# Investigation Report into Flooding Incident of 3rd September 2016 Varteg Road, Ystalyfera

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# Revision Schedule

| Version | Prepared by | Reviewed by | Approved by | Date |
|---|---|---|---|---|
| **Rev 1** | James Davies (Drainage Officer) | Steve Owen (Highways and Drainage Manager) | Mike Roberts (Head of Streetcare) | February 2017 |

# Contents

# 1. Introduction

An investigation has been undertaken by Neath Port Talbot Council as Lead Local Flood Authority in response to the flooding that occurred at Varteg Road, Ystalyfera on 3rd September 2016. This report is a summary of the investigation and includes relevant information required to meet the statutory requirements placed on the Authority by Section 19 of The Flood and Water Management Act 2010. Information regarding the duties and responsibilities placed on a Lead Local Flood Authority to investigate flooding can be found in Appendix A.

One of the requirements of Section 19 is that an investigation report must identify which Risk Management Authorities (RMA) have relevant flood risk management functions. Appendix B provides a summary of the roles and responsibilities of the RMA's within Neath Port Talbot.

Through the investigation process, it was determined that the relevant RMA's for the flooding that occurred at Varteg Road are:

- NPTCBC as Lead Local Flood Authority
- NPTCBC as Highway Authority
- Dwr Cymru Welsh Water as the water company

In addition, it was found that a number of land owners/developers and those with riparian responsibilities for watercourses are also relevant in this instance.

The flooding of Varteg Road occurred between 18:00hrs and 19:00hrs on Saturday 3rd September 2016 following a period of very intense localised rainfall, which fell on top of a 10 hour period of continuous rain.

Some actions have already been undertaken by NPTCBC to reduce the flood risk in the area, however there remain a number of recommended actions as set out in the report.

# 2. Flood Incident

## 2.1. Location of Flooding

Varteg Road is located in the South of the electoral ward of Ystalyfera which is situated in the upper Swansea valley. The upper Swansea valley is located in the

North West of Neath Port Talbot County Borough.

## 2.2. Rainfall Event

On Saturday 3rd September 2016, there was continuous rainfall across the County Borough between the hours of 08:00 and 21:00. The communities situated in the North West of the authority received the highest levels of rainfall throughout the day.

Between the hours of 08:00 and 18:00, the Authority's emergency out of hours contact centre received very few calls, with no real issues being reported. However at approximately 18:00hrs, intense rainfall fell across the North West of the County Borough causing numerous flooding incidents. Figure 1 below illustrates the levels of rainfall that fell on Ystalyfera throughout the day on 3rd September 2016.

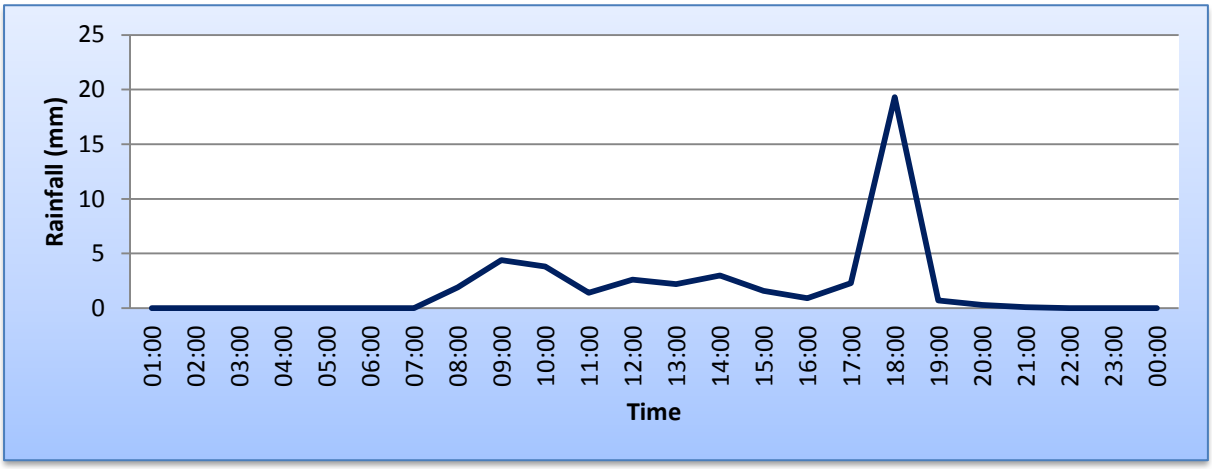


**Figure 1, Rainfall in Ystalyfera on 3rd September 2016 (Rainfall data provided by MetDesk Limited)**

The graph identifies that between 18:00hrs and 19:00hrs the average rate of rainfall in Ystalyfera was approximately 19.3mm/hr. However when studying the five minute rainfall radar over the same period, it was found that the peak rainfall intensity during that hour reached between 50-100mm/hr. A screenshot of the rainfall radar produced by NPTCBC's weather forecasters MetDesk Limited can be seen in Figure 2. The period where the rainfall intensity peaked above 50mm/hr was the time that numerous communities throughout the North West of the County Borough began to suffer from surface water, ordinary watercourse and river flooding. After 19:00hrs the rainfall intensity significantly reduced until it stopped completely by 21:00hrs.

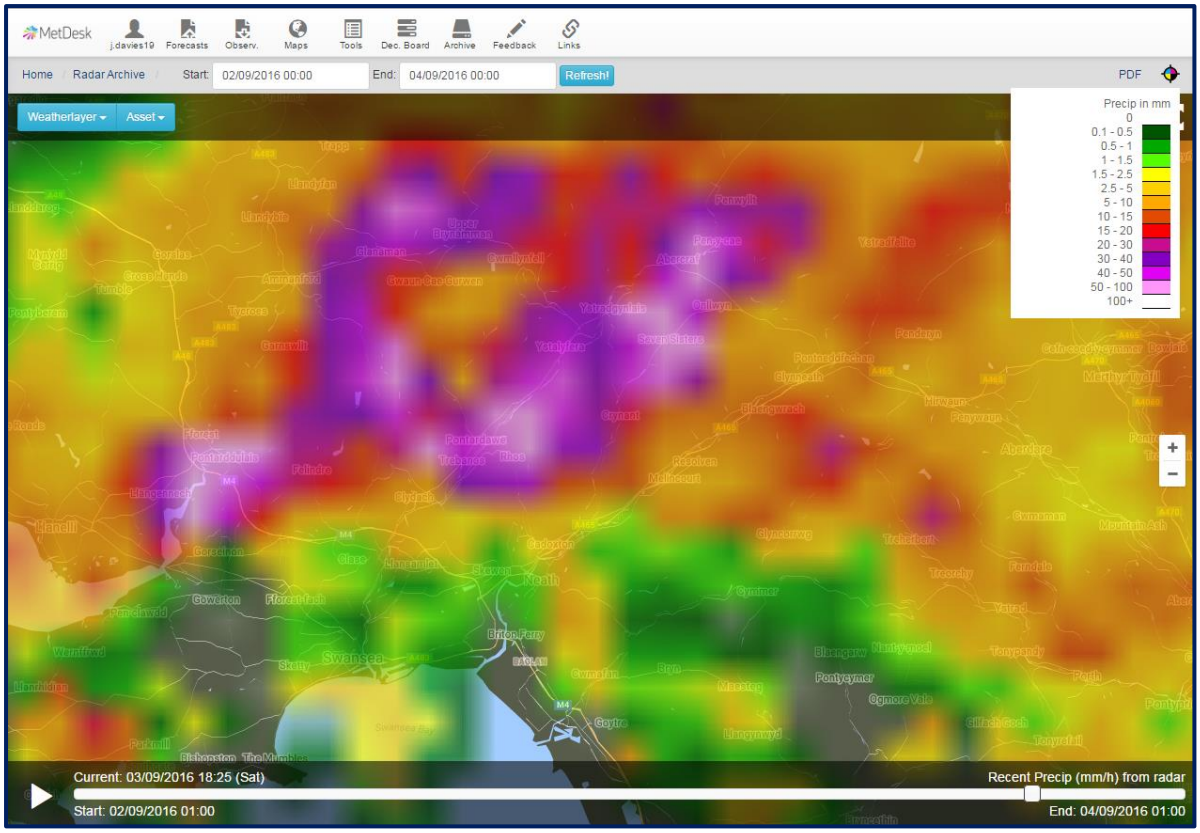


**Figure 2, Screenshot of radar imagery showing precipitation levels at 18:25 on 3rd September 2016 (Provided by MetDesk Limited)**

## 2.3. Flood Extent

A total of 18 properties suffered internal flooding on 3rd September at Varteg Road, with at least 2 more properties experiencing flooding of their gardens. In addition to those affected on Varteg Road, 1 property on Ynysydarren Road suffered internal flooding to an outbuilding. Figure 3 illustrates those properties that were affected as a result of the flooding.


**Figure 3, Properties affected by the flood event on 3rd September 2016**

## 2.4. Site Characteristics

The residential area of Varteg Estate and the immediate surrounding area forms part of the River Tawe flood plain in Ystalyfera. The catchment measures approximately 400m at its widest point and covers an area of circa 10 hectares.

The topography of the area is relatively flat, varying in level between 62.9m and 56.6m above ordnance datum the latter being at its lowest point which is situated around the Varteg Road and Ynysydarren junction. The River Tawe borders the site to the South East with a steep sided hillside and A4067 embankment to the North West. The underlying superficial geology consists of alluvial silts, sands and clays deposited over time by the River Tawe, however little of these soils are exposed due to the hardstanding development that is Varteg Estate.

## 2.5. Drainage Networks and Paths

Figure 4 identifies three separate surface water and land drainage networks in the vicinity of the flooding incident, as identified in the legend.

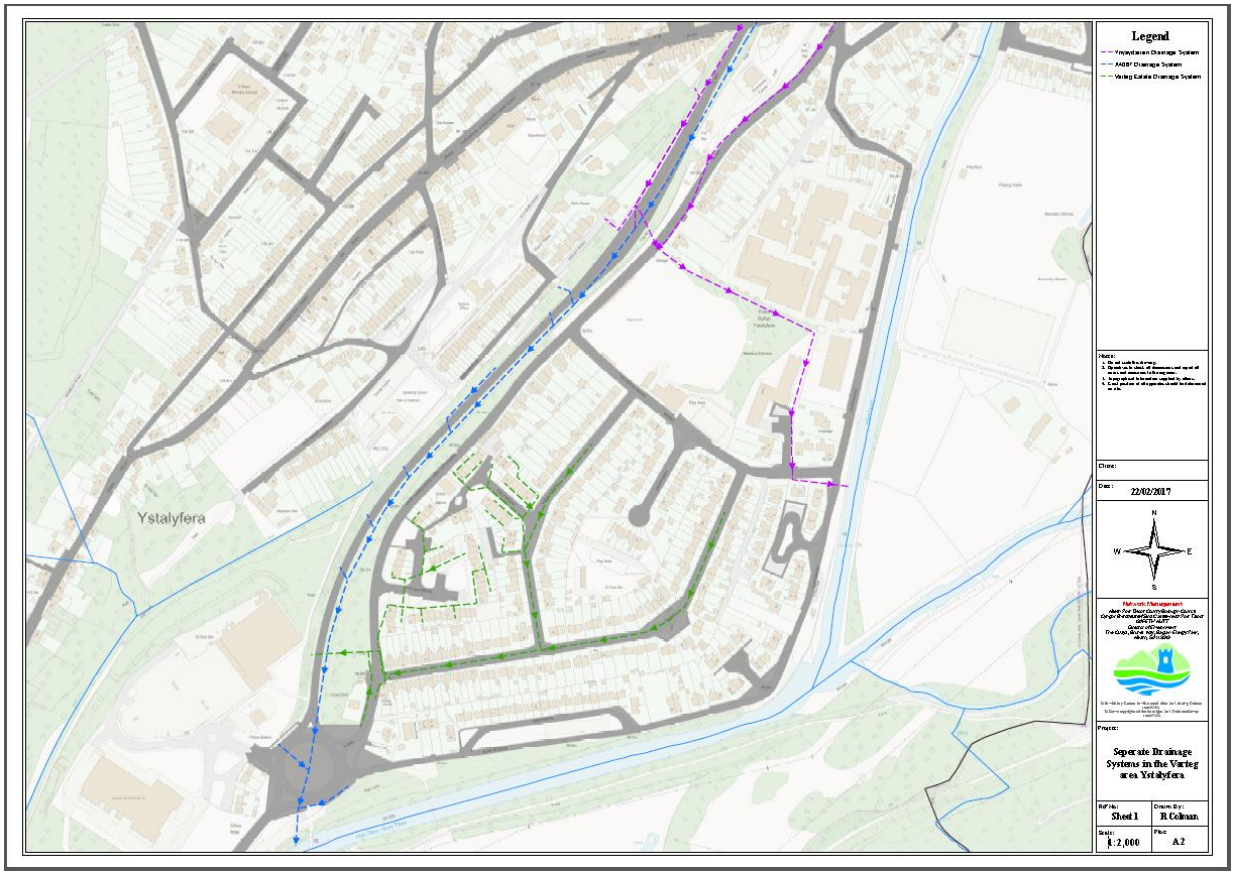


**Figure 4, Map identifying the drainage infrastructure relevant to the flooding at Varteg Road**

**Legend**

- Ynysydarren Drainage System
- A4067 Drainage System
- Varteg Estate Drainage System

(There is also a widespread DCWW sewer network which is fed into a trunk sewer that bisects the catchment, running through the Varteg Road and Ynysydarren Road junction before continuing down the Swansea Valley which is not shown.)

## Varteg Estate

The surface water drainage network in the area is extensive, conveying highway, private residential roof and yard water run-off as well as public surface water to a single point before discharging into a 1.2m diameter culvert which runs under the A4067. (See general flow paths within the estate shown in

Figure 5).

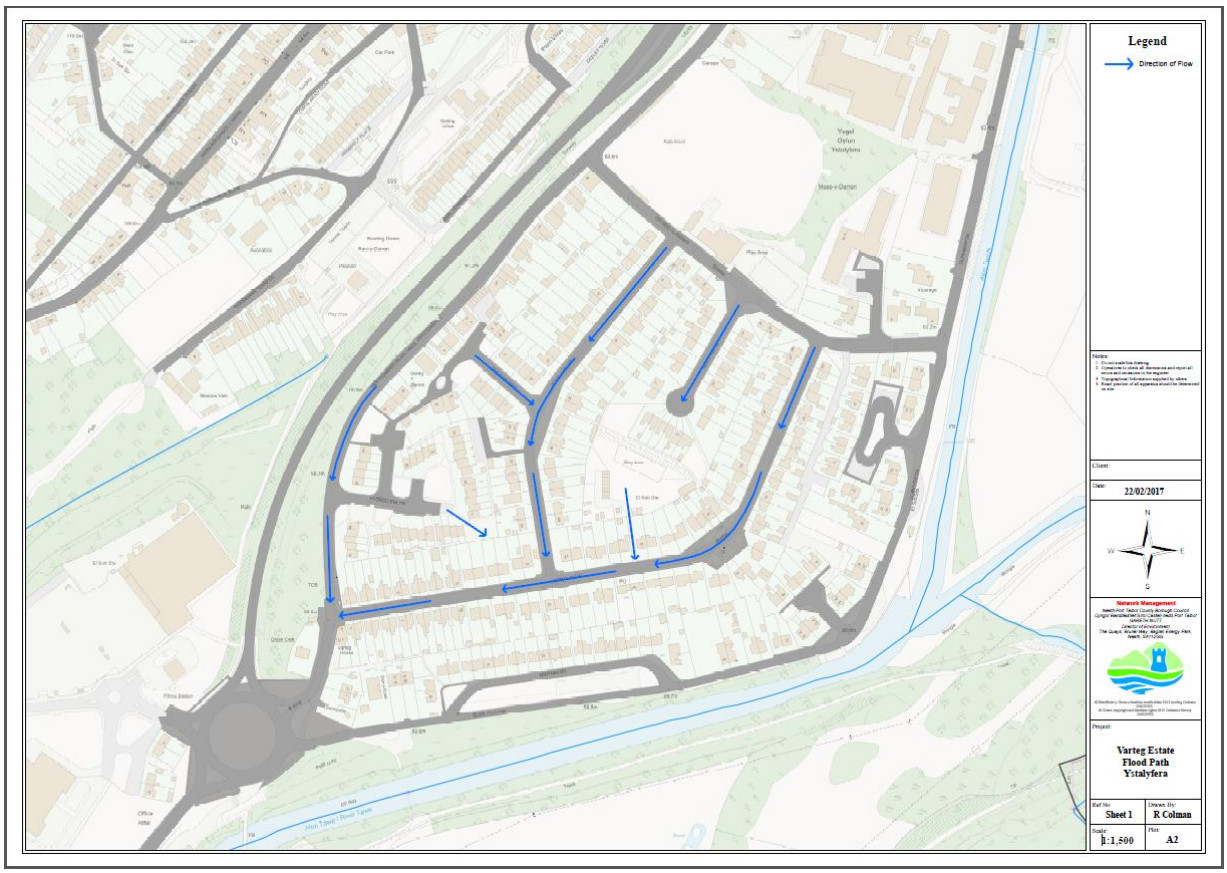


**Figure 5, map showing the flow route of water through the Varteg Estate**

## A4067

The A4067 highway drainage network is a separate system to the network in the Varteg Estate and discharges water directly into the River Tawe. The only time that there is an interaction between the A4067 and the Varteg Estate in drainage terms is when the drainage infrastructure on the A4067 is unable to accept rainwater that falls on the highway due to the level of rainfall exceeding system capacity. When this occurs then, as the A4067 is at a higher level than the Varteg Estate, surface water tracks from North to South on the bypass following the road around the roundabout exit onto the B4599 Ynysydarren Road, progressing towards the low point around the junction with Varteg Road. (See general flow path of surcharge water in Figure 6).

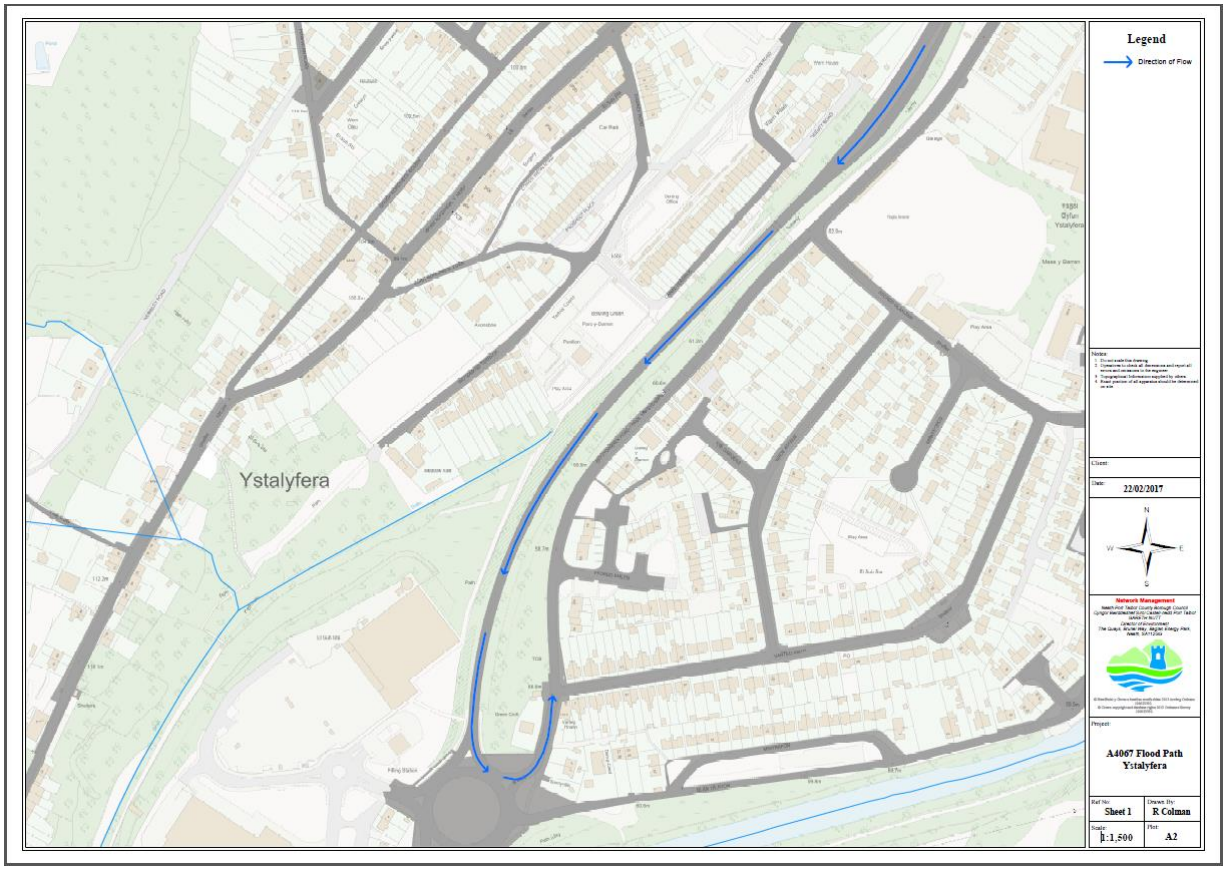


**Figure 6, Map showing the flow route of surcharge water from the A4067**

## Ynysydarren

A culverted watercourse crosses under Ynysydarren Road near to the northern most corner of Ystalyfera rugby fields. The culvert runs under private land along the northern boundary of the fields before entering a chamber in the grounds of numbers 1 – 35 Maes Y Darren, which is managed by Neath Port Talbot Homes. From this point the culvert turns 90$^{o}$ before discharging into the Afon Twrch. Another chamber is located on top of the culvert at the point that it crosses under Ynysydarren Road.

The culverted watercourse does not interact with the drainage system serving the Varteg Estate. However if the culvert surcharges on Ynysydarren Road as it did during the flooding event then water is channelled through the Varteg Estate to the low point of the catchment around the junction of Ynysydarren and Varteg Road. (See general flow path of surcharge water in Figure 7).

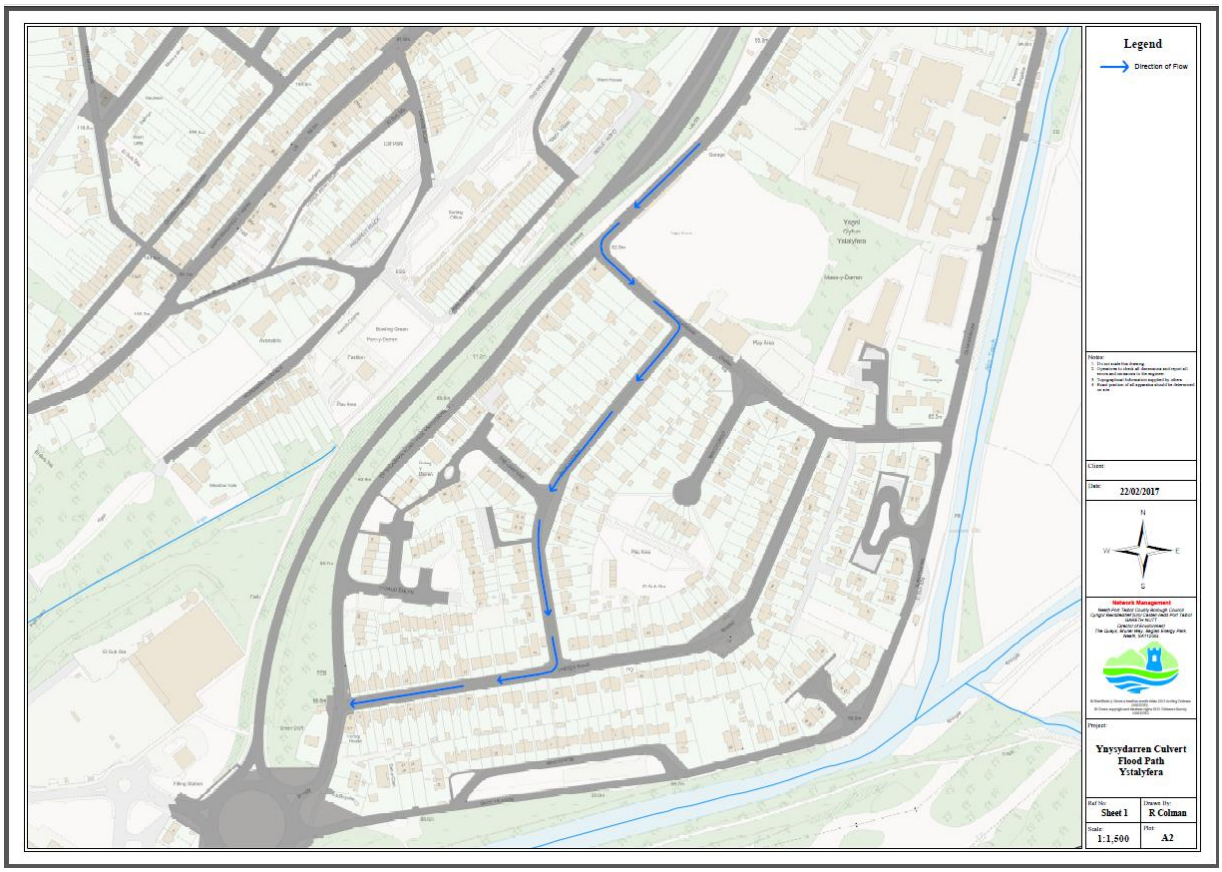


**Figure 7, Map showing the flow route of surcharge water from the Ynysydarren culvert**

## Summary of Water Flows on 3rd September

During the flood event, water from the Varteg Estate drainage system, along with surcharge water from the Varteg Estate, surcharge water from Ysyydarren, and surcharge water from the A4067 all migrated to the low point around the Ynysdarren and Varteg Road junction.

Chamber MH1 shown in figure 8 is situated at the lowest point and is the point at which all surface water would normally arrive. MH1 is built on a 1.2 metre diameter culvert that flows downstream East to West under the Varteg Estate, assumed originally to supply water to the old iron works and now conveys water from the estate under the A4067 towards the recently developed ASDA site. The section under the Varteg Estate itself is believed to be redundant other than it provides some storage capacity for flows entering MH1. Further to the investigation it is believed that water was then historically conveyed via a culvert system down the valley, before outfalling downstream.


**Figure 8, Map identifying the 1.2m diameter culvert (including believed redundant section)**

## 2.6. Detailed Investigation Findings

### Ynysydarren

During the time of the peak intensity rainfall, the available capacity of the culvert downstream of the chamber on Ynysydarren Road was exceeded, resulting in the watercourse surcharging out of the chamber and sending a significant flow of water into the Varteg Estate (Refer to figure 9). Investigations into the section of the culvert downstream of Ynysydarren Road later highlighted reduced capacity caused by a partial collapse of the culvert on privately owned land.

Figure 9, Picture showing surcharging water from Ynysydarren culvert

The Authority subsequently contacted the landowner and requested that work be undertaken to address the problem section of culvert, which the landowner has completed.

Further investigation work is planned by the Authority to check for any further issues within the culvert from the point of previous partial collapse down to the point of outfall. If problems are found, these will similarly be raised with the landowner for their attention. In such case, should remedial work not be taken then, the Authority has powers under the Highways Act 1980 or The Land Drainage Act 1991to seek redress.

## A4067

The intensity of rainfall that fell after 18:00hrs on 3rd September 2016 far exceeded the design capacity of the drainage infrastructure in the area generally, including that serving the A4067. The drainage infrastructure on the bypass was unable to receive all of the rainwater, resulting in surcharge water following the

flow path illustrated in Figure 6.

Notwithstanding the intense rainfall the condition of the drainage infrastructure serving the A4067 was investigated. This identified some root ingress into the drainage pipes located under the roundabout which is not an uncommon occurrence in drainage systems. Although the roots will have had some impact on the flow rate within the system, given the intensity of severe rainfall which overwhelmed the drainage systems generally, it is believed their presence did not have a significant effect on the level of flood water.

Subsequent to the flood event, to ensure free flow in the system the Authority has completed extensive gully cleansing operations on the A4067 and engaged a specialist contractor to remove roots in the pipes located underneath the roundabout which has been completed. Furthermore, work is planned by the Authority, when conditions permit, to reline the associated pipes. However, as indicated previously, during intense rainfall surface water runoff may be expected to occur from the A4067 and find its natural course.

## Varteg Estate

On 3rd September 2016, the design capacity of the surface water drainage system serving the Varteg Estate was exceeded, causing overland flows to the junction of Ynysydarren and Varteg Road. As previously identified, any water that did manage to enter the surface water drainage infrastructure, along with surcharge water, flowed towards the low point around the Varteg Road/Ynysydarren Road junction.

To address any detritus in the drainage system, reactive gully cleansing and jetting operations were undertaken throughout Varteg Estate by the Authority following the flood event.

## Carrier drain from Chamber MH1 to Point A (refer figure 10)

Given that the flood water at Varteg Road did not disperse for a significant time period, between 6 to 10 hours, an investigation of the main carrier drain under the A4067 was then undertaken.

On gaining access to chamber MH1, officers were unable to survey the 1.2m culvert due to the water level within the chamber. Furthermore, access was not able to be gained despite extensive tankering of water, the reason being, as was subsequently found during the investigation, that the Authority were attempting

to drain the entire catchment to reduce water levels within the chamber.

Records of a camera survey for the culvert dating from March 2011 were however examined. The survey provided information on the culvert downstream to a distance of 45.6m from MH1 to Point A.

The historical survey also included information from a chamber at Point B as shown in Figure 10. The survey recorded a culvert leading southwards from Point B towards the ultimate point of outfall, and a culvert leading from what is now the ASDA site, surveyed to a distance of circa 30m.

On inspection of the chamber at Point B after the flood event, it was found that a concrete block wall has been constructed in the end of the culvert leading from the ASDA site, blocking any flow of water into the chamber. A small diameter carrier drain had been laid and covered in the bottom of the old culvert, above which the block wall had been constructed. This small diameter drain is understood to carry drainage water from the development site only.


Figure 10

## 2.7. Summary of Investigation Findings

**The conclusion of the authority's investigation is that a drainage system which is believed to have previously connected Point A and Point B in figure 10 has been lost, this being the fundamental reason for the flooding.**

Correspondence has been initiated with the relevant landowner/developer of the ASDA site concerning the fact that the findings of this investigation indicate that the flooding of 3rd September 2016 occurred due to the removal and/or blockage of the associated culvert during the ASDA store construction works.

Whilst the Council has taken some action to lower the flood risk in the short term, to reduce the flood risk effectively and sustainably in the longer term a drainage connection between points A and B, or between MH1 and another suitable outfall to the south, needs to be established.

Investigations undertaken after the flood event but prior to the installation of the temporary mitigation measures, showed the ground at Point A to be generally saturated. It is believed that the 1.2m culvert under the A4067 is currently discharging water at a low rate into the ground within the ASDA site by means of percolation and dispersal. As such the ASDA site is believed to be currently acting as a soakaway for the Varteg Estate, with the drainage system acting as an attenuation tank.

The temporary mitigation measures introduced by the Council since the flood included building a new chamber near to the low point of the estate and installing a pump system. The system however only pumps surface water overland into the A4067 highway drainage system, and consequently its effectiveness at dealing with flood conditions can only be considered to be limited. There are also significant resource issues associated with maintaining operation of the temporary pump.

It is noted there have been some previous reports of more limited flooding by residents at Varteg Road since the development of the ASDA site; however none met the criteria for a Flood Investigation to be undertaken.

# 3. Recommended Actions

The actions contained within Table 1 are recommended actions to be taken forward by the relevant RMA or property/landowner.

Table 1, Recommended actions

| No. | Action by | Action | How it will be achieved |
|---|---|---|---|
| 1. | ASDA Land Owner/Developer | Resolve the issue with the lost drainage connection | • Consider the findings of the investigation in relation to the lost drainage connection and put forward proposals to NPTCBC as LLFA. |
| 2. | Property Owners | Consider flood risk to own properties. | • To install property level protection where necessary in liaison with the appropriate RMA's.pending resolution of the lost drainage connection |
| 3. | DCWW | Ensure efficient operation of public combined and surface water sewers | • Investigate any links between DCWW owned assets and the Varteg drainage system. |
| 4. | Land Owners | Remove any obstructions within a watercourse if found | • Consider the rights and responsibilities placed upon a landowner under common law in relation to riparian ownership of a watercourse. |
| | | | • |

The recommended actions that have been identified to be undertaken by RMA's and landowners will be monitored for progress by NPTCBC as the LLFA.

# 4. Appendices

## 4.1. Appendix A - Duty to Investigate

The Flood Risk Regulations 2009 and the Flood and Water Management Act 2010 identify NPTCBC as the Lead Local Flood Authority (LLFA) for the area. This has placed a number of flood risk management duties and responsibilities on the Council. In particular, Section 19 of the Flood and Water Management Act 2010 places a duty upon NPTCBC to undertake investigations into flood events to the extent that it considers necessary.

A 'Risk Management Authority' (RMA) means:

**Flood and Water Management Act: Section 19 - Local authorities: investigations**

**(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.

*Flood and Water Management Act (2010), S.19, c.29, London: HMSO*

A. Natural Resources Wales (NRW)
B. a lead local flood authority,
C. a district council for an area for which there is no unitary authority,
D. an internal drainage board,
E. a water company, and
F. a highway authority.

When considering if it is necessary or appropriate to investigate a flood event within its area, NPTCBC will review the severity of the incident along with the

number of properties affected and the frequency of such an occurrence. The Council's Local Flood Risk Management Strategy sets out the criteria to be used when considering a Flood Investigation Report.

## 4.2. Appendix B - Risk Management Authorities Responsibilities

RMAs in Neath Port Talbot have responsibilities in relation to flood risk management. Table 2 below identifies numerous sources of flooding and the RMA that has responsibility and flood risk management functions relating to a particular source of flooding.

**Table 2, Responsibilities of Risk Management Authorities**

| Flood Source | Natural Resources Wales | Lead Local Flood Authority | Water Company | Highway Authority |
|---|---|---|---|---|
| Main River | ✓ | | | |
| Ordinary Watercourse | | ✓ | | |
| Surface Water | | ✓ | | |
| Surface Water Originating on the Highway | | | | ✓ |
| Sewer Flooding | | | ✓ | |
| The Sea | ✓ | | | |
| Ground Water | | ✓ | | |

The general responsibilities placed upon RMAs in relation to flood risk management are outlined below.

### Natural Resources Wales

Natural Resources Wales (NRW) is responsible for managing the risk of flooding from main rivers and the sea. NPTCBC works closely with NRW, especially when managing flood risk from combined sources and in the event of a large flood incident. NRW also provide a flood warning service throughout Wales in areas at risk of flooding from rivers or the sea.

### Neath Port Talbot County Borough Council as LLFA

NPTCBC is responsible for managing the flood risk related to ordinary watercourses, groundwater and surface water. NPTCBC has produced a Flood Risk Management Plan in line with the Flood Risk Regulations 2009 which sets out how the authority proposes to undertake this function. In addition to this and as previously stated, the Authority also has a Local Flood Risk Management

Strategy which was produced to meet the requirements of the Flood and Water Management Act 2010. There are a number of duties and responsibilities placed upon the Authority as the LLFA for the area by these two legislative documents. The Authority is also responsible for consenting works on ordinary watercourses and enforcing the removal of any unlawful structure or obstruction within the watercourse.

### Neath Port Talbot County Borough Council as Highway Authority

The Authority undertakes routine maintenance on the water conveyance infrastructure contained within the highway including culvert and gully cleansing operations. These operations, together with visual inspections of the condition of such assets are undertaken to reduce the risk of flooding on the adopted highway network and adjacent land.

### Dwr Cymru Welsh Water

Dwr Cymru Welsh Water (DCWW) is responsible for the supply of drinking water and for taking away, treating and properly disposing the wastewater that is produced throughout Wales. Any flooding that occurs from the overload of public sewers or burst water mains is the responsibility of DCWW.

### South Wales Trunk Road Agency

The South Wales Trunk Roads Agency (SWTRA) is responsible for maintaining and managing the trunk road network throughout South Wales, including any associated drainage and flood risk assets.

### Land/Property Owners

Under common law, land or property owners have rights and responsibilities relating to any watercourse that passes through or adjacent to the boundaries of their land. This means that the landowner must:

- Pass on flow without obstruction, pollution or diversion affecting the rights of others.
- Accept natural flood flows through their land, even if caused by inadequate capacity downstream, as there is no common law duty to improve a watercourse.
- Maintain the bed and banks of the watercourse (including trees and shrubs growing on the banks) and clear any debris, natural or otherwise,

including litter and animal carcasses, even if it did not originate from their land.

- Not cause any obstructions to the free passage of fish.
- Keep the bed and banks clear from any matter that could cause an obstruction either on their land, or by being washed away by high flow to obstruct a structure downstream.
- Take responsibility for protecting their property from seepage through natural or constructed banks.
- Keep clear any structure that they own such as culverts, trash screens, weirs etc.

Under the FWMA 2010, a landowner needs consent from the Council if they want to construct a culvert or flood relief control structure on any ordinary watercourse.