, as illustrated in Figure 15. The named watercourse entering the investigation area is the Nantcoedcaetylefforest (highlighted red in Figure 15).

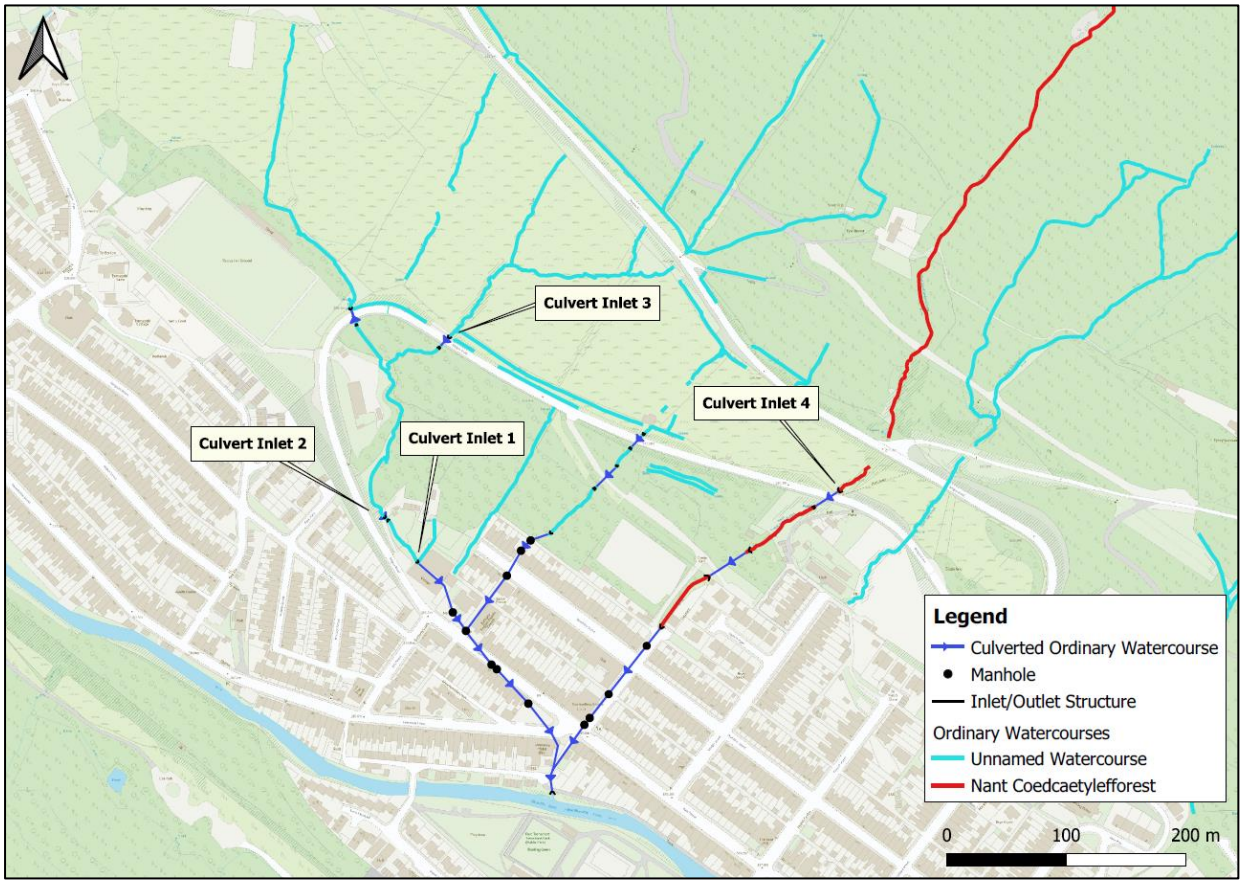

Figure 15: Map of open ordinary watercourses within FIA 25.

Following the storm event, RCT Flood Risk Management officers carried out a site walk-over assessment, where possible, of the ordinary watercourses identified as sources of flooding to assess the condition of the watercourses for any signs of overtopping, evidence of scour and any land movement of the hillsides.

On review of the unnamed open watercourse conditions between ‘Culvert Inlet 1’ and ‘2’, the watercourse appeared to be largely undefined, with dense vegetation restricting on-site inspections. Evidence of flattened grass and saturated ground (shown in Figure 16) indicated that significant flows had occurred during the event. As discussed in Section 3.1, fly tipping material within the channel had been removed during the storm event by the Council. This material is considered to have caused an obstruction to the watercourse during the storm event, contributing to the surcharging of both inlets.

Figure 16: Ordinary watercourse channel upstream of 'Culvert Inlet 1' (captured by RCT’s Flood Risk Management team on 27 November 2024).

The upper debris screen above ‘Culvert Inlet 3’ was identified during post event inspections as blocked with debris, largely consisting of stonewash and natural material. This debris was also identified with the upstream channel (as shown in Figure 17) and is considered to have become mobilised by the high flows during the event,

contributing to the blockage to the upper debris screen (shown in Figure 17) of ‘Culvert Inlet 3’.

Figure 17: Image of the unnamed watercourse conditions upstream of 'Culvert Inlet 3' (captured by RCT’s Flood Risk Management team on 27 November 2024).

‘Culver Inlet 4’, associated to the Nant Coedcaetylefforest, was identified as blocked with debris, consisting of stonewash, silt and woody debris, during the event. The obstruction has been identified as the primary cause of flooding to the inlet.

The Nant Coedcaetylefforest rises steeply from the town of Treherbert and the area immediately above ‘Culvert Inlet 4’ is comprised of land used predominately for grazing of livestock. Within this reach, bed incision has created a small V-shaped valley within the hillside. The channel is extremely steep, and the substrate is coarse, comprising of angular cobbles and gravels which has the potential to be transported during high flow energy. Figure 18 depicts the steepness of the channel above ‘Culvert Inlet 4’ and shows evidence of coarse stone and silt material that is considered to have been

mobilised and carried downstream towards the inlet by high flows during the storm event.

Figure 18: Image of the Nant Coedcaetylefforest watercourse looking upstream from 'Culvert Inlet 4' (image captured by RCT's Flood Risk Management team on 27 November 2024).

The upper valley reaches of the Nant Coedcaetylefforest are within a steep forested area, with dense vegetation surrounding the channels. The morphology of the valley is characteristic of a cobble cascade, meaning that active bank erosion and bed incision is present, resulting in both coarse and fine sediments feeding into the channel. Areas of embankment scouring and debris deposition throughout the channel was observed during site investigations (shown in Figure 19), further indicative of the high flows conveying down the steep catchment and mobilising scour material towards the investigation area during Storm Bert.

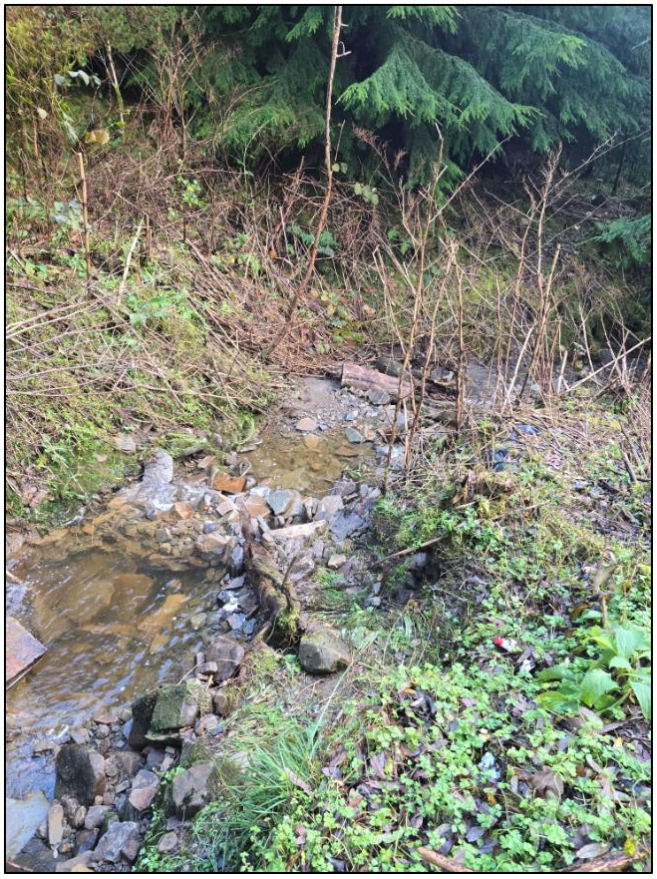

Figure 19: Evidence of minor embankment scouring and deposition of cobbles and stones within the upper reaches of the Nant Coedcaetylefforest (image captured by RCT's Flood Risk Management team on 27 November 2024.

It should be noted that parts of the forested area above FIA 25 have been felled in recent years. The area in which tree felling has occurred forms part of the Welsh Government Woodland Estate (WGWE) which is owned by the Welsh Government and managed by NRW.

Evidence of woody debris inclusive of loose branches and twigs were observed within the channel and along the embankments however, this type of debris is expected based on the morphology of the channel and the forested catchment above. The inspected drainage features associated to the WGWE showed minor evidence of obstruction caused by this type of debris however this was not substantial and did not indicate previous surcharging during the storm event.

Whilst forests and woodland can have an impact of flooding, for example, trees intercept rainfall and typically produce less runoff than other land uses such as farms and grasslands, it is difficult to determine the exact impact of woodland felling on overland and groundwater flow routes. The evidence presented within this report does not indicate that tree felling in the area contributed to the blockage of ‘Culvert Inlet 4’ nor the surcharging of the impacted culverts within FIA 25.

The delivery of sediment and stone towards the investigation area during Storm Bert has primarily been attributed to natural erosional processes associated with an extreme flood event which is exacerbated by the steep slope profiles of the ordinary watercourse flowing towards Treherbert which produce faster velocities and increased sheer stresses.

3.4. MAIN RIVER

The designated main River Rhondda Fawr flows through the village of Treherbert (Figure 1), to the south of the investigation area.

The hydrograph in Figure 20 illustrates the rapid rise in levels of the River Rhondda Fawr in response to rainfall between the 23 and 25 November 2024, captured at NRW's Tynewydd station. The River Rhondda Fawr at Tynewydd reached its highest peak recorded at approximately 06:30 on 24 November 2024, reaching 1.714 metres.

The green bar displayed on the hydrograph shows the typical level of the River Rhondda at Tynewydd, ranging between approximately 0.1 and 0.45 metres. At its peak, the River Rhondda Fawr was almost 4 times higher than its average level.

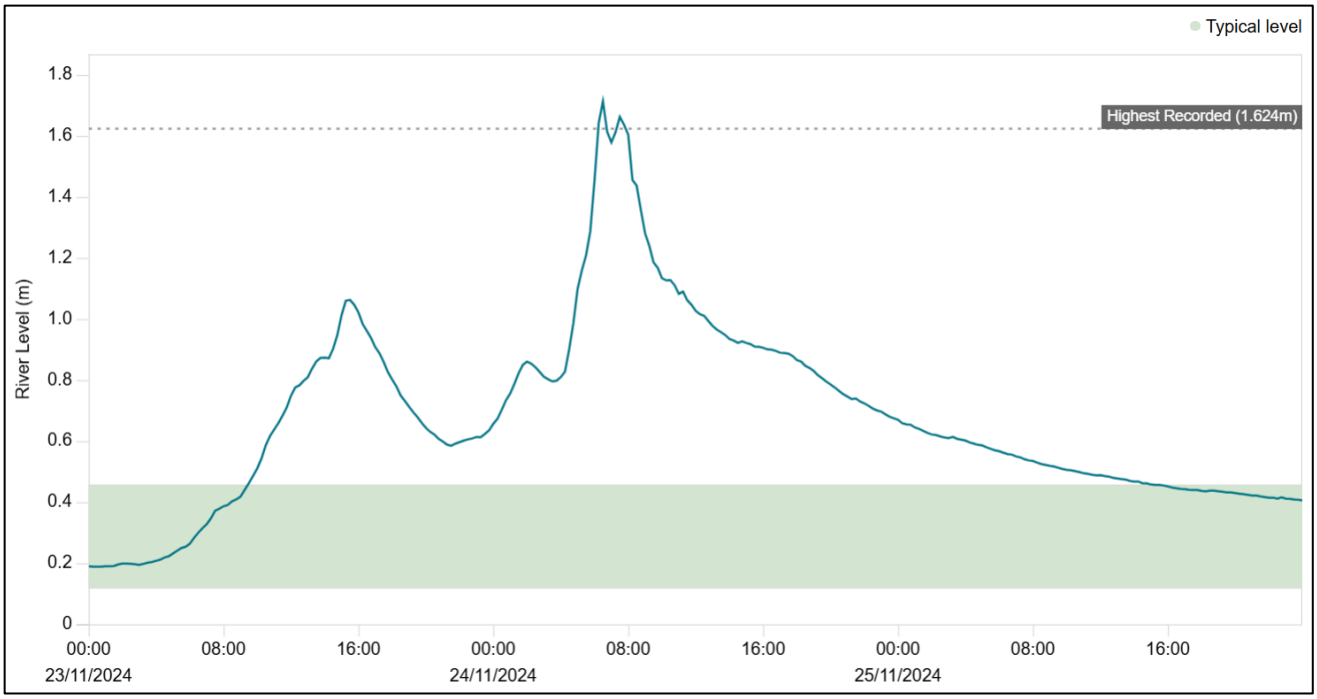

Figure 20: The River Rhondda Fawr levels at Tynewydd station between 23 and 25 November 2024 (Natural Resources Wales).

There is no evidence from this investigation to suggest that the River Rhondda Fawr significantly contributed to the recorded flooding of properties in FIA 25 during Storm

Bert, however, based on the record-breaking levels recorded within the River Rhondda Fawr during the storm event, it is considered likely that the outfall conditions of the culverted ordinary watercourse, surface water and sewer structures were influenced by the high levels. There is limited evidence to outline this interaction, however.

3.5. HIGHWAY DRAINAGE CONDITIONS

Surface water runoff and pooling of water along the highway was reported by residents and identified by on-site officers across the investigation area, however, there is no evidence to suggest that the condition of the highway drainage within FIA 25 significantly contributed to the flooding of properties. The highway drainage infrastructure was overwhelmed by intense rainfall and subsequent surface water flows, in addition to ordinary watercourse flooding associated to the surcharging of culvert inlets, which led to the accumulation of standing water entering properties within the lower reaches of the investigation area.

Evidence of flood water and deposited silt and debris as a result of the surface water and ordinary watercourse flows are depicted in Figure 21 and 22. These sediments and debris are considered to have entered the highway drainage system, leading to blockages and a reduction in the hydraulic capacity of the surface water network.

Figure 21: Evidence of silt deposited and blocked highway gullies along Hill Street (captured by RCT's Flood Risk Management officers on 24/11/2024).

Figure 22: Evidence of silt and debris deposited across the lane behind properties at Abertonllwyd Street (captured by RCT's Flood Risk Management officers on 25/11/2024).

Highway drainage is not designed to manage overland flows from private areas, parks or open space. In this instance, the capacity of the highway drainage in FIA 25 was exceeded as a result of the substantial ordinary watercourse and surface water flows, the associated settling of deposits, but also the sheer intensity of rainfall during Storm Bert entering the network. The maintenance condition of the highway drainage infrastructure is not considered to have significantly impacted the flooding experienced at FIA 25 during Storm Bert.

3.6. DCWW Apparatus

There is no evidence from this investigation that DCWW apparatus contributed to the flooding that occurred during Storm Bert within investigation area FIA 25.

DCWW reported no issues within FIA 25 during Storm Bert and it is not believed that any DCWW infrastructure was damaged during the storm event.

3.7. SURFACE WATER

Due to the steepness of the hillsides above Treherbert, the delivery of overland and ordinary watercourse flows towards the investigation area are accelerated, meaning the catchment will respond rapidly to rainfall. As a result, surface water flooding generated by intense rainfall and ordinary watercourse flows that overwhelmed culvert inlets has been determined as a contributing source of flooding to properties within the lower reaches of the investigation area where water naturally accumulates.

On review of NRW's national surface water and ordinary ("small") watercourse flood map (Figure 23), the extent of flooding from these sources is significant and correlates with the observed overland flow paths and areas of surface water accumulation during Storm Bert (particurarly along Dunraven Street and Hill Street).

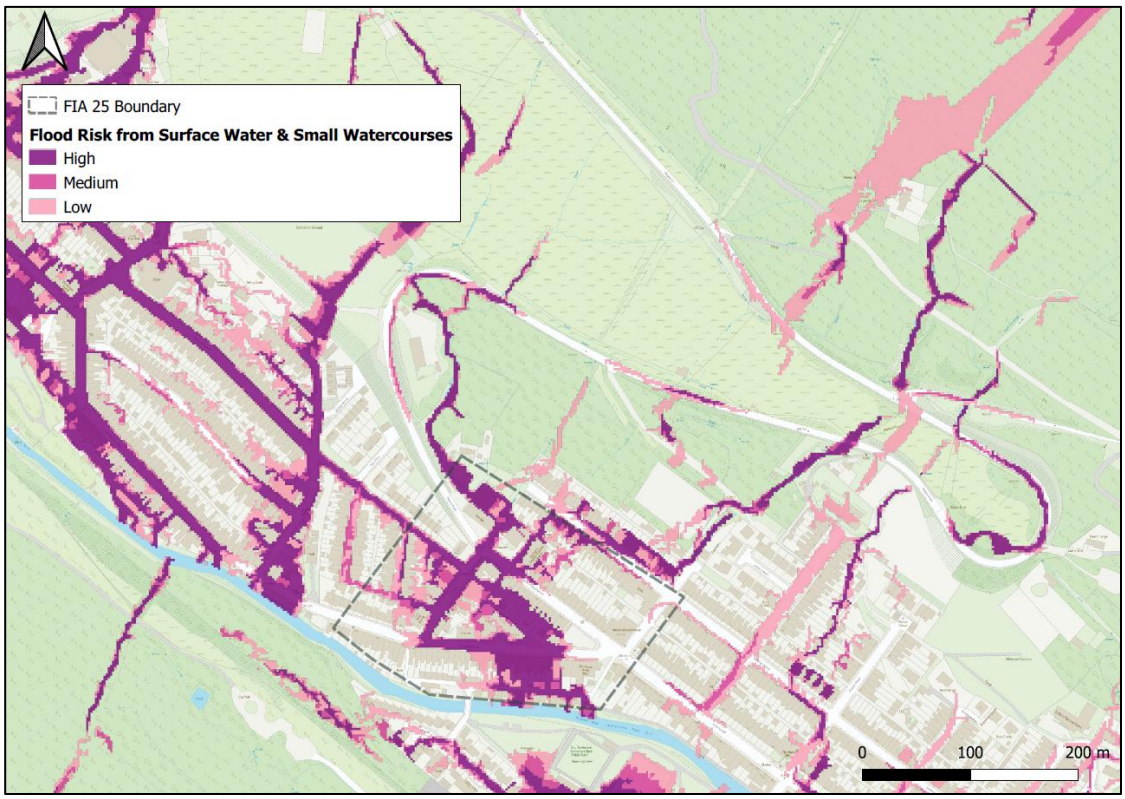

Figure 23: NRW's FRAW map for Surface Water and Ordinary Watercourse flood risk at FIA 25. Natural Resources Wales data.

3.8. SUMMARY OF POSSIBLE CAUSES

The above sections have identified and described the possible causes of flooding within FIA 25 during Storm Bert. A summary of the identified sources and possible causes of flooding (issue) have been outlined below in Table 7.

Table 7: Summary of the source(s) and possible cause(s) of flooding in FIA 25 during Storm Bert.

Ref Nr	Asset (Source)	Issue	Asset Owner	Type of Flooding
1	Culvert Inlet 1	The culvert inlet surcharged during the storm event after becoming hydraulically overwhelmed. Exceedance flows conveyed towards Abertonllwyd Street, Hill Street and Dunraven Street, contributing to the internal flooding to 39 properties. The poor condition of the culvert inlet and the hydraulic capacity of the downstream culvert network is considered to have contributed to the surcharging of the inlet.	Private Landowner	Ordinary Watercourse
2	Culvert Inlet 2	The culvert inlet surcharged during the storm event after becoming hydraulically overwhelmed. Exceedance flows conveyed towards Abertonllwyd Street, Hill Street and Dunraven Street, contributing to the internal flooding to 39 properties. Obstructions to the downstream watercourse caused by fly tipping material is considered to have	Private Landowner	Ordinary Watercourse

Ref Nr	Asset (Source)	Issue	Asset Owner	Type of Flooding
		contributed to the surcharging of the inlet.		
3	Upper Debris Screen (Culvert Inlet 3)	The upper debris screen above 'Culvert Inlet 3' (located on private land) was blocked with debris causing the associated watercourse to bypass the inlet, overtop and convey towards Abertonllwyd Street, Hill Street and Dunraven Street, contributing to the internal flooding to 39 properties.	Private Landowner	Ordinary Watercourse
4	Culvert Inlet 4	The culvert inlet surcharged during the storm event after becoming blocked with debris mobilised from the upper catchment. Exceedance flows conveyed towards Abertonllwyd Street, Hill Street and Dunraven Street, contributing to the internal flooding to 39 properties.	Private Landowner	Ordinary Watercourse
5	Surface water drainage network across FIA 25	Intense rainfall across FIA 25 combined with the surcharging of two culvert inlets, resulted in the accumulation of surface water on several streets throughout the investigation area.	RCTCBC Highway Authority	Surface Water

4. Risk Management Authority Functions

4.1. Risk Management Authorities and their Functions

The term 'Risk Management Authority' refers to the organisation(s) that have legislative powers concerning flood risk management. Risk Management Authorities (RMA) across Wales include NRW, the 22 Local Authorities as Lead Local Flood Authority (LLFA) and highway authority, water companies, and the Welsh Government as highway authority for trunk roads. Each RMA is required to fulfil a number of statutory duties, as defined under the FWMA. In addition to these statutory duties, the Act sets out a range of permissive powers for RMAs, enabling them to undertake defined activities if they so wish.

RCTCBC work in partnership with those organisations to investigate and manage flood risk. Whilst RCTCBC as the LLFA has a duty to investigate flood incidents in its area, it may be the responsibility of another RMA, or land/property owner, to take actions to resolve an issue.

Table 8 summarises which RMAs are primarily responsible for managing flood risk dependent on the type of flooding.

Further information pertaining to the roles and responsibilities of each individual RMA to manage flood risk is described in Section 5 of RCTCBC's Local Flood Risk Management Strategy and Action Plan[4].

Table 8: Risk Management Authorities responsible for managing different types of flooding in RCT.

Source of Flooding	Lead Local Flood Authority	Natural Resources Wales	Water Company	Highway Authority	South Wales Trunk Road Agency (Trunk Roads & Motorway)
Main River		✓			
Surface Water	✓			✓ (on or coming from the Highway)	✓ (on or coming from the Highway (Trunk Roads & Motorway)
Ordinary Watercourse	✓				
Groundwater	✓				
Sewer Flooding			✓		
Reservoirs		✓			

Risk Management Authorities have direct flood risk management functions under the Flood and Water Management Act 2010, as well as the Land Drainage Act 1991 and the Highways Act 1980. Through analysis of the flooding that impacted FIA 25, the flood risk management functions exercised or proposed to be exercised by relevant RMAs was recorded in pursuant to Section 19 of the Flood and Water Management Act 2010, which states;

“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 the response to the flood."

Through the investigation process, the source(s) and possible causes of flooding in FIA 25 as a result of Storm Bert have been previously identified and summarised within Table 7. The RMAs responsible for managing that flooding have been determined in Table 9.

Table 9: Risk Management Authorities identified in response to the source(s) of flooding in FIA 25 (as per Table 7).

Ref Nr	Asset (Source)	Asset Owner	Type of Flooding	RMA responsible for managing risk
1	Culvert Inlet 1	Private Landowner	Ordinary Watercourse	LLFA
2	Culvert Inlet 2	Private Landowner	Ordinary Watercourse	LLFA
3	Upper Debris Screen (Culvert Inlet 3)	Private Landowner	Ordinary Watercourse	LLFA
4	Culvert Inlet 4	Private Landowner	Ordinary Watercourse	LLFA
5	Surface water drainage network across FIA 25	RCTCBC Highway Authority	Surface Water	Highway Authority and LLFA

4.2. Lead Local Flood Authority

In review of Ref 1-5 in Table 9, the LLFA have been identified as the relevant Risk Management Authority in relation to the ordinary watercourse and surface water flooding which occurred across FIA 25 during Storm Bert.

The LLFA exercised the following functions in response to the flooding at FIA 25:

- Officers investigated the initial flooding and have produced this report in line with Section 19 of the Flood and Water Management Act 2010.
- Officers contacted residents affected by flooding to offer support and advice to assist in the recovery following the event.
- A public engagement exercise was carried out by the LLFA in order to gain further local insight and anecdotal evidence to support the flood investigation.
- The LLFA has exercised its powers, under Section 13 of the FWMA, to request information and co-operation from the relevant Risk Management Authorities (NRW and DCWW) in relation to their responsibilities as RMAs in response to Storm Bert.
- The LLFA have exercised their permissive powers under Section 64 of the Land Drainage Act 1991 to investigate the condition of culvert structures, network conditions, ordinary watercourse conditions and surface water drainage arrangements to determine their impacts on the flooding within the investigation area.
- An estimated 1,152 metres of culverted ordinary watercourse and surface water drainage network length within FIA 25 has been surveyed following the event to ascertain both the operational condition of the network, and its structural integrity along sections of the network.

- An estimated 26 tonnes of material and debris was removed from the culvert inlet structures, networks and surface water drainage networks within RCT25 during jetting and cleansing operations.
- In review of Ref 1-3, the LLFA have initiated engagement with riparian landowners to ensure the ordinary watercourse infrastructure is free flowing and unobstructed.
- The LLFA has developed a revised "Flood Response Protocol", designed to pro-actively determine the agreed requisite response and resource levels related to potential storm events.
- The Council's central Control Room, which was established following Storm Dennis, was in operation during Storm Bert to provide a comprehensive and informed response to the residents of RCT as appropriate during storm events, and to accommodate multi departmental / agency meetings where required.
- The Council introduced a Community Flood Recovery Grant (Hardship Payment) programme, with support from the Welsh Government, to provide financial assistance to residents who were subjected to internal flooding as a result of Storm Bert.
- The LLFA, working alongside the Council's Prosperity & Development Directorate, supported businesses impacted by Storm Bert by establishing a Flood Recovery Grant and Flood Resilience Grant, providing financial assistance during the recovery phase and longer-term measures to enhance resilience against future events.
- The LLFA have expanded their interim Property Flood Resistance project offering expandable flood gates to those residential properties who have suffered repeat flooding from the main river during Storm Dennis and Bert.
- The LLFA have completed the development of an Outline Business Case (OBC) to deliver a Flood Alleviation Scheme in the Treherbert area, to manage the risk of ordinary watercourse and surface water flooding.

The LLFA also propose to exercise the following functions in response to the flooding at FIA 25:

- Following a review of Met Office and NRW warning systems and their effectiveness when applied to localised weather events, the Council will establish internal trigger levels for extreme weather to provide a more robust warning and informing arrangement and improve the Council's standby protocol.
- The LLFA will engage with landowners and property owners to provide advice and guidance to help make them aware of their personal flood risk from local sources, and the options available to improve flood resilience.
- The LLFA will continue to engage with riparian landowners and regulate the ordinary watercourse infrastructure to ensure the infrastructure is free flowing and unobstructed.
- The LLFA have applied for funding from the Welsh Government to develop a Full Business Case (FBC) to carry out detailed design and development of the preferred option for managing the risk of ordinary watercourse and surface water flooding in the Treherbert area.
- The LLFA have received Welsh Government funding under the Resilient Road Fund, to explore the potential to undertake advanced works ahead of the FBC for the area, to reduce the risk of ordinary watercourse and surface water flooding associated to ‘Culvert Inlet 1’ and ‘2’ in the short term.
- The LLFA propose to install remote telemetry monitoring devices at key culvert structures to enable operators to ensure the drainage systems in Treherbert are operating effectively.

4.3. NATURAL RESOURCES WALES

NRW were not identified as a relevant authority in relation to the flooding at FIA 25 during Storm Bert. NRW do not propose to undertake any actions to the event within the investigation area.

4.4. WATER COMPANY

DCWW were not identified as a relevant authority in relation to the flooding at FIA 25 during Storm Bert. DCWW do not propose to undertake any actions to the event within the investigation area.

4.5. HIGHWAY AUTHORITY

In review of Ref 5 in Table 9, The Highway Authority has been identified as the relevant Risk Management Authority in relation to the surface water flooding that occurred along the highway across FIA 25.

RCTCBC as the Highway Authority have exercised the following functions in response to the flooding within FIA 25:

- The Highway Authority assisted with the emergency response during the event by supplying equipment and sandbags, some to individual properties and using sandbags to redirect flood water away from properties.
- The Highway Authority exercised their functions under Section 100 of the Highways Act 1980, to arrange for all gullies and open drains in the highway to be inspected and cleansed following the influx of fluvial flood water to ensure the safety of the highway post event.
- Since Storm Bert, the Highway Authority have sourced and deployed an additional Gulley cleansing vehicle for 6 months annually to increase gulley cleansing activities ahead of winter to improve the resilience of their highway drainage infrastructure to the impacts of heavy rainfall.
- The Highway Authority have undertaken clearance works to the culvert inlet structures and network systems which fall under the responsibility of the Authority.
- The Highway Authority has jetted, cleansed and mapped an estimated 1,152 metres of culverted ordinary watercourse and surface water drainage network length within FIA 25 following Storm Bert to ascertain both the operational condition and structural integrity along sections of the network.

- The Highway Authority have completed a project which involved raising the height of the headwall at ‘Culvert Inlet 3’ to manage the risk of exceedance ordinary watercourse flows conveying onto the highway.

RCTCBC as the Highway Authority propose to undertake the following functions in relation to the storm event at FIA 25:

- The Highway Authority's Pluvial Drainage Team, which was established following Storm Dennis, are to be reviewed and restructured to create increased response and resilience including staff, stores, machinery and materials deployment.

USEFUL LINKS/CONTACTS

Blue Pages – property Resilience - http://bluepages.org.uk/

Flood Re – Flooded Property Insurance Scheme - https://www.floodre.co.uk/

Natural Resources Wales – Check Flood Warnings – Natural Resources Wales / Check flood warnings

Natural Resources Wales – Check your flood risk on a map (Flood Risk Assessment Wales Map) - Natural Resources Wales / Check your flood risk on a map (Flood Risk Assessment Wales Map)

Natural Resources Wales – Sign up to receive flood warnings – Natural Resources Wales / Sign up to receive flood warnings

Rhondda Cynon Taf County Borough Council – Flood Risk Management - Flood Risk Management | Rhondda Cynon Taf County Borough Council