Pembrokeshire County Council
County Hall, Haverfordwest, Pembrokeshire, SA61 1TP
Cyngor Sir Penfro Neuadd y Sir, Hwlffordd, Sir Benfro, SA61 1TP

Flood Investigation Report

Lower Town, Fishguard, Pembrokeshire
Friday 3rd January 2014.

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Executive Summary

This Flood Investigation Report (FIR) has been completed by Pembrokeshire County Council under its duties as the Lead Local Flood Authority (LLFA).

Section 19 of the Flood and Water Management Act 2010 (FWMA) requires us, when appropriate following a flood incident, to investigate which relevant flood risk management authorities are involved and to find out what actions have been or will be taken. This report provides a summary of the history of the situation, the current position of risk management authorities and our recommendations.

Section 19

(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.

This report provides a summary of the actions being carried out by each of the Authorities involved. The aim is for the conclusions set out in this report to clarify the roles and responsibilities of all parties involved and suggest solutions or actions that may be taken to resolve the problem.

Where one or more organisations are jointly responsible, we would suggest that they work closely and share resources.

Our duty to investigate does not guarantee that flooding problems will be resolved and Pembrokeshire County Council cannot insist that other parties take action.

It was deemed necessary to carry out an investigation into the flooding at Lower Town, Fishguard Pembrokeshire following the event of January 3rd 2014 which resulted in the closure of the A487 (T) with 14 properties experienced internal flooding.

Site Description / Location

The Gwaun Valley runs inland from Lower Town Fishguard towards the Preseli Mountains and was created by melt water from the retreating ice during the last Ice Age to leave a steep sided verdant valley and has a total length of approximately 15km.

The river valley is deep and secluded up to where it meets the sea at Lower Fishguard and gives Lower Town its Welsh name, Abergwaun – mouth of the River Gwaun.

A single arched stone bridge, built in 1875, takes traffic travelling from Fishguard to Newport on the A487 Trunk Road into one of the worst bottlenecks on any main highway in Pembrokeshire. It bends in a narrow right-angle from Bridge Street into Newport Road. Vehicle length restrictions apply to this route.

Lower Town is the original harbour at Fishguard, Pembrokeshire and was home to the local herring fleet. It was also used for the filming of Dylan Thomas' *Under Milk Wood.*

Lower Town consisting of Glynymel Road, Bridge Street, Newport Road and Quay Street comprises of approximately 90 mainly residential properties with a mix of permanent residential and holiday lets.

Lower Town Fishguard is not situated with Pembrokeshire Coast National Park; the Administrative Authority is Pembrokeshire County Council.

The area is located at Grid Reference SM96294 37231. **Appendix 1**

Flood Zones

Natural Resources Wales Flood Risk Maps show the area to be at Risk of tidal and fluvial flooding.

Maps can be accessed by using the following link.

https://naturalresources.wales/our-evidence-and-reports/maps/flood-risk-map/?lang=en

Previous Flood Incidents

Flooding to the highway at Bridge Street, Quay Street, Glynymel Road and to the Public Car and Boat Parks has occurred historically as a result of tidal and fluvial events. Some of these incidents have resulted in internal flooding to properties; however this Authority has no record of any historic flooding events for this location.

Flood Event 3rd January 2014

On Friday 3rd January 2014, following a period of prolonged gale and storm force winds and low pressure systems, large wave formations and tidal surges were generated along the Pembrokeshire coast.

This, coinciding with High Astronomical Spring Tides, resulted in a flood event occurring at Lower Town, Fishguard, Pembrokeshire.

Information gathered by Natural Resources Wales **(Appendix 2)** show that the tidal flooding event on the 3rd January 2014 saw levels of 3.37m AOD recorded at the Fishguard tidal gauge.

3rd January Offshore observations at high tide, Aberporth Wave Buoy 62301

- Waves - 5.1m, 8 seconds period
- Wind Direction - South Westerly Direction
- Wind Speed – 17.5m/s

Investigation Findings

The subsequent investigation into this incident was undertaken by Pembrokeshire County Councils Highways and Construction Division.

Discussions with Officers of Pembrokeshire County Councils Maintenance team, Emergency Planning Staff and local residents confirmed that the tidal water overtopped the quayside and river bank at Lower Town, affecting an area of approximately 6000 msq. **(Appendix 4)**

Flooding of parts of the highway at Quay Street and to the Public Car Park took place with additional “wash” across the car park resulting in water being channelled through the opening at the river bridge flowing onto the (A487 T) Bridge Street into Newport Road.

Additional flows from the vicinity of 8 Glynymel Road onto Glynymel Road added to the flooding occurring in Bridge Street and in Newport Road.

14 properties in Bridge Street, Quay Street and Glynymel Road suffered internal flooding, some as a consequence of “wash” from passing vehicles. **(Appendix 3)**

We have been informed that some residents considered taking action themselves by blockading the main road with their own vehicles to prevent vehicles using the highway. However, it is understood that this action was not taken.

Residents were of the opinion that the highway gullies on the A487 Trunk Road were blocked causing the highway to become flooded. However, subsequent investigations have revealed that this was not the case.

The South Wales Trunk Road Agency have confirmed that the gullies on the main A487 Trunk Road were cleansed prior to the Christmas 2013 period and again following the first flood reports being received from PCC.

There was no evidence of sewage related flooding, however Pembrokeshire County Councils Pollution Control Officer has confirmed that although no water samples were taken the water was considered to be contaminated.

Following a subsequent query via the local County Council Member regarding foul odours it was established that the highway gully located outside Awelfor in Quay Street did not have a “bung” fitted to the rodding eye outlet. As a consequence of this, odours were venting back from the combined sewer through the gully grating. It is therefore highly probable that a surcharge from the combined sewer occurred during the flood event.

It is unconfirmed as to what depth internal flooding reached and its duration although we have been informed that the depth of water within properties ranged from 5mm to approximately 50mm. The nature and value of damage caused is also unaccounted for.

The depth of water in the car park adjacent to the river bridge was approximately 1.5m.

There was no evidence of a physical blockage to the single arch bridge at Lower Town where it enters the harbour; however residents have stated that river flows were fast and levels were relatively high following heavy prolonged rain over the preceding weeks.

It has become apparent that flooding along the highway could not be prevented; however, although most properties had flood gates and or sand bag protection, "wash" from passing vehicles was contributing to a wave which overtopped undefended thresholds. It is also understood that some properties do not benefit from having damp proof courses and / or under floor membranes which may have contributed to water egress into the properties.

Whilst it is understood that all of the properties within the Flood Risk Zone have been issued with flood gate protection by Natural Resources Wales, a number of property owners were not present due to their properties being holiday homes. In these instances it appears that reliance was placed upon County Council Staff to provide and place sandbag protection with the assistance of residents.

Subsequent investigations by Pembrokeshire County Council have confirmed that the highway gullies outside number 2 – 8 Quay Street do not discharge direct to the river or harbour area and it is assumed that they discharge to a combined sewer and Pumping Station located at Lower Town Bridge.

Flooding to the car and boat park area at the "Skirmisher" occurred as a result of tidal influences and surge up the slipway from the harbour. It is not known whether internal flooding occurred within the Skirmisher building itself.

It is understood that following the tide receding, the highways gullies were operating, resulting in the flood waters draining from the highways.

There are no Ordinary Watercourses which were a contributory factor to the flooding at Lower Town.

Dŵr Cymru Welsh Water has confirmed that they have no evidence of the foul sewerage systems in Lower Town surcharging or failing as a result of this flood event.

There was no surface "run off" issues associated with this flood event.

There are no issues relating to the blockage or surcharging of any Culvert associated with this flood event.

The River Gwaun at Lower Town is classed as a main river for which Natural Resources Wales are the Risk Management Authority.

Response to Flood Incident.

The risk of coastal flooding posed by the combination of exceptionally high tides, surge conditions and strong winds identified in the week preceding the event was further highlighted on Thursday, 2nd January 2014, which resulted in a multi-agency teleconference being held that afternoon.

This was escalated by the holding of a Strategic Coordination Group meeting of the Local Resilience Forum (LRF) covering the Dyfed Powys Police force area that evening. As a result, emergency planning procedures were instigated in preparation for the severe weather events that then occurred on the Friday morning 3rd January 2014 (tidal flooding), and further adverse weather conditions linked with continuing high tides over the days that followed.

Flood alerts and warnings had been issued for the area by Natural Resources Wales in the period preceding the event.

On the morning of Friday 3rd January 2014, reports of flooding and requests for the provision of sandbags were made to Pembrokeshire County Council Contact Centre.

Due to weather reports and warnings obtained from the Met Office and Natural Resources Wales, Pembrokeshire Council had instigated “Tide Watch” at Lower Town and other vulnerable locations throughout the County. Therefore manpower was in place to deal with any requests received from residents for assistance.

Mid and West Wales Fire Brigade personnel who had been contacted directly by residents and the local County Council Member provided assistance in the form of pumping equipment where required.

County Council personnel were generally employed in providing and placing sandbags where required, offering assistance where requested.

Traffic continued travelling along the A487T, however a broken down lorry caused the road to become impassable and we have been informed the road was eventually closed by the South Wales Trunk Roads Agency. However it would appear that local residents did continue to access their properties in their vehicles causing additional flooding problems to properties as a result of the creation of “bow waves”.

Approximately 14 properties were affected during the flood event that morning. Trained County Council Staff visited residents on the Friday afternoon to provide information advice and assistance,

It was noted that Flood Gates and sandbags were installed at most properties. Prior to the A487 Trunk Road being closed, vehicles driving down the A487 were creating bow waves exacerbating internal flooding to properties

Residents considered that floodwater flowing through the opening at the river bridge and from Glynymel Road onto Bridge Street and Quay Street was prevented from being conveyed away by blocked highway gullies.

Response to Flood Incident (Continued)

Pembrokeshire County Council issued regular Situation Reports (Sitreps) to its partners, staff and media for the duration of the event. There were a number of press releases issued, as well as communications via social media. There was substantial media interest in the event which affected not only Lower Town but many parts of Pembrokeshire.

It is understood that the local County Councillor who was in contact with the Authority was kept informed of the situation.

Pembrokeshire County Council received 55 Calls during office hours on the day of the event, and the following Saturday, concerning flooding. This appears to be low considering the impact of the event.

It is considered that the proactive Social and conventional media messages that had been issued, warning and informing the public, had a positive impact. In addition, the proactive presence of Pembrokeshire County Council personnel at key locations is considered to have reduced the call volume, since residents were approaching the workforce directly to obtain advice and/or assistance.

PCC resources deployed during the event

Strategic coordination – Emergency planning resources provided coordination, with senior staffing input via the Head of Environment and Civil Contingencies. The Authorities Head of Highways and Construction acted as strategic lead during the event participating in multi agency meetings with specific reference to the flood event at Lower Town.

Works Teams – deployment of area maintenance resources for preventative and reactive flooding events, coordinated via the Area Managers.

The work of the “front line” staff is to be highlighted - they were on site during particularly adverse weather conditions and were proactive in providing advice/support, as well as dealing with issues on site, with many being recalled from leave.

Pembrokeshire County Council gully emptying vehicles and contractors plant and equipment were available should their services be required.

Trained Officers were in attendance during the afternoon of the event to meet with residents offering advice and assistance where required.

Summary of Impacts

Risk to Life/ Health	On Public Highways, no risk to life has been identified. On the Quay side and public car park, the danger of pedestrians stepping off and or vehicles driving off the edge of the Quay wall and or river bank into deep waters of the harbour and river should be noted. In properties, it is considered that there is little or no risk to life due to the depth of internal flooding, however it has to be noted that electrical systems may be subject to water ingress and therefore extreme caution needs to be exercised. There is potential for floodwater to contain contamination such as raw sewage effluent. Residents affected by internal flooding should be aware of the dangers of such contamination. There is a risk of shock or electrocution should circuit breaker systems fail.
Highways	Flood events may necessitate the closure of the A487 Trunk Road resulting in long diversion routes being put into operation. In addition the area around the harbour and car park maybe rendered impassable. There are concerns that unattended vehicles in the car park and or quayside may float and enter the harbour should flood water depths increase without the knowledge of owners. The discharge of Surface Water drainage systems to the watercourse may have been impeded
Foul Sewers	Surcharge of sewers may take place, resulting in floodwater becoming contaminated with sewage. Raised manhole covers could cause additional danger to pedestrians. Dŵr Cymru Welsh Water confirms that there is no evidence of this occurring during this flood event.
Sewage Pumps	A Welsh Water Sewerage Pumping Station is located adjacent to the A487T and River Bridge at Lower Town. It would appear that highway drainage gullies are connected to a combined sewerage system

	Dŵr Cymru Welsh Water has confirmed the following in relation to the sewage pumping station. 1. There was no disruption to electricity supply for the duration of the event since all electrical panels and control systems are situated above the water level that can be expected within the building. 2. There is a non return valve situated on the emergency storm overflow outlet which is considered to be appropriate. 3. There were no recorded instances of mechanical or electrical failures due to flooding. 4. There was no evidence of the surcharge of the foul sewers in Lower Town for the duration of this event. 5. There are currently no plans to mitigate the effects of future flooding incidents.
Water Supply	There was no evidence of disruption to or contamination of water supplies for the duration of the event.
Electricity Supply	There are no Sub Stations located in the affected area. Western Power Distribution has confirmed that there was no prolonged disruption of the supply of electricity during this event.
Telecommunications	There are no telephone exchanges located in the affected area. There is no evidence of network disruptions occurring for the duration of the flooding, however the disruption to the electricity supply to households resulted in telephones which require a power supply being inoperable due to power failures.
Gas Supply	There is no evidence of disruption for the duration of the event.
Emergency Services	There are no A & E Units, ambulance stations, hospitals, police or fire stations located within the area of the flood event.
Social Infrastructure	There are no educational establishments, residential care homes, GP surgeries located within the area of the flood event.

Risk Management Authority Responsibilities

Pembrokeshire County Council as the Lead Local Flood Authority is responsible for managing the flood risk from Ordinary Watercourses, groundwater and surface water runoff and is also responsible for consenting to works on Ordinary Watercourses.

Pembrokeshire County Council as the Highway Authority is responsible for surface water on the highway and maintaining gullies and culverts to ensure effective highway drainage, with the exclusion of Trunk Roads.

To report an incident
Contact Centre, on 01437 764551
Emergency out of Hours contact number is 0845 601 5522
mailto:enquiries@pembrokeshire.gov.uk

Natural Resources Wales (The Environment Agency Wales) is responsible for managing flood risk from the sea, main rivers and reservoirs and has a strategic overview role for all flood risk management.

Natural Resources Wales provides a flood warning service throughout Wales in areas at risk of flooding from rivers or the sea.

To report an incident
Incident hotline: 0800 807060 (24 hour service)
General Enquiries: enquiries@naturalresourceswales.gov.uk

South Wales Trunk Road Agency (SWTRA) is responsible for Managing, maintaining and Improving the motorways, trunk roads and associated assets throughout the South Wales region on behalf of the Welsh Government.

To report an incident
Tel: 0300 1231213
Email: enquiries@southwales-tra.gov.uk

Dŵr Cymru Welsh Water's responsibilities are to provide a safe and reliable drinking water supply whilst ensuring its water abstractions and water supply activities do not damage the environment; and to collect and treat the wastewater produced by households and businesses, together with surface and highway drainage in many places, in a way that safeguards public health and protects the environment.

To report an incident

Water services and emergencies Telephone: **0800 052 0130**
(24 hours a day, 7 days a week)

Sewerage services and emergencies Telephone: **0800 085 3968**
(24 hours a day, 7 days a week)

Other Responsibilities

BTs responsibility is for the provision and maintenance of fixed line, broadband, mobile and TV products and services.

Contact	From a Landline	**0800 800 151**
	From a Mobile	**0330 123 4151**

Western Power Distributions responsibility is for the safe distribution of electricity in the Midlands, South West and Wales.

To Report an Incident

Contact	**0800 6783 105**
Mobile Users	**0330 123 5002**

Wales & West Utilities provide gas connection services to the whole of Wales and South West of England. Their responsibility ends at the customers emergency control valve located before the meter.

To Report an Incident

Contact Emergency	**0800 111 999**
General Enquiries	**0800 912 2999**
E-Mail	**enquiries@wwutilities.co.uk**

Riparian Landowners

Riparian landowners are those who own land adjoining a watercourse.
As detailed within the Natural Resources Wales document 'Living on the Edge'.

i) They must maintain the bed and banks of the watercourse, and also the trees and shrubs growing on the banks.

ii) They must clear any debris or silt, even if it did not originate from their land, this debris may be natural or man-made.

iii) They must keep any structures that they own clear of debris. These structures include culverts, trash screens, weirs and mill gates.

iv) If they do not carry out their responsibilities, they could face legal action under the 1991 Land Drainage Act.

Residents

Residents of Lower Town Fishguard are aware that they are at risk of flooding and should take action to ensure that they and their properties are protected. Community resilience is important in providing information and support to each other if flooding is anticipated.

Actions that can be taken can include laying sandbags and moving valuable items to higher ground, to more permanent measures such as installing floodgates, raising electrical sockets and fitting non-return valves on pipes.

Anyone affected by flooding should try to document as much information about the incident as possible.

Where properties are located near to main rivers, or in areas where they are susceptible to Tidal flooding, residents are advised to sign up to the Natural Resources Wales Flood Warning System.

It has been noted that one resident stated that she did not receive any notifications from Natural Resources Wales, however she remarked that she had not signed up to the Flood Warning System. Suitable advice was given to the resident.

Recovery

Advice and information previously given by Pembrokeshire County Councils Emergency Planning Team resulted in awareness amongst residents regarding what assistance the Authority is able to provide during the recovery process.

The level of queries from residents was low, with residents generally adequately prepared for the recovery process.

Risk Management Authorities Consulted

The following authorities are considered to have relevant responsibilities within the area of the flood event and have been consulted during the preparation of this report.

Pembrokeshire County Council Highways have carried out investigative work on the drainage in Quay Street and have no immediate plans to carry out further investigations.

A survey of all threshold levels and their relation to flood water levels has been undertaken and will be published and advertised at a public meeting.

Dŵr Cymru Welsh Water is satisfied that their sewerage and water supply networks were not compromised as a result of the flood event.

South Wales Trunk Roads Agency has no plans to carry out investigations into the surface water drainage network

Natural Resources Wales have no immediate plans to carry out remedial works to mitigate the effects of future flooding incidents.

Other

B.T has not responded to requests for information.

Western Power Distribution has confirmed that a power outage occurred of 10 minutes approximate duration affecting the area. They have no plans to upgrade their apparatus as a result of this event.

Wales & West Utilities confirm that their infrastructure was not affected by the event and currently have no plans to upgrade their apparatus.

Climate Change

It is generally accepted that the climate is changing and that global warming will continue to take place over the next century.

The latest prediction for the United Kingdom show increases in summer and winter temperatures, increases in winter rainfall, decreases in summer rainfall (although small increases are also possible), more days of heavy rainfall and rising sea levels. Sea levels are anticipated to rise 1m by 2100 and to carry on rising afterwards.

Flood risk is projected to increase significantly across the UK with increases in the frequency of Coastal, River, Surface Water, Ground water, Drain and Sewer flooding, with impacts being dependent upon local conditions and vulnerability.

Current local flooding 'Hot Spots' will be exacerbated by climate change with new ones emerging.

Sea levels are expected to rise due to the general increase in ocean temperatures and melting of ice caps caused by global warming resulting in larger and more frequent storm surges, increased wave heights and wind speeds, potentially increasing coastal flooding risk.

Shoreline Management Plan

A Shoreline Management Plan (SMP) provides a large-scale assessment of the risks associated with coastal evolution and presents a policy framework to address these risks to people and the developed, historic and natural environment in a sustainable manner. Further information can be obtained by using the following link.

http://www.westofwalessmp.org/content.asp?nav=14&parent_directory_id=10

The Flood report should be read with reference to the SMP PDZ 4 Fishguard Bay and Newport Bay which can be accessed by using the following link.

http://www.westofwalessmp.org/content.asp?nav=23&parent_directory_id=10

Conclusion

The principal source of flood risk at Lower Town Fishguard is from Tidal Flooding with a lower risk of fluvial flooding from the River Gwaun. Surcharge of highways drainage systems may occur during periods of high tides due to the outfalls being tide-locked.

It is highly likely that fluvial flows in the River Gwaun influenced by tidal surges and the restriction of the single arch bridge at Lower Town may have contributed to the flooding upstream of the bridge at 8 Glynymel Road and for subsequent flows into Glynymel Road and into Bridge Street and Newport Road.

Tidal surges over Lower Town Car Park resulted in flows onto Bridge Street through the opening between the bridge parapet and number 1 Bridge Street. This joined with the flows from Glynymel Road exacerbated the flooding in Newport Road and in Quay Street.

It would appear that blocked drains and or gullies were not a contributory factor to the flooding of the highway, however it is highly probable that the discharge of storm water systems which drain to the watercourse and or harbour may have been prevented or restricted for the duration of the high tide by tidal flap valves or by surcharge of tidal water into the system. The surcharge of highways gullies cannot be positively identified as being a contributory factor to this event.

The capacity of the combined sewerage and surface water system may have been influenced by possible overloading of the sewerage pumping station resulting in the highway drainage system being inoperative for the duration of the event.

No evidence relating to the surcharge of the Public Sewerage network has been identified however it is highly likely that surcharge of the combined sewer network through the highway gullies did occur.

The cause of Flood event at Lower Town Fishguard on Friday 3rd January 2014 is considered to be attributed to the overtopping of the quay, harbour, river walls and banks as a result of exceptional high spring tides, tidal surge and fluvial influences.

Recommendations

It is important for the relevant responsible body to assess each recommendation in terms of the legal obligation, resource implications, priority and cost benefit analysis of undertaking such action.

- It is recommended that Pembrokeshire County Council and all risk management partners review their response to the incident and implement improvements where necessary. Risk Management Authorities, and other groups, must continue to work together, sharing information and reports.

- It is recommended that procedures are strengthened by the South Wales Trunk Roads Agency to ensure that road closures are speedily put in place when necessary where flooding to the A487T occurs to reduce the possibility of the “wash” from passing vehicles contributing further to internal flooding of properties.

- It is recommended that the A487T highways drainage systems be further investigated by South Wales Trunk Roads Agency to ascertain whether works can be carried out to prevent or reduce the surcharging of highway gullies during tidal events by, for example, the fitting of flap valves or by the maintenance of those already in place.

- It is recommended that the other highways drainage systems be further investigated by Pembrokeshire County Council Highways Department to ascertain whether works can be carried out to prevent or reduce the surcharging of highway gullies during tidal events by, for example, the fitting of flap valves or by the maintenance of those which may already be in place.

- It is recommended that the Local Authority continues to provide “Tide Watch” cover for predicted exceptional tidal events.

- It is recommended that Dŵr Cymru Welsh Water continues to monitor, operate and maintain the Public Sewer Network to ensure its satisfactory operation to resist excessive rainfall and tidal influence with particular attention to its sewage pumping infrastructure.

- It is recommended that Pembrokeshire County Council provides further advice to residents in respect of dealing with the aftermath of an internal flooding event with particular attention to dealing with contaminated items of property.

- It is recommended that Natural Resources Wales investigate the provision of Flood Gates at the car park entrance located at the river bridge to prevent flows entering Bridge St.

- It is recommended that Natural Resources Wales ensure that property owners are made aware of the flood resistance and resilience measurers available, and that this information is provided by both Natural Resources Wales and the National Flood Forum Blue pages.

- It is important that Natural Resources Wales together with Pembrokeshire County Council Emergency Planning Team advise residents who are at risk of flooding, as to how they should consider preparing for future incidents, and how they could improve the protection to their properties.

- Natural Resources Wales should encourage residents who have not signed up to receive warnings from their flood warning service to consider doing so.

Next Steps

The next steps to be taken by the LLFA are to ensure that this report is forwarded to the responsible Risk Management Authorities identified above.

Response to Consultation

Dŵr Cymru Welsh Water

Agree that the events of 3rd January 2014 were down to the tidal water and bad weather and confirm their Networks team will continue with their routine desilting of the sewerage network and will continue to monitor the sewers in the area.

The South Wales Trunk Road Agency

Consider the Report to be “very comprehensive and the recommendations to SWTRA/WG highways are relatively straight forward and sensible” and have forwarded the document on to SWTRA’s Area Engineer for the A487 for his attention as regard the highway maintenance issues raised.

They have also requested that the Network Control Centre at Coryton be made aware of the Reports contents as regard to a more speedy closure of the Trunk road to protect properties from vehicle ‘wash’ bow waves, should another low probability event be forecast in the future.

Natural Resources Wales

Have no immediate plans to carry out remedial works to mitigate the effects of future flooding incidents.

Appendix 1 Location Plan

Pembrokeshire County Council
Cyngor Sir Penfro

Maintenance Division,
Unit 23,
Thornton Business Park,
Milford Haven,
Pembrokeshire,
SA73 2RR

FLOOD INVESTIGATION REPORT	Scale 1/38012
LOWER TOWN, FISHGUARD, PEMBROKESHIRE	Date 20/2/2014
LOCATION PLAN	

Appendix 2

Cyfoeth Naturiol Cymru
Natural Resources Wales

Flood Incident Management Team

TIDAL EVENT REPORT

Event Data

03 January 2014
2014_01_03am

MILFORD TIDE

Date Time GMT	Astro mAOD	Forecast Surge m	Updated Surge m	Astro And Surge mAOD	Observed Level mAOD	Observed Surge m
03/01/2014 07:15	3.92	0.58	0.58	4.5	4.51	0.58

ST DAVIDS WAVE

Date Time GMT	Wind Speed (m/s)	Wind Direction (Degrees)	Wave Height (m)	Wave Period (secs)	Wave Direction (Degrees)
03/01/2014 06:15:00	22.4	230	7.3	8.8	238
03/01/2014 06:30:00	22.5	228	7.4	8.8	239
03/01/2014 06:45:00	22.7	227	7.4	8.8	239
03/01/2014 07:00:00	22.8	225	7.5	8.9	239
03/01/2014 07:15:00	22.4	227	7.6	9	239
03/01/2014 07:30:00	21.8	229	7.7	9	240

OBSERVED OFFSHORE WAVES - Wave Buoy 62303 - Pembroke Buoy

Day /	Month /	Time	Wind Speed (m/s)	Wind Direction (Degrees)	Wave Height (m)	Wave Period (secs)
3	1	0500	18	SW	5.6	8
3	1	0500	18	SW	5.6	8
3	1	1000	16	SW	6.3	9
3	1	0900	18	SW	6.6	10
3	1	0800	16.5	SW	7.5	10
3	1	0700	17.5	SW	5.8	9
3	1	0600	17.5	WSW	6	8

Appendix 2 continued

BARMOUTH TIDE

Date Time GMT	Astro mAOD	Forecast Surge m	Updated Surge m	Astro And Surge mAOD	Observed Level mAOD	Observed Surge m
03/01/2014 09:15	3.11	0.55	0.69	3.81	3.92	0.81

Cardigan Wave Forecast

Date Time GMT	Wind Speed (m/s)	Wind Direction (Degrees)	Total Wave Height (m)	Wave Period (secs)	Wave Direction (Degrees)
03/01/2014 08:15:00	21	216	6.7	8.3	225
03/01/2014 08:30:00	22.2	217	6.7	8.4	225
03/01/2014 08:45:00	23.3	218	6.8	8.4	225
03/01/2014 09:00:00	24.5	219	6.8	8.4	225
03/01/2014 09:15:00	23.7	218	6.9	8.4	225
03/01/2014 09:30:00	22.9	218	7	8.5	225

OBSERVED OFFSHORE WAVES - Wave Buoy 62301 - Cardigan Bay

Day	Month	Time	Wind Speed (m/s)	Wind Direction (Degrees)	Wave Height (m)	Wave Period (secs)
3	1	1000	15.4	SW	5.8	9
3	1	0900	15.4	SW	5.7	9
3	1	0800	17.5	SW	5.1	8
3	1	0700	16.5	SW	5.4	8
3	1	0600	15.4	SW	4.6	8
3	1	0500	14.4	SSW	3.5	6

FISHGUARD TIDE

Date Time GMT	Astro mAOD	Forecast Surge m	Updated Surge m	Astro And Surge mAOD	Observed Level mAOD	Observed Surge m
03/01/2014 08:00	2.83	0.59	0.59	3.42	3.37	0.54

FISHGUARD WAVE

Date Time GMT	Wind Speed (m/s)	Wind Direction (Degrees)	Total Wave Height (m)	Wave Period (secs)	Wave Direction (Degrees)
03/01/2014 07:00:00	20.9	225	6.2	8.1	234
03/01/2014 07:15:00	19.9	225	6.3	8.2	234
03/01/2014 07:30:00	18.8	224	6.4	8.2	235
03/01/2014 07:45:00	17.7	223	6.4	8.3	235
03/01/2014 08:00:00	16.6	222	6.5	8.3	235
03/01/2014 08:15:00	17.7	220	6.6	8.3	235

OBSERVED OFFSHORE WAVES - Wave Buoy 62301 - Cardigan Bay

Day	Month	Time	Wind Speed (m/s)	Wind Direction (Degrees)	Wave Height (m)	Wave Period (secs)
3	1	1000	15.4	SW	5.8	9
3	1	0900	15.4	SW	5.7	9
3	1	0800	17.5	SW	5.1	8
3	1	0700	16.5	SW	5.4	8
3	1	0600	15.4	SW	4.6	8
3	1	0500	14.4	SSW	3.5	6

Appendix 2 continued

MUMBLES TIDE

Date Time GMT	Astro mAOD	Forecast Surge m	Updated Surge m	Astro And Surge mAOD	Observed Level mAOD	Observed Surge m
03/01/2014 07:15	5.16	0.68	0.68	5.84	5.73	0.57

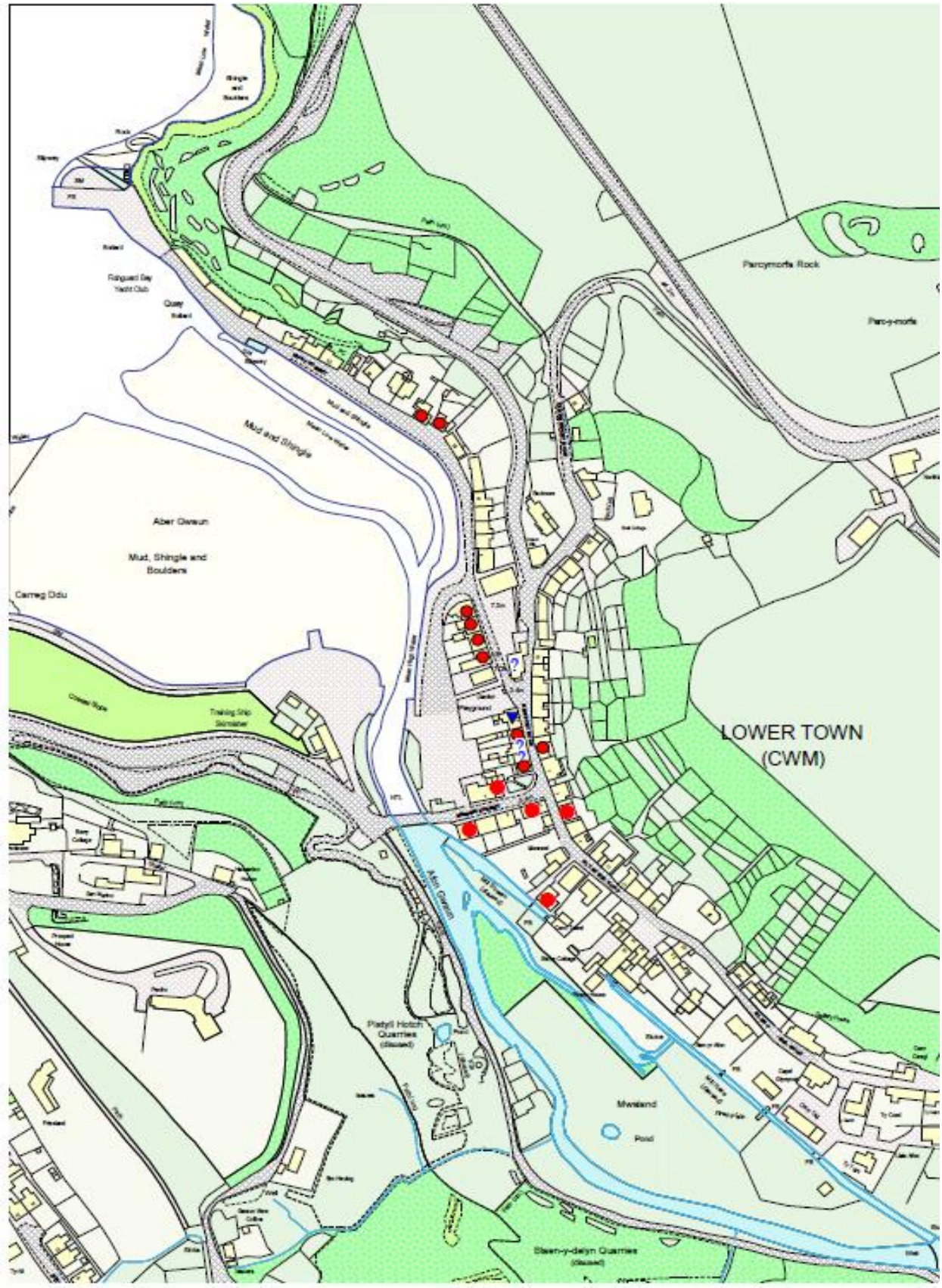
CARMARTHEN WAVE

Date Time GMT	Wind Speed (m/s)	Wind Direction (Degrees)	Total Wave Height (m)	Wave Period (secs)	Wave Direction (Degrees)
03/02/2014 09:45:00	18.4	155	4.5	6.8	207
03/01/2014 06:15:00	19.8	241	5.9	8	241
03/01/2014 06:30:00	19.3	237	6.1	8.1	241
03/01/2014 06:45:00	18.6	233	6.2	8.1	242
03/01/2014 07:00:00	18.2	228	6.3	8.2	242
03/01/2014 07:15:00	17.9	232	6.4	8.3	242
03/01/2014 07:30:00	17.6	235	6.6	8.4	243

OBSERVED OFFSHORE WAVES - Wave Buoy 62303 - Pembroke Buoy

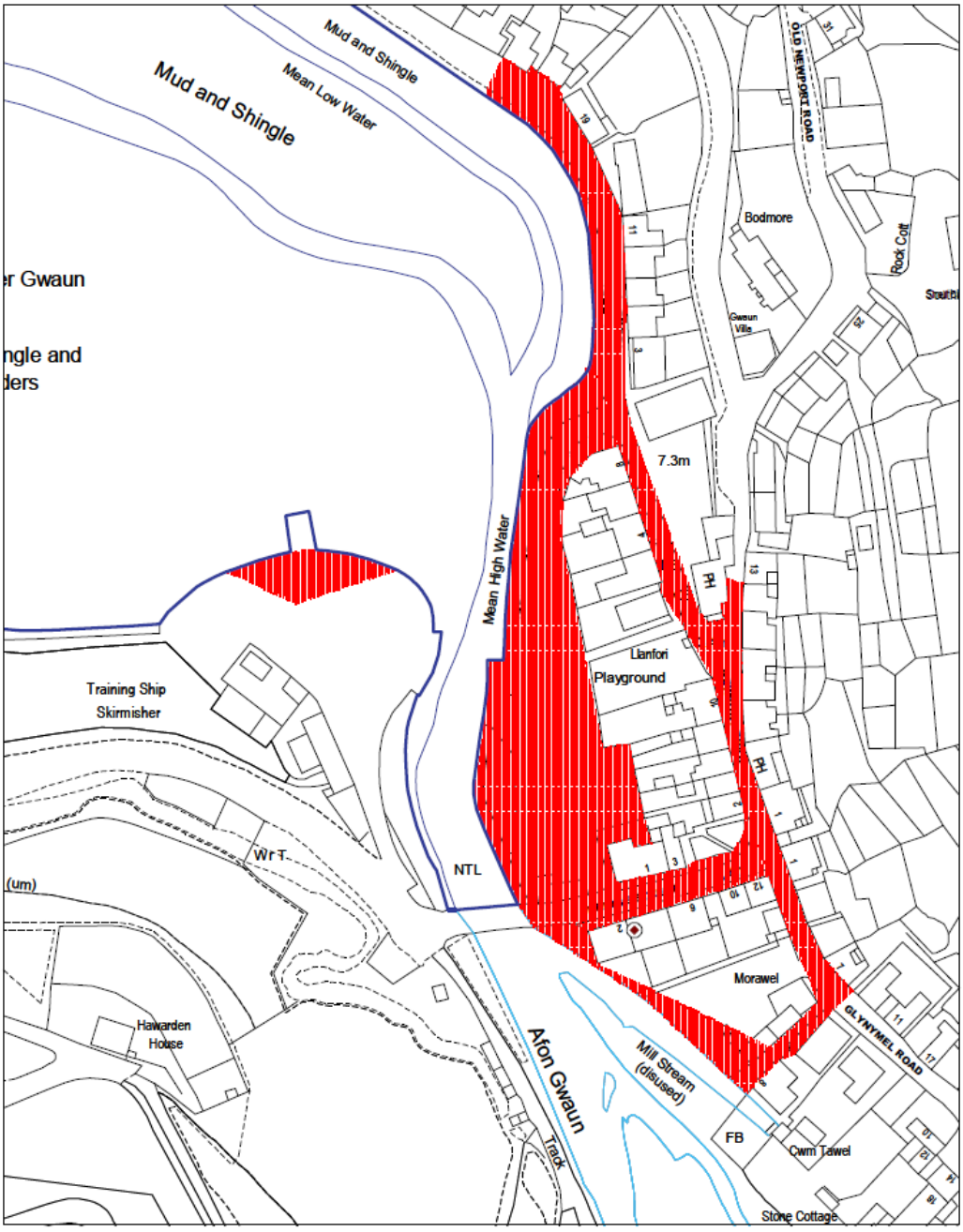
Day /	Month /	Time	Wind Speed (m/s)	Wind Direction (Degrees)	Wave Height (m)	Wave Period (secs)
3	1	0500	18	SW	5.6	8
3	1	0500	18	SW	5.6	8
3	1	1000	16	SW	6.3	9
3	1	0900	18	SW	6.6	10
3	1	0800	16.5	SW	7.5	10
3	1	0700	17.5	SW	5.8	9
3	1	0600	17.5	WSW	6	8

Appendix 3 Location of affected Properties



Appendix 4 Approximate area of flooding

The areas affected by the flooding incident include, Newport Road, Bridge Street, Quay Street, Car Park and Glynymel Road. The approximate area being affected being 6000 sq m.



Pembrokeshire County Council
Directorate of Transportation and Environment
County Hall
Haverfordwest
SA61 1TP

LOWER TOWN FISHGUARD

FLOOD EVENT 3rd JAN 2014

Scale: not to scale | Date: 13 March 2015

Appendix 5 Photographs

Quay Street

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Newport Road

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Quay Street

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Quay Street

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Rev	Date	Details	Author	Checked	Approved
01	15/06/2015	Draft Report / Revisions	Tony Lewis	Paul Morgan Emyr Williams	Darren Thomas
02	07/07/2015	Draft Report for Stakeholder Consultation	Tony Lewis		Paul Morgan
03	12/10/2015	Revision following additional information / consultation	Tony Lewis	Paul Morgan Emyr Williams	Paul Morgan
	01/02/2016	Report Published	Tony Lewis		Darren Thomas