Cyfoeth Naturiol Cymru
Natural Resources Wales

Wales Coastal Flooding Review Phase 1 Report – Assessment of Impacts

A National Overview by Natural Resources Wales for Alun Davies AM, Minister for Natural Resources and Food

31 January 2014

Executive Summary

Introduction

Following the coastal flooding of early January 2014, Alun Davies AM, Minister for Natural Resources and Food, asked Cyfoeth Naturiol Cymru/Natural Resources Wales (CNC/NRW) to expand the review of the North Wales flooding on the 5th December 2013, to include the coastal flooding between 3rd and 6th January 2014, and to include all coastal Local Authorities in Wales.

The Minister asked for this review to be carried out in two Phases. Phase 1 to be a review of impacts, to be completed by the end of January 2014. Phase 2 will consider the wider lessons learnt from both these incidents. This Phase 1 report explains the approach to this stage of the review and presents a Wales-wide overview of the storm impacts. It also considers the areas protected, that did not flood as a consequence of the national network of coast protection and defence infrastructure.

We would like to acknowledge and thank the many people and organisations involved in compiling this report. These are the same people and organisations who responded to these incidents and who continue to work hard to repair the damage and help communities to recover. Around Wales, some 40 organisations have been directly involved in collecting and collating the information for this report. This has enabled us to present this broad overview of the diverse impacts of these storms. The compilation of this report in a short timescale is a good example of risk management authorities and others working together in partnership.

Given the short timescale, this report contains the *'best information'* available at this time and this information will be subject to change in coming weeks and months as the scale of impacts and costs become better understood and evaluated. Despite this qualification, this report does present a compelling overview of the storm impacts across Wales, and highlights both the scale and diversity of these impacts all around the coast of Wales. These impacts include flooding to properties, damage to coastal defences and structures, flooding to farmland, damage to transport infrastructure and significant environmental change.

The coastline and coastal areas of Wales are extremely important to the people, communities, economy and environment of Wales. Many of our towns and cities are located in coastal areas and these are supported by a wide range of local and national infrastructure. A significant proportion of the total national resource of agricultural land is located in areas at risk from the sea. Our coastal areas are an important attraction to visitors from both within and outside of Wales and therefore provide an important contribution to the national economy. 75% of our coastline is formally designated for its environmental importance.

Storm Severity

The storms which affected the Wales coastline in December 2013 and January 2014 caused widespread disruption and locally significant impacts, including community evacuation and flooding to property and infrastructure. These storms also had UK wide impacts, notably on the east coast of England in December, and the south and south west coast of England in January. We are working with UK colleagues to assess the severity of these storms and this work is on-going. What we already know is these storms were amongst the most serious to hit Wales in the last twenty years.

Overview of Impacts

Between 4th and 5th December 2013, Natural Resources Wales issued 2 Severe Flood Warnings, (the highest level of warning we provide), and 15 Flood Warnings. We have been notified that around **155 properties** were directly flooded, mostly in Rhyl, with a further **160 indirectly affected**, for example by loss of access and flood water surrounding the property. Whilst the impacts of this storm were serious, they occurred during daylight hours. The risks to people could have been substantially greater if this incident had occurred overnight and in the hours of darkness.

The storms of early January were particularly widespread in their impacts and sustained over a number of tides and days. Between 2nd and 6th January Natural Resources Wales issued 6 Severe Flood Warnings and over 100 Flood Warnings. This severity and number of warnings is unprecedented in recent years. In total we have been notified that around **150 properties** were directly flooded, some on multiple occasions, with a further **415 indirectly affected**.

Evacuation procedures were initiated in a number of locations, including Rhyl in December 2013 and Borth, Aberystwyth, Cardigan and areas of Newport in January 2014.

In total it is estimated that coastal defence structures in Wales suffered storm damage at around 65 locations in December 2013 and 110 locations in January 2014.

At the request of Welsh Government, Natural Resources Wales has carried out an assessment of the information received to determine the potential costs which may be eligible for the Welsh Government's flood and coastal risk management grant funding.

These are estimated costs for works necessary to restore the national network of Local Authority and Natural Resources Wales managed coastal defences which were damaged specifically during the recent storm events.

This assessment has estimated that around **£8.1million** may be eligible for flood and coastal risk management grant funding. This is based on initial estimates provided by Local Authorities and NRW. It does not include other privately owned assets e.g. Network Rail.

Eligibility for funding does not mean that grant awards will be made. Local authorities will need to submit formal applications which will be subject to Welsh Government consideration. Applications and justification for grant funding will be considered alongside other flood and coastal risk priorities across Wales.

Some of the estimates received include elements of work which would not be eligible for flood and coastal risk management grant funding, for example street furniture, damage to paths and paving. In total this amounts to around £3.3million.

In addition to the impacts on people, property and communities, the January storms in particular had widespread impacts on:

- **The coastal environment**: Significant impacts, such as local erosion and loss of beach has been identified around the coast.
- **Infrastructure/utilities:** Significant impacts upon Network Rail assets causing ongoing service disruption, plus localised road closures and power cuts.
- **The Wales Coastal Path:** Damage at over 70 locations along the 870 mile route with repair costs estimated at £340,000.
- **Agricultural land:** Around 360ha of agricultural land is reported to have been flooded or impacted, the most serious reported impact being to over 200ha at Llanbedr.
- **Cultural heritage:** New palaeo-environmental and archaeological discoveries have been exposed, such as ancient submerged forest and peat cuttings at numerous locations.
- **Environmental change:** Nationally and internationally important conservation sites and their features have been affected, with change identified at 37 Sites of Special Scientific Interest and 10 Special Areas of Conservation.

The damage and disruption to our coast and coastal communities has been significant and the impact on those who have been affected is extremely distressing. The costs and challenge of restoring our coastline and coastal communities are also significant.

Areas Protected

Whilst the damage in these events has been substantial, it is important that these impacts are considered within the context of what was protected. We have carried out an assessment of the number of properties which did not flood during the December 2013 and January 2014 storms and therefore were protected by the national network of coast protection and defence infrastructure.

The results of this analysis suggest that:

- In excess of 24,000 properties could potentially have flooded across the North Wales coast during the December 2013 incident and;
- In excess of 50,000 properties around Wales could potentially have flooded during the January storms.

Therefore the number of properties which flooded in December and January represent **less than 1% of the total** of those potentially at risk during these storms.

If we apply an average buildings insurance flood claim figure of £40,000 to these numbers, it suggests the financial costs of the 'damages avoided' in December 2013 and January 2014 are of the order **£960million and £2billion** respectively.

In addition to these costs, there will have been additional financial costs, for example:

- Emergency services response and recovery;
- Repair and restoration of local and national infrastructure;
- Local business losses, for example visitors choosing not to visit the Welsh coastline but go elsewhere either in the UK or overseas. These would not necessarily be economic losses to the UK, but would represent a financial loss to Wales and Welsh communities.

In addition there would be significant social, health and well being impacts on affected individuals and communities. Whilst these cannot be readily converted to monetary values they can be very important.

A similar analysis for agricultural land indicates that of the order of **34,000ha of agricultural land** could potentially have flooded during the January 2014 storms, were it not for the national network of coast protection infrastructure.

Therefore the area reported flooded or impacted in January represents **around 1% of the total** area potentially at risk during this storm.

Conclusion

Whilst the impacts on those directly affected have been very serious and distressing, the damage significant, and the costs of repair substantial, these could have been very much worse. The fact that they were not, was a result of substantial investment in coastal defences and protection over many years and the 'day to day' investment and maintenance by many organisations around the Welsh coast.

In addition, in recent years a substantial amount of investment of time and money has taken place in improving our forecasting and warning processes, building and testing professional partner relationships, and increasing awareness and resilience to flooding in our communities. All the risk management partners, as well as other organisations, have contributed to this work and this all helped to manage and mitigate the impacts on this occasion.

Officers of Natural Resources Wales of many years' experience are of the opinion that 10 or 20 years ago, the impacts of these recent storms would have been worse on our coastal communities, with an increased risk of lives being lost.

These recent storms have reminded us how exposed and vulnerable our coastal areas can be to the elements and how extremely important these areas are for the people, the environment and economy of Wales.

The "*Future flooding in Wales: flood defences"* report produced by Environment Agency Wales in 2010 considered the impacts on flood risk of different investment scenarios up to 2035. In 2010 this assessment concluded:

"To maintain the numbers of properties at flood risk in 2035 at levels comparable to present day may require around three times the current level of investment in flood defences".

Climate change projections indicate we can expect more frequent and serious storms, as well as increasing sea levels, in the coming years. It will not be feasible or affordable to defend the entire Welsh coastline into the future and it will become increasingly more important that all responsible and affected parties work together to respond to these challenges and manage these increasing risks.

It is therefore important that we collectively review our performance during these storms and learn any lessons to help us become better prepared and as a nation become more resilient to such conditions when they occur in the future.

To this end, we will continue to work with partner risk management authorities and others around the coast, to respond to the Minister's request for a Phase 2 report and to identify and learn the lessons from these storms.

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Natural Resources Wales

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Introduction

The coastline and coastal areas of Wales are extremely important to the people, communities, economy and environment of Wales. Many of our important towns and cities are located in coastal areas and these are supported by a wide range of local and national infrastructure. Our coastal areas are an important attraction to visitors from both within and outside of Wales and therefore provide an important contribution to the national economy.

Approximately 60% (1.9million) of the population of Wales live on, or near to, the coast, and 75% of the coastline is designated for its environmental importance. The coastal and marine environment supports an estimated 93,000 jobs, with visits to the coast accounting for over 40% of overnight stays in Wales (*Visit Wales, the Tourism and Marketing Division of the Welsh Assembly Government, 2008).*

An estimated 415km of man-made sea defence structures exist to protect over £8billion of assets from coastal erosion and tidal flooding and replacing these structures would cost about £750million (*Wales Audit Office, 2009*). The national network of coastal protection and defence infrastructure has evolved and developed over many years, in order to protect and manage the risks to our important and sensitive coastal areas and communities.

This national infrastructure network is managed and maintained by a wide range of public and private sector organisations, as well as private owners. Some of the structures within this network have been specifically constructed for coastal flood and/or erosion protection. Others have been constructed for another primary purpose, such as railway embankments and highway retaining walls, but provide a degree of coastal protection as a secondary function.

Coastal defence and protection at individual locations can consist of individual structures such as walls and embankments, but in many locations is provided by a complex interaction between the foreshore conditions and the defences. Foreshore conditions can include offshore structures, groynes, salt marsh and beaches. These can help to manage the movement and loss of sediment, as well as dissipate wave energy before it hits the defence line. The flooding to Aberystwyth in January clearly demonstrated the destructive power of high energy waves.

At some locations there may be a primary defence line/structure, which provides the majority of the protection, in particular to still water levels, which is supplemented by secondary defences set back inland, such as walls and embankments. These secondary defences can help to control the volume of water accumulating from wave spills for example.

At some locations coastal protection is provided by manual interventions such as closing of tidal doors and installation of barriers or ‘stop logs’.

Storm Severity

On 5th December 2013 a deep low pressure system off the west coast of Scotland brought severe gale force winds to North Wales, specifically the Liverpool Bay area. These created a significant storm surge and large onshore waves that coincided with high tide and caused considerable disruption along the North Wales coastline.

During January 2014 a succession of low pressure systems, tracking from the Atlantic, generated significant storm surges and very large offshore waves which, combined with high astronomic tides, caused considerable disruption to the south and west coasts of Wales. Although the highest tide was on 3rd January, this event continued until the 6th January, as successive low pressure systems continued to bring gale force winds and very large waves, a considerable number of which were high energy swell waves.

Both of these storm incidents affected not only Wales, but also other parts of the UK, most notably the east coast of England in December and the south and south west coast of England in January.

Given the complexity of these conditions and their impacts across the UK, we are working with colleagues in the Flood Forecasting Centre, Met Office and Environment Agency, to ensure a consistent methodology for the assessment of the severity of these events. This is particularly important in the cross border areas of the Dee and Severn Estuary. This work is on-going.

However, what we know already is that the peak sea level experienced in December 2013 was the highest recorded in Liverpool Bay during the 21 years since the tidal gauge was established. The level exceeded the previous highest value by a considerable amount of 300mm (1 ft).

In January the peak recorded level at:

- Milford Haven was 4.51mAOD. This was the highest level since at least February 1997 and exceeded the March 2008 tide (another notable event) by 0.14m.
- Newport was 8.03mAOD. This was the highest level since at least February 1997 and exceeded the February 1997 level by 200mm.
- Barmouth was 3.92mAOD. This is marginally higher than the February 1997 level.
- Liverpool was 5.86mAOD. Some 0.36m lower than the peak level on 5th December 2013.

Note: Metres Above Ordnance Datum, (mAOD) is based on the mean sea level at Newlyn in Cornwall and is used as the reference point to calculate height above sea level in the UK.

What is apparent is the peak levels in January 3rd 2014 were the highest on the south and west coast of Wales for at least 16 years. The impacts on the coastline and defences were compounded by the successive and sustained nature of the storm conditions and powerful waves over a number of tides and days.

The severity of these storms can also be gauged by:

- The severity and numbers of Severe Flood Warnings and Flood Warnings issued during the two events.
- The volume of Cyfoeth Naturiol Cymru/Natural Resources Wales (CNC/NRW) social media activity.

A summary of the flood warnings issued in December and January is included in Table 1 and presented in map form below. This number and severity of warnings is unprecedented in recent years.

Table 1: Summary of flood warnings

Summary for period 4th - 5th December 2013			
Day	**Cumulative warnings**		
	Alerts	**Warnings**	**Severe**
Wednesday 4th December 2013	3	9	0
Thursday 5th December	0	6	2
TOTAL	**3**	**15**	**2**

Summary for period 2nd - 6th January 2014			
Day	**Cumulative warnings**		
	Alerts	**Warnings**	**Severe**
Thursday 2nd January 2014	4	55	4
Friday 3rd January	4	29	2
Saturday 4th January	1	2	0
Sunday 5th January	10	3	0
Monday 6th January	2	14	0
TOTAL	**21**	**103**	**6**

The distribution of these warnings is illustrated below in Map 1 and Map 2.

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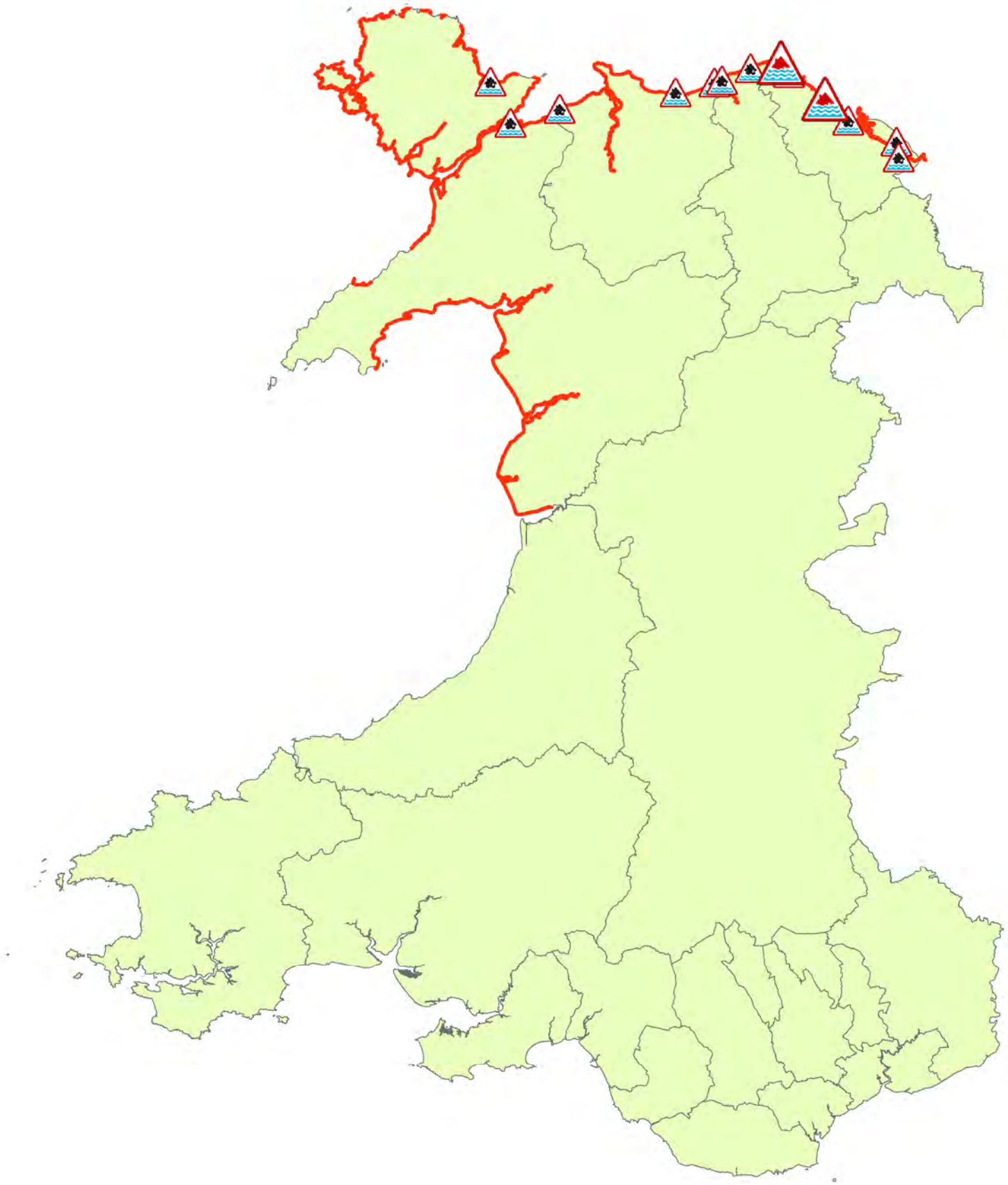
Map 1 - Flood Warnings Issued - December



Legend

Flood Warnings issued

Coastal Flood Alert Issued

Flood Warning

Severe Flood Warning

0 5 10 20 30 40 50 Kilometres

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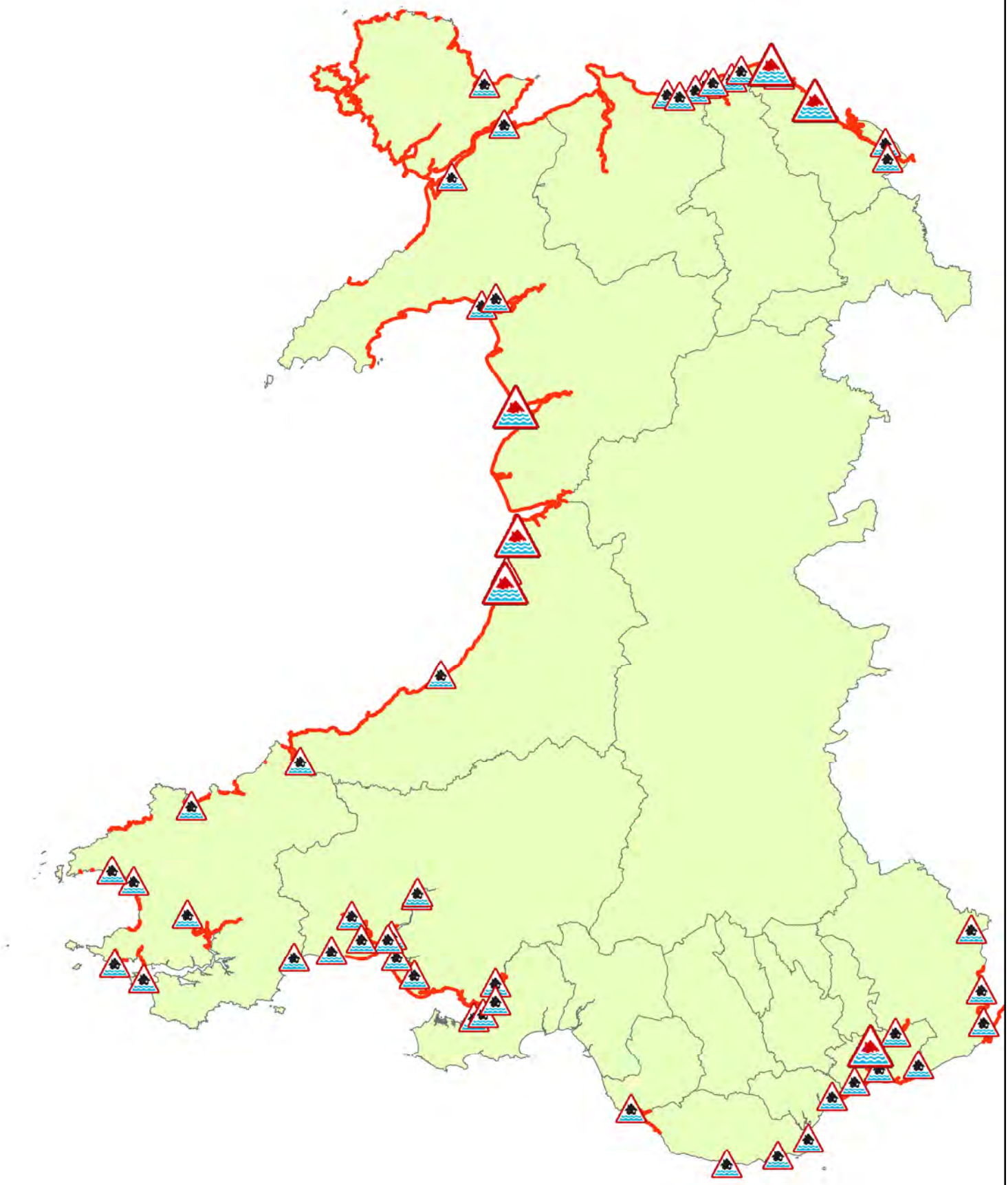
Map 2 - Flood Warnings Issued - January



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Flood Warnings issued

Coastal Flood Alert Issued

Flood Warning

Severe Flood Warning

0 5 10 20 30 40 50 Kilometres

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Flood Warning codes

	**Severe Flood Warning** Severe Flooding. Danger to Life
	**Flood Warning** Flooding is expected. Immediate action is required
	**Flood Alert** Flooding Possible. Be Prepared.

The volume of activity on social media and also via website visits is also a useful indicator of the severity of a flooding incident.

During the January storms the CNC/NRW media relations and communications team recorded the following activity:

- A 25% increase in Twitter followers.
- A reach of over 2 million accounts on Twitter.
- Over 700 re-tweets.
- Almost 30,000 visitors to the CNC/NRW website.

Minister's Request

Following the flooding to the North Wales Coast on 5th December 2013, Alun Davies AM, Minister for Natural Resources and Food, asked for an investigation into this coastal flood event to be coordinated by CNC/NRW and for the report to involve all of the North Wales authorities affected.

Following the flooding in January, the Minister wrote to CNC/NRW to ask that the North Wales review be expanded to include the January flooding across the whole of Wales. The Minister stated that as both are coastal reviews and cover similar issues, one combined review, incorporating all coastal authorities is preferred.

The relevant section of the Minister's written statement of 9th January 2014 is repeated below:

"This review will take a two-phased approach:

- *Phase one will be a swift review of the impacts across the whole of the country from both coastal flooding events and will look at the state of the coastal defences following the storm event. This will be produced by the end of January 2014.*
- *Phase two will look into the wider lessons learnt from both of these coastal flooding incidents and flood risk management in affected areas and include:*
    - *Details of the flood event, its modelling and forecasting*
    - *Operational response from flood risk management authorities*
    - *How defences performed, properties affected and estimates of those protected*
    - *Impacts on infrastructure and resilience to future flood events*
    - *Lessons learnt, so that we can be better prepared for future events.*

Phase two of the review will require agreement between all partners but the intention is to produce a report by April 2014, subject to further flooding incidents. However, in the short term the immediate focus for those authorities affected remains on clean-up and recovery."

The full statement can be found at:

http://wales.gov.uk/about/cabinet/cabinetstatements/2014/coastalflooding/?lang=en

Link to English Statement

Link to Welsh Statement

Approach to Phase 1

Following the Minister's request, we quickly started a three week programme of work to generate a Phase 1 submission by Friday 31st January 2014. We engaged with key coastal stakeholders in Wales via e-mail correspondence, sought their collaboration to provide data on their storm-related impacts and then analysed responses to inform this report.

On 13th January 2014 we wrote to the Chief Executives of the 15 maritime Local Authorities to invite them to participate in the Phase 1 review exercise. We created a spreadsheet as the mechanism for data collection, containing 48 columns grouped into the following five themes:

- '*Overview*' being the location, date and a brief summary of impacts plus a link to supporting photographs/media articles.
- '*Line of defence*' for details on the type of structural defence, its ownership and the severity of structural damage impacts.
- '*Impacts landward of defence*' being a) non-property related impacts upon farmland, utilities and transport infrastructure, and b) property related impacts being those that were either flooded internally or indirectly affected (no internal flooding).
- '*Impacts seaward of defence*' for details of beneficial or detrimental environmental change to habitats, heritage assets or maritime features.
- '*Approach to repairing defence*' being the intent, timing and cost of both temporary and permanent repairs to defences, plus identification of the potential consequences if no repairs are undertaken.

On the 15th January 2014 the spreadsheet was issued to the 15 maritime Local Authorities and our internal flood risk management teams, requesting responses by midday Friday 24th January. We engaged other external coastal stakeholders and internal environmental and access delivery teams with tailored versions of the spreadsheet between the 17th and 22nd of January, accepting responses until the end of Wednesday 29th January 2014 to inform this report.

Annex A lists the 38 organisations and groups that were consulted, with responses received from 37 (97%) that identified over 500 impacts from the two storms.

The distribution of the reported impacts is illustrated below on Map 3 and Map 4.

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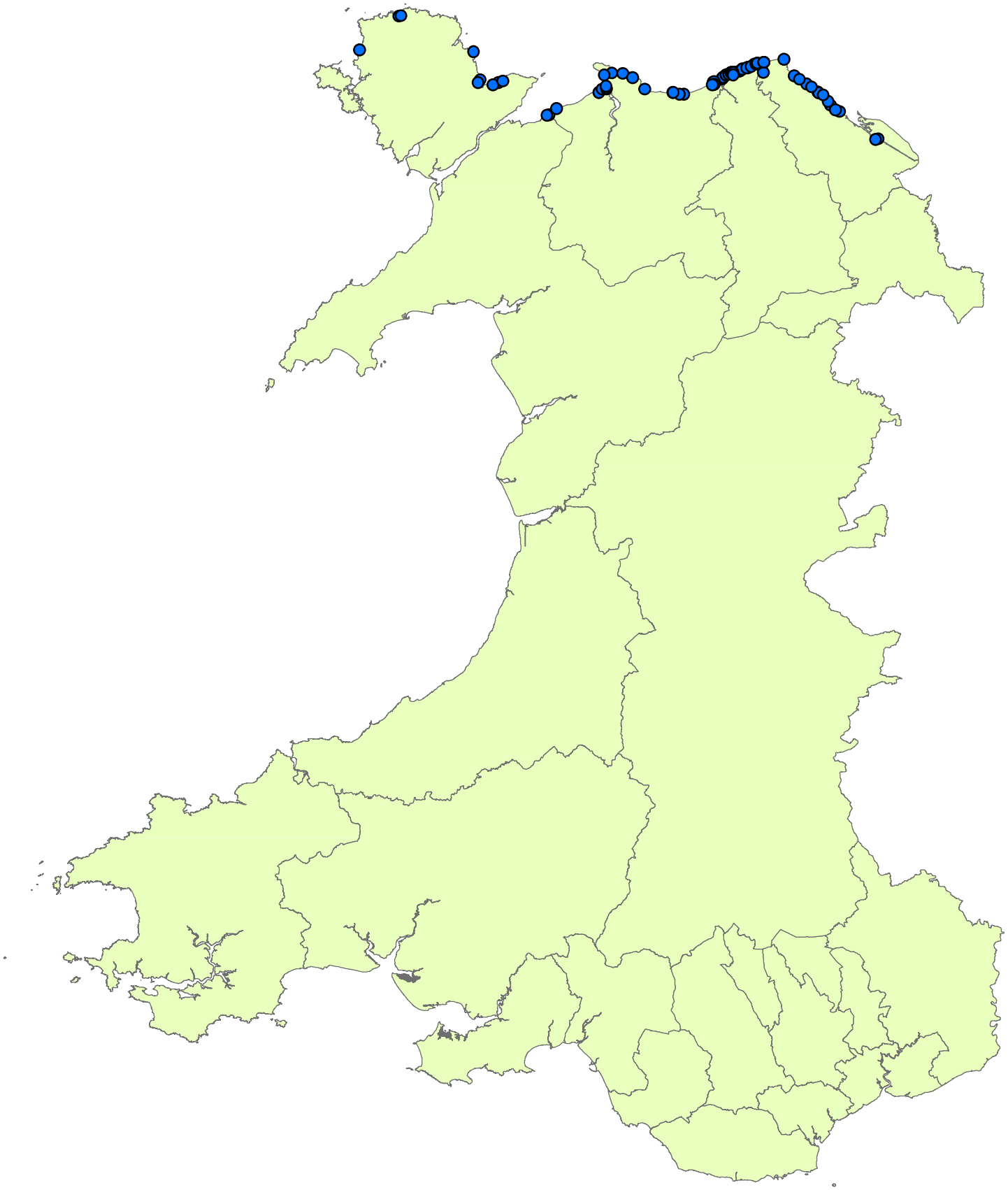
Map 3 - Coastal Impact Locations - December



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- Impact locations reported

0 5 10 20 30 40 50 Kilometres

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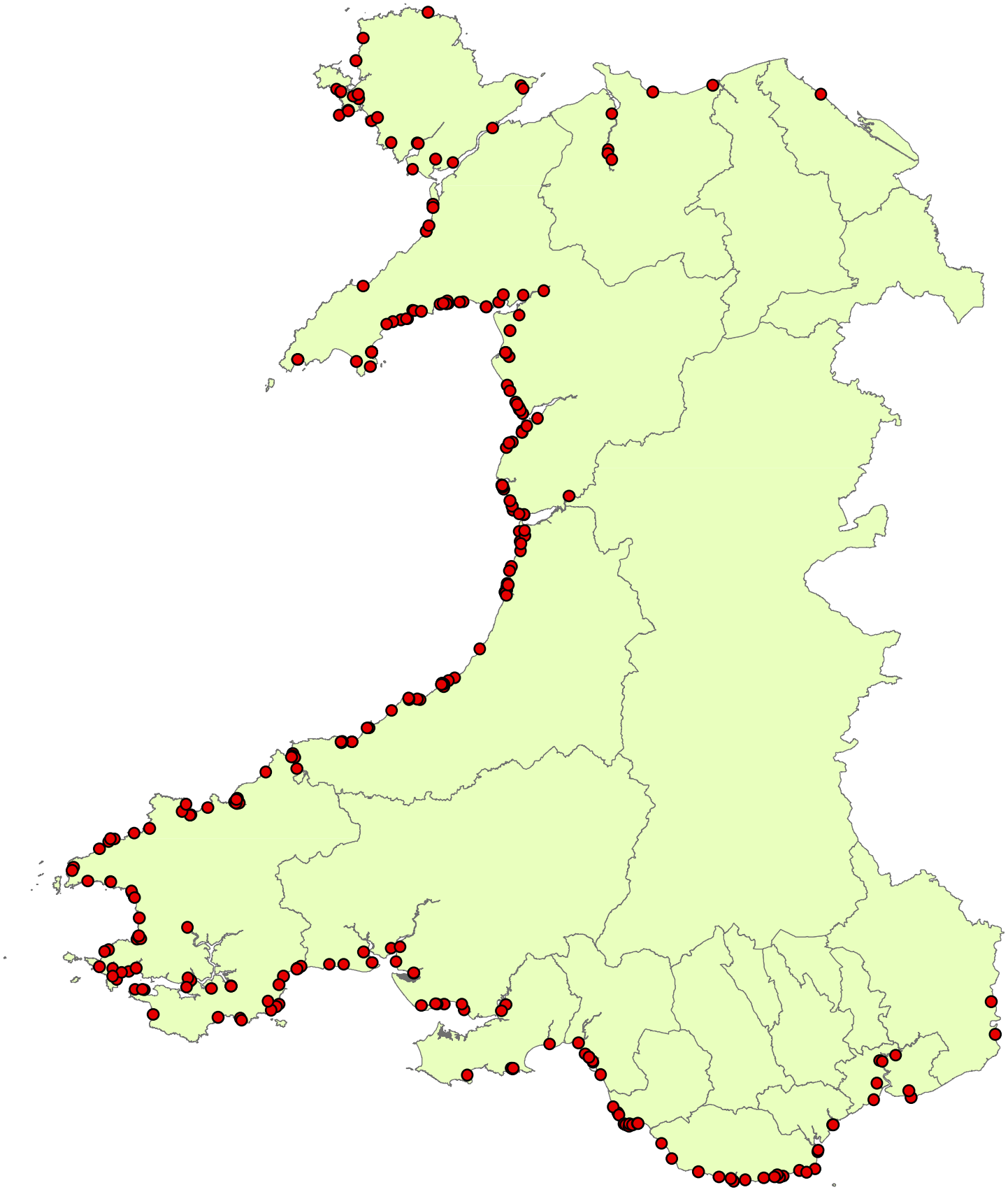
Map 4 - Coastal Impact Locations - January



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- Impact locations reported

0 5 10 20 30 40 50 Kilometres

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Summary of Impacts

People and property

Permanent residential and non-residential properties

The impacts of the December 2013 storm were spatially confined to the North Wales coastline, with over 20 communities affected within Flintshire, Denbighshire, Conwy and Anglesey. It is reported that around 155 properties experienced internal flooding, concentrated primarily in Rhyl (136) in Denbighshire and to a lesser extent in Kinmel Bay (8) in Conwy. A further 160 properties were indirectly affected by flooding and responses advised 125 properties were protected from internal flooding through the use of temporary local protection measures (e.g. individual property protection products or sandbags).

Denbighshire County Council noted that over 400 properties were advised to evacuate in Rhyl, with over 200 people received at rest centres. Five electrical fires occurred here in flooded properties and 4 casualties were recorded in Rhyl. Two are reported to have needed hospital treatment and two were treated at the rest centre.

Kinmel Bay, Conwy

The impacts of the January 2014 storm were spatially more widespread around the west and southern coastline of Wales, with approximately 100 communities affected from Anglesey through to Monmouthshire. Approximately 150 properties are reported to have experienced internal flooding, including Cardigan (21) and Aberystwyth (12) in Ceredigion, Barmouth (15) in Gwynedd and Fishguard (13) in Pembrokeshire. A further 415 properties were indirectly affected by flooding and responses advised 850 properties were protected from internal flooding through the use of temporary local protection measures (e.g. individual property protection products and sandbags).

Ceredigion County Council noted that over 600 properties were advised to evacuate across the communities of Borth, Aberystwyth and Cardigan. Newport County Council noted that 450 properties were advised to evacuate in the Crindau Pill area of Newport.

Borth, Ceredigion

Newport Parrog, Pembrokeshire

Caravan parks

Gwynedd Council noted six caravan parks were affected during the January 2014 storm event, with our flood risk management staff documenting that evacuation procedures were initiated prior to flooding of 130 caravans in Talybont, Gwynedd. Newport County Council also noted that 170 residential caravans at Lighthouse Park Estate were advised to evacuate during the same storm event.

The distribution of properties flooded and affected in December 2013 and January 2014 is illustrated on Maps 5 and 6 below.

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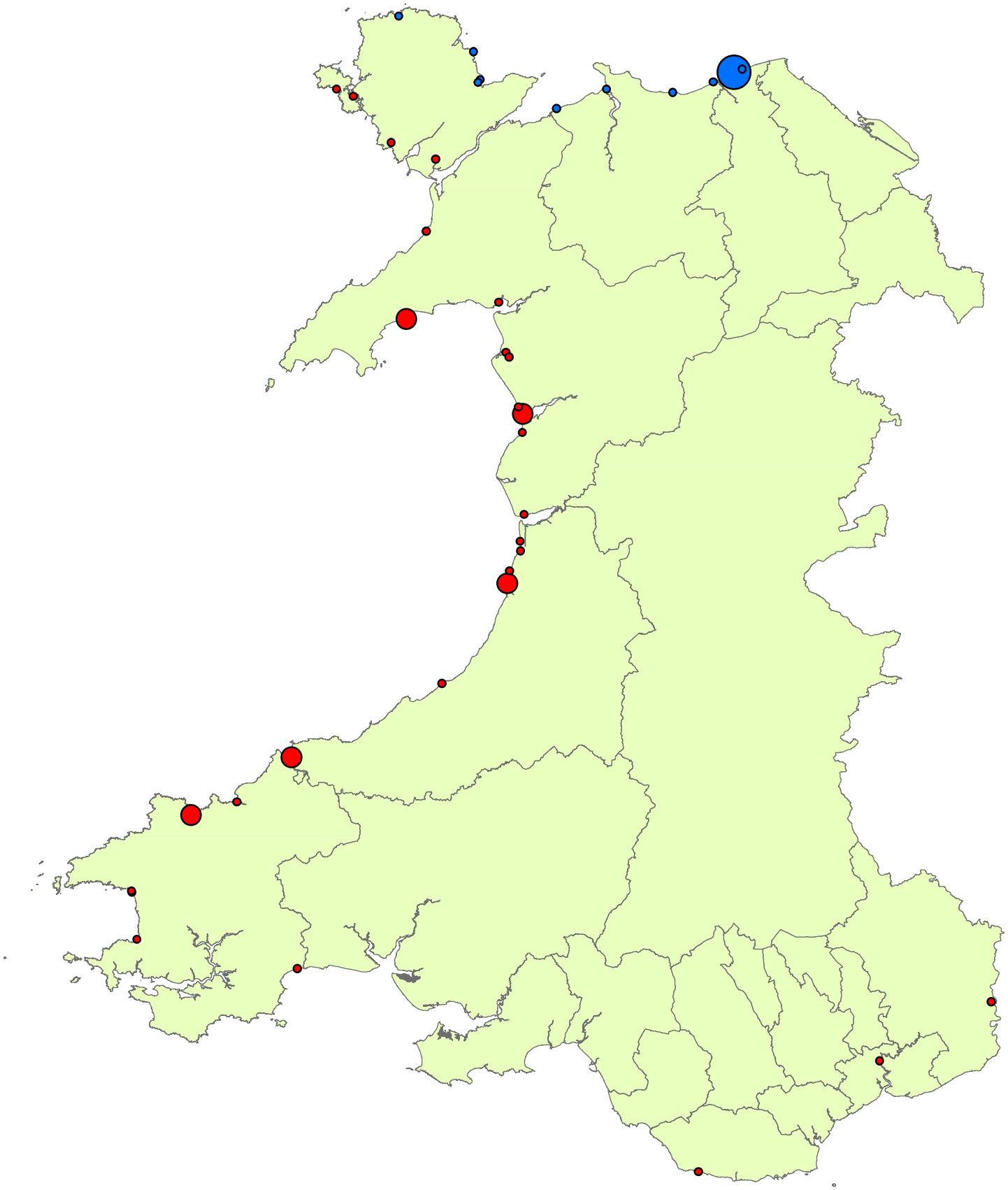
Map 5 - Properties Flooded



Legend

Number of Flooded Properties

December	January
Less than 10	Less than 10
10 to 50	10 to 50
Greater than 50	Greater than 50

0 5 10 20 30 40 50 Kilometres

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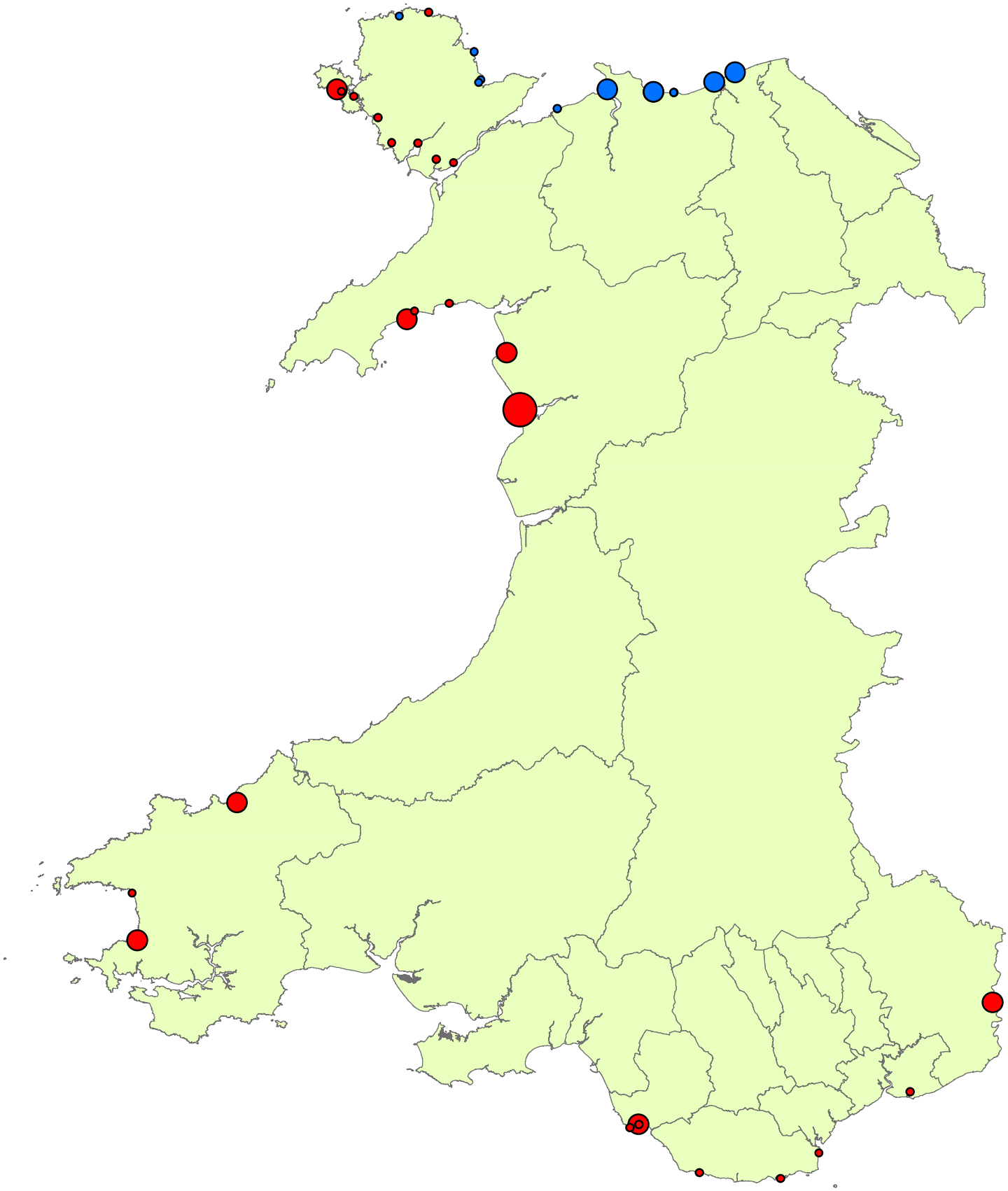
Map 6 - Properties Affected



Legend

Number of Properties Affected

December

- Less than 10
- 10 to 50
- Greater than 50

January

- Less than 10
- 10 to 50
- Greater than 50

0 5 10 20 30 40 50 Kilometres

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Coastal structures

Responses from Local Authorities and our own flood risk management teams indicated approximately 65 coastal defence structures were damaged during the December 2013 storm event, with over 25% comprising of damage to concrete sea defence walls and 12% comprising of damage to earthen embankments. 15% of damages affected multiple rather than singular structural components of coastal defences.

In January 2014 the same sources indicated approximately 110 coastal defence structures were damaged, with almost 30% comprising of damage to concrete sea defence walls and 13% being damage to earthen embankments. 20% of damages affected multiple rather than singular structural components of coastal defences.

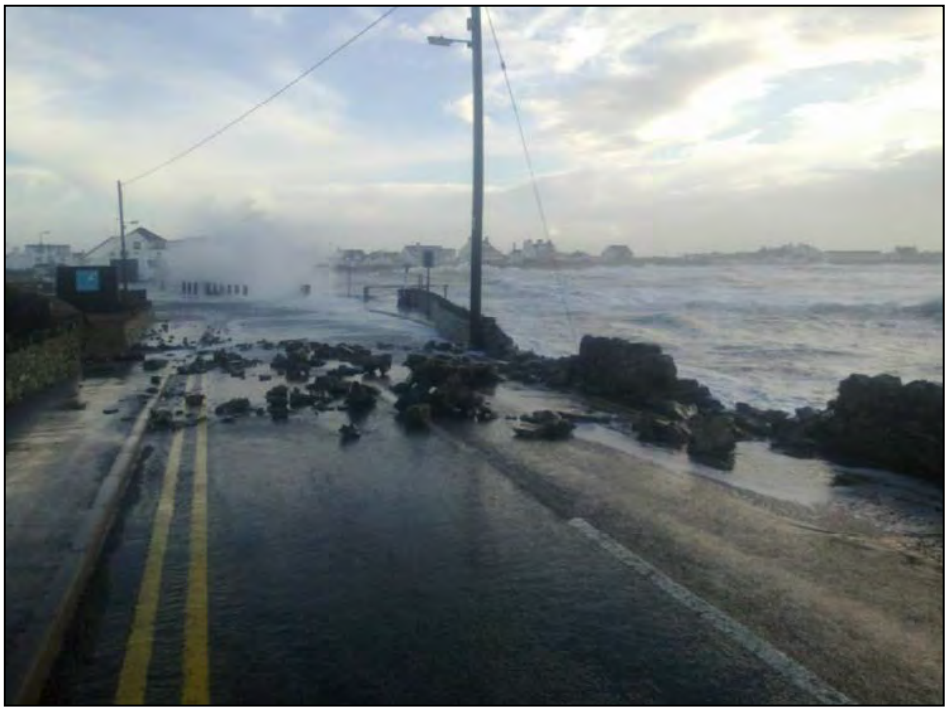
Respondents were asked to estimate the impact of structural damage to the line of defence using an indicator scale of 1 to 3, where 1 was 'low' impact that requires relatively minor repairs and/or localised refurbishment to restore to pre-storm conditions, and 3 was 'high' impact that requires major refurbishment and/or reconstruction to restore to pre-storm conditions. 30% of structural defence damages recorded over the two storm events were graded as 3, being 'high' impact.

Significant 'other' damage is also noted during both events to beach access infrastructure and non-structural 'soft' defences e.g. reduction in beach sediment volumes.

Llanddulas, Conwy

Rhyl, Denbighshire

Colwyn Bay, Conwy



Trearddur Bay, Isle of Anglesey

Rhyl, Denbighshire

Aberystwyth, Ceredigion

Aberystwyth, Ceredigion

The distribution of coastal structures impacted in December 2013 and January 2014 is illustrated on Maps 7 and 8 below.

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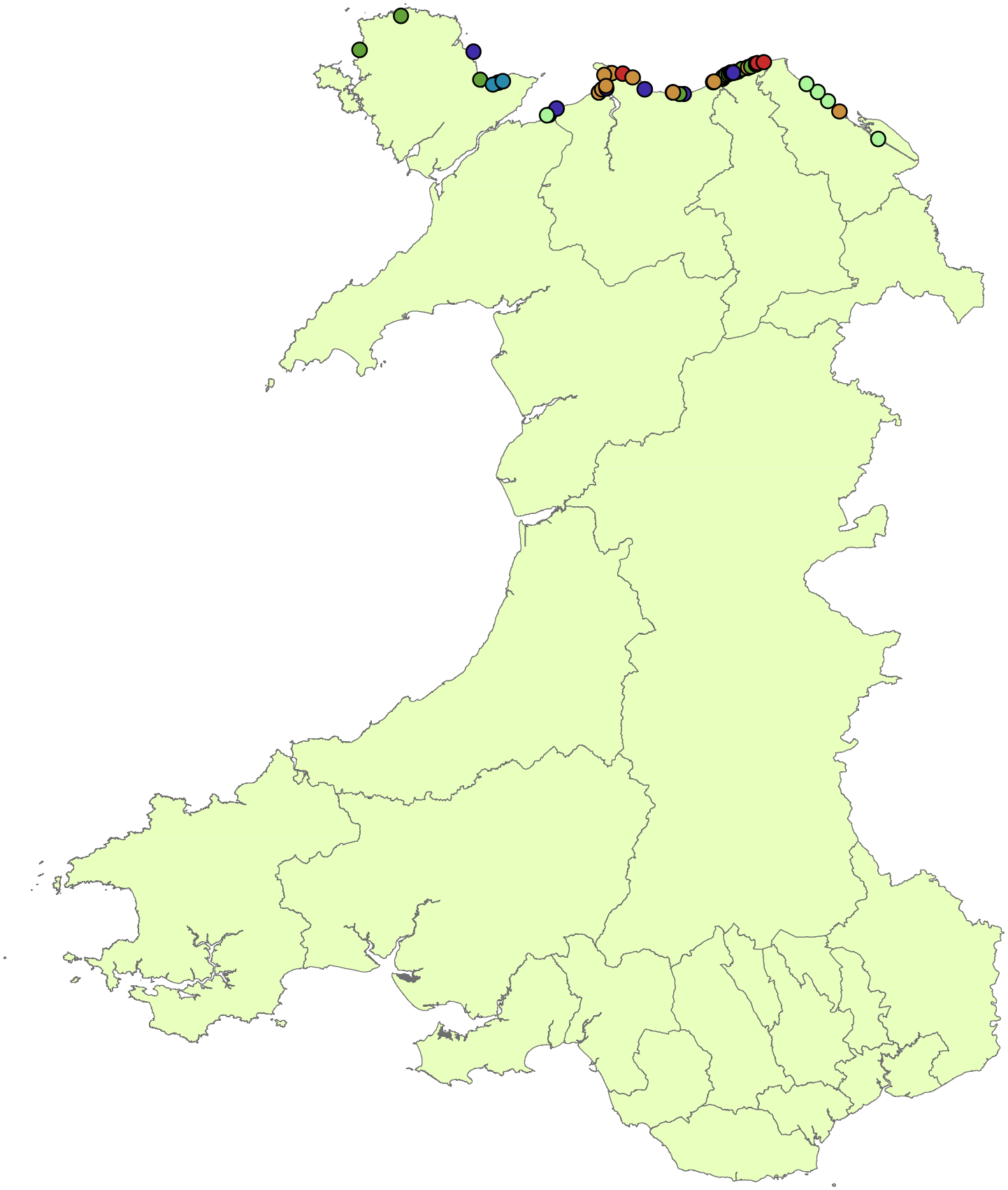
Map 7 - Coastal Defence Impacts - December



Legend

Coastal Defence impacts

- Multiple Damage Types
- Groyne Damage
- Other Damage
- Earth Embankment Damage
- Rock Revetment Damage
- Sea Defence Wall Damage

0 5 10 20 30 40 50 Kilometres

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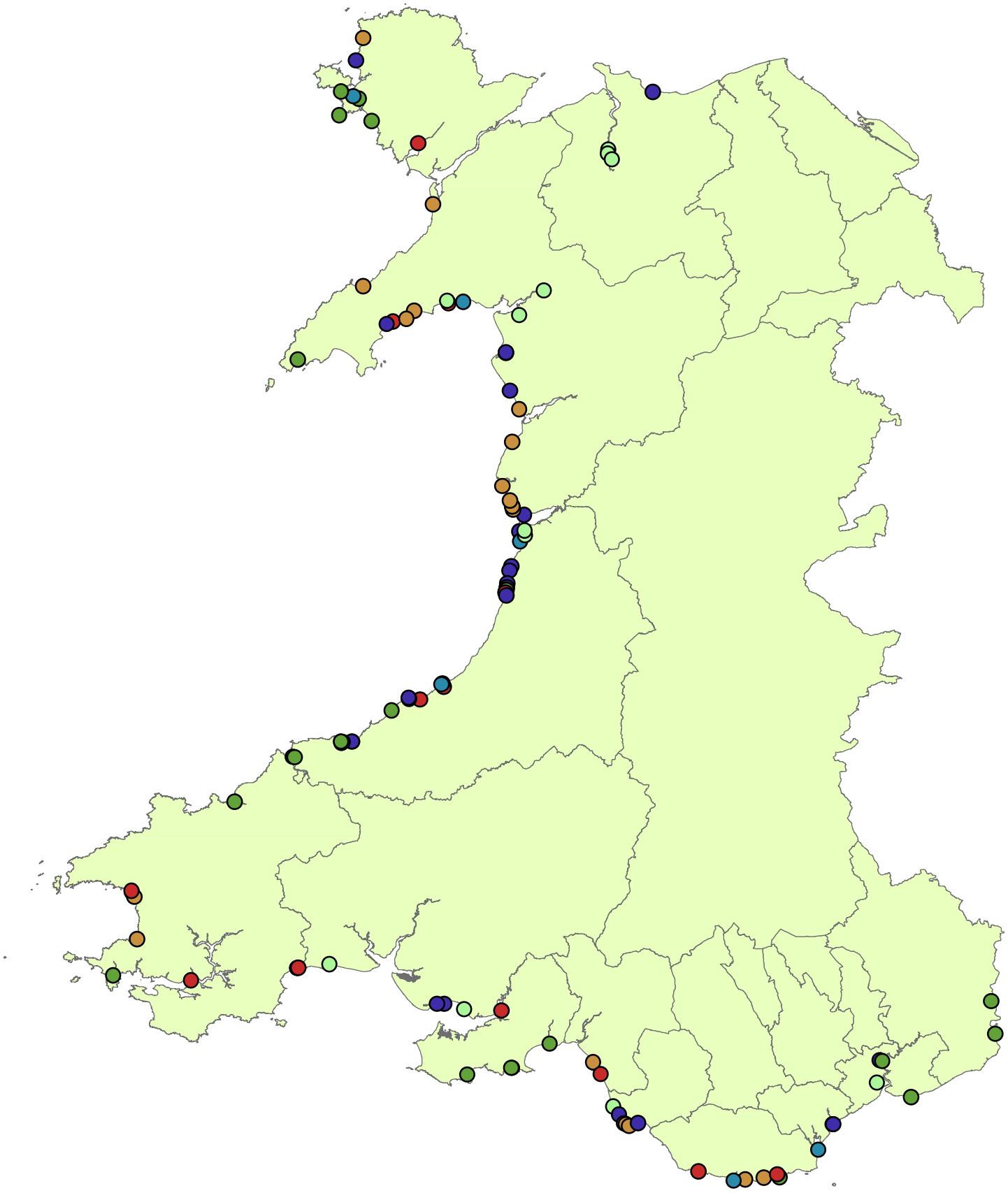
Map 8 - Coastal Defence Impacts - January



Legend

Coastal Defence impacts

- Multiple Damage Types
- Groyne Damage
- Other Damage
- Earth Embankment Damage
- Rock Revetment Damage
- Sea Defence Wall Damage

0 5 10 20 30 40 50 Kilometres

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Cost of restoration

We asked respondents to estimate costs for temporary and permanent restoration works to damaged coastal defences. Permanent restoration equate to reinstatement of pre-storm conditions rather than betterment to provide improved standards of protection. The majority of estimates were sourced by Local Authorities and CNC/NRW flood risk management teams with regards to coastal defence assets under their respective ownership. Repair costs to privately owned assets are largely unknown at present. We recognise that these cost estimates have been produced using best professional judgement in the limited time available.

At the request of Welsh Government, CNC/NRW has carried out an assessment of the information received to determine the potential costs which may be eligible for the Welsh Government's flood and coastal risk management grant funding.

These are estimated costs for works necessary to restore the national network of Local Authority and CNC/NRW managed coastal defences which were damaged specifically during the recent storm events.

This assessment has estimated that around **£8.1million** may be eligible for flood and coastal risk management grant funding. This is based on initial estimates provided by Local Authorities and CNC/NRW. It does not include other privately owned assets e.g. Network Rail.

Eligibility for funding does not mean that grant awards will be made. Local authorities will need to submit formal applications which will be subject to Welsh Government consideration. Applications and justification for grant funding will be considered alongside other flood and coastal risk priorities across Wales.

Some of the estimates received include elements of work which would not be eligible for flood and coastal risk management grant funding, for example street furniture, damage to paths and paving. In total this amounts to around £3.3million.

The distribution of estimated restoration costs is illustrated by Map 9 below.

Temporary repair costs in response to the December 2013 event are concentrated in North Wales only and estimated at approximately £80,000, of which 90% occur within Conwy County Borough Council. Permanent restoration costs are estimated at over £6,900,000, of which over 70% occur within Conwy County Borough Council and over 25% occur within Denbighshire County Council.

See Figure 1 and Table 2 below for estimated restoration costs by organisation after the December 2013 storm event.

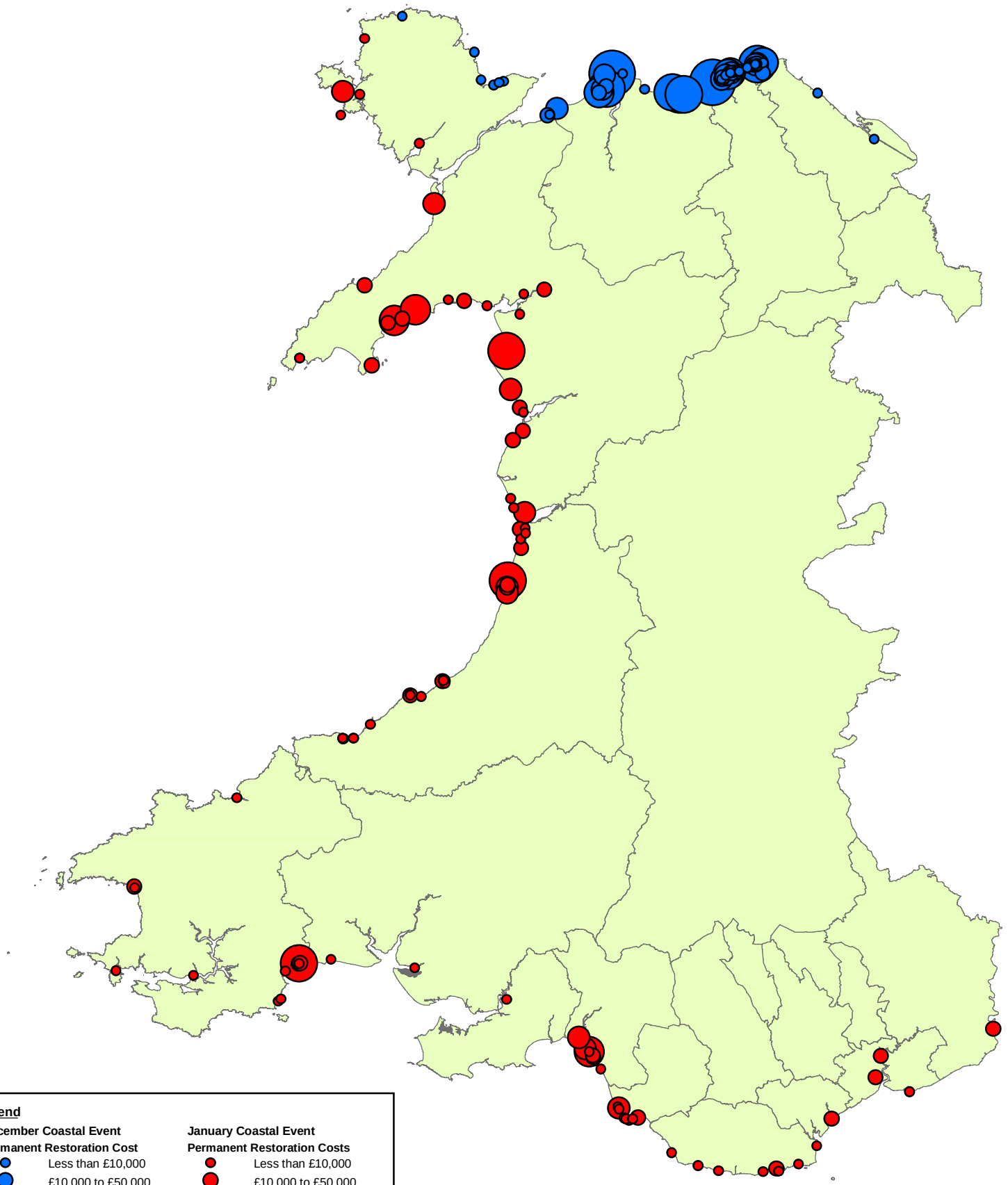
Temporary repair costs in response to the January 2014 event are geographically widespread and estimated at approximately £225,000, of which 30% occur within Gwynedd Council and almost 20% occur within Pembrokeshire County Council. The remaining costs are largely shared amongst the Local Authorities of Neath Port Talbot, Carmarthenshire and Ceredigion, plus our flood risk management teams in North Wales. Permanent restoration costs are estimated at over £4,216,000, of which 20% falls to our flood risk management teams in North Wales, 31% occurs within Ceredigion County Council, 16% occurs within Gwynedd Council and 15% occurs within Neath Port Talbot County Borough Council.

See Figure 2 and Table 3 for estimated restoration costs by organisation after the January 2014 storm event.

Table 4 below summarises the estimated costs by organisation for both storms.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 9 - Permanent Restoration Costs



Legend

December Coastal Event
Permanent Restoration Cost

- Less than £10,000
- £10,000 to £50,000
- £50,000 to £100,000
- £100,000 to £250,000
- £250,000 to £1,000,000
- Greater than £1,000,000

January Coastal Event
Permanent Restoration Costs

- Less than £10,000
- £10,000 to £50,000
- £50,000 to £100,000
- £100,000 to £250,000
- £250,000 to £1,000,000
- Greater than £1,000,000

0 5 10 20 30 40 50 Kilometres

N

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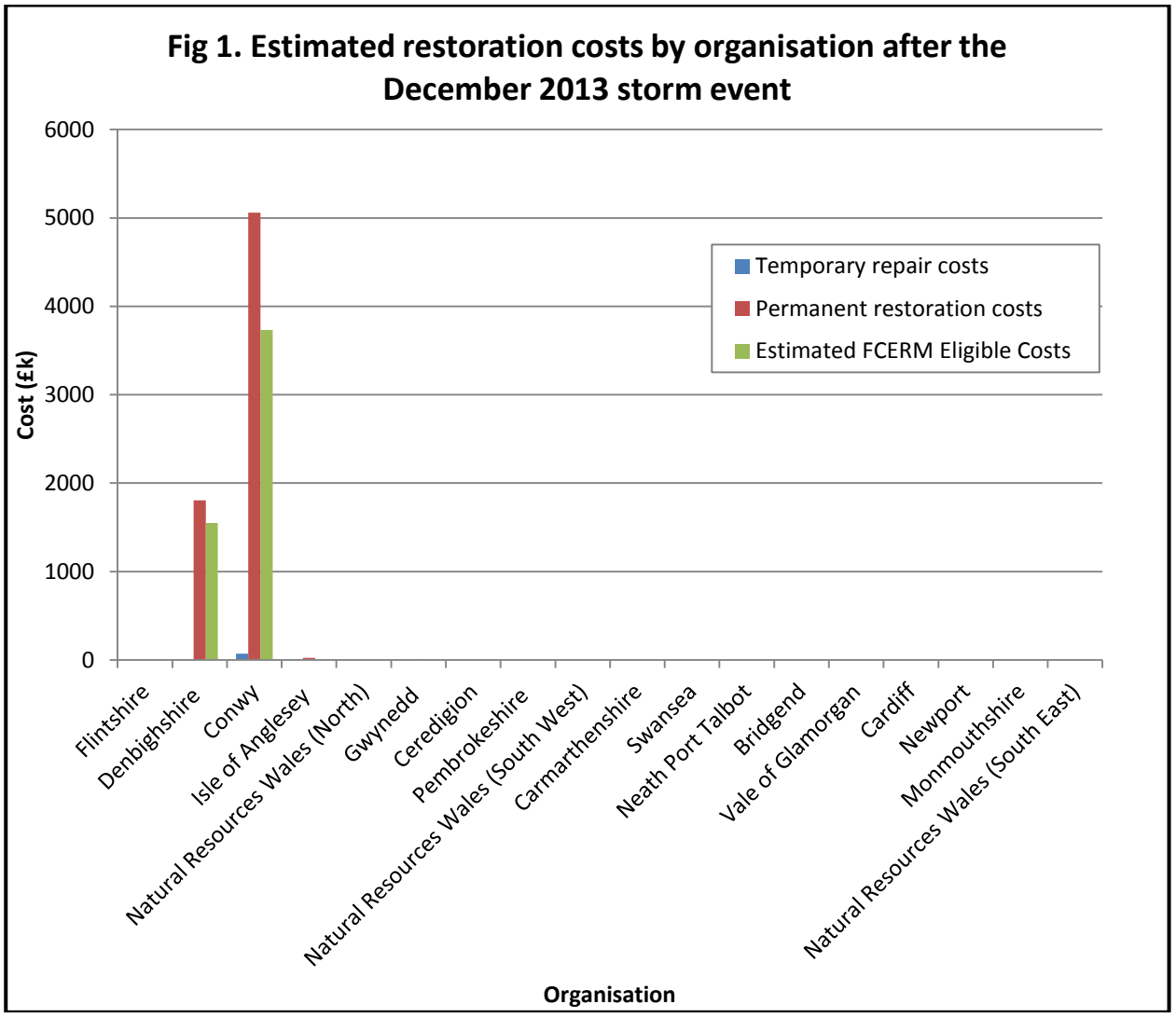


Fig 1. Estimated restoration costs by organisation after the December 2013 storm event
6000
5000
4000
3000
2000
1000
0
Cost (£k)
Temporary repair costs
Permanent restoration costs
Estimated FCERM Eligible Costs
Flintshire
Denbighshire
Conwy
Isle of Anglesey
Natural Resources Wales (North)
Gwynedd
Ceredigion
Pembrokeshire
Natural Resources Wales (South West)
Carmarthenshire
Swansea
Neath Port Talbot
Bridgend
Vale of Glamorgan
Cardiff
Newport
Monmouthshire
Natural Resources Wales (South East)
Organisation

Table 2. Estimated restoration costs by organisation after the December 2013 storm event			
Organisation	**Temporary repair costs (£)**	**Permanent restoration costs (£)**	**Estimated FCERM eligible costs (£)**
Flintshire	0	0	0
Denbighshire	0	1,806,500	1,550,500
Conwy	71,432	5,058,458	3,731,458
Isle of Anglesey	6,000	24,500	2,000
Gwynedd	0	12,000	0
Ceredigion	0	0	0
Pembrokeshire	0	0	0
Carmarthenshire	0	0	0
Swansea	0	0	0
Neath Port Talbot	0	0	0
Bridgend	0	0	0
Vale of Glamorgan	0	0	0
Cardiff	0	0	0
Newport	0	0	0
Monmouthshire	0	0	0
Total	***£77,432***	***£6,901,458***	***£5,283,958***
Natural Resources Wales (North)	2,000	0	2,000
Natural Resources Wales (South West)	0	0	0
Natural Resources Wales (South East)	0	0	0
Total	***£2,000***	***0***	***2,000***
	£79,432	**£6,901,458**	
	Total	**£6,980,890**	**£5,285,958**

Note: Given the short timescale, this report contains the 'best information' available at this time and this information will be subject to change in coming weeks and months as the scale of impacts and costs become better understood and evaluated.

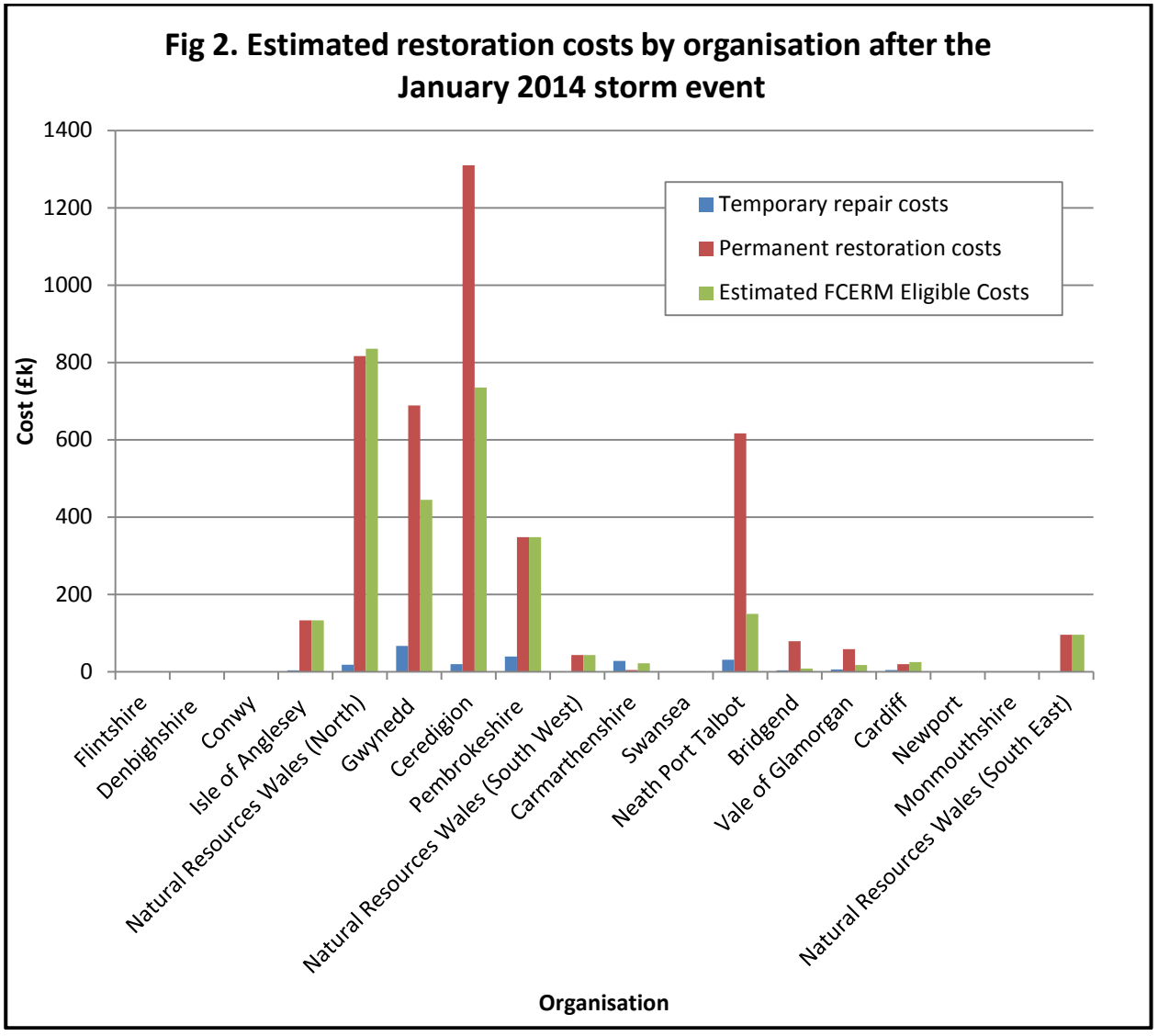
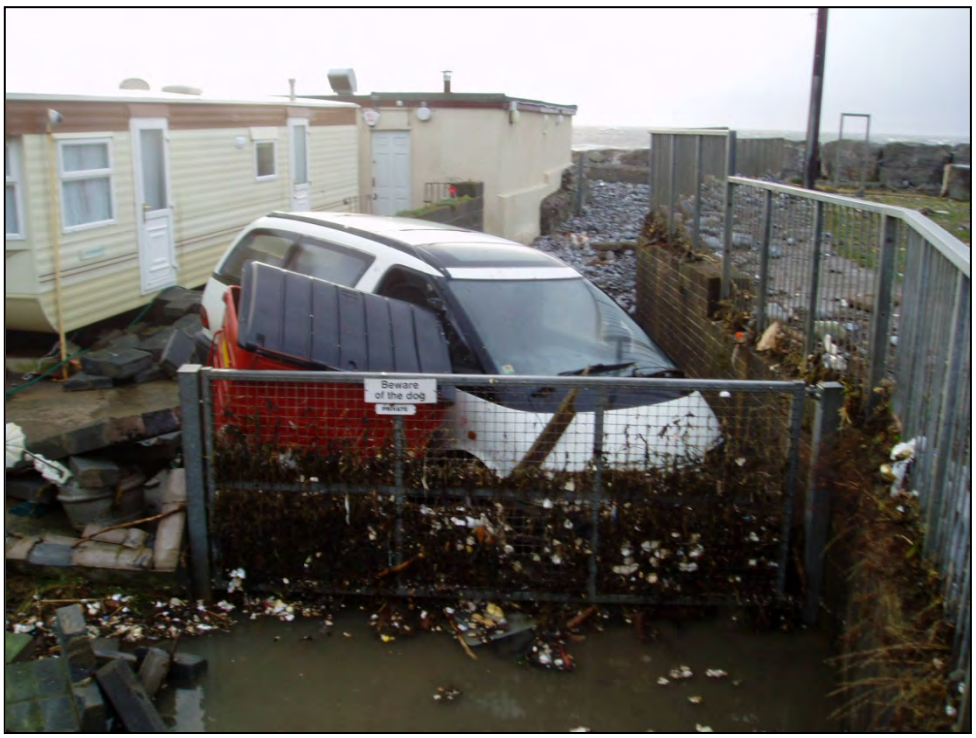


Fig 2. Estimated restoration costs by organisation after the January 2014 storm event
1400
1200
1000
800
600
400
200
0
Cost (£k)
Temporary repair costs
Permanent restoration costs
Estimated FCERM Eligible Costs
Flintshire
Denbighshire
Conwy
Isle of Anglesey
Natural Resources Wales (North)
Gwynedd
Ceredigion
Pembrokeshire
Natural Resources Wales (South West)
Carmarthenshire
Swansea
Neath Port Talbot
Bridgend
Vale of Glamorgan
Cardiff
Newport
Monmouthshire
Natural Resources Wales (South East)
Organisation

Table 3. Estimated restoration costs by organisation after the January 2014 storm event			
Organisation	**Temporary repair costs (£)**	**Permanent restoration costs (£)**	**Estimated FCERM eligible costs (£)**
Flintshire	0	0	0
Denbighshire	0	0	0
Conwy	0	0	0
Isle of Anglesey	4,000	133,000	133,000
Gwynedd	67,000	689,000	445,000
Ceredigion	20,000	1,310,000	735,000
Pembrokeshire	40,000	348,000	348,000
Carmarthenshire	28,000	5,000	22,000
Swansea	0	0	0
Neath Port Talbot	31,500	617,000	150,000
Bridgend	4,000	79,500	8,500
Vale of Glamorgan	6,000	59,000	18,000
Cardiff	5,000	20,000	25,000
Newport	0	0	0
Monmouthshire	1,000	0	0
Total	***£206,500***	***£3,260,500***	***£1,884,500***
Natural Resources Wales (North)	18,500	816,857	835,357
Natural Resources Wales (South West)	0	43,731	43,731
Natural Resources Wales (South East)	0	95,662	95,662
Total	***£18,500***	***£956,250***	***£974,750***
	£225,000	**£4,216,750**	
	Total	**£4,441,750**	**£2,859,250**

Note: Given the short timescale, this report contains the 'best information' available at this time and this information will be subject to change in coming weeks and months as the scale of impacts and costs become better understood and evaluated.

Penarth, Vale of Glamorgan



Llantwit Major, Vale of Glamorgan

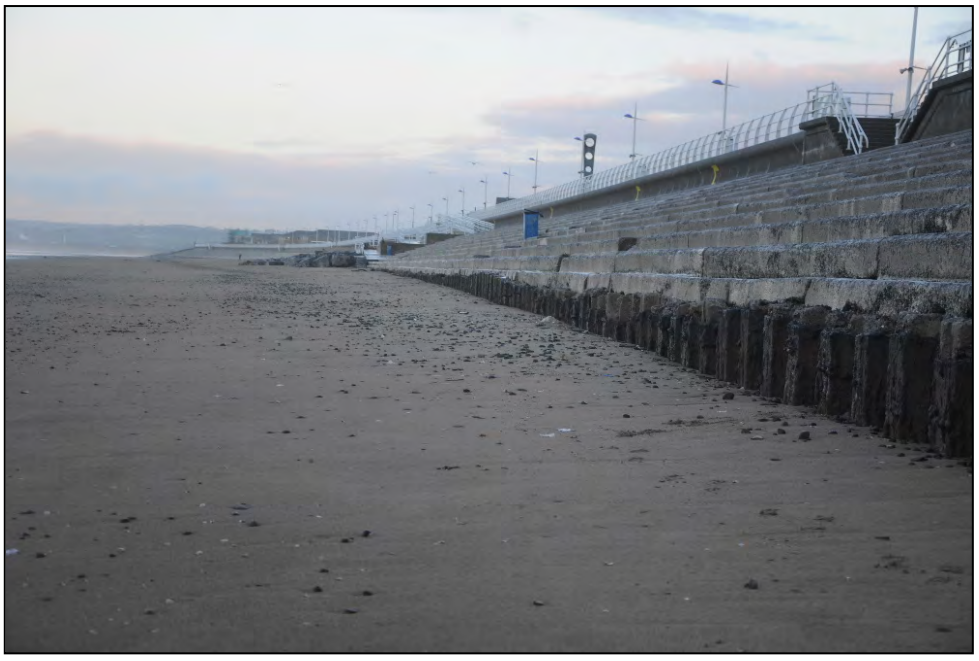
Table 4. Estimated restoration costs by organisation Both December 2013 and January 2014 storms			
Organisation	**Temporary repair costs (£)**	**Permanent restoration costs (£)**	**Estimated FCERM eligible costs (£)**
Flintshire	0	0	0
Denbighshire	0	1,806,500	1,550,500
Conwy	71,432	5,058,458	3,731,458
Isle of Anglesey	10,000	157,500	135,000
Gwynedd	67,000	701,000	445,000
Ceredigion	20,000	1,310,000	735,000
Pembrokeshire	40,000	348,000	348,000
Carmarthenshire	28,000	5,000	22,000
Swansea	0	0	0
Neath Port Talbot	31,500	617,000	150,000
Bridgend	4,000	79,500	8,500
Vale of Glamorgan	6,000	59,000	18,000
Cardiff	5,000	20,000	25,000
Newport	0	0	0
Monmouthshire	1,000	0	0
Total	***£283,932***	***£10,161,958***	***£7,168,458***

Natural Resources Wales (North)	20,500	816,857	837,357
Natural Resources Wales (South West)	0	43,731	43,731
Natural Resources Wales (South East)	0	95,662	95,662
Total	***£20,500***	***£956,250***	***£976,750***

£304,432	**£11,118,208 (£11.1m)**	
Total	**£11,422,640 (£11.4m)**	**£8,145,208 (£8.1m)**

Note: Given the short timescale, this report contains the 'best information' available at this time and this information will be subject to change in coming weeks and months as the scale of impacts and costs become better understood and evaluated.

Tintern, Monmouthshire



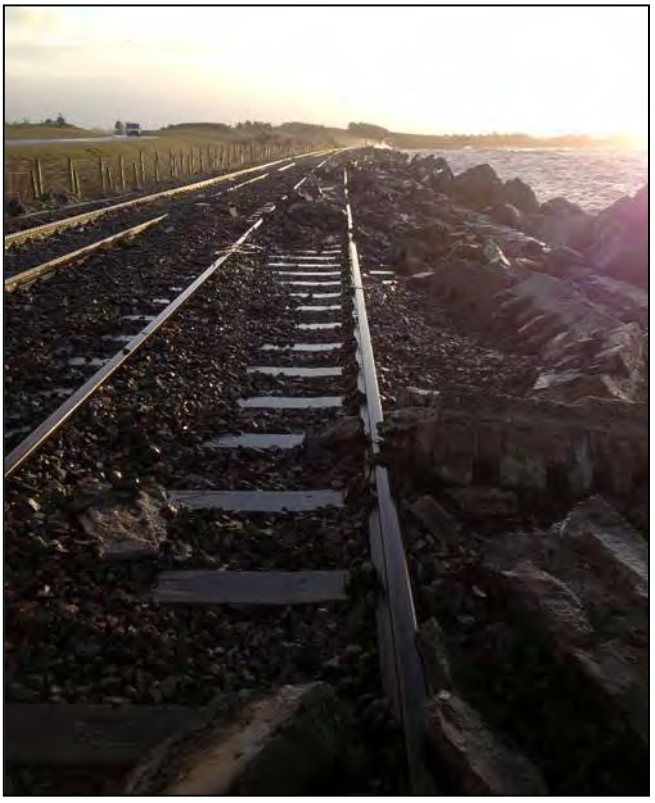
Aberavon, Neath Port Talbot

Infrastructure and utilities

Railway

Network Rail infrastructure beside the Dee Estuary was significantly affected during the December 2013 event, including six breaches along the Mostyn Sea Wall and damage to the Mostyn Embankment, Lord Vivian's Embankment and Holywell Embankment. The North Wales line from Holyhead to Chester was temporarily closed as a consequence.

In January 2014, significant structural damage occurred to Network Rail infrastructure on both the west coast Cambrian lines at Llanaber and Tywyn and on the South Wales line near Pembrey and St Ishmaels. The Cambrian line from Dovey Junction to Barmouth was closed during the early January 2014 storm and is expected to reopen for the start of service on 31st January 2014. The extent of damage incurred at Llanaber will however further delay re-opening of the Barmouth to Harlech line for several months from present.



Network Rail Damage

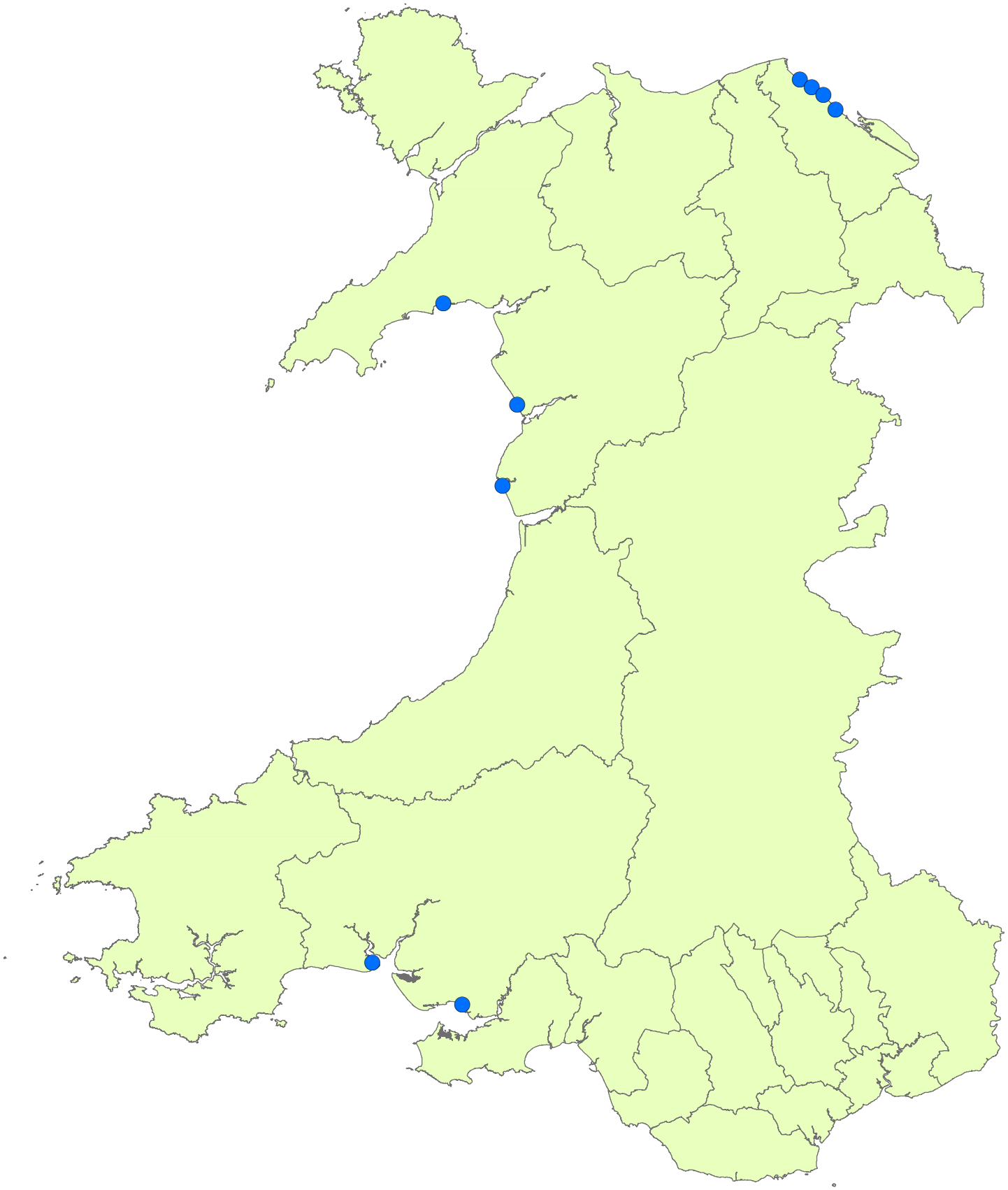
Network Rail Damage

Network Rail Damage

The distribution of impacts on the railway infrastructure is illustrated on Map 10 below.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 10 - Railway Impacts



Legend

- Railway impacts reported

0 5 10 20 30 40 50 Kilometres

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Road

Over 15.5km reported as being affected plus other unspecified lengths as a result of many temporary closures. Impacts reported include flooding, blockage by beach material and temporary closure for safety.

Conwy County Borough Council reported that approximately 2850m of road flooded within Kinmel Bay during the January 2014, with smaller scale impacts upon roads in several other communities. Ceredigion Council reported over 2500m of road impacted at Aberystwyth. Pembrokeshire County Council temporarily closed both the A487 and C3082 at Newgale due to flooding and coverage of the highway by shingle. In Amroth an estimated 40metres of the concrete sea wall was lost, leading to loss of the highway behind, affecting access to properties and a Welsh Water water main.

Borth-y-Gest, Gwynedd

Newgale, Pembrokeshire

Amroth, Pembrokeshire

A4080, Rhosneigr, Isle of Anglesey

The Wales Coastal Path

The storm damage recorded at over 70 locations to the natural substructure, surface and infrastructure of the Wales Coast Path highlights the challenge of maintaining and funding the 870 mile long route. Estimated repair costs collated by our access delivery team from Local Authority and Pembrokeshire Coast National Park Authority responses are £340,000.

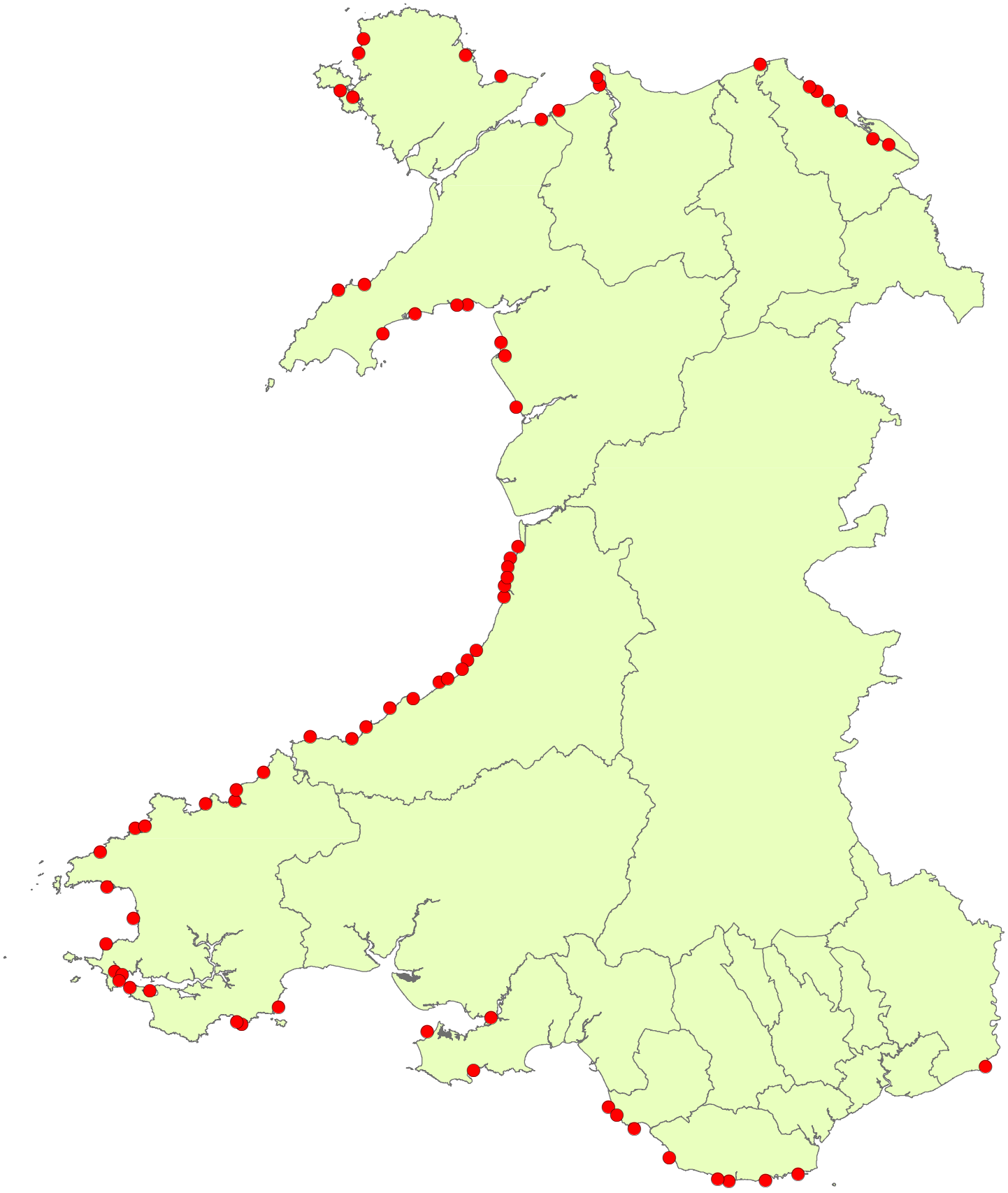
The distribution of impacts on the Wales Coastal Path is illustrated by Map 11.

Wales Coastal Path – Morfa Conwy

Wales Coastal Path – Morfa Conwy

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 11 - Wales Coastal Path Impacts



Legend

- Reported damage to Wales Coastal Path

0 5 10 20 30 40 50 Kilometres

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Utilities

Welsh Water experienced tidal flooding of a waste water treatment works at Connah's Quay in early December 2013. In January 2014 tidal flooding affected a waste water treatment works at Kidwelly and a sewage pumping station at Penrhyndeudraeth. Capital repair costs for these locations plus Amroth are estimated at £50,000, with other localised incidents of surcharging of the network and potential saline intrusion being addressed under routine operational expenditure.

Denbighshire County Council estimated that 350 properties lost electricity power and phone connections in the affected area of Rhyl in December 2013.

Fairbourne, Gwynedd

Farmland

It has been reported that coastal farmland across Wales has been affected by tidal flooding causing damage to property, fences, equipment, silage bales and hundreds of hectares of productive agricultural land.

The Farmers' Union of Wales confirmed flooding of over 30hectares at Englefield Farm, Holywell, Flintshire, in the December 2013 event following a 10m breach in an earthen embankment. Whilst internal property flooding and livestock loss was avoided, it took up to three weeks for the majority of floodwater to recede. Should the flooded land require re-seeding in the future, costs are estimated at £300-£400 per hectare.

The National Farmers' Union (Wales) indicated one of the worst hit areas in January 2014 was Pensarn, Llanbedr, where a 30 metre breach in the sea defence resulted in properties and around 200hectares of farmland being submerged by salt water. The severity and speed of the tidal flooding onset left farmers with no response time, resulting in the loss of over 120 sheep and four people were rescued from a property by an RNLI boat. It is reported that under recurrent high tides previously productive agricultural land has been rendered useless for agriculture, and there is insufficient time for drainage of the land between high tides.

Storm impacts have required farming systems and operations to be adjusted. Salt water remains on fields in some areas and, with certain pasture types having low tolerance to saltwater incursion, the long term effect of the damage is yet to be determined. The National Farmers' Union (Wales) believe the consequences will affect farmers well into 2014, and into future years for some.

Llanbedr, Gwynedd

Heritage

Archaeological sites along the coastline suffered significant erosion damage during the January 2014 storm and remain vulnerable to further erosion. Gwynedd Archaeological Trust note sand dune recession at Abererch further exposed Bronze Age features. Dyfed Archaeological Trust note further exposure of cist graves in Pembrokeshire, including cist grave falls from the cliffs at St Bride's. *(Cist grave = a box shaped burial structure made of stone slabs set on edge).*

Following the January 2014 storm, Dyfed and Gwynedd Archaeological Trusts recorded extensive peat and submerged forest exposures around the coastline including at Abermawr, Newgale and Broad Haven in Pembrokeshire, Llanrhystud in Ceredigion and Tywyn, Fairbourne and Porth Neigwl in Gwynedd. The Royal Commission on the Ancient and Historical Monuments of Wales noted that erosion at Borth has exposed a wattle walkway with associated posts that possibly dates from 4000 to 3100 BP.

Cadw and the Royal Commission on the Ancient and Historical Monuments of Wales recorded the damage and subsidence of Bath Rock Shelter on Aberystwyth Promenade and potential damage to the early 19th Century Marine Baths beneath. Gwynedd Archaeological Trust noted erosion to the Scheduled Ancient Monument of World War II features at Fairbourne.

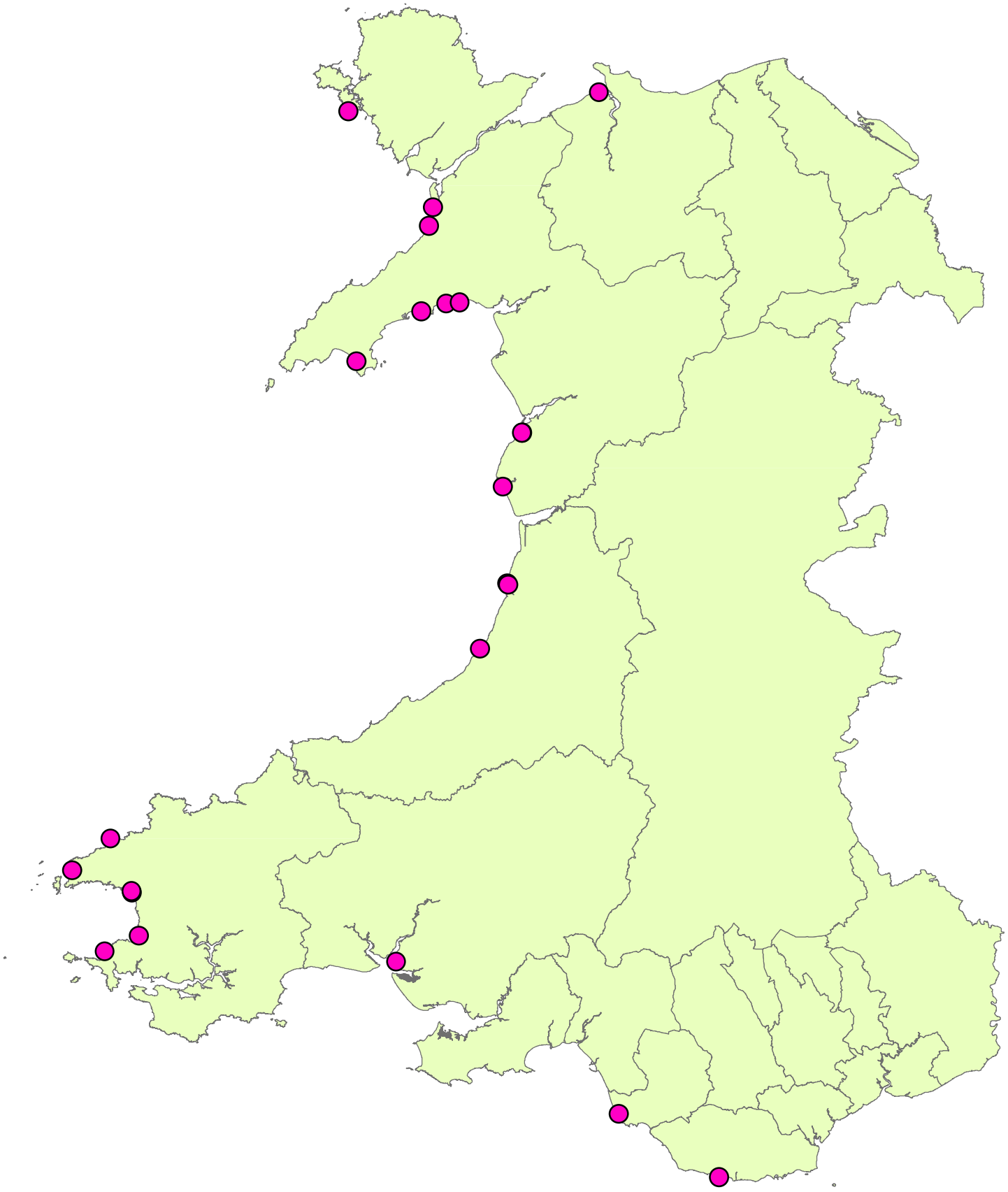
The National Trust reported only minor damage to two holiday cottages at Porth Dinllaen in Gwynedd and to the remains of engine house walls at Blue Lagoon in Pembrokeshire.

The distribution of impacts on Heritage features is illustrated by Map 12.

Fairbourne, Gwynedd

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 12 - Heritage Impacts



Legend

Heritage impacts reported

0 5 10 20 30 40 50 Kilometres

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Environmental change

The coast of Wales is home to a wide range of habitats and landforms which have been affected by the storms, especially beaches, sand dunes and vegetated shingle and to a lesser extent saltmarsh and soft cliff. They include biodiversity and geodiversity features of national and international importance.

The National Trust noted significant recession of sand dune systems at locations including Llandanwg near Harlech, Morfa Bychan near Porthmadog, and Freshwater West, Barafundle and Broadhaven in Pembrokeshire. The Crown Estate confirmed they are aware of storm damage on Welsh Common Land at Llandanwg and are liaising with the National Trust and Llandanwg Dune Committee on their proposals for managing the restoration.

The following information was gathered by an audit initiated and coordinated by the Knowledge Strategy and Planning Directorate within CNC/NRW, with records being submitted by the Operations Directorates.

- **Coastal grazing marsh** in Wales was not seriously inundated with only three reports submitted, including a report from the National Trust regarding Cwm Ivy, North Gower, and two further CNC/NRW records for Morfa Madryn near Bangor and the Dee Estuary. This contrasts with the experience in England were extensive areas were submerged.
- **Nationally and internationally important conservation sites and their features** have been affected. Records to date have identified change at 37 Sites of Special Scientific Interest and 10 Special Areas of Conservation.
- **Geodiveristy sites** range from active coastal processes to static landforms and geological features exposed in cliffs. The recent storms have lead to large scale changes to the shape and morphology of the coastline in some areas. According to CNC/NRW's geologists, fresh features of geodiversity conservation significance have been revealed in several locations such as Dinas Dinlle and Abermawr, and active processes have lead to significant changes at places like Morfa Dyffryn. These will require scientific recording and monitoring.
- The National Trust and CNC/NRW Reserve Managers have confirmed that important **coastal freshwater habitats** (such as the Bosherston Lakes) have not been impacted by saltwater intrusions, while saline lagoon environments, such as Cemlyn Lagoon on Anglesey have evolved to cope with increases in salinity.
- There have been no reports of **mass wildlife mortality** from the records received, and through further checks with Skomer Marine Nature Reserve, although there have been records of small numbers of seabirds been found dead. However the true extent of wildlife impact may not become apparent until surveys are carried out later. In particular, CNC/NRW staff have identified concern about some rare coastal invertebrate species.

- **The large accumulation of litter** on the coastline offers an opportunity to remove this material from the marine ecosystem.
- **The significant morphological change** highlights the importance of ongoing coastal monitoring to inform management of not just built assets but also our biodiversity and geodiversity resource.

The distribution of environmental impacts is illustrated by Map 13.

Penally, Pembrokeshire

Ynyslas, Ceredigion

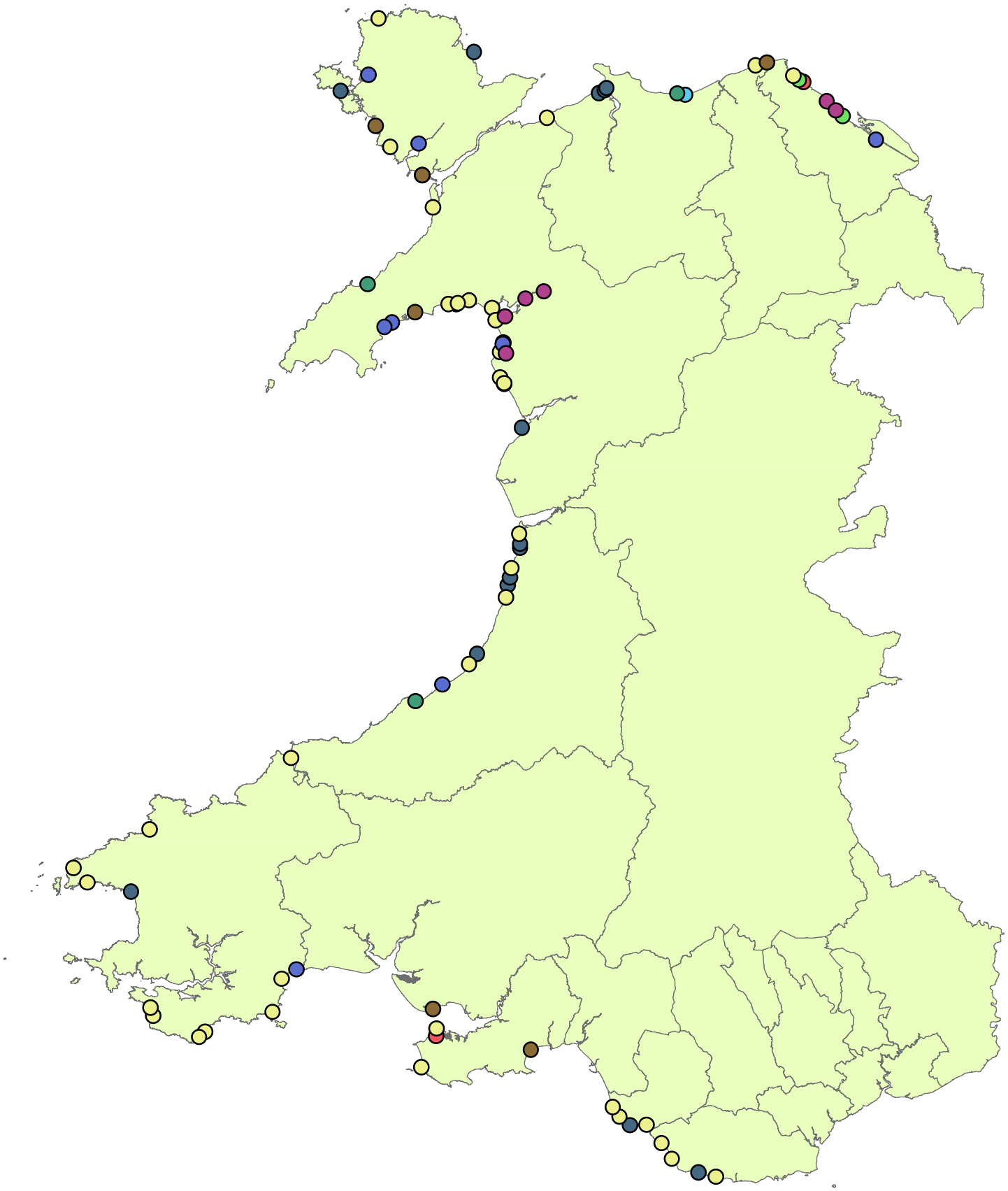
Aberystwyth beach re-profiling

Beach Litter

Mariners Point, Neath Port Talbot

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 13 - Environmental Impacts



Legend

Environmental Impacts

- Multiple Damage Types
- Beach Damage
- Marsh Damage
- Mudflat Damage
- Saltmarsh Damage
- Sand Dune Damage
- Shingle Damage
- Soft Cliff Damage
- Other Damage

0 5 10 20 30 40 50 Kilometres

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Areas Protected

As part of any assessment of flooding impacts it is important that these are considered within the context of what did not flood and the areas which were protected by flood defences and flood risk management interventions.

To support this Phase 1 swift assessment of impacts, we have carried out a broad scale national assessment of those areas which benefitted from the national network of coastal protection/defence infrastructure.

The purpose of this analysis is to provide an indication of the scale of impacts which could have occurred during the December and January storms if the national network of coastal protection/defence infrastructure was not in place. This is in effect the benefit provided by this infrastructure during these incidents.

We have carried out the assessment on the number of properties and area of agricultural land protected. This analysis is based on peak still water projections from the December and January storms and makes no allowance for wave overtopping and damage. So in this respect this analysis is conservative, as the impact experienced in some locations, particularly on the south and west coast, was particularly associated with wave impacts, most notably at Aberystwyth.

The results of this analysis suggest that:

- In excess of 24,000 properties could potentially have flooded across North Wales during the December 2013 incident and;
- In excess of 50,000 properties around Wales could potentially have flooded during the January storms.

Therefore the numbers of properties which flooded in December and January represent **less than 1% of the total** of those potentially at risk during these storms.

If we apply an average buildings insurance flood claim figure of £40,000 to these numbers it suggests the financial costs of the 'damages avoided' in December 2013 and January 2014 are of the order **£960million and £2billion** respectively. *(Source of the unit damage: Securing the future availability and affordability of home insurance in areas of flood risk, Defra publication June 2013. Ref 27 Association of British Insurers, unpublished).*

In addition to these costs, there will have been additional financial costs, for example:

- Emergency services response and recovery;
- Repair and restoration of local and national infrastructure;

- Local business losses, for example visitors choosing not to visit the Welsh coastline but go elsewhere either in the UK or overseas. These would not necessarily be economic losses to the UK, but would represent a financial loss to Wales and Welsh communities.

In addition there would be significant social, health and well being impacts on affected individuals and communities. Whilst these cannot be readily converted to monetary values they can be very important.

Whilst these numbers need to be considered with caution given the nature of the analysis, it is very clear that the magnitude of the properties protected and the flood damages avoided was very significant.

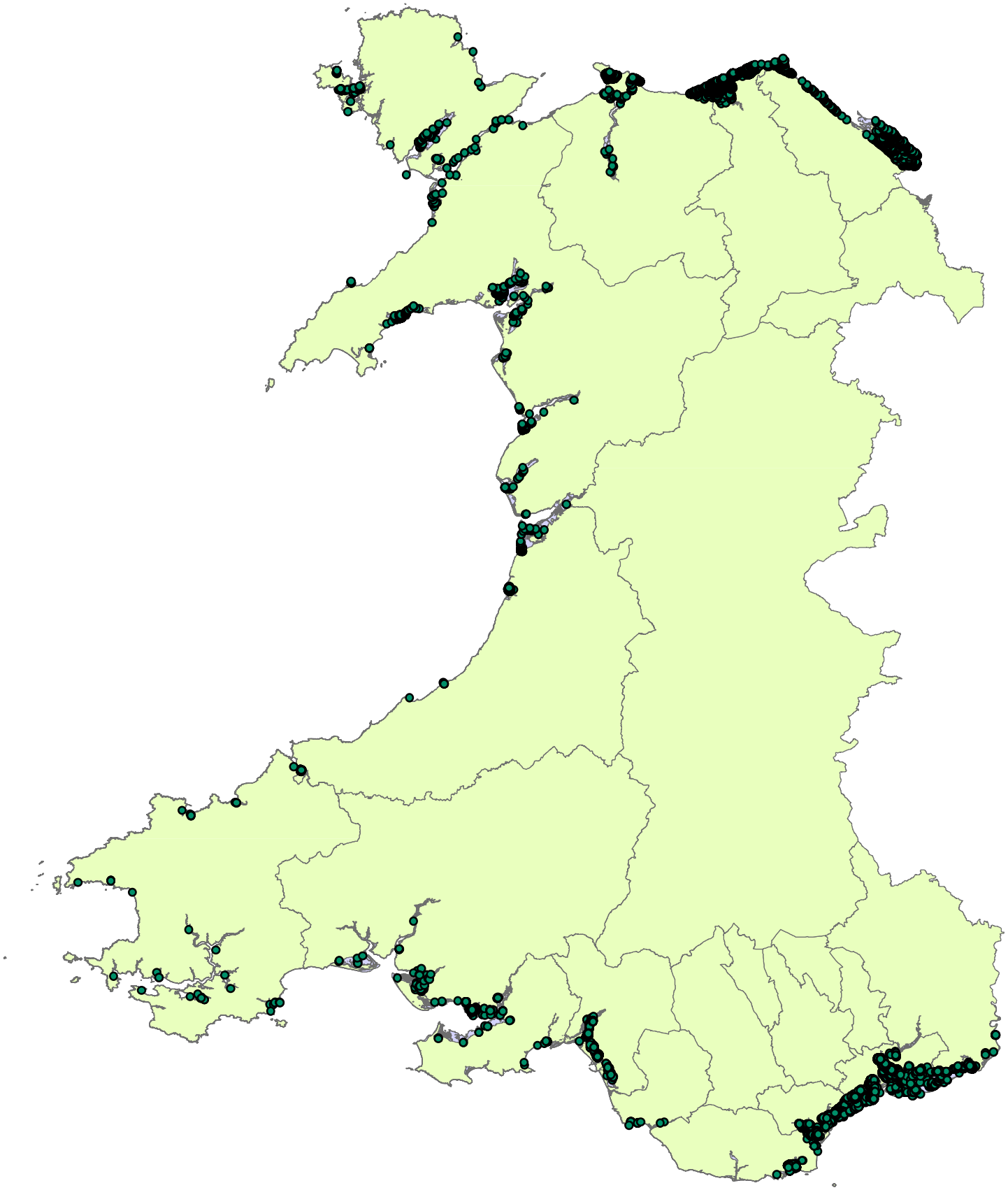
This analysis serves to demonstrate the value and benefit of the national coast protection/defence infrastructure, as well as place the impacts of these recent storms into the context of the potential impacts avoided.

The geographical distribution of the properties protected during these storms is illustrated by Map 14 and Figures 3 and 4. The purpose of this information is to illustrate the relative spatial distribution of the properties benefitting and not specific numbers.

Map 14 and Figure 4 for the January 2014 storms clearly illustrates that the majority of properties benefitting from protection/defences are in north east (Deeside), Conwy and south east Wales. The west and south west of Wales is more typically characterised by discrete communities with localised protection.

Cyfoeth Naturiol Cymru
Natural Resources Wales

Map 14 - Damages Avoided - Properties



Legend

- Potentially flooded properties

0 5 10 20 30 40 50 Kilometres

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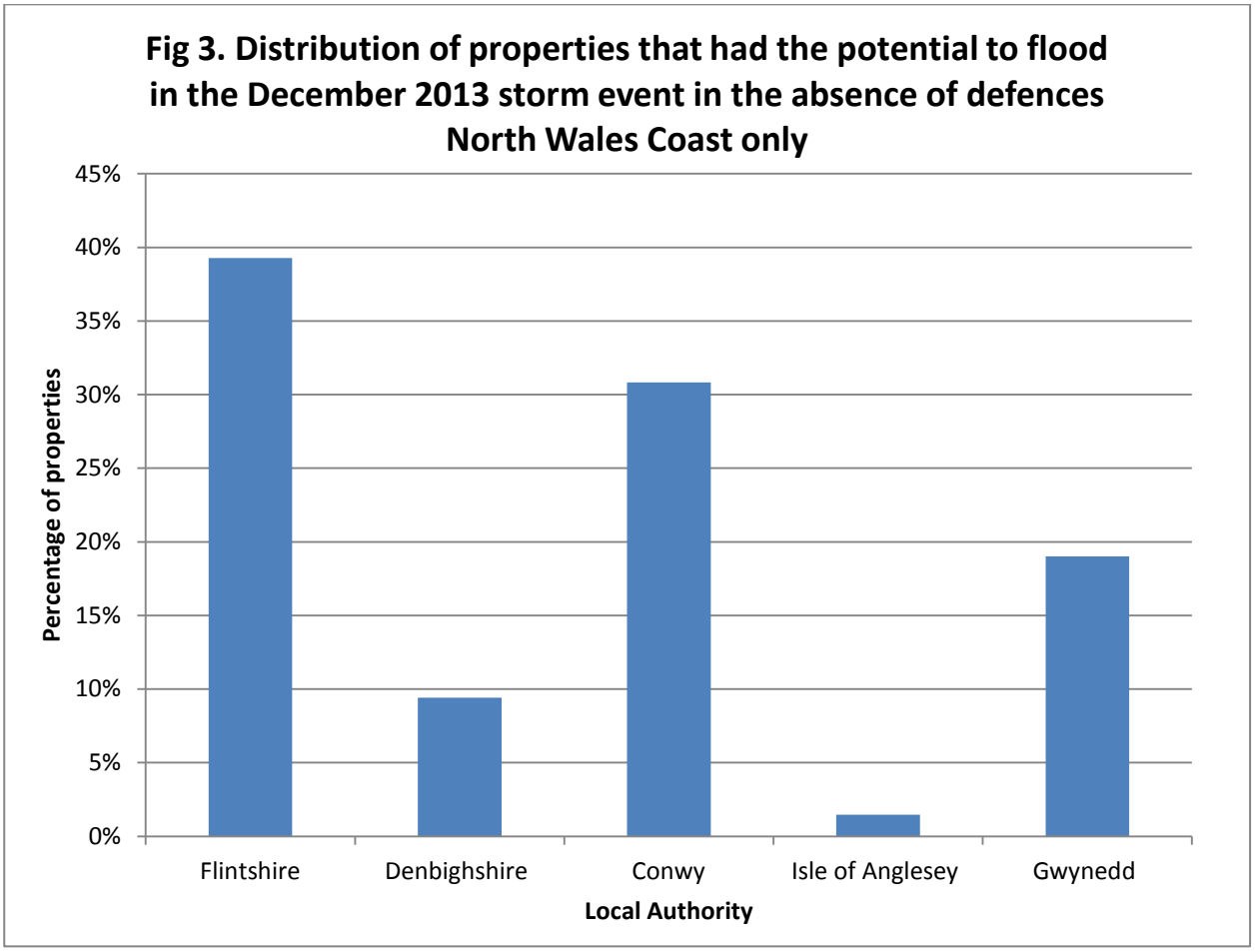
Fig 3. Distribution of properties that had the potential to flood in the December 2013 storm event in the absence of defences North Wales Coast only
45%
40%
35%
30%
25%
20%
15%
10%
5%
0%
Percentage of properties
Flintshire
Denbighshire
Conwy
Isle of Anglesey
Gwynedd
Local Authority

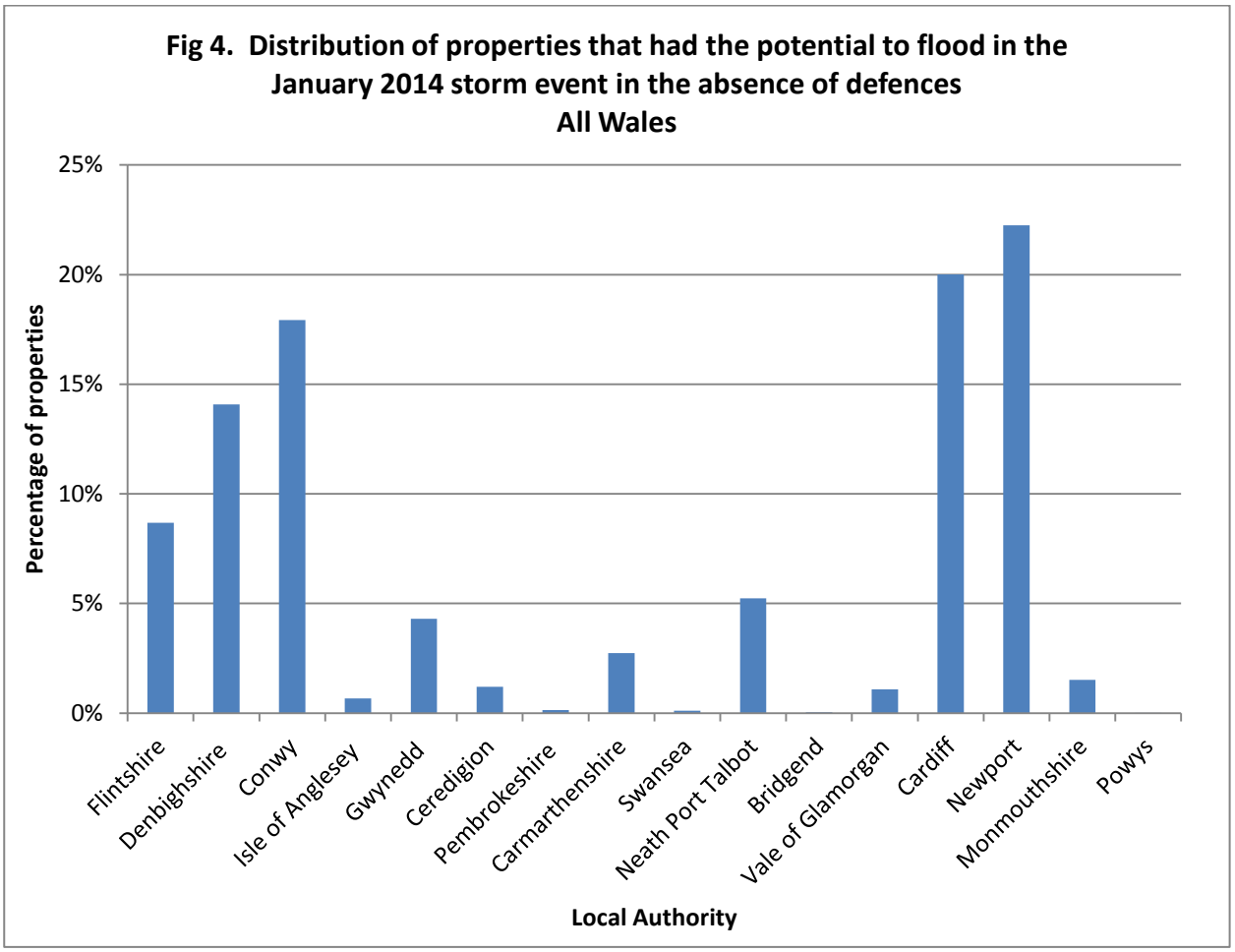
Fig 4. Distribution of properties that had the potential to flood in the January 2014 storm event in the absence of defences
All Wales
25%
20%
15%
10%
5%
0%
Percentage of properties
Flintshire
Denbighshire
Conwy
Isle of Anglesey
Gwynedd
Ceredigion
Pembrokeshire
Carmarthenshire
Swansea
Neath Port Talbot
Bridgend
Vale of Glamorgan
Cardiff
Newport
Monmouthshire
Powys
Local Authority

We have also carried out a similar assessment by applying the peak January 2014 levels around the coast to the agricultural land use classification dataset.

The results from this analysis indicate the following areas agricultural land could potentially have flooded without the presence of the national coastal protection/defence network.

Table 5: Estimate of agricultural land which could potentially have flooded during the January 2014 storms in the absence of defences/protection

Classification	Hectares	Description
Grade 1	7	Excellent quality agricultural land
Grade 2	1,989	Very good quality agricultural land
Grade 3	10,910	Good to moderate quality agricultural land
Grade 4	12,087	Poor quality agricultural land
Grade 5	9,500	Very poor quality agricultural land
Other	3,413	Non agricultural, Woodland, Agricultural buildings, Open Water and Land not surveyed
Urban	4,528	Urban
Total Grades 1-3	**12,906**	
Total Grades 1- 5	**34,493**	
Total - All	**42,433**	

This indicates that of the order of **34,000ha of agricultural land** could potentially have flooded in January 2014, were it not for the national network of coast protection and defence infrastructure. Therefore the area reported flooded in January 2014 (360ha) represents **around 1% of the total** area potentially at risk during this storm.

As with the property number estimates these values should be considered with caution, however they do indicate that significant areas of agricultural land were protected during the January storms.

Map 15 provides a general illustration of the locations which had the potential to flood in the January 2014 storms.

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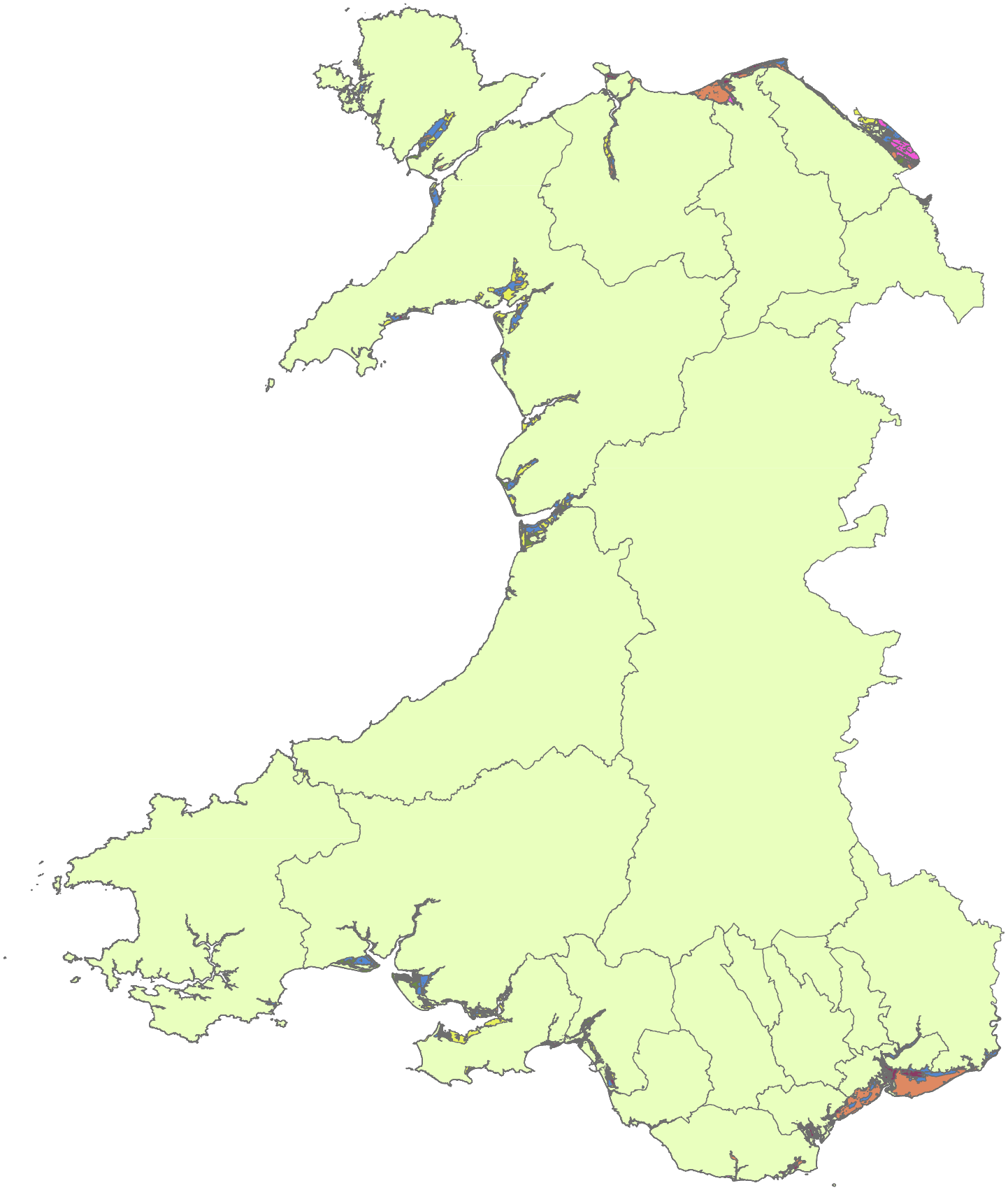
Natural Resources Wales

Map 15 - Damages Avoided - Agriculture



Legend

- Grade 1 - Excellent quality agricultural land
- Grade 2 - Very good quality agricultural land
- Grade 3 - Good to moderate quality agricultural land
- Grade 4 - Poor quality agricultural land
- Grade 5 - Very Poor quality agricultural land
- Urban
- Other

0 5 10 20 30 40 50 Kilometres

N

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Cyfoeth Naturiol Cymru, 100019741, 2014.

Conclusion

Whilst the impacts on those directly affected have been very serious and distressing, the damage significant, and the costs of repair substantial, these could have been very much worse. The fact that they were not, was a result of substantial investment in coastal defences and protection over many years and the 'day to day' investment and maintenance by many organisations around the Welsh coast.

In addition, in recent years a substantial amount of investment of time and money has taken place in improving our forecasting and warning processes, building and testing professional partner relationships, and increasing awareness and resilience to flooding in our communities. All the risk management partners, as well as other organisations, have contributed to this work and this all helped to manage and mitigate the impacts on this occasion.

Officers of Natural Resources Wales of many years' experience are of the opinion that 10 or 20 years ago, the impacts of these recent storms would have been worse on our coastal communities, with an increased risk of lives being lost.

These recent storms have reminded us how exposed and vulnerable our coastal areas can be to the elements and how extremely important these areas are for the people, the environment and economy of Wales.

The "*Future flooding in Wales: flood defences"* report produced by Environment Agency Wales in 2010 considered the impacts on flood risk of different investment scenarios up to 2035. In 2010 this assessment concluded:

"To maintain the numbers of properties at flood risk in 2035 at levels comparable to present day may require around three times the current level of investment in flood defences".

Climate change projections indicate we can expect more frequent and serious storms, as well as increasing sea levels, in the coming years. It will not be feasible or affordable to defend the entire Welsh coastline into the future and it will become increasingly more important that all responsible and affected parties work together to respond to these challenges and manage these increasing risks.

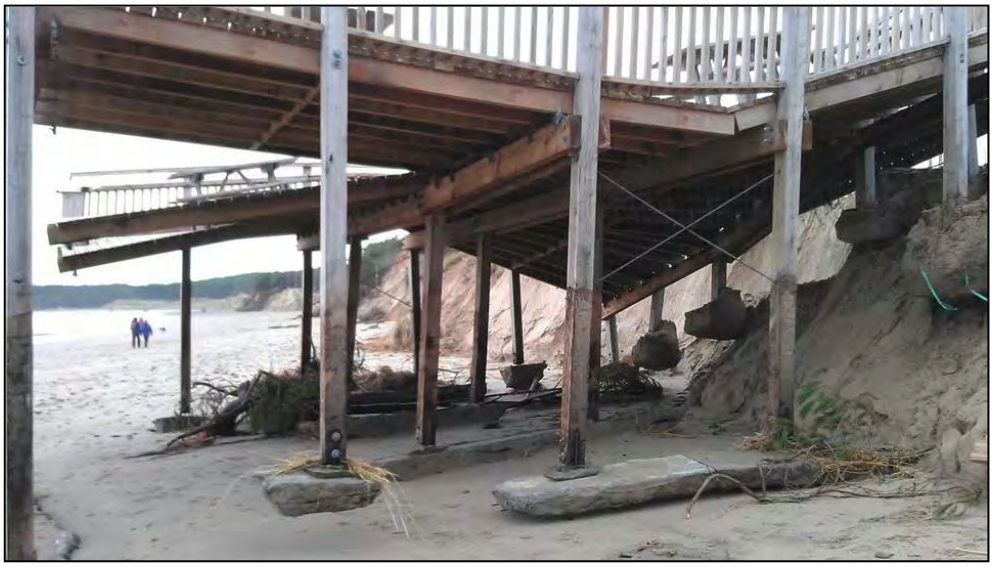
It is therefore important that we collectively review our performance during these storms and learn any lessons to help us become better prepared and as a nation become more resilient to such conditions when they occur in the future.

To this end, we will continue to work with partner risk management authorities and others around the coast, to respond to the Minister's request for a Phase 2 report and to identify and learn the lessons from these storms.

Phase 2 of the review will consider both the facts of these storms and also the lessons to be learnt. In particular it will consider matters of:

- Modelling and forecasting.
- Operational response of risk management authorities.
- Performance of the national network of coastal defences.
- Infrastructure resilience both present day and for the future.

Penrhyn Bay, Conwy



Newborough, Isle of Anglesey

Annex A: Organisations Consulted During this Phase 1 Review

Bridgend County Borough Council
Cadw
Caldicot & Wentlooge Levels IDB
Cardiff Council
Carmarthenshire County Council
Ceredigion County Council
City and County of Swansea
Conwy County Borough Council
Country Land and Business Association
Denbighshire County Council
Dyfed Archaeological Trust
Dwr Cymru – Welsh Water
Farmer's Union Wales
Flintshire County Council
Glamorgan Heritage Coast
Gwynedd Archaeological Trust
Gwynedd Council
Isle of Anglesey County Council
Kenfig Nature Reserve
Monmouthshire County Council
National Farmers Union (Wales)
National Trust
Natural Resources Wales - flood risk management, access delivery and protected sites teams
Neath Port Talbot County Borough Council
Network Rail
Newport City Council
North Wales Wildlife Trust
Pembrokeshire Coast National Park Authority
Pembrokeshire County Council
Powys County Council
Snowdonia National Park Authority
The Crown Estates
The Royal Commission on the Ancient and Historical Monuments of Wales
Vale of Glamorgan Council
Wales and West Utilities Ltd
Wales Biodiversity Partnership – Coastal Ecosystems Group
Wales Utilities Group
Wrexham County Borough Council

Annex B: Headlines from the Phase 1 Report

At the request of Welsh Government, Natural Resources Wales has carried out an assessment of the information received to determine the potential costs which may be eligible for the Welsh Government's flood and coastal risk management grant funding.

These are estimated costs for works necessary to restore the national network of Local Authority and Natural Resources Wales managed coastal defences which were damaged specifically during the recent storm events.

This assessment has estimated that around **£8.1million** may be eligible for flood and coastal risk management grant funding

December 2013 event – *Impacts upon North Wales only*

- Peak sea level was the highest recorded in Liverpool Bay for at least 21 years.
- Natural Resources Wales issued 2 Severe Flood Warnings and 15 Flood Warnings.
- Over 400 properties were advised to evacuate in Rhyl.
- 155 properties flooded internally and 160 properties were indirectly affected.
- Approximately 65 coastal defences were damaged.
- Costs to both temporarily and permanently restore damaged defences to their pre-storm condition are estimated at £5.3million.
- Defences protected over 24,000 properties in North Wales during this event and over £960 million of damages were avoided.

January 2014 event – *Widespread impacts upon the West and South Wales coast*

- Peak sea levels on January 3rd 2014 were the highest on the south and west coast of Wales for at least 16 years.
- Natural Resources Wales issued 6 Severe Flood Warnings and over 100 Flood Warnings.
- Over 1050 properties were advised to evacuate in Borth, Aberystwyth, Cardigan and Newport combined.
- 150 properties flooded internally and 415 properties were indirectly affected.
- Approximately 110 coastal defences were damaged.
- Costs to both temporarily and permanently restore damaged defences to their pre-storm condition are estimated at £2.8million.
- Defences protected over 50,000 properties around the coast of Wales during this event and over £2billion damages avoided.

Combined storm impacts:

- Network Rail assets were significantly damaged during the storms, with the Barmouth to Pwllheli line remaining closed for several months due to damage at Llanaber.
- Widespread damage occurred to the Wales Coastal Path with repair costs estimated at £340,000.
- Over 360ha of agricultural land was flooded, most significantly in January 2014 at Llanbedr with flooding to four properties, over 200ha of farmland and loss of over 120 sheep.
- New palaeo-environmental and archaeological discoveries have been uncovered, such as ancient submerged forest and peat cuttings at numerous locations.
- Environmental change has been identified at 37 Sites of Special Scientific Interest and 10 Special Areas of Conservation.

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