

**Powys Local Development Plan
Topic Paper
Environment – Pollution and Flooding**

DEPOSIT VERSION PAPER

(Updates the Pre-Deposit Stage version)

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Executive Summary

The purpose of this paper is to explore the pollution and flooding topic area looking at related strategies and policies and the situation and key issues for Powys. The document looks at the following areas: contaminated land, water quality, air pollution, greenhouse gas emissions, noise and light pollution and flooding.

At present one of the main drivers for water quality is the EU Water Framework Directive. The Directive applies to the water environment (surface and ground waters) with its main objective being to establish a strategic framework (that is based on river basins) for managing surface water and groundwater through common objectives and principles. These objectives are implemented at the local level through River Basin Management Plans. The Powys Local Development Plan has had to have regard to these Management Plans. The main sources of pollution effecting water quality identified in this paper are from agriculture and sewage treatment facilities.

The Air Quality Strategy (2007) sets air quality objectives and policy options that serve to improve the air quality in the UK now and in the long term. A number of assessments and detailed monitoring have found that along New Road in Newtown the levels of Nitrous Oxide exceed the levels of acceptance determined in the Air Quality Strategy. This has resulted in Powys County Council having to declare an Air Quality Management Area. The paper also recognises that the background levels of nitrogen deposition across Powys are at a level considered to be harmful for a large number of habitats. This has been demonstrated for those habitats that have been identified for being of international importance and designated as Special Areas of Conservation (SAC).

Powys has approximately 10,000 potentially contaminated sites, ranging from low risk areas of unknown fill to former gas works. There are two ways in which contaminated sites are addressed. The first is through Part IIA of the Environmental Protection Act which places a duty on Powys County Council to identify, assess and remediate land where necessary; this is done through the implementation of the Contaminated Land Inspection Strategy. The second and most preferable way of dealing with contaminated sites is through the planning system with remediation works being funded by redevelopment.

Planning Policy Wales (Ed 7, 2014) highlights that a strategic approach needs to be taken to flood risk with the catchment as a whole being considered. Whilst Technical Advice Note 15 requires that new development is directed away from areas at high risk from flooding, where development is considered in a high risk area it needs to be justified. As part of the LDP preparation process a Strategic Flood Consequence Assessment (SFCA) was undertaken, this should be read in conjunction with this paper.

Section 9 of this paper identified the emerging issues that have been taken into account by the LDP and its detailed policies and proposals.

Introduction

The planning system regulates the development and use of land in the public interest. It should reconcile the needs of development and conservation, securing economy, efficiency and amenity in the use of land, thereby contributing to sustainable development.

In 2004, the Planning and Compulsory Purchase Act introduced a new Local Plan process for Wales. The new system requires each authority in Wales to prepare a Local Development Plan (LDP) for their area which, once adopted, replaces any existing development plan, which for Powys is the Powys Unitary Development Plan (UDP).

Welsh Assembly Government guidance on the preparation of LDPs includes, within Paragraph 4.3 of *Local Development Plans Wales: Policy on Preparation of LDPs* (WAG, 2005), that local planning authorities are required to prepare, maintain or have access to an up-to-date information base on sufficient aspects of the economic, environmental and social characteristics of their area in order to ensure that its development plan policies and proposals are founded on a thorough understanding of the area's needs, opportunities and constraints

This paper is therefore one of a series of topic papers being prepared by Powys County Council as part of its preparation of the Powys Local Development Plan.

The aims of these papers are therefore to:

- Provide a summary of the policies and strategies at national, regional and local level that will influence the development of Powys' Local Development Plan
- Provide a summary of the current evidence base for the topic
- Identify key messages arising from the policy review and evidence base
- Identify emerging key issues
- Provide a review of existing Powys development plan (UDP) policies for the topic

Whilst each topic paper produced focuses on a different theme, they are inter-related and together form the strategic overview of issues to be addressed in the Local Development Plan.

- The *Environment* Theme

The Environment theme covers a broad range of spatial planning and development issues that can be distilled into four main sub-themes:

- Natural Heritage
 - Leisure and Recreation
 - Pollution and Flooding
 - Historic Environment
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- The subject of this topic paper is the *Pollution and Flooding* sub-theme.

Pollution and Flooding Policy Context

1. International

1.1.1 The EU Water Framework Directive (WFD) 2000/60/EC

1.1.2 The Water Framework Directive has been described as the most substantial piece of EC water legislation to date; it was published in 2000 and transposed into Welsh law in December 2003. The Directive applies to all water bodies, including lakes, streams, rivers and canals. Its overall objective is to establish a strategic framework (that is based on river basins) for managing surface water and groundwater through common objectives and principles, which serve to:

- enhance the status and prevent further deterioration of aquatic ecosystems and associated wetlands, which depend on the aquatic ecosystems;
- promotes sustainable water use based on a long-term protection of available water resources;
- reduce pollution of water, especially by 'priority' and 'priority hazardous' substances ;
- ensure progressive reduction of groundwater pollution;
- contribute towards mitigating the effects of floods and droughts.

1.1.3 The key concept that underpins the Water Framework Directive is the provision of River Basin Districts (RBDs) for which River Basin Management Plans are produced. These districts are defined on the principle that all parts of the water cycle are connected and that actions in one part of the basin can have an impact on another part. See paragraphs 4.1 and 4.2 for the Plans covering RBDs in Powys.

1.1.4 In addition to the objectives listed above which should be implemented through the River Basin Management Plans, all water bodies within an RBD should achieve 'good status' by 2015 (in some cases this may be extended to 2021 or 2027). Failure to reach 'good status' may result in infractions from Europe.

1.1.5 The Environment Agency together with the Local Government Association, RTPi, and the Welsh Local Government Association published some guidance (in 2006) on how the Water Framework should influence spatial planning. This document outlines the following implications that need to be considered in the Powys LDP:

- The inclusion of policies that influence the design and location of new development so that it doesn't create adverse pressures on the water environment.
- The inclusion of policies for sustainable water management.
- Ensuring that the LDP complements the relevant River Basin Management Plans.

1.2 The EU Floods Directive 2007/60/EC

1.2.1 The European Flood Directive required all Member States to carry out preliminary flood risk assessments by 2011; the purpose of which was to identify all river basins and associated coastal areas that are at risk of flooding.

1.2.2 The next stage on from the preliminary flood risk assessments was for flood risk maps to be produced (by 2013). These maps identify areas which have a medium likelihood of flooding (at least a 1 in 100 year event) and extreme events or low likelihood events in which expected water depths are indicated. In the areas identified as being at risk the number of inhabitants potentially at risk, the economic activity and the potential for environmental damage are indicated.

1.2.3 The third stage in the process is for flood risk management plans to be drawn up for those areas identified as being at risk (by 2015). The management plans include measures to reduce the probability of flooding and its potential consequences. The intention is that the plans address all phases of the flood risk management cycle but focus particularly on prevention (*i.e.* avoiding construction of houses and industries in present and future flood-prone areas or by adapting future developments to the risk of flooding), protection (taking measures to reduce the likelihood of floods and/or the impact of floods in a specific location such as restoring flood plains and wetlands) and preparedness (e.g. providing instructions to the public on what to do in the event of flooding). All three steps are required to be reviewed every 6 years.

1.2.4 Information from the PFRA has been fed into the Strategic Flood Consequence Assessment (SFCA) which in turn has influenced the decisions made in the LDP.

2. National – United Kingdom

2.1 Climate Change Act (2008)

2.1.1 This is the first legislation worldwide to introduce a long term legally binding framework to tackle climate change. The Climate Change Act adopts a new approach to managing and responding to climate change in the UK, by:

- setting legally binding targets to reduce emissions,
- taking powers to help meet those targets,
- strengthening the institutional framework,
- enhancing the UK's ability to adapt to the impact of climate change,
- establishing clear and regular accountability to the UK Parliament and to the devolved legislatures.

2.1.2 The key provision of the Act that the Powys LDP will need to take into account is the legally binding target that has been set of at least an 80 percent cut in greenhouse gas emissions by 2050. This has to be achieved through action in the UK and abroad. The Act also stipulates a reduction in emissions of at least 34 percent by 2020. Both these targets are against a 1990 baseline.

2.2 Flood Risk Regulations (2009)

2.2.1 The purpose of the Flood Risk Regulations are to implement the requirements of the European Floods Directive. As detailed in paragraph 1.2, the aim of the Directive is to provide a consistent approach to managing flood risk across Europe. It establishes three stages of activity that include assessing areas at flood risk, mapping them and producing a management plan. These three stages take place within a six year flood risk management cycle.

2.2.2 In addition to this the Flood Risk Regulations define new responsibilities for flood risk management which are consistent with the Flood and Water Management Act (2010):

Flood Risk Management Responsibilities:

Natural Resources Wales / Environment Agency (England) – the competent authority for managing risk from main rivers, the sea and large raised reservoirs.
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Lead Local Flood Authority (Powys County Council) – responsible for managing local flood risk in particular from ordinary watercourses, surface runoff and groundwater.
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2.3 The Flood and Water Management Act (2010)

2.3.1 The Flood and Water Management Act received Royal Assent on the 8th April 2010. However the different sections of the Act will be coming into force in Wales at different times. It aims to improve both flood risk management and the way that water resources are managed.

2.3.2 The Act defines clear roles and responsibilities and instills a more risk-based approach. Local authorities are given the lead role in managing local flood risk (from surface water, ground water and ordinary watercourses) while the strategic overview role, for all flood risk is undertaken by Natural Resources Wales / Environment Agency.

2.3.3 Schedule three of the act requires sustainable drainage systems (SuDS) to be incorporated into all construction works that have drainage implications. This new requirement works alongside the planning system, with combined planning applications needing approval for the SuDS from the approving body. This section of the Act has yet to come in.

2.3.4 The Flood and Water Management Act 2010, also establishes that flood risk will be managed In Wales through a National Strategy (see para 3.5) supported by a Local Strategy for each Lead Local Flood Authority area.

2.4 The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)

2.4.1 The Air Quality Strategy (2007) provides a clear, long-term vision for improving air quality in the UK and offers options for further consideration to reduce the risk to health and the environment from air pollution.

2.4.2 Its aim is to set out air quality objectives and policy options that serve to further improve the air quality in the UK now and in the long term. As well as providing direct benefits to public health the options are intended to provide important benefits to quality of life and to protect the environment.

2.4.3 The strategy highlights that the UK Government's and the devolved administrations' primary objective is to ensure that all citizens have access to outdoor air without significant risk to their health, where this is economically and technically feasible.

2.4.4 The strategy is based on standards that represent the levels at which no significant health effects would be expected on the population as a whole and on the standards and principles of better regulation. Objectives have been set for each pollutant that aim to move air quality as close to these standards as possible. In addition to this further objectives have been set for those pollutants that have a detrimental effect on vegetation and ecosystems. For a full list of the pollutants for which targets have been set see Appendix 1.

2.4.5 The strategy highlights that action taken at a local level can be an effective way of tackling localised air quality problems, leading to an overall improvement of air quality across the UK. The Powys LDP contributes to this by having policies that aim to reduce air pollution, particularly by reducing the need for people to travel.

2.5 Environmental Protection Act 1990, Part IIA (Wales, 2001)

2.5.1 Part two of the Environmental Protection Act (1990) (also known as the Contaminated Land Regime) came into force in Wales in 2001. Its main objective was to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment, assessed in the context of the current use and circumstances of the land.

2.5.2 Part IIA works on a suitable for use approach; requiring the risks associated with each parcel of contaminated land to be assessed on a site by site basis. It only applies to land that suffers from chemical contamination where those contaminants pose an unacceptable risk to human health or the wider environment.

2.5.3 The main regulatory role of Part IIA falls with Local Authorities they are responsible for identifying where land is contaminated, to establish who should bear responsibility and to determine what remediation is required in any individual case.

2.5.4 This Act only considers those risks that are associated with the current use of the site. Any risks that are associated with the future use of the site should be dealt with through the planning system.

2.6 Section 102 of the Clean Neighbourhoods and Environment Act 2005

2.6.1 Section 102 of the Clean Neighbourhoods and Environment Act 2005 serves to amend Section 79 of the Environmental Protection Act 1990 (c. 43); to include artificial light emitted from premises. This allows for poor lighting to be legally recognised as a statutory nuisance, however there are exceptions relating to artificial light being emitted from sources such as transport premises, some operating centers, prisons and lighthouses.

2.7 Guidance Notes For the Reduction of Obtrusive Light (GN01:2011) ILP

2.7.1 This guidance note has become an established and widely accepted reference standard. Page 4 identifies and characterises five levels of Environmental Zone which are commended to Local Planning Authorities to adopt and specify for exterior lighting control within their Development Plans. In addition to this, the document gives advice on design that includes a table of limitations and a clear set of definitions.

3. National – Wales

3.1 People, Places, Futures - The Wales Spatial Plan – 2008 update

3.1.1 The overall role purpose and principles of the Wales Spatial Plan are:

- To make sure that decisions are taken with regard to their impact beyond immediate sectoral or administrative boundaries and that everything is governed by core sustainable values
- To set the context for local community planning
- To influence where the Welsh Assembly Government spends money by understanding the roles of and interactions between places
- To provide a clear evidence base for the public, private and third sectors to develop policy and action.

(Wales Spatial Plan 1.1)

3.1.2 The five national themes that govern the plan are the following:

- Building Sustainable Communities;
- Promoting a Sustainable Economy;
- Valuing our Environment;
- Achieving Sustainable Accessibility; and
- Respecting Distinctiveness.

(Wales Spatial Plan 9.1)

3.1.3 Wales has been split into six sub-regions (without the definition of hard boundaries). In each of these areas the local authorities, the private and third sectors along with the Welsh Government and its agencies are working together in '*Spatial Plan Area Groups*' to achieve the strategic vision for that area. The pollution and flooding priorities for the Central Wales Spatial Plan Area Group which encompass Powys are the following:

- Adapting and responding to climate change both in terms of challenges and opportunities for the Area (flood risk, carbon capture / offset, coastal erosion, renewable energy).
- Improving the local environment, including the built environment, and access to the coast and countryside, and prioritising the development of brownfield sites.

3.1.4 The Powys LDP contributes to implementing these priorities by taking climate change and sustainability into consideration in all of its policies. Furthermore the plan has policies to avoid the development of areas at a high risk from flooding and ensuring new development does not cause or exacerbate flooding elsewhere.

3.2 Environment Strategy for Wales (2006)

3.2.1 The purpose of the Environment Strategy for Wales (2006) is to provide a framework that will enable the achievement of an environment that is clean, healthy, biologically diverse and valued by the people of Wales. The strategy contains a series of outcomes that are supported by actions laid out in the '*Environment Strategy Action Plan (2008 – 2011)*'.

3.2.2 The main outcomes identified in the strategy relating to pollution and flooding are:

- Greenhouse gas emissions are minimised, consistent with Wales contributing fully to meeting UK – wide targets and specific targets for Wales.
- Wales has improved resilience to the impacts of climate change. With a clear flexible programme of measures in place to enable Wales to adapt to climate change.
- Environmental nuisances such as litter, fly tipping, graffiti, dog fouling, fly-posting, noise pollution and light pollution are minimised.
- Appropriate measures will be in place to manage the risk of flooding from rivers and the sea and help adapt to climate change impacts.
- Everyone who lives in a flood risk area will understand the flood risk they are subject to, the consequences of that risk and how to live with that risk.
- A reduction in air pollution leads to increased life expectancy and ecological protection.
- The extent of contaminated land is better understood and actions are being undertaken to remediate such land for beneficial use where appropriate.

- Diffuse pollution is better understood and action is being taken to manage diffuse pollution.

3.2.3 The strategy emphasises that the action plans alone will not deliver the strategy and that it will need to be done through other policies and programmes reflecting its priorities. The Powys LDP will contribute to some of these actions by directing new development away from areas at risk of flooding, ensuring that new development reduces the need to travel therefore reducing emissions and by ensuring new developments are designed in such a way that they limit light and noise pollution.

3.3 Planning Policy Wales Edition 7 (July 2014)

3.3.1 Planning Policy Wales (PPW) sets out the land use planning policies of the Welsh Government. PPW alongside Technical Advice Notes (TANS), circulars and policy clarification letters make up the national planning policy which should be taken into account in the preparation of the local development plan.

3.3.2 The Welsh Government's objectives regarding pollution and flooding are to:

- Maximise environmental protection for people, natural and cultural resources, property and infrastructure; and
- Prevent or manage pollution and promote good environmental practice.

3.3.3 PPW highlights the importance of integrated working with the pollution control authorities and of adopting the precautionary principle in planning, taking into account the latest climate change scenarios from the UK Climate Impacts Team. Planning Authorities should consider how a changing climate is expected to influence environmental risks over the lifetime of new development (para 13.1.4).

3.3.4 In relation to flood risk PPW requires development plans to ensure that new developments are not at risk themselves from flooding and do not increase the risk of flooding elsewhere. It should be acknowledged that any resources for flood defence projects are aimed at protecting existing developments and are not available for anticipated future developments. A sustainable approach to flooding should be adopted that avoids developing flood hazard areas, and where practical managed retreat is promoted for flood plain restoration (para 13.3.1).

3.3.5 Paragraph 13.6 of PPW has required contaminated land to be taken into consideration during the preparation of the Powys LDP to ensure:

- New development is not undertaken without an understanding of the risks, this includes those associated with the previous land use such as mine and landfill gas emissions, and rising groundwater from abandoned mines;
- Development does not take place without appropriate remediation;
- Consideration is given to the potential impacts which remediation of land contamination might have upon the natural and historic environments.

3.3.6 Paragraph 13.7 requires the LDP to contain policies for the rehabilitation and development of polluted land that also makes provision for derelict sites.

3.3.7 Paragraph 13.8 of PPW required unstable land to be taken into consideration during the preparation of the Powys LDP to ensure:

- New development is not undertaken without an understanding of the risks, including those associated with subsidence, landslips or rock falls;
- Development does not take place without appropriate precautions;
- Development is not allowed if expensive engineering projects are required that need public monies to prevent erosion;
- Unstable land is restored to safeguard investment and, where possible, returned to productive use.

3.3.8 During the preparation of the LDP ground instability that has the potential to pose direct risks to life (including health), buildings and structures has been taken into account. This would include where it presents indirect hazards associated with ground movement such as the possible migration of landfill or mine gas. The nature, scale and extent of the ground instability will need to be taken into consideration.

3.3.9 Where appropriate the LDP must indicate the general location of known areas of contaminated and unstable land, and may contain site specific proposals in some cases these sites may be accompanied by a warning that such sites have been identified using the best information available but that the responsibility for determining the full extent and effects will lie with the developer.

3.3.10 Paragraph 13.11 of PPW requires the Powys LDP to enable consideration of the effects that new developments and their transport demands, may have on air or water quality and the effect which air or water quality may have on them.

3.3.11 Paragraph 13.14 requires the Powys LDP to take into account noise and light pollution. Policies and allocations should be developed that separate developments such as hospitals and dwellings away from potentially noisy developments such as some industrial uses. In addition to this development plan policies should have regard to any relevant Noise Action Plan.

3.4 Technical Advice Note (TAN) 15 – Development and Flood Risk (2004)

3.4.1 TAN 15 supplements the policy set out in Planning Policy Wales in relation to development and flooding. It advises on development and flood risk and provides a framework within which risks from all sources of flooding can be assessed.

3.4.2 Like Planning Policy Wales this TAN advises caution in respect of new development in areas at high risk of flooding by setting out a precautionary framework to guide planning decisions. The overarching aim of this (in order of preference) is to:

- Direct new development away from those areas at high risk from flooding.
- Where development in C2 has to be considered then it needs to be justified through the tests set out in sections 6 and 7 of TAN15.

3.4.3 Development advice maps have been drawn up for the whole of Wales; these maps identify different zones that represent different levels of risk from flooding. Areas that are considered to be of high risk fall within either zones C1 or C2.

3.4.4 There are four categories of development described in the TAN:

- Emergency Services
- Highly Vulnerable (e.g. residential, schools, public buildings, waste disposal sites) and
- Less Vulnerable (e.g. commercial/industrial).
- Other – Those that are required to be in a fluvial, tidal or coastal location by their nature (e.g. boatyards and marinas).

3.4.5 Emergency Services and Highly Vulnerable developments should not be permitted in Zone C2. TAN 15, (section 9) states that plan allocations should not be made for such development and planning applications not proposed.

3.4.6 Any development proposal in Zone C must satisfy the criteria set in paragraph 6.2 of TAN 15. Part of this justification is that a “Flood Consequence Assessment” is conducted to establish whether the risks and consequences can be managed to an acceptable level, which includes not increasing the risk of flooding elsewhere.

3.4.7 A Strategic Flood Consequences Assessment has been undertaken to inform the selection of sites for the LDP and to inform the proposed policies.

3.4.8 Paragraph 10.11 of TAN 15 has required the LDP to include policies which promote the use in appropriate locations of sustainable drainage systems that control surface water as close to its source as possible.

3.5 National Strategy for Flood and Coastal Erosion Risk Management in Wales (November 2011).

3.5.1 The purpose of this strategy is to set out the Welsh Government’s policies on flood and coastal erosion risk management and to establish a delivery framework that meets the needs of Wales both now and in the future. The Welsh Government is required to develop, maintain and apply this strategy under the Flood and Water Management Act 2010. The document provides detailed information on the roles and responsibilities of all those involved and how they should work together.

3.5.2 The Welsh Government’s overall aim in the strategy is to develop a system that:

- Embeds sustainable development as the key principle informing decisions and which is reflected in an approach that promotes the wellbeing of people in Wales and addresses the needs of the economy and the environment.
- Is focussed on the needs of individuals, communities and businesses and which recognises that different groups have different needs and varying capacity to deal with flood risk and that the service they receive must be tailored accordingly.
- Promotes equality and does not exacerbate poverty.
- Is based upon a holistic understanding of the risks and consequences.
- Considers the full range of risk management responses.

- Facilitates long term resource planning.
- Allows prioritisation of investment, resources and actions.

3.5.3 In support of this aim, four objectives have been identified:

- Reducing the impacts on individuals, communities and businesses from flooding and coastal erosion.
- Raising awareness of and engaging people in the response to flood and coastal erosion risk.
- Providing an effective and sustained response to flood and coastal erosion events.
- Prioritising investment in the most at risk communities.

3.5.4 The strategy identifies that in order to implement its aims and objectives the lead local flood authorities will need to:

- Work with planning policy to ensure that new developments are discouraged from areas at risk from flooding.
- Work with planning policy to ensure that any redevelopment in an area at risk from flooding will take place only if it is properly justified.

3.5.5 The Powys LDP aims to support these objectives which are also in line with the requirements of Technical Advice Note (TAN) 15.

3.6 Climate Change Strategy for Wales (2010)

3.6.1 The Climate Change Strategy for Wales sets out how greenhouse gas emissions in Wales are to be reduced and what adaptations will need to be made to changes in the climate.

3.6.2 The target inline with that set in *One Wales: A Progressive Agenda for Wales* is to reduce annual reductions in greenhouse gas emissions by 3% each year. This target relates to:

- The six greenhouse gases – carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
- All ‘direct’ greenhouse gas emissions in Wales (except those from heavy industry and power generation). This also includes the emissions associated with electricity consumption, allocated to end-users in Wales.

3.6.3 Individual targets have been set for each of the following sectors; the table below identifies the contributions that the Powys LDP can make to achieve these targets.

Sector	Identified actions that the LDP can contribute to:
Transport	Improving walking and cycling facilities and reducing the need to travel.
Business	Enabling low carbon development.
Residential	Ensuring low carbon developments that are built in sustainable locations and are resilient to climate change.

Sector	Identified actions that the LDP can contribute to:
Agriculture and Land Use	Woodland creation.
Resource efficiency and waste.	Implementing the waste strategy.
Public Sector	Enabling low carbon development.

3.7 One Wales: One Planet – The Sustainable Development Scheme of the Welsh Assembly Government (2009)

3.7.1 The purpose of this document is to set out how the Welsh Government intends to promote sustainable development throughout the Welsh Ministers' functions, as required under section 79 of the Government of Wales Act.

3.7.2 The document defines sustainable development in Wales as '*enhancing the economic, social and environmental wellbeing of people and communities, achieving a better quality of life for our own and future generations:*

- *In ways which promote social justice and equality of opportunity; and*
- *In ways which enhance the natural and cultural environmental and respect its limits – using only our fair share of the earth's resources and sustaining our cultural legacy.*

Sustainable development is the process by which we reach the goal of sustainability.'

3.7.3 The scheme lays out an approach to policy making which is supported by two core principles and six supporting principles.

Core principle 1: Involvement - people and communities are at the heart of sustainable development, so we will be inclusive in our involvement of all our stakeholders in the development of our policies and programmes, and the identification of solutions that meet their needs, promoting innovation in the way that we deliver services.

Core principle 2: Integration - only an approach that makes the connections between, and effectively integrates economic, social and environmental challenges, will achieve sustainable development.

3.7.4 The supporting principles of relevance to this topic paper include showing how greenhouse gas emissions will be reduced by 3% year on year and ensuring that pollution problems are solved locally, rather than passing them on to other places and future generations.

3.8 Technical Advice Note (TAN) 11 – Noise (1997)

3.8.1 This TAN provides advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding undue costs or administrative burdens to businesses.

3.8.2 Paragraph 6 of the TAN states that where it is particularly difficult to separate noise sensitive development from noisy activities, the development plan should contain an indication of any general policies which the planning authority proposes to apply in respect of planning conditions or obligations.

3.8.3 To assist local planning authorities in considering planning applications for residential development near transport related sources the TAN provides a series of Noise Exposure Categories that should be referred to. In addition to these, a number of noise mitigation measures are also discussed.

3.9 Planning Policy Guidance (PPG) 14 – Development on Unstable Land (Appendix A) (1990)

3.9.1 Only Appendix A of PPG 14 that relates to the development of unstable land remains in force in Wales. This document identifies that instability may pose a threat to development and / or public safety and so should therefore be considered in land use decisions. It is also noted that instability can be caused by both natural processes and human activities.

3.9.2 The causes of instability are split into three broad categories:

- The effects of underground cavities (including mining operations)
- Unstable slopes; (includes landslides) and
- Ground compression

3.9.3 The document goes into detail for each of the categories explaining how instability can occur, the effect they can have and what development may need to take into account.

4. Regional

4.1 River Basin Management Plan Severn River Basin District *Water for life and livelihoods (2009) (to be updated 2015)*

4.1.1 River Basin Management Plans are prepared under the Water Framework Directive (see 1.1 above). Regulation 17 of “*The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003*”, places a duty on all public bodies to have regard to River Basin Management Plans (and supplementary plans) in exercising their functions.

4.1.2 The plan itself describes the river basin district and the pressure on the water environment. It provides information on the current state of the waters and what actions will be taken to address the pressures. The Severn River Basin District is made up of ten catchment areas, three of which fall within Powys. These are the Severn Uplands which covers northern Powys including the towns of Llanidloes, Newtown and Welshpool; the Wye which covers mid Powys particularly the Elan Valley and The Usk which covers southern Powys including the Brecon area.

4.1.3 The Water Framework Directive (WFD) sets a number of different objectives which each River Basin Management Plan should aim to achieve. The environmental objectives for surface waters are:

- Prevent deterioration in status for water bodies;
- To aim to achieve good ecological and good surface water chemical status in water bodies by 2015;
- For water bodies that are designated as artificial or heavily modified, aim to achieve good ecological potential by 2015;
- Comply with objectives and standards for protected areas where relevant;
- Reduce pollution from priority substances and cease discharges, emissions and losses of priority hazardous substances.

4.1.4 The environmental objectives for groundwater are:

- Prevent deterioration in the status of groundwater bodies;
- Aim to achieve good quantitative and good groundwater chemical status by 2015 in all those bodies currently at poor status;
- Implement actions to reverse any significant and sustained upward trends in pollutant concentrations in groundwater;
- Comply with the objectives and standards for protected areas where relevant;
- Prevent or limit the input of pollutants into groundwater.

4.1.5 Annex C of the plan sets out a series of tables of actions. The implementation of these actions will assist in managing the pressures on the water environment and achieving the plan's set objectives. One of the actions is for the Powys LDP to take into account the objectives of this River Basin Management Plan. Further actions that specifically relate to the Powys LDP are to:

- Promote the widescale use of sustainable drainage systems (SuDS),
- Include strong water efficiency policies,
- Assess opportunities for surface water storage areas on new development sites as a potential source for re-use in the development and to reduce the need for abstraction.

4.2 River Basin Management Plan Western Wales River Basin District *Water for life and livelihoods (2009) (to be updated 2015)*

4.2.1 This plan is similar to that above, but is for the Western Wales River Basin District. It is made up of five catchment areas, two of which cross over into Powys. These are the North West Wales catchment area which covers the Machynlleth area and The Ogmore to Tawe catchment which covers the Ystradgynlais area. The objectives and actions that need to be taken into account by the Powys LDP are the same as those listed above in the Severn River Basin District Management Plan.

4.3 River Severn Catchment Flood Management Plan (2009)

4.3.1 The purpose of a Catchment Flood Management Plan (CFMP) is to help understand the scale and extent of flooding today and in the future, and to set policies to manage the flood risk within the catchment.

4.3.2 The River Severn Catchment Flood Management Plan covers a catchment area that is approximately 11,000km² and has a population of 2.3 million. It extends from Plynlimon in Powys, down to the mouth of the Bristol Channel. Urban areas included within this catchment include Newtown, Welshpool, Shrewsbury, Telford, Wolverhampton, Warwick, Coventry, Rugby, Ludlow and Gloucester.

4.3.3 In order to assess the most sustainable approach to managing flood risk in the catchment area it is divided into 20 subsections. However some areas of similar characteristics have been combined resulting in nine sub areas in total. The two areas that fall within Powys are the “*Severn Uplands and the Vyrnwy Confluence*” and “*Caersws and Newtown*”.

4.3.4 Severn Uplands and the Vyrnwy Confluence - This subarea covers the upper reaches of the Rivers Severn and Vyrnwy catchments. Within the area there are approximately 1,000 properties that have been identified as being at risk from flooding in a 1% flood event (this means there is a 1% annual probability of flooding). It has been recognised that parts of Meifod, Llanidloes and Pentre are at risk from localised fluvial floods. Essential infrastructure within the subarea at risk includes three water treatment and sewage works, five emergency response centres, eight electricity and gas installations, a telephone exchange and four trunk roads.

4.3.5 This subarea has been presented as a good opportunity for the increased storage of floodwaters on undeveloped floodplains. This would serve to increase attenuation and reduce the risk of flooding to communities locally and down stream. The management plan also acknowledges that there has been an increased risk of flooding over time due to man made trends in land management and land use.

4.3.6 The vision and policy for this subarea focuses on setting a framework to deliver a sustainable approach to flood risk management that considers the natural function of the river and reduces the long term dependence on raised flood defences. This includes identifying opportunities where the natural floodplain can be utilised further for water storage.

4.3.7 The proposed actions to implement this policy are the following:

- For a strategic study to investigate making the best use of existing storage areas and the potential for further storage areas within the undeveloped floodplain.
- To encourage best practices in land use and management to restore more sustainable natural floodplains and to reduce run-off.
- Raise awareness of flooding among the public and key partners to allow and encourage them to be better prepared.
- Carry out a review on the effectiveness and sustainability of each flood defence.

4.3.8 Caersws and Newtown – This subarea covers the towns of Caersws and Newtown, whilst being completely surrounded by the Severn Uplands and the Vyrnwy Confluence subarea that is discussed above. Both towns suffer from flash flooding and there are approximately 1,000 properties at risk from flooding in a 1%

flood event. The subarea suffers from a high level of fluvial flooding and surface water flooding is an issue. Essential infrastructure at risk includes three electricity and gas installations and four trunk roads.

4.3.9 Similar to above the management plan acknowledges that there has been an increased risk of flooding over time due to man made trends in land management and land use. This is a trend that needs to be reversed to offset the rising risk of flooding due to climate change. In addition to this the continued development and urbanisation of the area needs to be carefully managed to ensure it doesn't increase the risk of flooding across the subarea.

4.3.10 The vision and policy for this subarea focuses on the fact that the subarea is already managed for flood risk appropriately but recognises that the level of risk is likely to rise with climate change. In these circumstances more will need to be done in the future to reduce the expected increase in risks.

4.3.11 The proposed actions to implement this policy are the following:

- Develop a better understanding of flooding from surface water, drainage systems and from 'non-main' watercourses. Whilst producing a strategy for operation and investment and integrating these with main rivers.
- Ensure floodplains are not inappropriately developed. Using the approach identified in TAN15 and the consideration of land swapping opportunities.
- Encourage compatibility between urban open spaces and their strategic uses in floods (e.g. making space for rivers to expand as flood flows occur, blue corridors).
- Raise awareness of flooding among the public and key partners to allow and encourage them to be better prepared.
- Carry out a review on the effectiveness and sustainability of each flood defence.
- Encourage vulnerable buildings, infrastructure and existing buildings to be more resilient and resistant to flooding.
- Improve fish habitat by modifying /removing obstacles, such as weirs that prevent fish moving freely.

4.3.12 The LDP has had to ensure a consistent approach with this policy, together with the policies in Technical Advice Note 15, and avoid the development of floodplains.

4.4 Wye and Usk Catchment Flood Management Plan (2009)

4.4.1 The Wye and Usk Catchment Flood Management Plan covers a catchment area that is approximately 5,700 km² and covers about 240,000 properties. About 3% of the area is urbanised with the five main areas being Hereford, Cwmbran, Monmouth, Newport and Chepstow. Smaller towns in the catchment include Builth Wells, Llandrindod Wells, Brecon, Abergavenny and Leominster.

4.4.2 In order to assess the most sustainable approach to managing flood risk in the Wye and Usk catchment, the area is divided into seven subsections. Each

subsection has similar physical characteristics, sources of flooding and level of risk. The Upper Wye and Usk is the only subsection that falls within Powys.

4.4.3 The Upper Wye and Usk subsection is predominantly a rural area covering towns such as Llandrindod Wells, Builth Wells and Glasbury. The main source of flood risk in the subarea is from the River Wye and its tributaries. There are currently about 430 properties that have a 1% annual risk of flooding, but this figure is expected to increase to around 570 properties in the future due to climate change.

4.4.4 The vision and policy for this subarea focuses on influencing land use and management practices to provide an overall reduction in flood risk and contribute to a wider range of benefits such as biodiversity and water quality.

4.4.5 The proposed actions to implement this policy are the following:

- Encourage and support land use and management changes by others where these deliver flood risk management and wider benefits for the environment.
- Seek opportunities to store water or manage run-off to provide flood risk or wider environmental benefits.
- Provide encouragement and support in the production of long term plans to manage all sources of flooding particularly in Builth Wells. Consideration should be given to future options and investment needs for defences, emergency planning and response together with development control issues.
- Review and rationalise current actions to ensure they are appropriate and targeted to locations of greatest risk.
- Engage and advise local communities to encourage people at risk to take action to help themselves.

4.5 North West Wales Catchment Flood Management Plan (2010)

4.5.1 The North West Wales Catchment Flood Management Plan covers a catchment area that is approximately 3,400 km² and covers about 103,000 properties. It extends from Anglesey in the north down to Borth in the south, included within it are the towns of Bangor, Caernarfon, Pwllheli, Machynlleth and Dolgellau. Only a small area of this catchment falls within Powys, covering the market town of Machynlleth and the upper Dyfi estuary. This area is divided between two of the subareas.

4.5.2 The Snowdonia subarea is fairly extensive covering most of the National Park and the communities of Llanberis, Bethesda, Blaenau Ffestiniog, Machynlleth and Abergynolwyn. The common flood issue that affects this subarea is the run-off from the mountains causing localised surface water and rapid response flooding from rivers and streams. In Powys this has been identified as a particular issue for Machynlleth where between 25 and 50 properties are at risk from a 1 in 100 flood event. It has been predicted that this number could rise to between 50 and 100 properties being susceptible to 1 in 100 event floods by 2100 due to climate change.

4.5.3 The policy approach identified for this subarea is that the area is generally managed effectively for flood risk and that the flood defences will be maintained. The proposed actions to support this policy are the following:

- Encouragement and support for the production of long term plans to manage all sources of flooding particularly at towns such as Machynlleth.
- Review and rationalise current actions to ensure they are appropriate and targeted to locations of greatest risk.
- Encourage and support opportunities for land use and management change, which assist in achieving flood risk management and wider benefits for the environment.
- Seek opportunities to store water or manage run-off to provide flood risk or wider environmental benefits.
- Engage and advise local communities to encourage people at risk to take action to help themselves.

4.5.4 The other subarea that crosses over into Powys is the Upper Dyfi and Upper Wnion. This subarea is very rural with only a handful of small settlements and other dispersed settlements; there is very little flood risk to property or infrastructure. The policy for this subarea focuses on monitoring and advising. A flood warning service is provided in this area and there are no plans to change this or to provide any planned significant flood risk management activity.

4.5.5 The following actions have been identified:

- Continue to monitor and advise.
- Review the policy if monitoring suggests it is inappropriate.
- Encourage and support land use and management changes by others where these deliver flood risk management and wider benefits for the environment.

4.6 Ogmore to Tawe (including Thaw and Cadoxton) Catchment Flood Management Plan (2010)

4.6.1 The Ogmore to Tawe (including Thaw and Cadoxton) Catchment Flood Management Plan covers a catchment area that is approximately 1,300 km² and covers about 196,000 properties; it extends from Swansea docks, to Penarth point and the Brecon Beacons to the north. The area includes a number of large urban areas such as Swansea, Neath, Port Talbot and Bridgend. The catchment is of relevance to Powys because it covers the historic mining town of Ystradgynlais.

4.6.2 The Ystradgynlais area falls within the Tawe Valley subarea. Historic development of the Tawe Valley has resulted in dense urbanisation of the valley floor. The main river channel is highly modified with poor connectivity with its natural flood plain. Flood risk is considered to be high with the main source of flooding within the subarea coming from the River Tawe.

4.6.3 The policy approach to this subarea is that generally further action can be taken to reduce flood risk. Defences will continue to be maintained and a set of management actions have been identified:

- Encouragement and support for the production of long term plans to manage all sources of flooding particularly at towns such as Ystradgynlais.
- Encourage and support studies to identify surface water and sewer flooding issues particularly in Ystradgynlais.
- Engage and advise local communities to encourage people at risk to take action to help themselves.
- Encourage and support owners and operators of important infrastructure, to plan for and manage their current and future flood risks.
- Encourage and support opportunities for land use and management change, which assist in achieving flood risk management and wider benefits for the environment.

4.6.4 The LDP has made sure it has had a consistent approach with all the policies identified in the Catchment Flood Management Plans for the various parts of Powys. In general these policies support those set out in Technical Advice Note 15, particularly regarding avoiding the development of floodplains. It is acknowledged that there are some Catchment areas that do cross over into Powys that haven't been mentioned above, however the main issues and towns have been covered.

4.7 West of Wales Shoreline Management Plan

4.7.1 The Minister for Natural Resources has agreed the West of Wales Shoreline Management Plan (SMP), with the caveat that the situation at Fairbourne is constantly monitored. The Plan has been prepared to provide a large-scale assessment of the risks associated with coastal processes that result in both erosion and flooding. Similarly to the Catchment Flood Management Plans mentioned above it presents a policy framework that aims to reduce these risks to people and the developed, historic and natural environment in a sustainable manner into the 22nd century.

4.7.2 The first West of Wales SMP was produced in 2000; however it has now been reviewed to take into consideration the impact of rising sea levels amongst other things. The majority of Powys is land bound so is unaffected by this plan. However the upper reaches of the Dyfi estuary do fall within Powys and any changes to sea levels, together with coastal flooding have the potential to affect the market town of Machynlleth and the local transport routes particularly at the Dyfi Junction.

4.7.3 The revised SMP looks ahead for 100 years, considering management over the short term (in 20 years time), medium term (in 50 years time) and long term (in 50-100 years time). It recognises that there is increasing uncertainty about the future but that we should be planning for this uncertainty. The key issue identified is that climate change is going to result in an increase in coastal flooding in the future together with an increase in coastal erosion. The Defra UK Climate Projections predict that sea levels may rise by approximately 1 metre over the 100 year period however due to the level of uncertainty of this prediction a 2 metre scenario has been determined for vulnerability testing (<http://ukclimateprojections.defra.gov.uk/content/view/1843/500/>). The SMP has looked at different scenarios over the 100 year period based on the different levels of sea rise.

4.7.4 The SMP identifies that a one metre sea level rise would put Dyfi Junction at risk from normal tidal flooding. Whilst under the two metre sea level rise scenario and following extreme surge conditions, the lower parts of Machynlleth may be affected. The policy approach identified in the SMP is to hold the line in the short to medium term, defending Dyfi Junction. A strategy will need to be in place in the long term that looks at the full extent of the route of the railway with plans for possible realignment. This would lead to the policy approach moving away from defences to that of managed realignment of the coast being adopted into the longterm. The policy approach for Machynlleth is to maintain defences in the short term whilst moving to managed realignment and adaptive management in the medium term.

4.8 Flood Risk Management Plans

4.8.1 The Environment Agency and Natural Resources Wales (NRW) are in the process of preparing and consulting on Flood Risk Management Plans (FRMPs) for each of the River Basin Districts (RBDs). However the Flood Risk Regulations also require Lead Local Flood Authorities (LLFAs) to prepare FRMPs for areas defined as Flood Risk Areas.

4.8.2 The purpose of Flood Risk Management Plans (FRMPs) are to highlight the hazards and risks of flooding from rivers, the sea, surface water, groundwater and reservoirs, and set out how Risk Management Authorities (RMAs) such as NRW work together with communities to manage flood risk.

4.8.3 Flood Risk Management Plans must include:

- a map showing the boundaries of the Flood Risk Area
- the conclusions drawn from the flood hazard and risk maps
- objectives for the purpose of managing the flood risk
- proposed measures for achieving those objectives
- a description of the proposed timing and manner of implementing the measures including details of who is responsible for implementation
- a description of the way implementation of the measures will be monitored
- a report of the consultation
- where appropriate, information about how the implementation of measures under the FRMP and RBMP area will be co-ordinated

4.8.4 These plans are currently in draft form, but are required to be finalised and published by 21st Dec 2015.

5. Local – Powys

5.1 Powys County Council - Contaminated Land Inspection Strategy (Revised 2006)

5.1.1 The purpose of this strategy is to fulfil the council's duty under "The Contaminated Land (Wales) Regulations 2001". The Regulations require the council to produce a written strategy outlining how it will deal with contaminated land that is posing an unacceptable risk to human health, water resources or the wider environment.

5.1.2 For the purposes of this strategy and in line with the Environmental Protection Act (1990) contaminated land has been defined as:

"Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- a) Significant harm is being caused or there is a significant possibility of such harm being caused, or;*
- b) Pollution of controlled waters is being, or is likely to be caused"*

5.1.3 This definition reflects the requirements of the regulations which is to enable the identification and remediation of land on which contamination is causing unacceptable risks to human health or the wider environment.

5.1.4 The underlying objectives in respect to contaminated land, identified in the strategy are:

- to identify and remove unacceptable risks to human health and the environment;
- to seek to bring damaged land back into beneficial use; and,
- to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable

5.1.5 The strategy identifies that it deals primarily with contaminated land that has resulted predominantly from former industrial activity. However it recognises that additional problems can result from the redevelopment of land (e.g. when housing replaces industrial land uses). To overcome such issues and to ensure the safe redevelopment of Brownfield land the document highlights the importance of there being a close working relationship between Planning and Environmental Health. In addition to this a list of activities undertaken by Environmental Health in relation to planning applications has been drawn up.

5.2 Local Flood Risk Management Strategy (April 2014)

5.2.1 The Flood and Water Management Act (2010) placed a duty on Powys County Council to prepare a Local Flood Risk Management Strategy that sets out how the Council will proactively seek to minimise flood risks and prepare communities.

5.2.2 The Strategy is seen as the building block for flood and coastal erosion risk management in Powys and works towards understanding and managing flood risk within the County. The aim of the Strategy is to highlight the roles and responsibilities of the various organisations which contribute to managing flood risk within Powys, and what householders and businesses need to do to protect their properties from the consequences of flooding.

5.2.3 As a Lead Local Flood Authority (LLFA), Powys County Council principally looks to tackle 'local flood risk', i.e. flooding from surface water, groundwater and ordinary watercourses such as ditches and streams. Until now there has been little co-ordinated work to address these forms of flood risk; therefore the Strategy looks to address this by setting out the steps that are to be taken to improve knowledge of flood risk, to work better with organisations and the public towards to reduce those risks, whilst aiming to balance the need of communities, the economy and the environment.

5.3 Powys Strategic Flood Consequence Assessment

5.3.1 As part of the LDP process Powys conducted a SFCA to ensure that sites are allocated into those areas that are at the lowest risk from flooding. Where flooding was highlighted as an issue through the SFCA then sites were discounted or a detailed assessment took place to obtain more information on the risk of flooding. Some areas in the flood zone are more at risk than others, the SFCA helped to determine these areas and to ensure a sustainable approach was undertaken.

5.3.2 The benefits of producing the SFCA were the following:

- It helped to deliver a sequential approach to the allocation of land for development and assisted in the preparation of policies to minimise and manage flood risk.
- It served to quantify the risks of flooding in the county.
- It provided an evidence base.
- It will be used to inform the development management process.
- It identified issues that need to be investigated at the site specific flood consequence assessment stage.
- It assisted the Powys LDP to contribute to a reduction in flood risk, working towards the aims of achieving sustainable development.

5.3.3 The overall aim of the SFCA was to situate development in Powys according to the guidance set out in TAN 15, sequentially locating development taking the consequences of flooding into account.

5.3.4 Stage 1- This was primarily a desk top exercise collating and making use of existing information and analysing it to determine if flooding was a significant issue, where it occurred, and how it could be avoided.

5.3.5 The collated data was analysed to determine which areas were considered to be at high risk of flooding, this was partially influenced by the Technical Advice Note (TAN) 15, Development Advice Maps. TAN 15 states clearly that development of the C2 Zone (high risk of flooding) should be avoided where possible. In accordance with TAN 15, sites being put forward for highly vulnerable development were not considered as allocations in the C2 Zone (unless there was evidence that the C2 Zone did not reflect the true extent of flood risk). This includes sites for:

- emergency services,
- residential uses,
- public buildings,
- vulnerable industrial uses (incinerators, chemical plants),
- and waste disposal sites.

5.3.6 Stage 2 - Any site that was still determined to be suitable for the development proposed, but had been identified as being at risk from flooding proceeded to stage two of the assessment.

5.3.7 Stage two of the process worked on the principle that not all sites identified in stage one will be subject to the same level of risk. This part of the assessment focused on directing new development to areas within the flood zone where the risk can be managed acceptably, however the reliance on raised defences was limited. Additionally in some cases there were discrepancies in the data used in Stage 1 so sites proceeded to Stage 2 to clarify the exact nature of any flood risk. This stage in the assessment process also served to identify the need and type of policies and practices to be fed into the Powys LDP.

6. Local Context

6.1 Contaminated Land

6.1.1 Powys County has approximately 10,000 potentially contaminated land sites, ranging from low risk areas of unknown fill to former gas works. Contamination of land can occur as a result of previous industrial use; although this is not exclusive as it can also arise from natural sources as well as from human activity. The presence of contamination can represent risks to human health, property and the environment, including long-term limitations on the use of soils.

6.1.2 Generally there are two ways in which contaminated land is addressed. Paragraphs 2.5 and 5.1, describe Part IIA of the Environmental Protection Act and the duty it places on Powys County Council to identify, assess and remediate land

where necessary this is done through the implementation of the Contaminated Land Inspection Strategy.

6.1.3 Contaminated Land is defined in Part IIA as:

“Any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that:

- a) Significant harm is being caused or there is a significant possibility of such harm being caused, or;*
- b) Pollution of controlled waters is being, or is likely to be caused”*

6.1.4 The contaminated land regime in Part IIA was introduced specifically to address the historical legacy of land contamination. It only applies where there is an unacceptable risk that has been assessed on the basis of the current use and the current circumstances of the land.

6.1.5 The second way that contaminated land is dealt with is through the planning system. Planning Policy Statement (PPS) 23 which applies in England (there is no similar guidance in Wales) refers to a broader term *“land affected by contamination”*. This definition is more inclusive covering all cases where the actual or suspected presence of substances in, on or under the land may cause risks to people, property, human activities or the environment, regardless of whether or not the land meets the statutory definition in Part IIA.

6.1.6 Where possible, the Government’s policy is that land contamination should be dealt with *“voluntarily”*. Local authorities often use the planning system, rather than Part IIA, to encourage remediation of land affected by contamination. The idea is that:

- (i) Remediation will often be funded by redevelopment, and the planning system can and should secure appropriate investigation and remediation of land.
- (ii) Part IIA measures should be held in reserve for use where there is no suitable voluntary solution. For instance, this might be the case where development has already taken place in the past without adequate investigation, risk assessment and remediation being dealt with; or where there is no realistic prospect of voluntary remediation in the near future; or where the risks are too great to wait for redevelopment.

6.1.7 Local planning authorities have a responsibility for ensuring that land contamination is dealt with (as a material consideration) through the planning system and that remediation takes place where it is required. However it is the responsibility of the developer to carry out the remediation works to satisfy the local authority that the remediation has been carried out as agreed.

6.1.8 Further information can be found in PPS 23 where it explains the relationship between Part IIA and the planning system. One of the principles is that after carrying out a development and commencement of its use, the land should not be capable of being determined as contaminated land under Part IIA. Problems have occurred in

Powys where conditions are being discharged without evidence through a validation report, that remediation works have taken place. The consequences of this include the possibility that when environmental searches come to the Council, the site is highlighted as still being contaminated and that it has not been satisfactorily remediated.

6.1.9 The basic principle of establishing whether land is contaminated is called the 'pollutant linkage'. The pollutant linkage refers to the relationship between a source - pathway - receptor. All three parameters must be in place to establish the pollutant linkage. For sites to be considered under Part IIA there has to be a 'Significant Pollutant Linkage', effectively this is when the level of contamination recorded is at a level where there is little doubt unacceptable risk exists.

6.1.10 As mentioned above, under the Part IIA regime the Council has a duty to identify, inspect and assess potentially contaminated land. The Environmental Health department use a risk assessment model (Geokon) to assess land that has a former or current potentially contaminative use. It is known what potential contamination is associated with a particular land use and this 'source' is assessed against its current use. For example, a former petrol filling station may have been impacted by hydrocarbons which are known to be mobile in the ground, groundwater and in the air (vapour). If the current use of the site is for residential then the risk model will consider this land use to be a high risk. Accordingly the site will be of a high priority.

6.1.11 Conversely, a former pond that has been identified as 'unknown filled ground' in an open field that has no viable sensitive receptors (i.e. humans or rivers etc) will be of a low priority.

6.1.12 In Powys, priority is given to assessing risk to human health first with controlled waters and other receptors as secondary considerations. Therefore, the risk assessment model is used to inspect land in order of priority on the basis of risk to human health, although other issues may also be relevant. When land is remediated either following a statutory inspection or after development its risk status is re-calculated amending its priority. However, it should be noted that a validation report from the developer is required to demonstrate that the site no longer presents an unacceptable risk.

6.1.13 As discussed above, it is acknowledged that the vast majority of land will be dealt with through the planning system and development. However, the same methods of assessment as described in the Part IIA Statutory Guidance apply. Crucially though, the standard of remediation in the planning context is generally higher as it is not constrained by just breaking a significant pollutant linkage.

6.1.14 Powys has a great diversity of potentially contaminated land sites but with similar issues to those encountered in urban areas. However, the key difference generally is that the pollutant source is significantly smaller. For example, there are many former gas works but they generally affect only a few houses. There are many landfills, some registered but many not, some adjacent housing developments but many in rural areas where controlled waters and ecology are the most likely receptors.

6.1.15 The table below provides a brief summary of the types of commonly encountered contamination in respect of particular sources (more detailed information can be found in Appendix 3). The table is not exhaustive and is intended as a guide only. In a planning context, the relevance and impact of contaminants relates to the proposed end use. Generally speaking, for a residential development the level of contamination in the top one metre presents the greatest risk and this forms the basis of any assessment. Contamination can be an issue from direct contact, soil ingestion, ingestion of plants and ingestion of soil attached to plants.

6.1.16 However, certain contaminants at a greater depth can also present a risk i.e. hydrocarbons and landfill gas can ingress vertically into buildings and migrate laterally to existing buildings. It should be noted that landfill gas is not just associated with landfills, similar gases can be produced by made ground. Made ground can be found almost everywhere meaning that an assessment is always necessary.

Brief summary of the main types of land contamination in Powys

Contamination Source	Typical Issues
Gas works	Ground contamination is likely to be associated with the by-products and waste products e.g. ammonical liquor, coal tar, spent oxide and fowl lime. Landfills and lagoons may have adversely affected watercourses, as a result of direct surface water run-off and migration of contamination in groundwater. High risk for identified site and land adjoining or adjacent depending on geology/hydrogeology. Significant issues for development.
Petrol filling stations and garages	Petrol, diesel, MTBE and solvents are highly mobile and may migrate over great distances. Free product may vapourise and diffuse through the soil or accumulate in poorly ventilated spaces causing a health hazard.
Landfills	Landfill sites may be contaminated by a wide range of materials. Landfill gas may be present throughout a landfill and may vent to the atmosphere or migrate into the ground around a landfill. Its main constituents are methane and carbon dioxide, present typically in a ratio of 60:40 in actively gassing landfills containing biodegradable waste. The migration of landfill gas through waste is determined by several factors, including the gas pressure within the landfill, changes in atmospheric pressure, gas concentration gradients, the gas permeability of the surrounding strata and any displacement of gas by changes in water levels. Gas may migrate several hundreds of metres in areas with highly permeable strata.
Landfills (Continued)	Landfill leachates are generated in all sites and may continue to be produced long after a site has been closed. Early landfill leachate is usually slightly acidic and may

Contamination Source	Typical Issues
	contain simple organic compounds, ammonia and some metals. Leachates from older landfills also typically contain ammonia, but rarely metals in any significant quantities. The characteristics of leachate produced at a landfill site and its impact on surface and groundwater is dependent on the permeability of the wastes, the degree of infiltration of surface water, the depth of the water table, movement of groundwater through the site and the permeability of the surrounding geology.
Clay pits & tiles	Typical contaminants include: Metals such as cadmium, chromium, copper, lead, mercury, nickel, zinc. Refractory bricks, inorganic compounds, Air entraining agents, cement dusts, organic compounds, acids, oils and asbestos.
Unknown filled ground i.e. ponds	Various potential contaminants associated with fill activities i.e. domestic, commercial waste. Putrescible materials can cause landfill gas.
Made ground	Can be found on any ground that has been previously used. It is possible to encounter any contaminant listed above. A commonly occurring contaminant is Benzo a pyrene - a known carcinogen.
Agricultural land i.e. barn conversions	Various contaminants associated with agriculture could include hydrocarbons (fuels), solvents / disinfectants etc.

6.1.17 Powys has a huge number of landfills (many owned and/or managed by the Council), in both rural and (relatively) urban areas. There are many other unregistered landfills that effectively were not formally controlled meaning unknown materials may be present. As discussed in the table above, landfill gas may be present throughout a landfill site and may vent to the atmosphere or migrate into neighbouring land. Its main constituents are methane and carbon dioxide, both of which are identified as greenhouse gases that are contributing to climate change.

6.1.18 The issue of the cost and time involved in carrying out formal monitoring and remediation works on these sites is recognised in the Powys LDP particularly when looking at the feasibility of these sites being developed. National policy (Wales Spatial Plan) stipulates that development should be directed to brownfield sites where possible, protecting those sites considered as greenfield and recognising that the best way of removing risks from the contaminated state of land is through development. The costs placed on the developer for any remediation works serve to benefit the wider environment. This will need to be taken into consideration when looking at how the Community Infrastructure Levy may/will be implemented or other S106 contributions (including affordable housing) are being sought.

6.1.19 Redundant mine working can also be an issue; one example is the Y Fan lead mine near Llanidloes. This mine was in operation between 1866 and closed in 1923; within this period 97,000 tonnes of lead concentrate were extracted making it

one of the biggest lead mines in terms of output in Britain. Whilst the site is of historical importance it is also valued as an important area for biodiversity.

6.1.20 Discharge from the mine shafts contains a high proportion of heavy metal contamination. To alleviate pollution of the adjacent watercourse the outflow passes into settling lagoons which precipitate and sequester the contaminants. In 2009 Capita Symonds were commissioned to conduct a survey to look at the re-excavation of the lagoons (to reduce overspill) whilst conducting a full ecological survey. The results of the survey found that the site is important for birds, plants, lichens, invertebrates, mammals and reptiles.

6.1.21 Other sites considered to be of importance for biodiversity include Waun-y-Cwrt. This is a closed landfill site near Nantmel which closed in 1990. It covers an area of 11 hectares and in the past posed a serious threat to animals and fish living nearby. Following remediation works the site now hosts otters, lapwings, herons, red kites and buzzards and the treated leachate is cleaner than the stream it discharges into.

6.1.22 To the south of the county in the Ystradgynlais area there is a history of heavy industry including metal working (also present in the north of the county) and coal mining. This has left a legacy of ground instability that covers a large area. Risks from coal mining in particular can include any of the following:

- Collapse of shallow coal mine workings;
- Collapse of or risk of entry into, mine entries (shafts and adits).
- Gas emissions from coal mines including methane and carbon dioxide;
- Spontaneous combustion or ignition of coal which may lead to the production of carbon monoxide;
- Transmission of gases into adjacent properties from underground sources through ground fractures;
- Coal mining subsidence; or
- Water emissions from coal mine workings.

Before any development can take place in this area a site specific investigation needs to be conducted. This will enable any risks to be highlighted and assessed and where appropriate mitigation/remediation measures identified.

6.2 Water Quality

6.2.1 Severn Trent supplies mains water to the north of Powys from a large groundwater abstraction in the Severn valley. Dwr Cymru Welsh Water supplies mains water to the east of Powys from a large groundwater abstraction in the Lugg Valley and also supplies mains water from several smaller groundwater abstractions across the county. In addition to this the county hosts a number of reservoirs, two of which supply water to the cities of Birmingham and Liverpool. The issue of water quality is of importance for public health, recreational activities such as fishing and for the environment. Some of the largest watercourses in Powys are of European

importance for conservation; these include the River Wye Special Area of Conservation (SAC) and the Montgomeryshire Canal SAC.

6.2.2 Within Powys there are 7 source protection zones (SPZs). Source Protection Zones are used by Environment Agency Wales to protect abstractions used for public water supply and other forms of distribution to the public, such as mineral and bottled water plants, breweries or commercial food and drink production. These zones show the areas of groundwater within which there is particular sensitivity to pollution, and where certain polluting activities are to be restricted or controlled.

6.2.3 One of the main issues that has an effect on localised instances of water pollution in Powys is sewerage flooding. This has taken place in some of the main towns such as Machynlleth. This type of flooding can occur and be exacerbated when new development puts a strain on an existing system.

6.2.4 Other examples of where new residential development can have a detrimental impact on an existing system include in Llandinam and New Radnor. In these areas the lack of capacity in the original system to cope with the increase in flow, can at times result in an overflow that discharges into nearby watercourses.

6.2.5 Due to the rural nature and dispersed population of Powys there are number of settlements that are not connected to mains drainage. In these cases septic tanks and private sewage treatment plants are most commonly used. For these systems to work efficiently there needs to be adequate capacity in nearby watercourses to take the treated effluent and/or the ground conditions need to be suitable for incorporating soakaways. Powys has several settlements (e.g. White Grit, Forden and Coedway) where the nearby water courses are at capacity and the ground conditions are unsuitable; in these situations no further development will be able to take place without mains drainage. Several attempts have been made to assess whether the residents of some of these settlements are interested in going onto mains drainage with a very poor response. Without this demand there is no requirement for the utility companies to provide the service and therefore further developments are limited. See the utilities topic paper for more information.

6.2.6 Another source of pollution to watercourses is that from nutrient runoff. This can occur through heavily sheep grazed river banks and the application of fertilizers to sheep grazed pastures. A particular issue in Powys is the recent increase in the number of free range poultry units that the county has recently experienced. The manure (which is high in nitrogen) from the units is spread across the fields to act as a form of fertilizer, this can then find its way into groundwater and surface waters (including watercourses) threatening the ecology.

6.2.7 The threat mentioned above is not specific to poultry units as nutrient runoff can occur from any application of fertilizer, slurry or organic manure that is applied to the land. Of particular concern are the potential effects of ammonia and nitrogen runoff within the catchment of the River Wye Special Area of Conservation (SACs). The Natural Heritage topic paper highlights the threat that nutrient run-off is having on biodiversity. It also recognises that a large number of the SACs are in unfavourable condition and in some cases this can in part be attributed to pollution from nutrient run-off.

6.2.8 Powys has recently considered a planning application for a large scale intensive unit for a herd of dairy cows. One of the main issues for this type of development is the disposal of the manure/slurry and its effect on the quality of nearby watercourses.

6.2.9 The county of Powys has a history of mining for metals some of these remnant mine workings are known to leach out pollutants, such as lead, into local watercourses. One example is the lead mine at Y Fan, see paragraph 6.1.20, for more information.

6.2.10 As mention in paragraph 1.1.1, the Water Framework Directive (WFD) requires all water bodies to achieve 'good status' by 2015 (in some cases this may be extended to 2021 or 2027). Failure to reach 'good status' may result in infractions from Europe.

6.2.11 The Water Bodies Status summary table below shows the numbers of each type of water body in each ecological, chemical and quantitative (groundwater only) class according to the baseline (2009, classification of WFD water bodies). The Water Framework Directive requires no deterioration from this baseline. The aim is to achieve at least Good status. Ecological status is shown for all surfacewater water bodies; this includes measuring biological elements such as invertebrates and fish as well as supporting physico-chemical elements such as phosphates and nitrates. Chemical assessment of water bodies is risk-based, with not all water bodies requiring assessment. Chemical monitoring looks for priority substances such as mercury. Groundwaters are classified in terms of chemical and quantitative status; quantitative status is about the impacts of groundwater abstraction.

Water Framework Directive: Water Bodies Status Summary for Powys Planning Authority.

Water Body Category	Total No. Water Bodies	Chemical Status			Quantitative Status	
		Good	Failing to achieve Good	Does Not Require Assessment	Good	Poor
Coastal	0	-	-	-	-	-
Ground - water	11	5	6	-	10	1
Lake	9	-	-	9	-	-
River	198	6	2	190	-	-
Transitional	1	-	-	1	-	-

		Ecological Status				
Water Body Category	Total No. Water Bodies	High	Good	Moderate	Poor	Bad
Coastal	0	-	-	-	-	-
Ground - water	11	-	-	-	-	-
Lake	9	-	4	4	1	
River	198	-	79	96	21	2
Transitional	1	-	-	1	-	-

Source: Environment Agency, Local Evidence Package – Powys Planning Authority (2014)

6.2.12 Groundwater - Six of the 11 groundwater water bodies in Powys are failing to achieve Good Chemical Status. The failure of these six groundwater water bodies has the potential to impact on surface water Status, which includes areas protected for drinking water (Source Protection Zones).

6.2.13 One of these groundwaters fails the Quantitative Status. This status is important because if groundwater quantity is insufficient in one groundwater water body, this could potentially lead to a detrimental impact upon surface water quantity which could lead to further environmental issues.

6.2.14 Lakes - One of the nine lakes in Powys is of Poor Ecological Status. This is Cerrigllwydion Isaf Lake due to acidification pressures. These acidification pressures form because there is lack of buffering capacity within the local geology to neutralise acid rainfall. This results in the Lake waters becoming acidic, which can impact on local ecology.

6.2.15 The rest of the lakes are classed as heavily modified water bodies and have the alternative objective of Good Ecological Potential, which means reasonable measures need to be put in place to maximise the ecology, while accepting the 'use' for which the water body was designated as modified in the first place.

6.2.16 Rivers (Chemical Status) - Two of the 198 rivers in Powys are failing to achieve Good Chemical Status because of high levels of Cadmium and Tributyltin (TBT), these metals can be toxic to the local ecology. It is suspected that the presence of these metals is due to metal mines upstream, however the Environment Agency is currently carrying out investigative works to rule out any potential industrial discharges.

6.2.17 Six of the 198 rivers are achieving Good Chemical Status; but the other 190 have not required an assessment due to a risk based monitoring programme, based on nationally produced risk assessments.

6.2.18 Rivers (Ecological Status) - 79 of the 198 rivers in Powys are of Good Ecological Status and these rivers should be protected from any deterioration.

6.2.19 96 of the 198 rivers are of *Moderate Ecological Status* this is due to failures in the following parameters detailed in the table below:

Parameter	No of Rivers affected	Reasons
Invertebrate	9	acidification, sheep dip, and 'unknown'
Fish	41	<ul style="list-style-type: none"> - Acidification because there is not enough buffering by local geology to neutralise acid rain. This results in rivers with acidic waters which impacts upon the local ecology; - Barriers to migration; - Dissolved oxygen (downstream of Llangorse Lake). The only oxygen failures are downstream of Llangorse Lake and this is largely due to 'natural' processes. This is because as there is little flow from the lake, the water sits over degrading organic material which requires oxygen; - Metals; - Sediment; - and unknown.
pH	11	Acidification via both aerial deposition and forestry deposition. Note: This is under review.
Phosphate	14	Mixture of point and diffuse source (no location is available but the investigation is still ongoing);
Copper	41	Metal mines
Cypermethrin	3	Sheep dip (but this is also used to treat forestry);
Diazinon	1	Sheep dip
Zinc	22	Metal mines
Diatoms	1	Unknown

21 of the 198 of rivers are of *Poor Ecological Status* due to failing the fish parameter, as a result of acidification, sheep dip and unknown reasons.

6.2.20 One of the 198 rivers is of *Bad Ecological Status* due to failing the invertebrate parameter. The second river classed as having *Bad Ecological Status* is a data error which should be corrected following further survey work.

6.2.21 Transitional – this is the term for waters that are intermediate between fresh and marine water and includes estuaries and saline lagoons. In Powys this refers to the area covered by the Dyfi and Leri which is classified as having Moderate Ecological Potential, as a heavily modified water body it needs measures to maximise ecology. This water body has been altered (and termed as Heavily Modified) to such an extent that Good Ecological Status is not possible. Therefore (following an acceptance the modifications are necessary) the alternative objective of Good Ecological Potential applies. This means there is a need to maximise the ecology because of an acceptance of the modified nature of the water body.

Please note that where water bodies are failing due to 'Physical Modification' this is often because of man made barriers to fish migration. 'Diffuse source non-

agriculture' will include the impacts of acidification both aerial deposition and forestry.

6.2.22 Sustainable Drainage Schemes (SuDS) such as swales and wetlands, can be used to minimise pollution run-off such as sediments, heavy metals, hydrocarbons, and nutrients into surface waters. It not only serves to improve water quality (and status) but can also lead to:

- A good management of surface water flow rates (which reduces of flood risk)
- Provides valuable wildlife habitat
- Creation of green open space
- Community amenity
- Recreational benefit including fishing

This is not an exhaustive list and many benefits may be outside land use planning issues, such as community health.

6.2.23 One example of a scheme of this nature being implemented is in Llanfyllin, here the Town Council wanted to extend the existing car park. However the proposed car park extension encroached into the Afon Cain floodplain. In 2008 the Afon Cain was a candidate Water Framework Directive 'Good Ecological Status' failing stretch. The Environment Agency developed and influenced a sustainable drainage scheme to resolve the problem. The scheme acted to collect, store and treat run-off from the car park. This served to manage surface water run off flow rates, slowing them down and preventing them from increasing the risk or causing flooding. In addition to this public access was created to the wetlands and river corridor.

6.3 Air Pollution

6.3.1 Powys County Council has a statutory duty for the review and assessment of ambient air quality. This involves carrying out an '*updating and screening assessment*' every three years. This examines the levels of seven pollutants that are known to have a detrimental impact on human health at elevated levels.

6.3.2 The updating and screening assessment conducted in 2006 found that along New Road in Newtown the levels of Nitrogen Oxide exceeded the objective level set out in the National Air Quality Strategy. This resulted in a 'detailed assessment' having to be carried out. The detailed assessment included the automatic and passive monitoring of nitrogen dioxide being carried out at numerous locations along New Road. In addition to this, computer dispersion modelling was used to predict concentrations of nitrogen dioxide at locations in New Road where monitoring was not undertaken. The results of the study proved that the national objective for nitrogen dioxide was exceeded in 2006. Further monitoring in 2007 continued to confirm this exceedance.

6.3.3 Having identified an exceedance of the air quality objective level Powys County Council declared an Air Quality Management Area which included the two properties exceeding the objective level.

6.3.4 The pollutant of concern in Newtown is nitrogen oxide which is formed during high temperature combustion processes from the oxidation of nitrogen in the air or fuel. The principal source of nitrogen oxides, (nitric oxide (NO) and nitrogen dioxide (NO₂), collectively known as NO_x), is road traffic. NO and NO₂ concentrations are at their greatest in urban areas where traffic is heaviest.

6.3.5 Nitrogen dioxide has a variety of environmental and health impacts. It is a respiratory irritant, may aggravate asthma and possibly increase susceptibility to infections. In the presence of sunlight, it reacts with hydrocarbons to produce photochemical pollutants such as ozone.

6.3.6 Plans are in place to build a bypass diverting traffic away from the centre of Newtown, this would seek to resolve the town's air pollution issues. Work is due to commence on the bypass before the Powys LDP is adopted, therefore the risk of the development of new housing allocations exacerbating the problem is reduced.

6.3.7 It is recognised in the Natural Heritage topic paper that many of the habitats and ecosystems in Powys are sensitive to air pollution, particularly mosses, liverworts and lichens. Some pollutants are generated locally such as ammonia from poultry units and fertilisers. This is a particular issue following the recent increase in the number of free range poultry units that the county has recently experienced. The manure (which is high in nitrogen) breaks down either inside the sheds or out on the fields (where it is spread to act as a form of fertilizer) releasing what is known as airborne ammonia.

6.3.8 Emissions from livestock units result in local hotspots of high ammonia concentrations and deposition around installations. It should be noted that this occurs against a background of high nitrogen deposition across the county (see below). The Countryside Council for Wales (CCW) has published interim casework internal guidance on Livestock Production which advises how developers and Planning Officers should consider the impacts of such development on sites of International and National importance for biodiversity using the Simple Calculation of Ammonia Impact Limits (SCAIL) tool (<http://www.scail.ceh.ac.uk/>).

6.3.9 The guidance highlights the planning authority's responsibility to consider all impacts and to demonstrate that the development will not have an adverse effect on the site integrity of international and nationally designated sites. However locally designated wildlife sites and LBAP habitats and species are afforded no such protection.

6.3.10 Soils and vegetation have the capacity to absorb pollutants, however once the quantity of the pollutant is considered to be harmful it is described as a critical load. Wales has the highest percentage of habitats in exceedance of critical loads both for acidity and nutrient nitrogen in the UK (The Welsh Soils Action Plan (2008)). This is partly due to the landscape in Wales with large areas of sensitive upland habitats with base-poor soils.

6.3.11 Appendix 3 contains information taken from the Air Pollution Information System (APIS) website (<http://www.apis.ac.uk/>). It looks at levels of nitrogen and acid deposition in the Special Areas of Conservation (SACs) across Powys

(excluding Brecon Beacons National Park). Particular attention is given to the critical loads of the qualifying habitats of each of the SACs. This provides a brief overview on how many of the species and habitats protected through internationally important sites, are at risk from nitrogen and acid deposition in Powys. Where the critical loads have been exceeded then a detailed breakdown of the source of the pollutant is provided.

6.3.12 A critical load is defined as *“The threshold level for the deposition of a pollutant above which harmful indirect effects can be shown on a habitat or species, according to current knowledge.”* The critical load for each habitat is displayed as a range with a minimum and a maximum value. Concerns are raised if the deposition levels of the pollutant fall within or above the range.

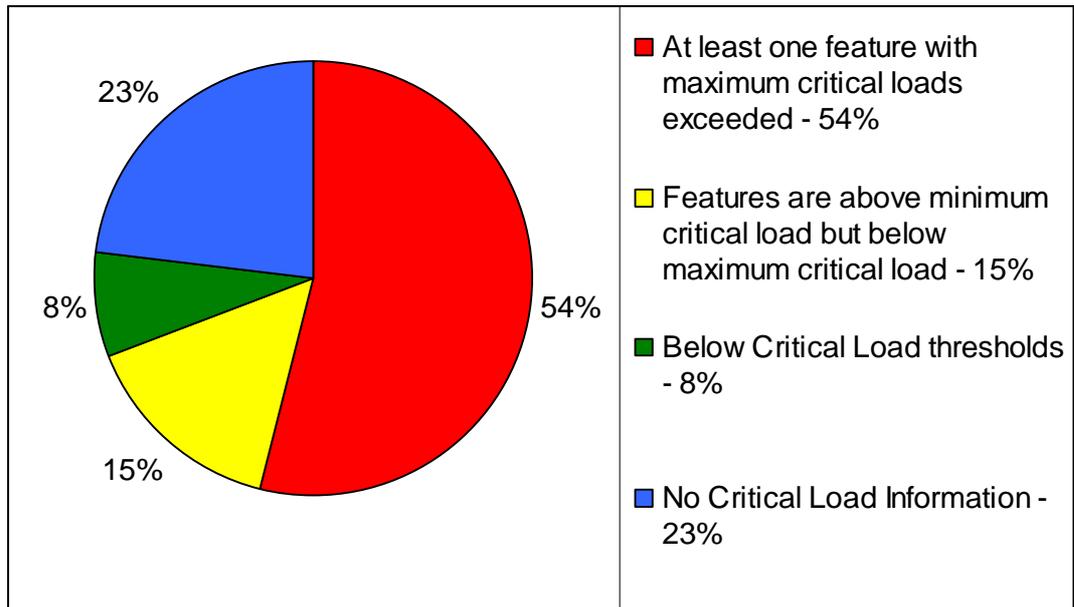
The Common Biological Effects Caused by an Exceedance of the Nitrogen Deposition Critical Load.

Pollutant	Exceedance Impacts
Nitrogen deposition	<p>Terrestrial Impacts</p> <ul style="list-style-type: none"> • Changes in species composition especially in nutrient poor ecosystems with a shift towards species associated with higher nitrogen availability (e.g. dominance of tall grasses) • Reduction in species richness • Increases in plant production • Decrease or loss of sensitive lichens and bryophytes. • Increases in nitrate leaching <p>Freshwater Impacts</p> <ul style="list-style-type: none"> • There is a potential in N-limited systems for N deposition to change algal productivity and nutrient regimes in upland lakes. • Increase rate of succession.

http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm

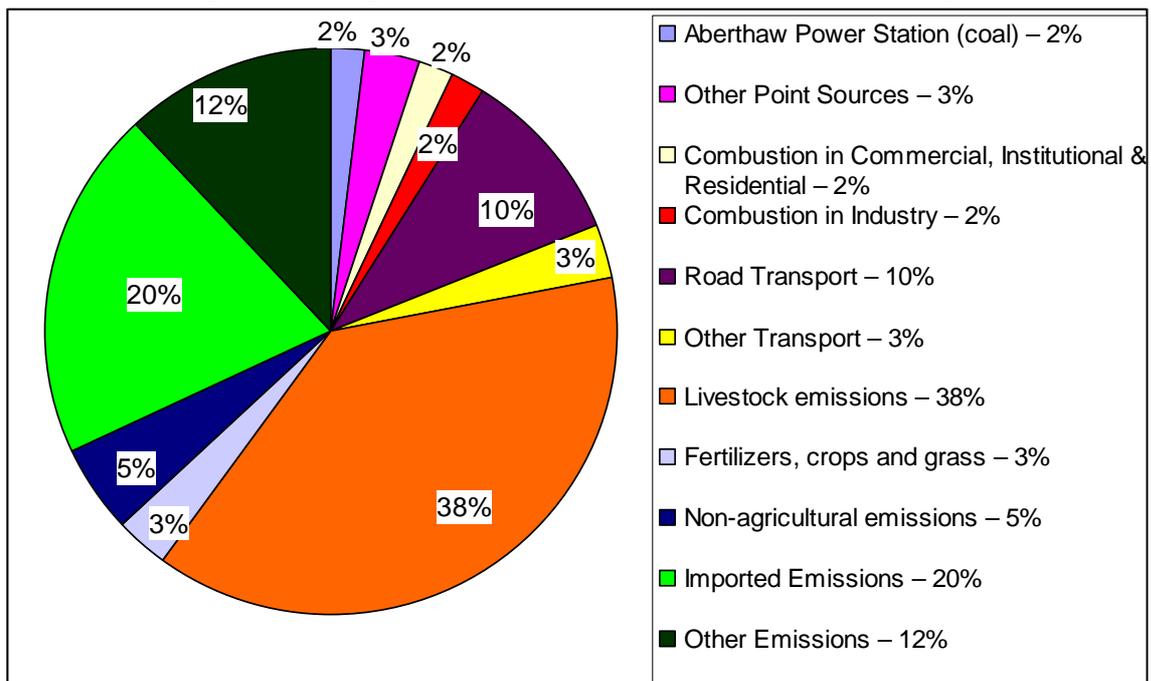
6.3.13 The data in Appendix 3 shows that the majority of the SACs in Powys have at least one feature where the maximum critical load for nitrogen deposition has been exceeded. In some cases the detrimental effect this has had, has resulted in the SACs condition being classified as unfavourable. See the Natural Heritage Topic Paper for more information.

Chart Showing the Percentage of SAC's in Powys (excluding BBNP) where the Critical Load of at Least One Feature has been Exceeded for Nitrogen Deposition.



6.3.14 The APIS website gives a detailed breakdown of the main sources that contribute to the background levels of nitrogen deposition at each site. For each of the SACs 'Livestock Emissions' were overwhelmingly the largest pollutant accounting for between 35% and 51% of the total emissions on each site. This is a problem compounded by the growing number of intensive poultry units throughout the county. The chart below shows the source of the emissions affecting the Elenydd SAC; this is fairly typical of the situation in Powys.

Chart showing the background emissions in 2010 for the Elenydd SAC



6.3.15 Another threat to biodiversity resulting from air pollution is that of acidification. The deposition of sulphur, as sulphate (SO₄²⁻), and nitrogen, as nitrate (NO₃⁻), ammonium (NH₄⁺) and nitric acid (HNO₃⁻), can cause acidification. When assessing the acidification of soils the deposition of both sulphur and nitrogen compounds are taken into account.

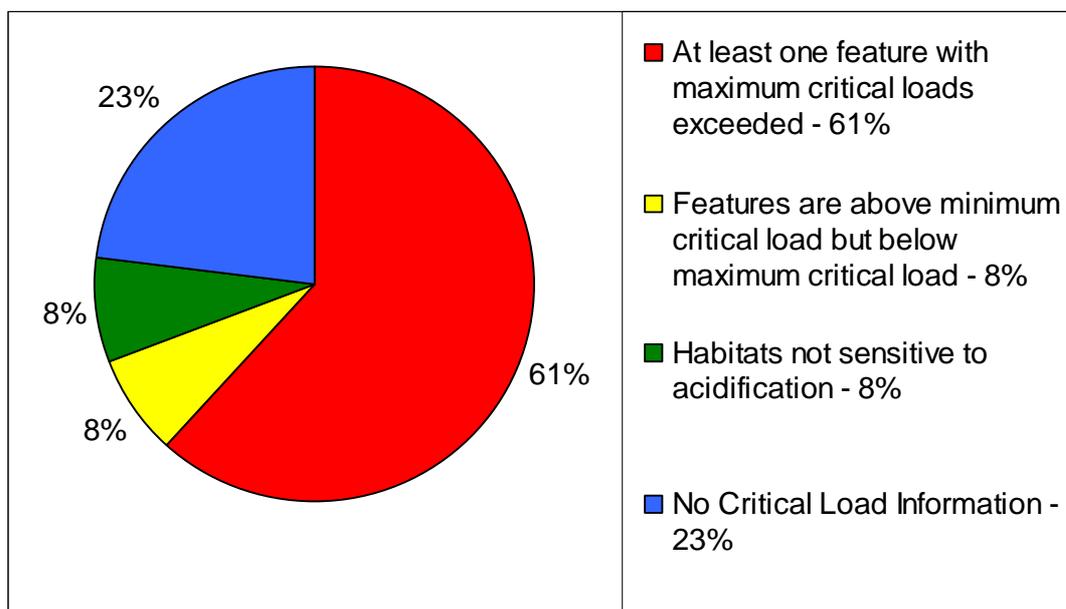
The common biological effects caused by of an exceedance of the Acid deposition critical load.

Pollutant	Exceedance Impacts
Acid deposition	<p>Terrestrial Impacts</p> <p>Terrestrial - Leaching will cause a decrease in soil base saturation, increasing the availability of Al₃⁺ ions, mobilisation of Al₃⁺ may cause toxicity to plants and mycorrhiza, and have a direct effect on lower plants (bryophytes and lichens).</p> <p>Freshwater Impacts</p> <p>Freshwater - Increase Al₃⁺ concentration associated with freshwater acidification, impact on invertebrate populations, toxicity to fish.</p>

http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm

6.3.16 The data in Appendix 3 shows that the majority of the SACs in Powys have at least one feature where the maximum critical load for acid deposition has been exceeded. In all but one of the cases where a features maximum critical load had been exceeded for acidification it was due to nitrogen deposition. However there were a number of cases where the minimum critical load levels had been exceeded for sulphur deposition.

Chart Showing the Percentage of SAC's in Powys (excluding BBNP) where the Critical Load of at Least One Feature has been Exceeded for Acid Deposition.



6.3.17 The source of emissions causing the nitrogen deposition will be the same as those detailed in the chart on page 34, with livestock emissions being the main concern. The majority of the sulphur emissions are generated outside of Powys from sources such as power stations, refineries and shipping.

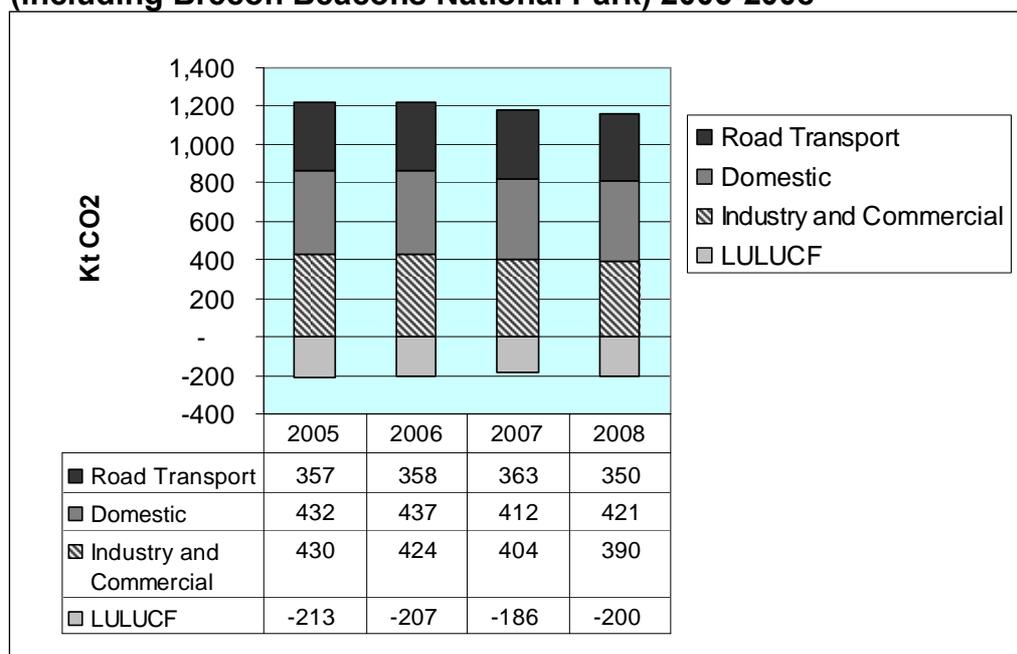
6.3.18 This assessment has been undertaken on the SACs in Powys to give a brief overview of the situation. To determine the full picture the same assessment would need to be done for every habitat (using its grid reference) in Powys; this would be a time consuming exercise and is not considered to be necessary. However, critical load information can be used in any location to form a judgement on how a proposed development may have an effect on its surroundings.

6.4 Greenhouse Gas Emissions

6.4.1 The Climate Change Strategy for Wales (2010) highlights how urgent and sustained action to cut emissions is needed worldwide to avoid the worst impacts of climate change in the future. The Welsh Assembly Government has set targets of reducing greenhouse gas emissions by 3% each year from 2011, in areas of devolved competence. This is against a baseline of average emissions between 2006 and 2010. In addition to this a target has been set of achieving at least a 40% reduction in all greenhouse gas emissions in Wales by 2020 against a 1990 baseline.

6.4.2 The term greenhouse gas includes carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride. Carbon dioxide (CO₂) is the main greenhouse gas, it accounted for about 84 per cent of the total UK greenhouse gas emissions in 2009. The chart below gives a break down of the CO₂ emissions and removals in Powys between 2005 and 2008.

Estimated Net Carbon Dioxide Emissions, kilotonne per year across Powys (including Brecon Beacons National Park) 2005-2008



Source: DECC Climate Change Statistics, Greenhouse Gas Emissions by LA, © Crown Copyright

6.4.3 The chart shows that between 2005 and 2008 the estimated net CO₂ emissions in Powys decreased from 1,007 kilotonnes a year to 961 kilotonnes. The largest change has been in the reduction of CO₂ emissions generated by the industrial and commercial sector. The LULUCF category stands for Land Use, Land Use Change and Forestry; LULUCF activities represent both a source and sink for atmospheric CO₂. In general emissions are produced from soils and the liming of soils and are removed through forest growth. The chart above shows that the LULUCF activities in Powys are predominantly acting to remove CO₂ from the atmosphere.

6.5 Noise Pollution

6.5.1 As discussed in paragraph 3.3.12, Planning Policy Wales requires the Powys LDP to take into account noise pollution. This includes having policies and allocations that separate developments such as hospitals and dwellings away from potentially noisy developments such as some industrial uses. In addition to this TAN 11 requires that where it is particularly difficult to separate noise sensitive development from noisy activities, the development plan should contain an indication of any general policies which the planning authority proposes to apply in respect of planning conditions or obligations.

6.5.2 Noise pollution can be defined as unwanted sound that can be a source of irritation and stress. Noise nuisance is covered by Part III of the Environmental Protection Act 1990 (EPA). The Act empowers local authorities (Environmental Health) to deal with noise from fixed premises (including land) if they consider that the noise amounts to a statutory nuisance. Proceedings may be taken against noise from factories, shops, pubs, dwellings and stationary vehicles.

6.5.3 In Powys local issues have been created when a dwelling has been built nearby an existing noisy activity, following this the occupants have found that the noise is a problem or the property changes hands and the new occupants find that the noise is a problem. This results in a complaint being made and Environmental Health Officers having to take action.

6.5.4 Similar issues can arise by the development of brownfield/infill sites whereby the gap between residential and industrial landuses is reduced. Further conflict can occur with the sustainable approach that is now being adopted for work / live units and the rural diversification of agricultural buildings for other uses such as workshops. In these cases if the workshop is sold off noise issues can be a problem for the neighbouring dwelling (farm house).

6.5.5 Small scale renewable energy can also have noise implications for local residents; the most widely documented concern being from wind turbines. New applications for wind turbines must be situated a good distance away from all properties. Another potential issue is that of Air Source Heat Pumps these units extract heat from the outside air normally to heat radiators, underfloor heating systems, or warm air convectors and hot water in a dwelling. The units need to be

attached to the dwelling and can cause a noise issue on high density developments whereby all of the properties are adjoining. Each system can potentially cause an issue for the neighbouring residents unless they are acoustically enclosed.

6.6 Light Pollution

6.6.1 Light pollution can be described as an artificial light that is illuminating an area that isn't intended to be illuminated whilst causing an intrusion. Problems can occur from poorly directed and over bright lights on neighbouring properties that shine light through bedroom windows causing an intrusion.

6.6.2 Another concern is sky glow; this is the brightening of the night sky from upward light. In some areas this can obscure the night sky from astronomers, school children and students, tourists and residents preventing the studying and enjoyment of this important natural asset. The dark skies of Powys are an important resource that should be recognised for their qualities and afforded adequate protection. The next page shows satellite derived information on sky-glow for Wales in 2000. From this map it can be seen that the majority of Powys has some of the darkest skies in the country. From the map it could be said that the dark skies of Powys are equivalent to those of the Brecon Beacons National Park which has been designated as an International Dark Sky Reserve.

6.6.3 Due to the generally unlit rural landscape of Powys it would only take a small increase in area lighting or even the introduction of a single bright, badly directed light at a given location to create a relatively bigger sky-glow impact than would be created in an already urban context. Similarly when viewing the daytime landscape, a single light or even a sizable lighting scheme may have very little impact on the rural nature and setting of the buildings or development associated with that lighting. At night, however, an intrusive lighting scheme or even just a single bright or badly-directed light can at a stroke signal the arrival of the town into the country.

6.6.4 Further issues caused by inconsiderate or incorrectly set lighting are the following:

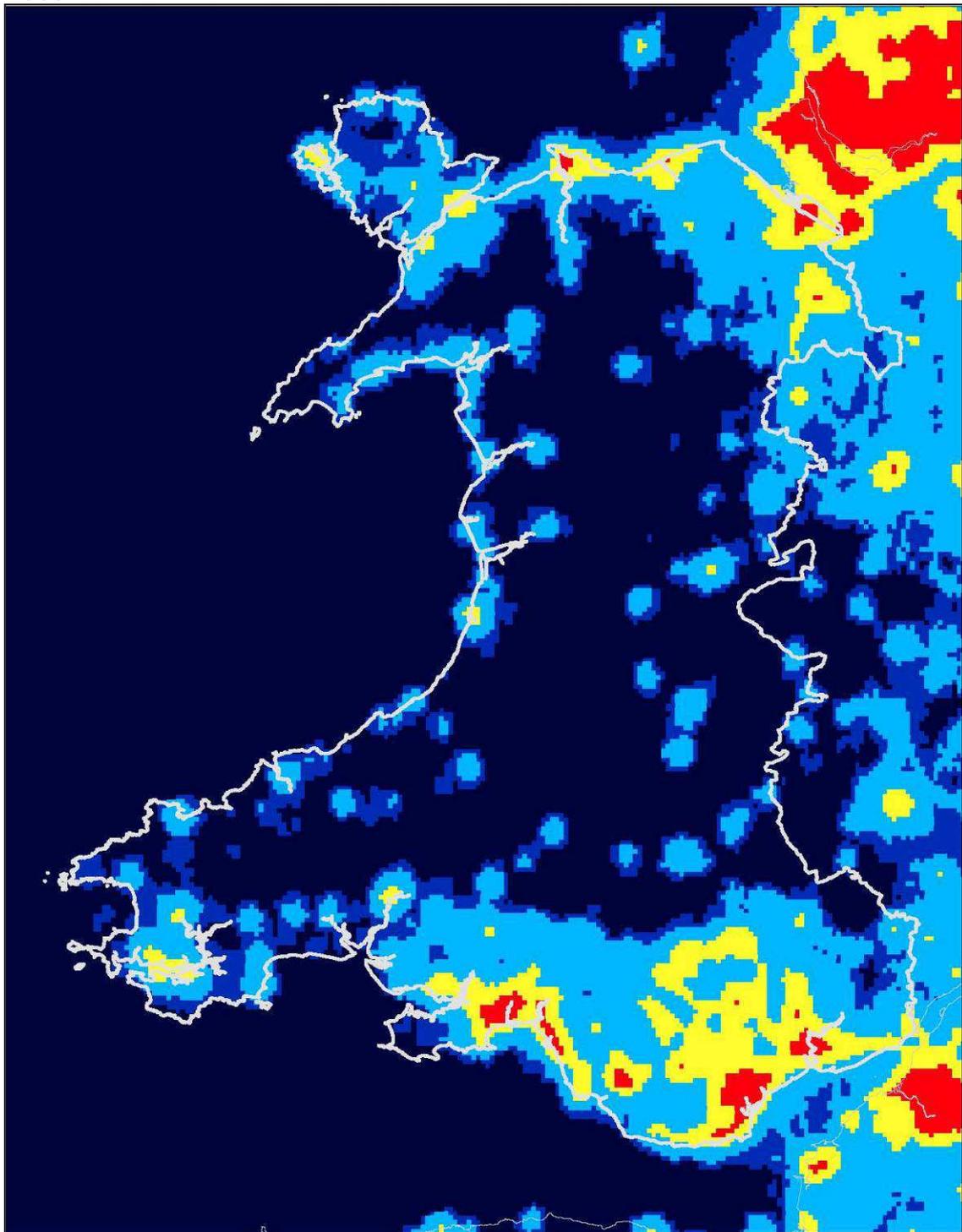
- The production of glare when over bright lighting against a dark background affects a person's ability to view an object (conceals rather than reveals).
- It can detract from the architectural appearance of a building even hiding complex and attractive features.
- It can impact on the wildlife and ecology of an area, effecting species such as bats, otters, birds and fish.
- It can be a waste of energy and resources (including carbon).

6.6.5 Buglife the Invertebrate Conservation Trust commissioned a "*Review of the Impact of Artificial Light on Invertebrates*" (2011). Invertebrates include crustaceans, insects, spiders and snails they make up the majority of living species and are vital to the functioning of ecosystems. The study highlights the impact artificial lighting can have on these species attracting insects such as moths and disrupting natural light/dark patterns. Many invertebrates depend on the natural rhythms of day-night and seasonal and lunar changes to light levels. As a result artificial lighting can have

severe negative impacts on a range of invertebrates including the disruption of feeding, breeding and the movement of species; this may act to reduce and fragment populations. The polarisation of light by shiny surfaces can also be a problem attracting aquatic insects particularly egg laying females away from water. Reflected light has the potential to attract pollinators and impact on their populations, predators and pollination rates.

6.6.6 Some issues can be resolved through the submission of lighting plans at the planning application stage. The involvement of Environmental Health, the Built Heritage Officer and the Ecologist at this stage can make sure the proposed lighting on new developments takes place in a sensitive manner. In some cases the replacement of one big light with several smaller better targeted lights may be appropriate. Further issues can be caused by illuminating advertisements; these should be in keeping with the surrounding area.

Map Showing Night Time Light Pollution – from Wales Tranquil Areas Map 2009



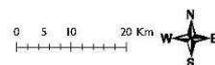
Wales Tranquil Areas 2009
Map 18: Night time light pollution, 2000

Key

	1 - 1.7		150 - 240
	1.7 - 50		240 - 255
	50 - 150		Wales boundary

Source: CPRE

Night skies data obtained and manipulated/analysed by and on behalf of CPRE by Land Use Consultants and Nigel Press Associates. Satellite images from: NOAA-NESDIS National Geophysical Data Center
 Date: 21/04/2009

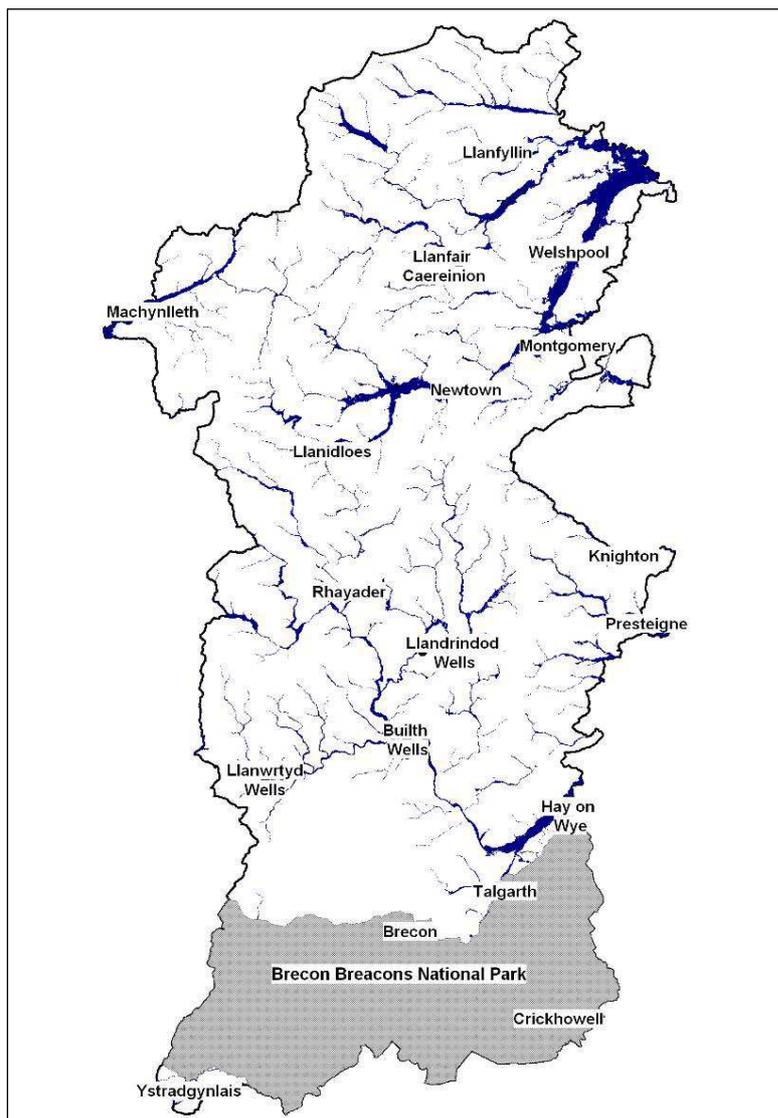


6.7 Flooding

6.7.1 Flooding particularly that of rivers and coastal waters is seen as a natural process that shapes our environment. However floods are difficult to predict and can cause wide spread disruption, extensive damage to property, personal trauma and in some cases loss of life.

6.7.2 Planning Policy Wales and Technical Advice Note (TAN) 15 require local planning authorities to adopt the approach of directing new development away from areas that are at high risk from flooding. In conjunction with TAN 15, Development Advice Maps have been drawn up for the whole of Wales; these maps identify different zones that represent the different levels of risk from flooding. Areas that are considered to be of high risk fall within either Zones C1 or C2. If development does need to be located in Zone C, the development category should be appropriate to the flood zone in question and the location of the development needs to be justified.

6.7.3 The Development Advice Maps are based on the Environment Agency's extreme 1 in 1000 year flood outlines (Zone C) and the British Geological Survey (BGS) drift data (Zone B). The maps provide information on flooding from rivers and the sea. There are some limitations to the DAM and Environment Agency Flood Map, as generally, only catchments over 3km² have been mapped.

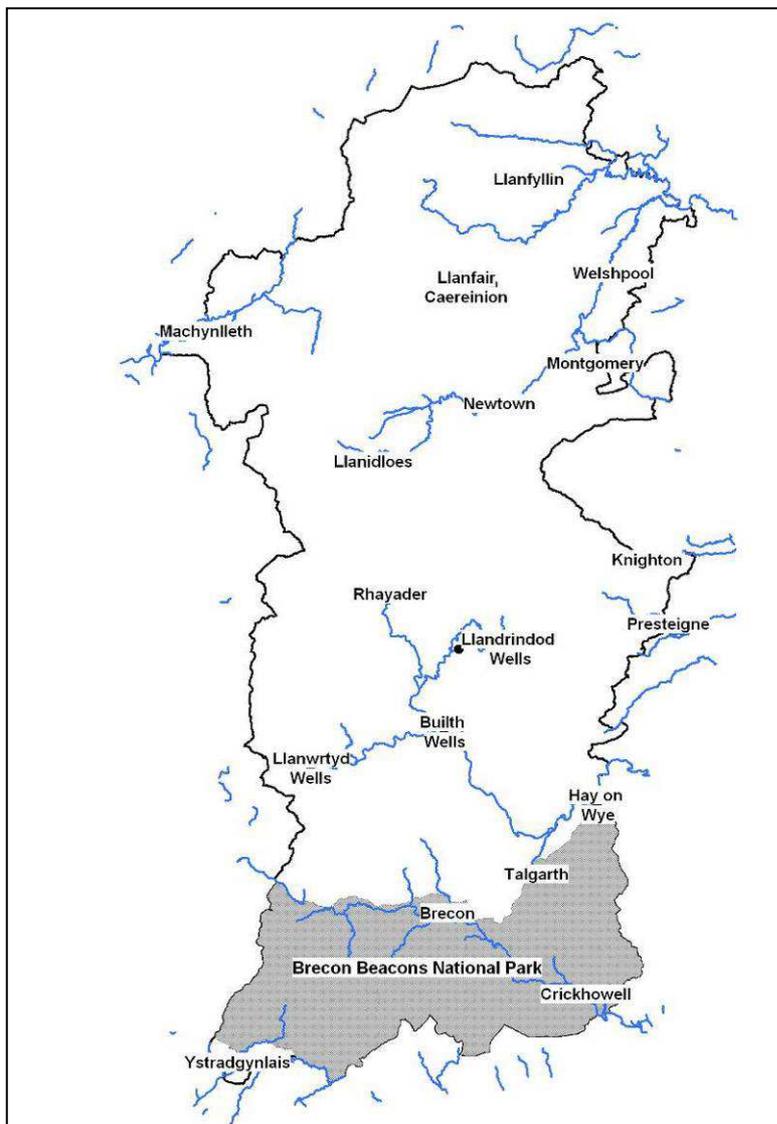


Map showing the Extent of Zone C in the TAN 15 Development Advice Maps in Powys.

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6.7.4 Main River Flooding – Main Rivers are usually larger streams and rivers, but also include smaller watercourses of strategic drainage importance. A main river is defined as a watercourse shown on a main river map, and can include any structure or appliance for controlling or regulating the flow of water in, into or out of the main river. The Environment Agency is the competent authority for managing flood risk from main rivers and has powers to carry out main river flood defence works. Main rivers are designated by the Welsh Government and DEFRA.

The main rivers that flow through Powys include the Severn, Vyrnwy, Tanant, Wye, Usk, Irfon, Ithon, Dyfi, Tawe and the Lugg. In some areas fluvial flooding from these sources is the main source of flood risk; this includes the settlements of Llanidloes, Newtown, Meifod and Builth Wells. The Development Advice Maps above are based on this information together with the probability of a flood event.



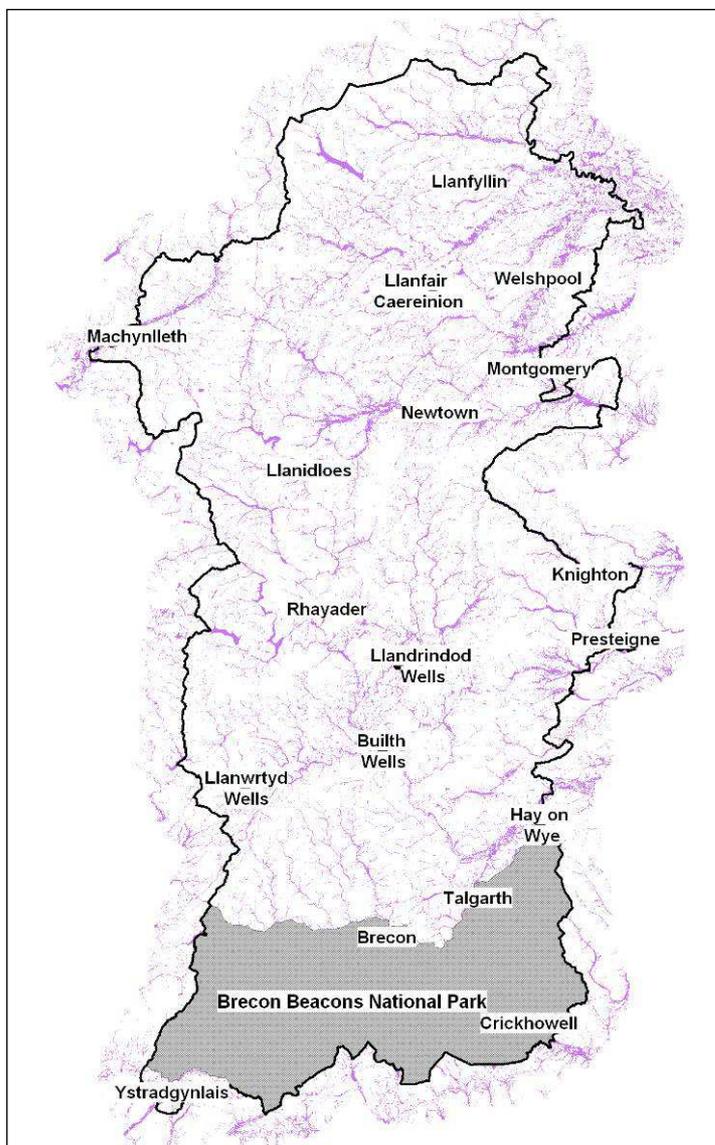
Map Showing the Location of the main Rivers in Powys

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6.7.5 In some cases the probability of a flood event occurring is reduced through the use of flood defences. Flood defences do not completely eliminate the risk of flooding, any proposals for new development behind existing defences need to demonstrate that the consequences of flooding should the defences overtop or breach are manageable. However a more sustainable approach that is being

adopted through the Catchment Flood Management Plans is that of making better use of floodplains. This includes the current approach of avoiding the development of floodplains and actually using the floodplains for increased water storage. The advantage of using floodplains for water storage is that it reduces the risk of flooding in the catchment.

6.7.6 Surface Water Flooding – A surface water flood event takes place when rainfall falls so hard that the local circumstances and topography are unable to absorb the water. This results in a high volume of surface runoff that can overwhelm sewerage / drainage systems and surface watercourses preventing drainage. The map below does not take into account existing drainage systems but provides a general idea of those areas that are susceptible to surface water flooding.



Map Giving a General Indication of the Areas Susceptible to Surface water Flooding.

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6.7.7 Surface Water Flooding is predominantly from rainfall but can also occur from snow melt, particularly when the ground is frozen. Problems can be exacerbated by the development of greenfied sites; replacing agricultural land with impermeable surfaces that increase the rate and volume of surface runoff. Towns within Powys

that are susceptible to this type of flooding include Welshpool, Talgarth (BBNP) and Newtown.

6.7.8 Most new planning applications are encouraged to incorporate Sustainable Drainages Systems (SuDS) within the design to compensate for the loss of permeable surfaces and increased surface run off caused by the development. However, Schedule 3 of the Flood and Water Management Act, which is yet to be fully commenced, will make it a formal requirement for all developments to incorporate SuDS which will need to be approved by a SuDS Approving Body (SAB) that has been set up within lead local flood authorities (LLFAs) such as Powys County Council..

6.7.9 Groundwater Flooding – this type of flooding can occur when water levels in the ground rise above surface levels. Groundwater flooding is not a significant issue in Powys.

6.7.10 Sewage Flooding - this occurs when sewers are overwhelmed by heavy rainfall or when they become blocked. The probability of this type of flooding depends on the capacity of the local sewerage system. When an event does take place land and property can be flooded with water that is contaminated with raw sewage, rivers can also become polluted by sewer overflows (see paragraph 6.2.3 on water pollution). This form of flooding has taken place in the town of Machynlleth, whereas water pollution from sewer overflows has taken place at Llandinam, New Radnor, Llanfaes, Howey and Llanyre.

6.7.11 Ordinary Watercourse Flooding – Ordinary watercourses can be described as any river, stream, or ditch which has not been defined as a main river. The responsibility for flooding from these watercourses lies with the local authority. Flooding of this nature occurs when a watercourse cannot cope with the water draining into it from the surrounding land. An example of when this can happen is when heavy rain falls into an already waterlogged catchment.

In Powys ordinary watercourse flooding commonly arise when blockages occur in the system. Blocked culverts have caused significant flooding issues in the towns of Welshpool and Newtown.

6.7.12 Reservoirs - In Powys there are a number of reservoirs that hold large volumes of water above ground level, contained by walls, or 'dams'. Although the safety record for reservoirs is excellent, there is always a slight possibility that a dam could fail. This would result in a large volume of water being released very quickly.

Large scale reservoirs in Powys include the one at Lake Vrynwy which supplies water to Liverpool and the Elan Valley which supplies water to Birmingham. Further reservoirs on a smaller scale are located throughout the county.

6.7.13 Coastal Flooding – this form of flooding can occur from a combination of high tides and stormy conditions. Powys is a predominantly landlocked county with only the upper Dyfi estuary and Machynlleth that have the potential to be at risk from this type of flooding. The current level of risk is very low but this could change if sea levels rise as predicted with climate change and any changes are made to the flood defenses in the area.

6.7.14 Climate Change and Future Flood Risk

Flood risk in the future will be influenced by how the land has been developed / managed together with agricultural practices and climate change. Climate change is expected to be the biggest driver for change whilst changes to rural land use such as a decrease in forest cover may also have some effect.

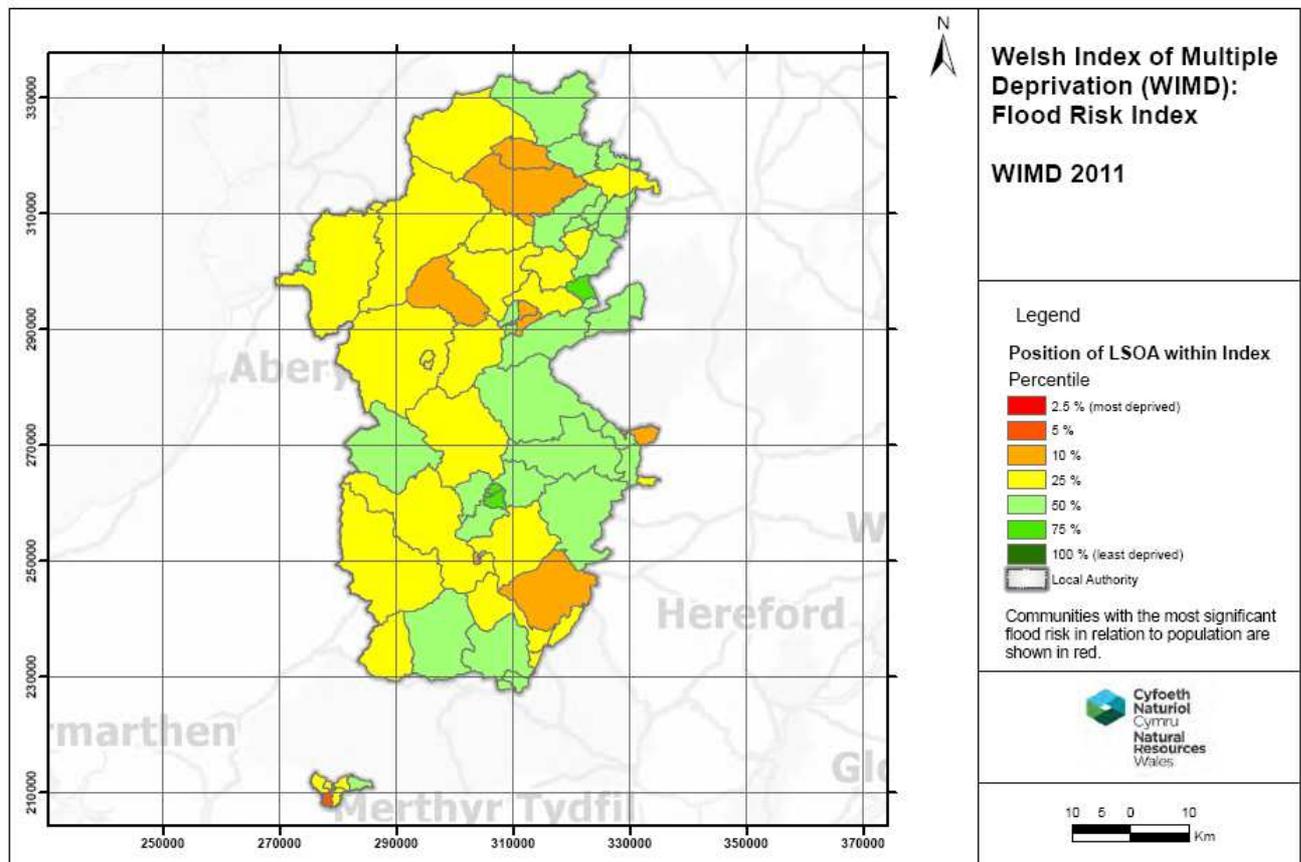
Modeling carried out in support of the catchment flood management plans has been based on there being a 20% increase in peak river flows in all watercourses and a total sea level rise of one to two metres by 2100. Climate change will result in some areas already at risk from flooding becoming flooded more frequently, whilst an increased number of properties will find themselves in an area of flood risk.

6.8 Strategic Flood Consequence Assessment (SFCA)

6.8.1 Further detailed information on flooding in Powys can be found in the Strategic Flood Consequence Assessment.

6.9 Flood Risk in Powys

Map Showing Welsh Index of Multiple Deprivation: Flood Risk Index 2011



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6.9.1 Those who suffer flooding have a significant lowering of quality of life that can last for a number of years. Homes in areas that suffer increased flood risk will often have significantly higher insurance premiums, potentially leading to higher financial hardship in these areas. It is likely that economically and socially deprived areas will take longer to recover from flood events.

6.9.2 Flood risk calculations and maps have been created based on the 2009 NAFRA database which includes flood risk, taking into account flood defences where these are known. Different levels of risk have been taken into account, as is done with insurance companies, with 3 levels of risk; significant, moderate and low risk. The risk is based on frequency rather than level of damage caused by any flooding.

6.9.3 Consideration has been given to how the LDP can contribute to reducing or better managing existing flood risk. Provisions for critical infrastructure (such as medical facilities, fire / police stations, sewerage / waste water treatment works and substations), and buildings (such as schools, leisure centres / community halls) that may be used as refuge buildings in an emergency must be directed to areas which have no or little risk of flooding. Care also needs to be taken that further new developments do not increase the risk of flooding elsewhere particularly in areas with critical infrastructure.

6.9.4 Some land uses can create certain problems related to flood risk, such as caravans, camp sites and holiday chalets. These sites are classified, under TAN15, as highly vulnerable. The instability of these types of development places their occupants at special risk. One concern is that historically, there seems to be a progression from touring caravans, to static caravans (all year inhabitants) to mobile homes and in some cases permanent homes. Also, once sites become established, it becomes more difficult to resist applications for ancillary buildings (toilet/shower blocks, shops, a clubhouse and café facilities).

6.9.5 Another land use that can be problematic are proposals for open space / recreation. These types of development are referred to in paragraph 11.21 of TAN15, which concludes that they are likely to be acceptable in all areas at risk of flooding. In some instances, such development can present opportunities to improve flood risk by providing additional flood storage capacity. However, in others, the proposals involve large scale earthworks / ground re-profiling with adverse impacts upon flood flow routes and flood storage. Such proposals, therefore, need careful consideration

7. Data / Information Gaps

7.1 Sustainable Drainage Systems (SuDs)

7.1.1 The Flood and Water Management Act (2010) introduced a requirement for SuDs to be incorporated into all construction works. The Act requires local authorities to set up an approving body to which applications for SuDs will need to be submitted. This permitting process will be separate but work alongside the planning system.

7.1.2 This requirement has yet to be introduced and no details have been published of exactly what developments are going to be included, or what is going to be required of developers. SuDs are an important mechanism for controlling surface water runoff so need to be incorporated within new developments. The mechanism in which this will take place will to some extent be through the SuDs approving body. Until further details have been published the LDP must provide policies requiring the inclusion of SuDs within new development. This will not only assist in reducing surface water flooding it will also help prevent new developments having a detrimental effect on water quality in line with the requirements of the Water Framework Directive.

7.2 Contaminated Land

7.2.1 Paragraph 6.1.6 highlights the importance of the planning system in remediating contaminated land. When land has been remediated in this way then the developer should submit a validation report to the council confirming that the land is no longer considered to be contaminated. This does not always take place meaning that some sites are considered to be contaminated when they may not be.

7.2.2 Although the council has a database of over 10,000 sites that may be subject to contamination there may be others that have not yet been identified such as unofficial landfill sites. Proposals for new development will need to respect this. In addition to this unstable ground needs to be taken into consideration along with the risks it presents. However, the responsibility for determining the full extent and effects of contaminated and unstable land lie with the developer.

7.2.3 For the 10,000 contaminated sites included on the database limited information is available. The level of risk associated with each site will vary; close working with the Contaminated Land Officer in Environmental Health is essential.

7.3 Flooding

7.3.1 The current system for assessing if a proposed development is at risk from flooding is by using the Development Advice Maps (DAMs) as instructed by Technical Advice Note (TAN) 15 and the Environment Agency's Flood Map. There are limitations to these sources but they are only meant to act as a trigger to the Local Planning Authority for further investigation.

8. Implications of Drivers for Change

8.1. This involves looking at how wider external factors have an influence in Powys. This has been important for informing the strategy and policies so that they can respond to, manage and where possible and appropriate tackle key changes.

8.2 Climate Change

8.2.1 Climate change is an important driver for change for this topic paper, it includes the measures to reduce greenhouse gases and what adaptations developments need to incorporate in response to changes in the climate. The Powys LDP is required to facilitate a contribution to the Welsh Assembly's targets of reducing greenhouse gases by 3% each year. However it is recognised that if not done sensitively addressing the impacts of Climate Change can cause a deterioration of air quality. This can take place when companies generate electricity primarily for their own consumption (including combined heat and power) or when there is a switch from petrol cars to diesel (for more information see *Air pollution: Action in a Changing Climate (DEFRA 2010)*).

8.2.2 The latest scenarios from the UK Climate Impacts Team suggest that Climate Change may increase the frequency and levels of flooding. For the Powys LDP this has meant taking a close look at all sources of flooding including coastal, which may be worsened through a rise in sea levels and surface water; and making sure new development avoids these areas or is adapted to the risk without exacerbating the problem elsewhere.

8.3 EU Water Framework Directive 2000/60/EC

8.3.1 The Water Framework Directive requires all the water bodies (e.g. rivers, streams, lakes and canals) in Powys to have achieved a good status by 2015. The Powys LDP must assist in contributing to reaching and maintaining this target by looking at the issues impacting on the water environment in Powys and seeing if the planning system can do anything to resolve them. This includes looking at the issues highlighted in this topic paper on the impact of intensive farming and the sewage disposal. In addition to this the Directive requires member states to promote the sustainable use of water and to contribute towards mitigating the effects of floods and droughts.

8.4 Previously Developed Land

8.4.1 National policy highlights that development should be directed to brownfield sites where possible, protecting those sites considered as greenfield and recognising that the best way of removing risk from the contaminated state of land is through development. The viability of redeveloping such sites has been taken into consideration (see the Viability Assessment) along with the impact remediation works may have on the natural and historic environment.

9. Issues

Below are the issues that have emerged throughout the topic paper.

9.1 Flooding

9.1.1 Planning Policy Wales (Ed 7, 2014) highlights that a strategic approach needs to be taken to flood risk with the catchment as a whole being considered. TAN 15 requires that new development is directed away from areas at high risk from flooding, however where development is considered in a high risk area it needs to be justified. The local priorities identified in the Wales Spatial Plan (2008) and the Environment Strategy (2006) highlight the importance of adapting and responding to climate change. This includes anticipating that the frequency and areas at risk of flooding will increase and that any development within an area at risk adapts against the risk without causing increased flooding elsewhere. The Catchment Flood Management Plans (that cover Powys) in line with Planning Policy Wales seek for the development of floodplains to be avoided; in addition to this the role of floodplains for water storage should be explored. *See key issues 11 and 16.*

9.2 Contaminated and Unstable Land

9.2.1 The Wales Spatial Plan (together with Planning Policy Wales para 4.8.1) state that development should be directed to brownfield sites where possible protecting those sites considered as greenfield. In support of this, it is recognised that the best way of removing risks from the contaminated state of land is through development. The Environment Strategy for Wales (2006) has as one of its outcomes that actions should be undertaken to remediate contaminated land for beneficial uses where possible.

9.2.2 Planning Policy Wales requires the Powys LDP to take contaminated land into consideration during its preparation. This helps to ensure any risks associated with previous landuses are understood, development doesn't take place without appropriate remediation and to make sure any remediation works are undertaken with an understanding of how they may affect the natural and historic environment. Further to this unstable land also needs to be taken into consideration. During the preparation of the LDP the nature, scale, and extent of ground instability which may pose direct risks to life and health, buildings and structures, or present indirect hazards associated with ground movement needs on allocated sites has been taken into account.

See key issues 17 and 18.

9.3 Greenhouse Gas Emissions

9.3.1 The Welsh Government has set targets of reducing greenhouse gas emissions by 3% each year from 2011, in areas of devolved competence. This is against a baseline of average emissions between 2006 and 2010. In addition to this a target has been set of achieving at least a 40% reduction in all greenhouse gas emissions in Wales by 2020 against a 1990 baseline. The LDP has developed a sustainable approach to development through its settlement hierarchy and detailed policies. *See key issues 4, 5, 28, 32, 43 and 44.*

9.4 Water Quality

9.4.1 The EU Water Framework Directive (2000/60/CE) (WFD) establishes a strategic and integrated river basin management approach to the land and water environment. The Directive is being implemented using management plans that operate at a river basin scale and Powys falls within the Severn and Western Wales River Basin Management Plans. Regulation 17 of the Directive, places a duty on all public bodies to have regard to the River Basin Management Plans (and supplementary plans) in exercising their functions – this has included the preparation of the Powys LDP. Planning Policy Wales requires the Powys LDP to enable consideration of the effects that new developments and their transport demands may have on the water environment.

9.4.2 The main sources of pollution that enter into watercourses in Powys are generated through agriculture and nutrient runoff. This issue is set to increase due to the agricultural practices and trends that the county are experiencing in terms large scale intensive farming. However the role that the planning system can have in preventing this type of pollutant is limited as many farming practices fall outside of the planning system.

9.4.3 Instances of sewage flooding have occurred in the county primarily due to the capacity of the sewerage system being exceeded. The utility companies have been consulted and involved in the process of identifying site allocations to try and avoid new development from exacerbating the problem.
See key issues 11, 12, 18, 41 and 42.

9.5 Air Quality

9.5.1 The Environmental Strategy (2006) has an objective for a reduction in air pollution leading to an increase in life expectancy and ecological protection. Planning Policy Wales requires the Powys LDP to enable consideration of the effects that new developments and their transport demands may have on air quality. An Air Quality Management Area has been designated in Newtown due to an exceedance of nitrogen oxide level concentrations beyond the levels at which no significant health effects would be expected.

9.5.2 A large number of the Special Areas of Conservation (SACs) in Powys contain habitats where the background levels of nitrogen deposition exceed what is considered to be safe for that particular habitat. The majority of these emissions (30-50%) result from intensive livestock farming.
See key issues 11, 12 and 18.

9.6 Noise and Light Pollution

9.6.1 The Environmental Strategy (2006) has as one of its objectives for environmental nuisances such as noise and light pollution to be minimised. In addition to this Planning Policy Wales (para 13.14) requires the Powys LDP to take noise and light pollution into account particularly through the separation of conflicting land uses. This is supplemented by further guidance on noise pollution in TAN 11. TAN 11 states that for where it is difficult to separate noise sensitive development

from noisy activities then the development plan should contain an indication of any general policies which the planning authority proposes to apply in respect of planning conditions and obligations.

9.6.2 The county of Powys enjoys some of the darkest night skies in Wales; this has been identified in the Wales Tranquil Areas Map (2009). The Powys LDP recognises these qualities and has policies in place to offer some level of protection. See *key issues 11, 12, 13, and 18*.

10. Key Issues in the plan that relate to the issues identified in the Pollution and Flooding topic paper.

10.1 Economic Considerations

Key Issue: 4. Rising energy costs and peak oil are impacting on all economic sectors given the rural geography of the county. Adapting to these changes and the transition to a low carbon / green economy to ensure a more sustainable and resilient economy needs to be supported by the LDP.

Key Issue: 5. Sustainable travel to work opportunities should be promoted through the LDP co-locating employment, housing and public transport and supporting home-working.

10.2 Environmental Considerations

Key Issue: 11. As a rural county, Powys' natural resources and ecosystems are important for carbon storage (soil and vegetation), renewable energy generation, food, materials, water, flood alleviation, recreation and amenity. The LDP must manage development carefully to protect these resources and reconcile competing demands.

Key Issue: 12. Powys' important internationally, nationally and locally designated sites of biodiversity and geodiversity interest as well as sites of importance in the wider environment should be protected and enhanced. Wildlife corridors such as hedgerows and streams are important for many species and should also be protected.

Key Issue: 13. The landscape of Powys is extremely diverse and includes upland landscapes and valleys that are scenically and historically important. Development which impacts on the landscape must be carefully managed and appropriately designed particularly in terms of visual impact.

Key Issue: 16. Most settlements in Powys are located in valleys close to rivers which are susceptible to flooding. New development must be directed away from areas at high risk from flooding and must not increase flood risk elsewhere, and where possible should aid the reduction or better management of existing flood risk for communities, infrastructure and businesses. Powys is also important as an upstream catchment for several major rivers including the Wye and Severn, providing for water storage and alleviating flooding downstream.

Key Issue: 17. Where possible, development should be directed to appropriately located brownfield sites (previously developed land) and should re-use vacant buildings in order to protect greenfield land, assist in the remediation of contaminated land and facilitate regeneration opportunities.

Key Issue: 18. The LDP must protect air, water and land resources and quality, prevent pollution and inappropriate development and deal with the consequences of climate change. For instance, it should support: the protection of quality of the water environment in line with the Water Framework Directive; the reduction of greenhouse gas emissions in line with Welsh Government targets (3% each year from 2011); and ensure that Special Areas of Conservation (SACs) in Powys do not suffer from increased levels of nitrogen deposition as a result of development in Powys.

10.3 Population and Housing Considerations

Key Issue: 28. Increasing energy bills combined with extreme weather events are causing fuel poverty amongst households living in energy inefficient properties. Sympathetic retro-fitting of existing properties and designing new developments to be energy efficient should be facilitated by the LDP.

10.4 Infrastructure and Resource Considerations

Key Issue: 32. One of the challenges for the LDP, given the rural nature of Powys and its dispersed population, will be to direct development to accessible locations which ideally provide a choice of transport modes such as walking, cycling and public transport.

Key Issue: 41. Utility infrastructure, such as public sewers, sewage treatment works and mains gas supply, are not available or are operating at capacity in some parts of the county which can act as a constraint to development.

Key Issue: 42. The LDP should encourage the conservation of water and reduction in the demand for water and seek to minimise the effects of water abstraction on the natural environment and important ecological habitats.

Key Issue: 43. The energy requirements of development should be minimised and renewable energy opportunities grasped wherever feasible.

Key Issue: 44. Utilisation of Powys's renewable energy resource and associated infrastructure should be supported where cumulative, environmental, socio-economic effects are acceptable.

11. Objectives

The following objectives relating to this topic have been proposed for the LDP. They have been written to address the key issues listed in this topic paper above and those listed in some of the other topic papers.

LDP Objective 2 – Sustainable Settlements and Communities

To support sustainable development, access to services and the integration of land uses, by directing housing, employment and services development in accordance with a sustainable settlement hierarchy. Higher levels of development will be directed to Powys' towns and larger villages but where these are unable to sustain further growth due to capacity constraints, development will be accommodated in nearby towns or large villages. *(Addresses key issues 5, 32 and 41).*

LDP Objective 3 – Efficient Use of Land

To support the re-use and remediation of suitably and sustainably located previously developed land and where this is not possible to make efficient use of green field sites. To apply a general presumption against unsustainable development in the open countryside and development on soils of high value and important mineral resources which are recognised as finite resources. *(Addresses key issues 11, 17 and 18).*

LDP Objective 4 – Climate Change and Flooding

To support the transition to a low carbon and low waste Powys through all development, including the reduction of waste to landfill and by directing development away from high flood risk and, where possible, to reduce or better manage existing flood risk for communities, infrastructure and businesses. *(Addresses key issues 4, 16 and 28).*

LDP Objective 5 – Energy and Water

To support the conservation of energy and water and to generate energy from appropriately located renewable resources to enable households, businesses and communities to meet their needs where acceptable in terms of the economic, social, environmental and cumulative impacts.

In particular, to:

- i. Contribute to the achievement of the Water Framework Directive targets in Powys.
- ii. Provide an additional 50,000kW installed capacity of renewable electricity generating technology and 100,000kW installed capacity of renewable heat generating technology over the plan period.

(Addresses key issues 4, 5, 11, 18, 28, 42, 43 and 44).

LDP Objective 11 – Natural Heritage

To conserve and protect Powys' land, air and water resources important for environmental quality, geodiversity and biodiversity and where possible to ensure development enhances them and produces a net gain for biodiversity. *(Addresses key issues 11, 12, 13, 18 and 42).*

LDP Objective 12 - Resources

To facilitate the sustainable management of Powys' natural and environmental resources whilst enabling development to take place including the contribution of 2.51 million tonnes of crushed rock aggregates to the South Wales supply per year. *(Addresses key issues 11, 12, 13 and 18).*

12. Policies

The Policies below are what have been included in the draft deposit plan that support and aim to achieve the objectives above. Most of these policies cover a wide range of issues and objectives not just those in this topic paper, additionally some of the policies have not been repeated in their entirety please see the Deposit Plan for the full policy. Furthermore the deposit LDP contains supporting text which in most cases is covered in this and other topic papers (where relevant) so has not been repeated here.

Policy DM1 - Strategic Planning Matters

All proposals for development must not compromise, or unacceptably adversely affect, either on their own or in combination with existing or approved development, the following:

- 1. The integrity, role or objectives of a settlement as defined by the LDP's Sustainable Settlement Hierarchy or lead to unacceptable detrimental pressure on existing community facilities, public service provision or infrastructure.**

- 9. The natural environment, integrity or conservation objectives of:**
 - i. European Protected Sites / Habitats (Natura 2000 sites).**
 - ii. Local Biodiversity Action Plan Habitats.**
 - iii. Wildlife Trust Reserves.**
 - iv. Local Wildlife Sites.**
 - v. Sites Importance for Nature Conservation.**
 - vi. Local Nature Reserves.**
 - vii. Sites of Special Scientific Interest.**
 - viii. Regionally Important Geological Sites.**
 - ix. Important carbon stores**
 - x. Best and most versatile Agricultural land (Grades 1, 2 and 3a).**

- 10. ~~The achievement of Water Quality Standards in line with the Water Framework Directive.~~ Amend to read (in response to Deposit 1 representation 5196.D14) **The achievement of the Water Framework Directives overarching objectives.****

- 12. Flood plains and and flood protection. In accordance with National Guidance, proposals must be located away from high flood risk areas, must not increase flood risk elsewhere, and shall where possible allow floodplains to provide water storage to reduce flooding in the catchment.**

(Objectives 2, 4, 11 and 12)

Policy DM2 – Detailed and Site Specific Planning Matters

In addition to the requirements set out in National Guidance, all proposals for development will be permitted where they comply with the following:

- 1. Proposals must make the most efficient use of land.**
- 2. Proposals on contaminated or unstable land shall not:**
 - i) Result in any additional problems of ground instability or contamination either on or off site and shall remediate the contamination / instability.**
 - ii) Unacceptably adversely affect public health and safety, nature conservation, historic or archaeological interests**
- 5. Proposals near a watercourse or within an area of floodplain must comply with the following:**
 - i) In areas identified at risk of flooding (fluvial, surface water) or where a watercourse has insufficient channel capacity, opportunities to improve existing flood risk by using Sustainable Drainage Schemes (SuDS), wetlands or other agreed and appropriate measures are investigated and implemented wherever possible.**
 - ii) Where possible, opportunities are taken on previously developed land to make space for water by reinstating the functional floodplain.**
 - iii) Opportunities to make space for water by undertaking restoration and enhancement as part of the development, are identified and implemented.**
 - iv) Actions are taken to de-culvert wherever possible. Where this is not possible, an assessment of the structural integrity of the culvert, with any required remedial work, should be carried out prior to the development. A maintenance schedule should be developed for all culverts to ensure regular clearance.**
 - v) Any developments located adjacent to a watercourse should leave an appropriate undeveloped buffer strip, maintaining the watercourse and the immediate riparian zone as an enhancement feature and allowing for routine maintenance. The width of any buffer strip should be agreed with the relevant authorities on a site by site basis. Such sites should have a maintenance strategy for clearing and maintaining the channel, with particular regard to structures such as trash screens and bridges.**

6. Satisfactory provision shall be made for land drainage and Sustainable Drainage Schemes (SuDS). In addition to the requirements set out in national guidance, proposals must comply with the following:

i) The post development runoff volumes and peak flow rates are maintained at either the greenfield rate for greenfield sites or deliver a 50% reduction to surface water runoff rates for brownfield sites (up to and including the 1 in 100 year event inclusive of an appropriate allowance for climate change for both development scenarios).

ii) SuDS are included for all new development; space should be specifically set aside for SuDS and used to inform the overall site layout.

iii) Hardstanding areas are kept to a minimum and infiltration techniques and the re-use of water are considered before attenuation devices.

iv) SuDS have a maintenance strategy to ensure they are maintained and working efficiently.

If SuDS cannot be implemented, a full written justification should be submitted explaining why this is the case.

7. Adequate utility services shall exist or be capable of being readily and economically provided without unacceptable adverse effect on the surrounding environment.

10. The amenities enjoyed by the occupants or users of nearby or proposed properties shall not be unacceptably affected by levels of noise, dust, air pollution, litter, odour, hours of operation, overlooking or any other planning matter. *The proximity of development needs to be decided on a case by case basis, for most forms of development, taking these factors into consideration.*

11. Proposals involving external lighting must provide a lighting scheme and demonstrate that the lighting will not individually or cumulatively cause:

i. Unacceptable levels of light pollution especially in the countryside.

ii. An adverse effect on the visibility of the night sky.

iii. A nuisance or hazard to highway users including pedestrians, and local residents.

Biodiversity is covered in the overarching policy DM1, it is not the intention to repeat this further.

14. All development must demonstrate a sustainable and an efficient use of resources by including measures to achieve:

I. Energy conservation and efficiency.

- II. The supply of electricity and heat from renewable sources.
 - III. Water conservation and efficiency.
 - IV. Waste reduction.
- (Objectives 3, 4, 5 and 12)

13. Additional Planning Policy in Planning Policy Wales

Within Planning Policy Wales, Edition 7 (July 2014) the following paragraphs contain statements of national development control policy which should not need to be repeated as local policy in the LDP:

Paragraph	Policy Issue
13.2.1	Flood Risk
13.2.4	Development proposals should seek to reduce flood risk
13.3.1	Hard engineered flood defences; sustainable approaches to flood risk management
13.3.2	Unobstructed floodplains
13.4.1	Justification of new development in areas of high flood hazard
13.4.2	Surface water run-off
13.4.4	Environment Agency flood warning service
13.5.1	Guiding development to minimise risks from land instability and contamination
13.7.1-2, 13.9.1-2	Investigating and overcoming land contamination and instability
13.12.1	Impact of development on Air Quality Management Areas; minimising pollution of air and water
13.12.2	Satisfaction that any remaining pollution concerns are capable of being dealt with under other pollution regimes
13.12.3	Designing development to prevent adverse effect to the environment
13.13.1	Minimising emissions and levels of ambient noise
13.13.2	Balance provision of lighting with protection of amenity and environment
13.15.2	Noise generating development, statutorily designated areas and protected species.

14. Monitoring

Below are the Annual Monitoring Indicators that link to this topic.

Topic & Reference	Previously Developed Land – AMR 4
LDP Objective	3 - Efficient Use of Land
Target	To achieve at least 40% of development on previously developed sites.
Policies	PPW
Core Indicator	Amount of new development (ha) permitted on previously developed land (brownfield redevelopment and conversions) expressed as a percentage of all development permitted.
Source	Northgate.
Triggers and Actions	Less than 40% of development to take place on previously developed land will trigger a review of the policy and, dependent upon the review, actions may include policy review and modification.

Topic & Reference	Environmental Quality – Water – AMR 5
LDP Objective	5 – Energy & Water To contribute to meeting the Water Framework Directive targets.
Target	By 2027 for all surface waters meet good status / potential or better and for all groundwater bodies to meet good status. *Plan contributes to meeting this target. Other non-planning factors influence whether it will be met. This is also monitored as an environmental indicator through the Strategic Environmental Assessment.
Policies	DM1 Criterion 10. DM2 Criteriuon 5, 6, 7 & 14 III).
Local Indicators	By River Basin Management Plan Area: % of surface waters meet good status /potential or better; and % of groundwater bodies are at good status.
Source	Western Wales River Basin Management Plan 2009 & 2012 stats: http://naturalresourceswales.gov.uk/content/docs/pdfs/consultation-pdfs/western-wales-river-basin-facts-and-statistics?lang=en e-mail - westernwalesrbd@naturalresourceswales.gov.uk Severn River Basin Management Plan 2009 stats:

	https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291442/gemi0910bssk-e-e.pdf e-mail - severnrbd@environment-agency.gov.uk
Triggers and Actions	Deterioration (0 – 10%) – Investigation / internal audit and recommendations. Significant deterioration (>10%) – Consider policy review and modification.

Topic & Reference	Greenfield Sites / Loss of Open Space – AMR 7
LDP Objective	14 - Healthy Lifestyles
Target	For the amount of development, that is not taking place on allocated sites, to result in a minimal loss of greenfield land and open space.
Policies	DM1, H14
Core Indicator	Amount of greenfield and open space lost to development (ha) which is not allocated in the development plan.
Source	Planning Applications and Sustainable Development Indicators.
Triggers and Actions	More than 10% of development , not on an allocated site, takes place on greenfield land or results in a loss of open space – Investigation / internal audit and recommendations. More than 20% of development, not on an allocated site, takes place on greenfield land or results in a loss of open space – Consider policy review and modification.

Topic & Reference	Flood Risk – AMR 8
LDP Objective	4 - Climate Change and Flooding
Target	No loss of flood plain
Policies	DM1, DM2
Core Indicator	Amount of development (by TAN 15 paragraph 5.1 development category) permitted in C1 and C2 floodplain areas not meeting all TAN 15 tests (paragraph 6.2 i-v).
Source	Nothgate, Planning application files
Triggers and Actions	Between 5 and 10 % planning applications in the flood plain in any given year are approved contrary to NRW advice – Investigation / internal audit and recommendations. More than 10% planning applications in the flood plain in any given year are approved contrary to NRW

	<p>advice – Consider policy review and modification.</p> <p>Number of applications permitted with FCA's not meeting tests i-iii in TAN 15 6.2. Consider policy review and modification. <i>Added following rep 5196.D66.</i></p>
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Topic & Reference	SUDS – AMR 9
LDP Objective	4 - Climate Change and Flooding
Target	For all developments to incorporate SUDS
Policies	DM2
Local Indicator	All developments to include SuDS where appropriate (Excluding developments that have provided a full justification why SUDs cannot be incorporated).
Source	Nothgate, Planning application files
Triggers and Actions	<p>If less than 95% of developments have incorporated SUDS where appropriate – Investigation / internal audit and recommendations.</p> <p>If less than 90% of developments have incorporated SUDS where appropriate – Consider policy review and modification.</p>

15. Differences between UDP and LDP Policies

Table of review of existing UDP policies

UDP Policies	Comments	LDP Approach
DC13. Surface Water Drainage	A general policy covering all development proposals that have drainage implications. Deals with when mitigation is required to enable a development to proceed and when these will not be acceptable due to undesirable consequences.	Included within Policy DM 2 (6). Incorporates the recommendations from the SFCA and reflects the new requirements coming into place from the Flood and Water Management Act (2010).
DC14. Flood Prevention Measures	Policy regarding the installation of flood prevention measures.	The aim of this plan is to dissuade development from building in areas at risk from flooding. However any schemes that come in for flood prevention should be determined under the rest of policies DM1 and DM2, together with TAN 15 and PPW Chapter 13.
DC15. Development on Unstable or Contaminated Land	General policy on the conditions required for developing on contaminated / unstable sites.	Very similar policy included DM2 (2).
SP14. Development in Flood Risk Areas	Repeats a lot of the policy in TAN15.	Included within policy DM1, with extra details in DM2 (8) these details incorporate the recommendations from the SFCA and the actions from River Basin Management Plans and Catchment Flood Management Plans.
DC3. External Lighting	General policy protecting effect of lighting on highway users, buildings and wildlife, together with minimising light pollution.	The aim of the revised policy DM2 (11) is to protect the dark sky bearing in mind the BBNP dark sky status, whilst also reducing the impact of light pollution on highway users. Representations have been made to include biodiversity within this policy however this issue would be covered under Policy DM1 (9) it is not the intention of the plan to repeat itself.

16. Table of Involvement

Person /Org Contacted.	Method	Reason	Outcome	Date
PCC Contaminated Land Officer	Meeting	Discussed contaminated land database, process for candidate sites and contaminated land issues in Powys.	To have access to contaminated land database to inform candidate sites and preferred strategy. David Jones to provide a summary of contaminated land types and issues in Powys.	31/03/2011
PCC Land Drainage Engineer	Meeting	To talk about topic paper and how preliminary flood risk assessment can inform Strategic Flood Consequence Assessment	Identified that the expertise lies in house to conduct the SFCA. Need to meet with emergency planning to discuss PRFA data.	05/04/2011
PCC Environmental Health	Meeting	To discuss Air Pollution	Highlighted the issue of the New Road Newtown Air Quality Management Area.	05/04/2011
PCC Environmental Health & Environment Agency	Meeting	To discuss water pollution	Discussed general issues concerning water pollution in Powys.	07/04/2011
Environment Agency	Meeting	To discuss Strategic Flood Consequence Assessment (SFCA)	Identified the work would be better done in house. What needs to be done and what data and support the EA can give.	07/04/2011
PCC Environmental Health	Meeting	To discuss noise and light pollution	Discussed general issues concerning noise and light pollution in Powys.	12/04/2011
Emergency Planning	Meeting	To discuss Preliminary Flood Risk Assessment (PFRA) data and reservoir flooding.	Given an overview of the data collated to inform the PFRA	19/05/2011
Countryside Council for Wales	Telephone Conversation	Air Pollution and environmental impact in Powys	Directed to APIS website with explanation on how to use it. Further information on designated sites to be supplied.	12/05/2011
Environment Agency, PCC Emergency Planning, PCC Land Drainage.	Meeting	To discuss Strategic Flood Consequence Assessment (SFCA)	Outline of broad methodology and how the study is to be conducted.	07/06/2011
Dark Skies in Powys	Meeting	To discuss Dark Skies	To discuss how the LDP can protect dark skies.	15/05/2012

Appendix 1

Table of the various pollutants for which objectives have been set in *The Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007)*.

Pollutant	Description	Sources	Potential effects on health / environment
Particulate Matter (PM-PM ₁₀ and PM _{2.5})	<p>Particulate Matter is generally categorised on the basis of the size of the particles (for example PM_{2.5} is particles with a diameter of less than 2.5µm).</p> <p>Concentrations of PM comprise primary particles emitted directly into the atmosphere from combustion sources and secondary particles formed by chemical reactions in the air. PM derives from both human made and natural sources (such as sea spray and Saharan dust).</p>	<p>In the UK the biggest human-made sources are stationary fuel combustion and transport. Road transport gives rise to primary particles from engine emissions, tyre and brake wear and other non-exhaust emissions. Other primary sources include quarrying, construction and non-road mobile sources. Secondary PM is formed from emissions of ammonia, sulphur dioxide and oxides of nitrogen as well as from emissions of organic compounds from both combustion sources and vegetation.</p>	<p>Short and long term exposure can worsen respiratory and cardiovascular illness and increase mortality. Various forms can cause acidification and eutrophication.</p>
Oxides of nitrogen (NO _x)	<p>All combustion processes in air produce oxides of nitrogen (NO_x). Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen and together are referred to as NO_x.</p>	<p>Road transport is the main source, followed by the electricity supply industry and other industrial and commercial sectors.</p>	<p>At high levels NO₂ causes inflammation of the airways. Long term exposure may affect lung function and respiratory symptoms. NO₂ also enhances the response to allergens in sensitive individuals. High levels of NO_x can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from NO_x emissions contribute to acidification and/or eutrophication of sensitive habitats leading to loss of biodiversity, often at locations far removed from the original emissions.</p>

			NO _x also contributes to the formation of secondary particles and ground level ozone, both of which are associated with ill-health effects.
Ozone (O ₃)	Ozone is not emitted directly from any human-made source. It arises from chemical reactions between various air pollutants, primarily NO _x and Volatile Organic Compounds, initiated by strong sunlight. Formation can take place over several hours or days and may have arisen from emissions many hundreds, or even thousands of kilometres away.		Exposure to high concentrations may cause irritation to eyes and nose. Very high levels can damage airways leading to inflammatory reactions. Ozone reduces lung function and increases incidence of respiratory symptoms, respiratory hospital admissions and mortality. Ground level ozone can also cause damage to many plant species leading to loss of yield and quality of crops, damage to forests and impacts on biodiversity.
Sulphur dioxide (SO ₂)		UK emissions are dominated by combustion of fuels containing sulphur, such as coal and heavy oils by power stations and refineries.	Causes constriction of the airways of the lung. This effect is particularly likely to occur in people suffering from asthma and chronic lung disease. Precursor to secondary PM and therefore contributes to the ill-health effects caused by PM10 and PM2.5. Potential damage to ecosystems at high levels, including degradation of chlorophyll, reduced photosynthesis, raised respiration rates and changes in protein metabolism. Deposition of pollution derived from SO ₂ emissions contribute to acidification of soils and waters and subsequent loss of biodiversity, often at locations far removed from the original emissions.

Polycyclic aromatic hydrocarbons (PAHs)	There are many different PAHs emanating from a variety of sources. The Air Quality Strategy uses benzo[a]pyrene (B[a]P) as a marker for the most hazardous PAHs.	The main sources of B[a]P in the UK are domestic coal and wood burning, fires (e.g. bonfires,) and industrial processes such as coke production. Road transport is the largest source for total PAHs, but this source is thought to be less hazardous than B[a]P.	Studies of occupational exposure to PAHs have shown an increased incidence of tumours of the lung, skin and possibly bladder and other sites. Lung cancer is most obviously linked to exposure to PAHs through inhaled air. Individual PAHs vary in their ability to induce tumours in animals or humans. The carcinogenic potency of some PAHs is unknown or uncertain. Individual PAHs have been classified by the International Agency for Research on Cancer, with three classified as “probably carcinogenic to humans”, including B[a]P, and three classified as “possibly carcinogenic to humans”.
Benzene		Has a variety of sources, but primarily arises from domestic and industrial combustion and road transport.	Benzene is a recognised human carcinogen which attacks the genetic material and, as such, no absolutely safe level can be specified in ambient air. Studies in workers exposed to high levels have shown an excessive risk of leukaemia.
1,3 - butadiene		Mainly from combustion of petrol. Motor vehicles and other machinery are the dominant sources, but it is also emitted from some processes, such as production of synthetic rubber for tyres.	1,3-butadiene is a recognised genotoxic human carcinogen, as such, no absolutely safe level can be specified in ambient air. The health effect of most concern is the induction of cancer of the lymphoid system and blood-forming tissues, lymphoma and leukaemia.
Carbon monoxide (CO)	Formed from incomplete combustion of carbon containing fuels.	The largest source is road transport, with residential and industrial combustion making significant contributions.	Substantially reduces capacity of the blood to carry oxygen to the body’s tissues and blocks important biochemical reactions in cells. People with existing diseases which affect delivery of

			oxygen to the heart or brain, such as angina, are at particular risk.
Lead (Pb)		Emitted from the combustion of coal and also the iron and steel combustion and nonferrous metals.	Exposure to high levels in air may result in toxic biochemical effects which have adverse effects on the kidneys, gastrointestinal tract, the joints and reproductive systems, and acute or chronic damage to the nervous system. Affects intellectual development in young children.
Ammonia	No direct objective has been set for this pollutant. However it is still considered to be an issue particularly for the environment.	Mainly derived from agriculture, primarily livestock manure / slurry management and fertilisers. Small proportion derived from variety of sources including transport and waste disposal.	Ammonia can lead to damage of terrestrial and aquatic ecosystems through deposition of eutrophying pollutants and through acidifying pollutants. Precursor to secondary PM and therefore contributes to the ill-health effects caused by PM ₁₀ and PM _{2.5} .

APPENDIX 2

Table of Commonly Encountered Contamination in Respect of Particular Sources in Powys

Contamination source	Typical issues and contaminants
Gas works	<p>Ground contamination is likely to be associated with the by-products and waste products eg. ammonical liquor, coal tar, spent oxide and fowl lime. Landfills and lagoons may have adversely affected watercourses, as a result of direct surface water run-off and migration of contamination in groundwater.</p> <p>High risk for identified site and land adjoining or adjacent depending on geology/hydrogeology.</p> <p>Significant issues for development.</p> <p>Constituents of Coal Tar - Aromatic Hydrocarbons (eg benzene, toluene and xylenes) Polycyclic Aromatic Hydrocarbons (PAHs) e.g. Napthalene and Anthracene Hydroxy Substituted Phenyls e.g Phenols, Cresol, Xyenols and related compounds, Sodium Phenoxide, Heterocyclic Nitrogen Compounds e.g. Pyridine, Organo-Sulphur Compounds e.g. Hydrazine (boiler maintenance), Triethanolamine 2-Mercaptobenzothiazole</p> <p>From Natural Gas Processing - Methyl Alcohol, Ethylene Glycol, Diethylene Glycol, Triethylene Glycol, Synthetic Resins, Alkanolamine, heavy absorption oil Fuels -Petroleum, Naptha, Acids - Sulphuric, Hydrochloric, Alkali's - Sodium Hydroxide Sodium Carbonate. Other Inorganic Compounds - Sulphates, Sulphides,Carbonates Phosphates, Cyanides (mostly complex cyanides such as ferricyanides and ferrocyanides), Ammonium Sulphate and Ammonium Cyanide (from ammonical liquor), Thiocyanates Oxides, Elemental Sulphur Arsenatic Salts, Calcium Hydrosulphide and Calcium Thiocarbonate (fowl lime)</p> <p>Metals and metal compounds (likely to be found around coal storage/breaking areas, Process areas) - Cadmium, Chromium, Cobalt, Copper, Iron, Lead, Nickel, Manganese, Magnesium, Mercury, Molybdenum, Uranium (only likely to be found on sites where uranium was used as a catalyst in oil gas production), Vanadium (only associated with reformer plants) as Sodium Metavandanate, Zinc</p>
Petrol filling stations and	<p>Car washes Car wash detergents essentially comprise of a surfactant (alkyl</p>

garages	<p>sulphonates) and chemicals to increase the effectiveness of surfactants (e.g. phosphate-silicate formulations, EDTA etc).</p> <p>Repair Garages</p> <p>Engine, transmission oil, Ethylene Glycol (anti-freeze), brake fluids (polymerised glycols), solvents (cleaners, degreasers, thinners, fillers, adhesives, paints, strippers), paints are usually stored and used on site in metal containers and storage tanks.</p> <p>Wastes:</p> <p>Spent oil containers, sludges, petrol storage tanks, used batteries, asbestos (from brake linings) spent oil or solvent containers.</p> <p>Contamination is associated with storage, spillage, leakage or disposal of raw materials or waste products and contaminated run-off.</p> <p>Petrol, diesel and MTBE and solvents are highly mobile and may migrate over great distances. Free product may vapourise and diffuse through the soil or accumulate in poorly ventilated spaces causing a health hazard.</p> <p>Potential Contaminants</p> <p>Filling Stations:-</p> <p>Organic compounds (petroleum spirits, diesel, paraffin), linear alkyl sulphonates, EDTA, NTA, oil and waste (containing PAHs, heavy metals) ethylene glycol, polymerised glycols and ethers, chlorinated solvents (e.g. TCE) non-chlorinated solvents (methanol, esters, white spirit etc, isocyanates, asbestos, acids (sulphuric) metals and metal compounds (chromium, copper, lead, zinc).</p> <p>Fuelling areas, servicing areas, vehicle washing areas, paint shops.</p>
Landfills	<p>Landfill Sites: Modern landfills take two forms, containment sites or attenuation and dispersal sites. Attenuation and dispersal sites are developed after consideration of the characteristics of the expected leachate and the underlying and surrounding strata. At containment sites, leachate is contained by the underlying strata or by the applied lining materials.</p> <p>Landfill sites may be contaminated by a wide range of materials. Landfill gas may be present throughout a landfill and may vent to the atmosphere or migrate into the ground around a landfill. Its main constituents are methane and carbon dioxide, present typically in a ratio of 60:40 in actively gassing landfills containing biodegradable waste. Trace components include hydrogen, hydrogen sulphide, organo-sulphur compounds, aliphatic hydrocarbons and halogenated hydrocarbons. Landfill gas is colourless and has a neutral buoyancy in air. The migration of landfill gas through waste is determined by several factors,</p>

	<p>including the gas pressure within the landfill, changes in atmospheric pressure, gas concentration gradients, the gas permeability of the surrounding strata and any displacement of gas by changes in water levels. Gas may migrate several hundreds of metres in areas with highly permeable strata.</p> <p>Landfill leachates are generated in all sites and may continue to be produced long after a site has been closed. Early landfill leachate is usually slightly acidic and may contain simple organic compounds, ammonia and some metals. It may have a high BOD. Leachates from older landfills also typically contain ammonia, but rarely metals in any significant quantities. The characteristics of leachate produced at a landfill site and its impact on surface and groundwater is dependent on the permeability of the wastes, the degree of infiltration of surface water, the depth of the water table, movement of groundwater through the site and the permeability of the surrounding geology.</p> <p>Landfills may contain drummed special wastes including asbestos.</p> <p>Capping materials may also be contaminated, especially on older landfills where caps are shallow and poorly engineered.</p>
Clay pits & tiles	<p>Typical contaminants include:</p> <p>Metals: cadmium, chromium, copper, lead, mercury, nickel, zinc</p> <p>Refractory bricks - may contain hexavalent chromium</p> <p>Other inorganic compounds - alum (hydrated aluminium potassium sulphate)</p> <p>aluminium sulphate, Group V compounds eg arsenic compounds</p> <p>calcium carbonate, potassium salts, sodium carbonate, sodium silicate</p> <p>sodium sulphate, Inorganic compounds, calcium oxide, calcium hydroxide</p> <p>calcium carbonate, calcium chloride, hydrated calcium sulphate (gypsum)</p> <p>manganese dioxide, titanium dioxide, Blast furnace slag, Pulverised fuel ash (PFA), constituents of PFA include: calcium chloride, calcium hydroxide, calcium oxide, silica, sulphates eg magnesium sulphate</p> <p>Air entraining agents - sulphonated hydrocarbons, Plasticisers - lignosulphonic or hydrated carboxylic acid</p> <p>Cement dusts, Flue gas dusts, Bitumen - long chain aliphatics, aldehydes, ketones, phenols</p> <p>polycyclic aromatic, Hydrocarbons (PAHs), amines, Asphalt - bitumen, kerosene</p> <p>Other organic compounds amine blends eg propylene diamine derivatives, ethylene diamine, ethanolamine</p> <p>creosote oil, kerosene, solvents eg petroleum extracts, isopropyl alcohol, tar eg phenol</p> <p>Acids - hydrochloric, ammonium compounds, Fuels - fuel oils, coal,</p>

	<p>industrial waste solvents</p> <p>Other oils - lubricating oils, Ash, Polychlorinated biphenyls (PCBs)</p> <p>Asbestos</p>
Unknown filled ground i.e. ponds	Various potential contaminants associated with fill activities i.e. domestic, commercial waste. Putrescible materials can cause landfill gas.
Made ground	Can be found on any ground that has been previously used. It is possible to encounter any contaminant listed above. A commonly occurring contaminant is Benzo a pyrene - a known carcinogen.
Agricultural land i.e. barn conversions	Various contaminants associated with agriculture could include hydrocarbons (fuels), solvents / disinfectants etc.

APPENDIX 3

Information on Nitrogen Deposition for Special Areas of Conservation (SACs) in Powys.

This information is taken from the Air Pollution Information System (APIS) website (<http://www.apis.ac.uk/index.html>). It looks at levels of nitrogen deposition in the Special Areas of Conservation (SACs) across Powys (excluding Brecon Beacons National Park). Particular attention is given to the critical loads of the qualifying habitats of each of the SACs. This provides a brief overview on how many of the internationally important sites, species and habitats are at risk from nitrogen deposition in Powys. Where the maximum critical loads have been exceeded then a detailed breakdown of the source of the pollutant is provided.

A Critical Load is defined as:

“The threshold level for the deposition of a pollutant above which harmful indirect effects can be shown on a habitat or species, according to current knowledge.”

The common biological effects caused by an exceedance of the Nitrogen Deposition critical load.

Pollutant	Exceedance Impacts
Nitrogen deposition	<p>Terrestrial Impacts</p> <ul style="list-style-type: none">• Changes in species composition especially in nutrient poor ecosystems with a shift towards species associated with higher nitrogen availability (e.g. dominance of tall grasses)• Reduction in species richness• Increases in plant production• Decrease or loss of sensitive lichens and bryophytes.• Increases in nitrate leaching <p>Freshwater Impacts</p> <ul style="list-style-type: none">• There is a potential in N-limited systems for N deposition to change algal productivity and nutrient regimes in upland lakes.• Increase rate of succession.

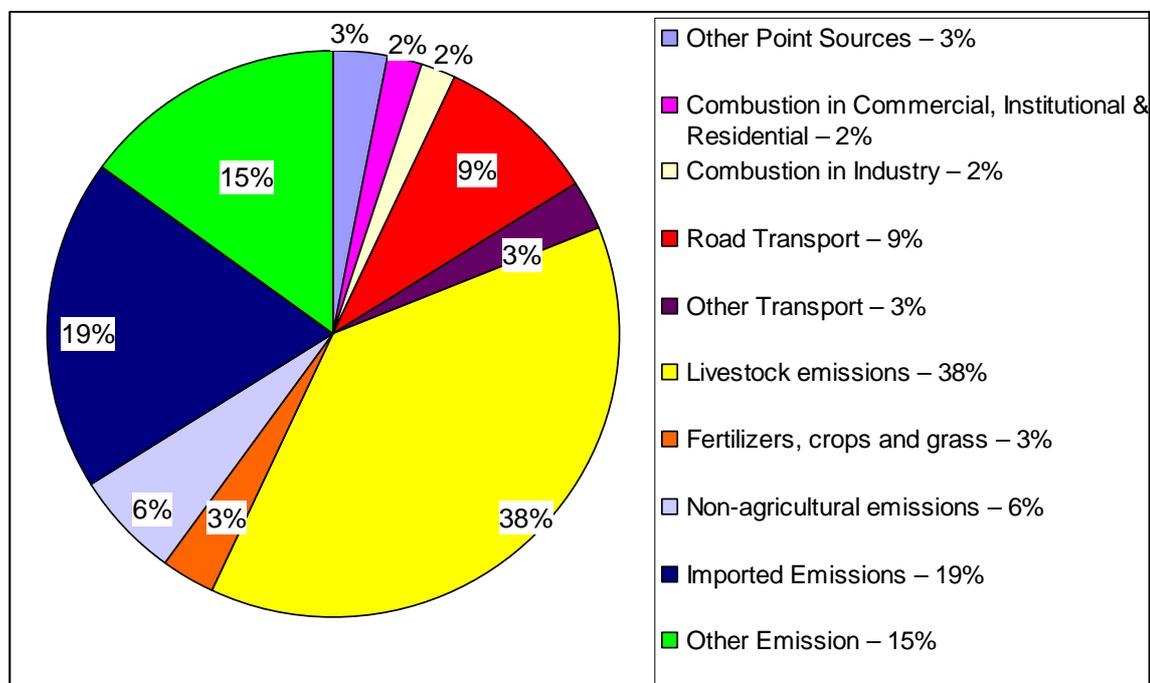
http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm

The background levels of nitrogen deposition at a site are calculated in a different way between woodlands and other habitats. This means that some SACs listed below may have two background levels of nitrogen deposition. For more information please see the APIS website.

SAC - Berwyn and South Clwyd Mountains

2010 Background Levels of Nitrogen Deposition - **18.3 kg/ha/yr**

Sources of Nitrogen emissions:

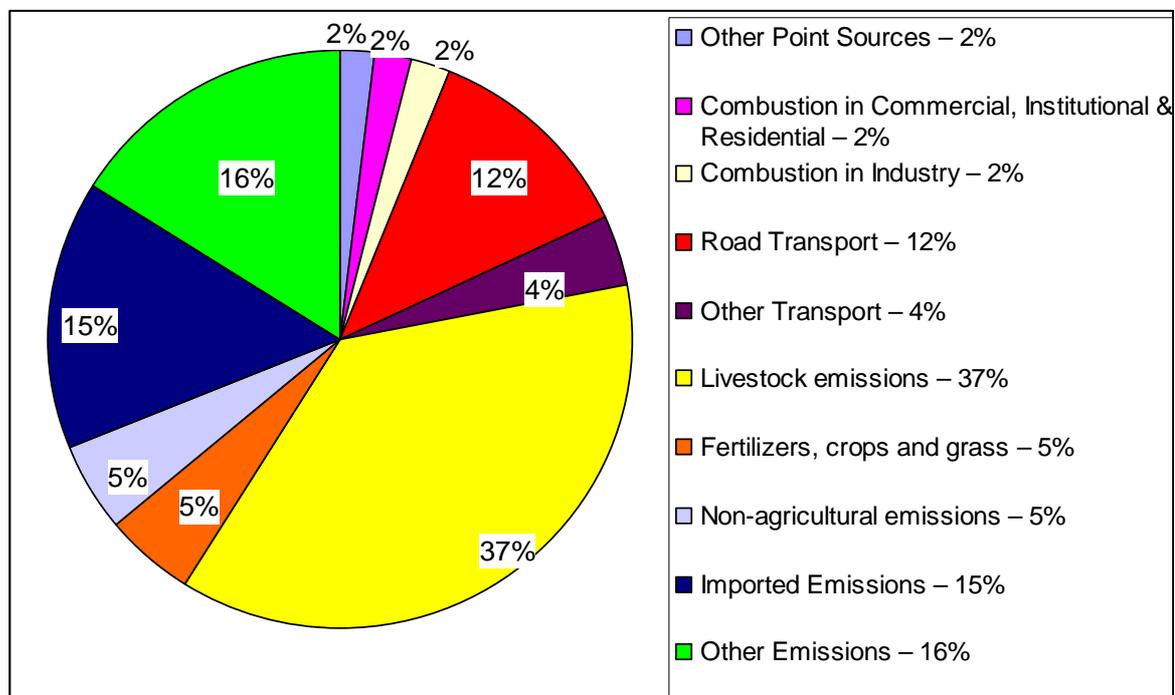


Feature	Critical Load – Kg N/ha/yr	Exceedance
Blanket Bog	5-10	Critical load exceeded
Dry Heath	10-20	Below maximum critical load but above the minimum critical load.
Semi-natural dry grasslands and scrubland facies: on calcareous substrates	15-25	Below maximum critical load but above the minimum critical load.
Transition mires and quaking bogs	10-20	Below maximum critical load but above the minimum critical load.
Calcareous and calcshist screes of the montane to alpine levels	5-15	Critical load exceeded
Calcareous rocky slopes with chasmophytic vegetation	10-15	Critical load exceeded

SAC – Coedydd Llawr-y-glyn

2010 Background Levels of Nitrogen Deposition – **23.2 kg/ha/yr**

Sources of Nitrogen emissions:



Feature	Critical Load – Kg N/ha/yr	Exceedance
Sessile oak woodland	10-15	Critical load exceeded

SAC – Drostre Bank

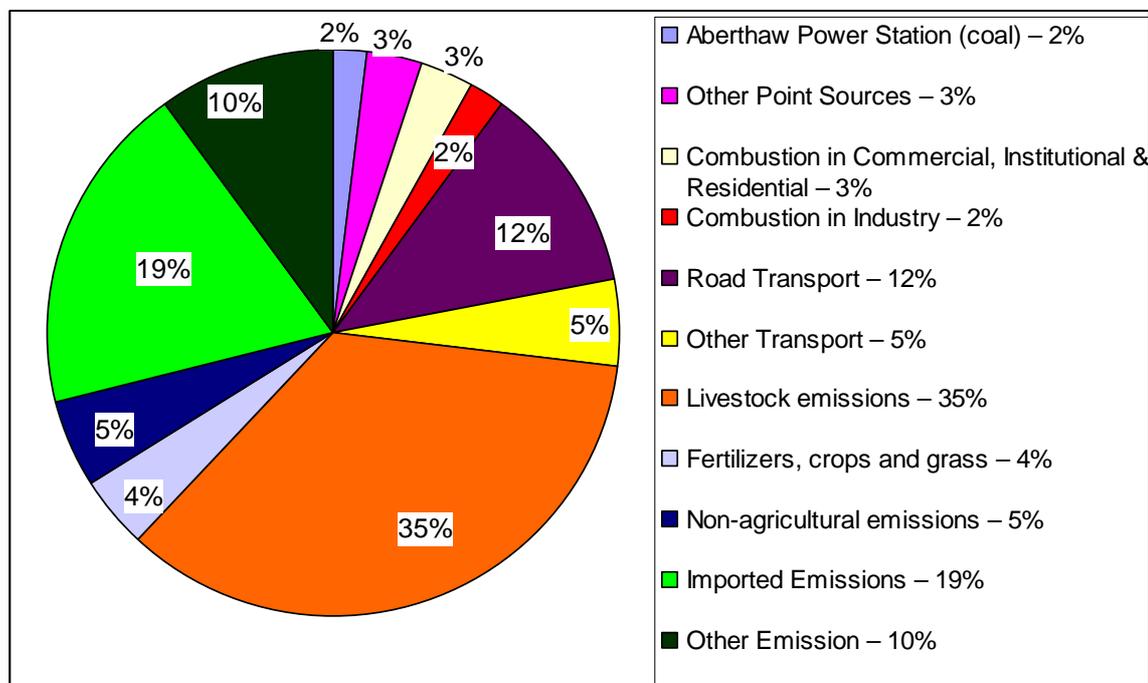
2010 Background Levels of Nitrogen Deposition – **14.3 kg/ha/yr**

Feature	Critical Load – Kg N/ha/yr	Exceedance
Purple moor grass meadows	10-15	Below maximum critical load but above the minimum critical load.
Alder woodlands on floodplains.	Not sensitive to nitrogen deposition	

SAC – Elan Valley Woods

2010 Background Levels of Nitrogen Deposition – Woodland - **24.1 kg/ha/yr**, other habitats - **16 kg/ha/yr**.

Sources of Nitrogen emissions:

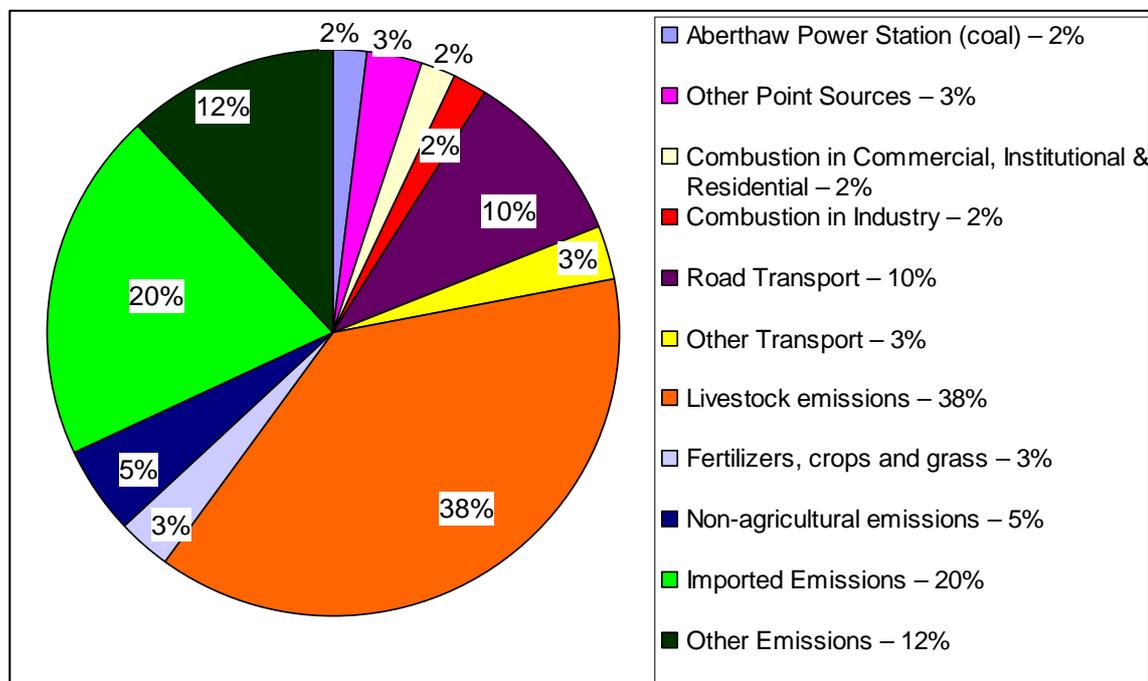


Feature	Critical Load – Kg N/ha/yr	Exceedance
Western acidic oak woodland	10-15	Critical load exceeded
Mixed woodland on base-rich soils associated with rocky slopes	10-15	Critical load exceeded
Dry Heath	10-20	Below maximum critical load but above the minimum critical load.

SAC – Elenydd

2010 Background Levels of Nitrogen Deposition – **13.7 kg/ha/yr**,

Sources of Nitrogen emissions:



Feature	Critical Load – Kg N/ha/yr	Exceedance
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	5-10	Critical load exceeded
Dry Heath	10-20	Below maximum critical load but above the minimum critical load.
Grasslands on soils rich in heavy metals	15-25	Below critical load thresholds
Blanket Bog	5-10	Critical load exceeded
Floating water plantain	5-10	Critical load exceeded

SAC – Granllyn

2010 Background Level of Nitrogen Deposition – **12.5 kg/ha/yr**

Feature	Critical Load – Kg N/ha/yr	Exceedance
Great crested newt	No critical load information	

SAC – Lleyn Peninsula and the Sarnau

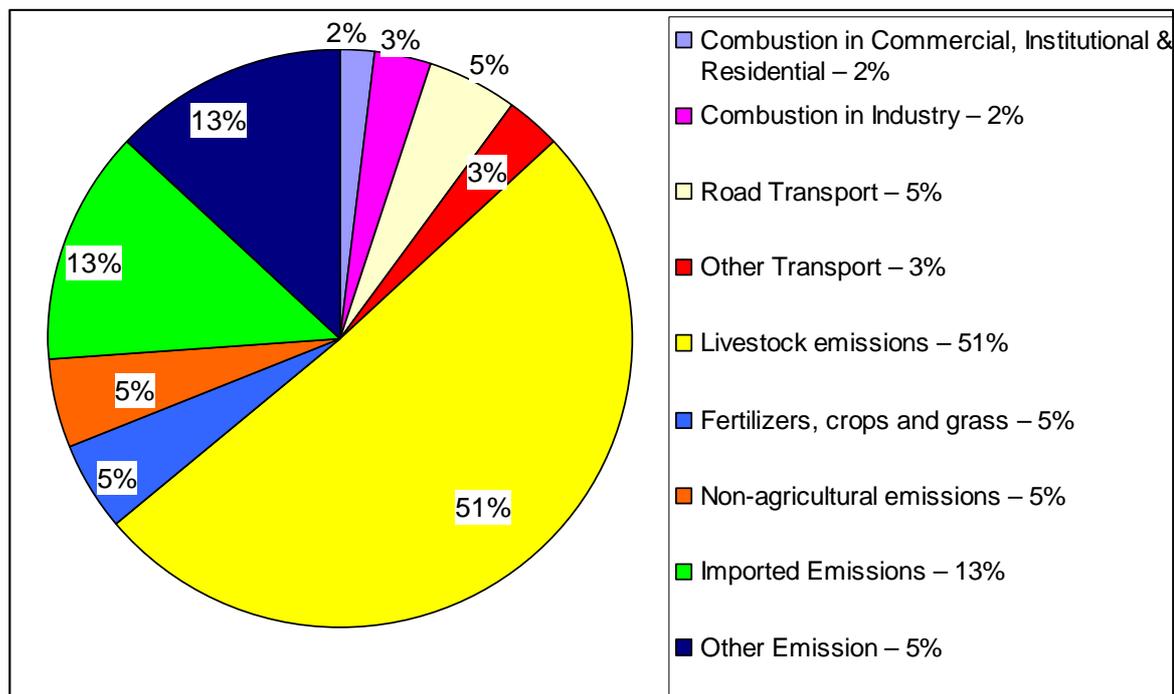
2010 Background Level of Nitrogen Deposition – **6.3 kg/ha/yr**

Feature	Critical Load –Kg N/ha/yr	Exceedance
Atlantic salt meadows	30-40	Below critical load thresholds
Estuaries	30-40	Below critical load thresholds
Otter	No critical load information	
Glasswort and other annuals colonising mud and sand	30-40	Below critical load thresholds
Intertidal mudflats and sandflats	30-40	Below critical load thresholds

SAC – Montgomery Canal

2010 Background Level of Nitrogen Deposition – **12.7 kg/ha/yr**

Sources of Nitrogen emissions:



Feature	Critical Load –Kg N/ha/yr	Exceedance
Floating water plantain	5-10	Critical load exceeded

SAC – Mynydd Epynt

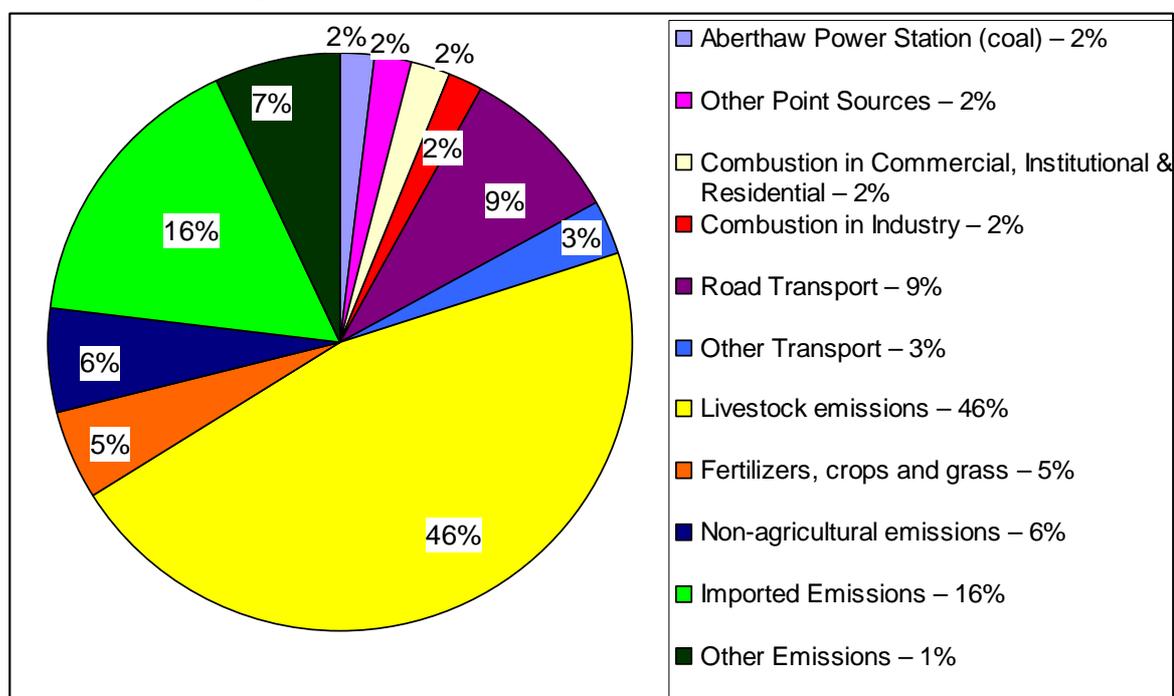
2010 Background Level of Nitrogen Deposition – **13.4kg/ha/yr**

Feature	Critical Load –Kg N/ha/yr	Exceedance
Slender green feather-moss	10-20	Below maximum critical load but above the minimum critical load.

SAC – Rhos Goch

2010 Background Levels of Nitrogen Deposition - Woodlands – **22.4 kg/ha/yr**, other habitats **13.3 kg/ha/yr**.

Sources of Nitrogen emissions:



Feature	Critical Load –Kg N/ha/yr	Exceedance
Purple moor-grass meadows	15-25	Below critical load thresholds
Active raised bogs	5-10	Critical load exceeded
Very wet mires often identified by an unstable `quaking` surface	10-20	Below maximum critical load but above the minimum critical load.
Bog Woodland	5-10	Critical load exceeded
Alder woodland on floodplains	Not sensitive to nitrogen deposition	

SAC – River Usk

2010 Background Level of Nitrogen Deposition - **16 kg/ha/yr**

Feature	Critical Load – Kg N/ha/yr	Exceedance
Rivers with floating vegetation often dominated by water-crowfoot	No critical load information	
Brook lamprey	No critical load information	
River lamprey	No critical load information	
Sea lamprey	No critical load information	
Allis shad	No critical load information	
Twaite shad	No critical load information	
Atlantic Salmon	No critical load information	
Bullhead	No critical load information	
Otter	No critical load information	

SAC – River Wye

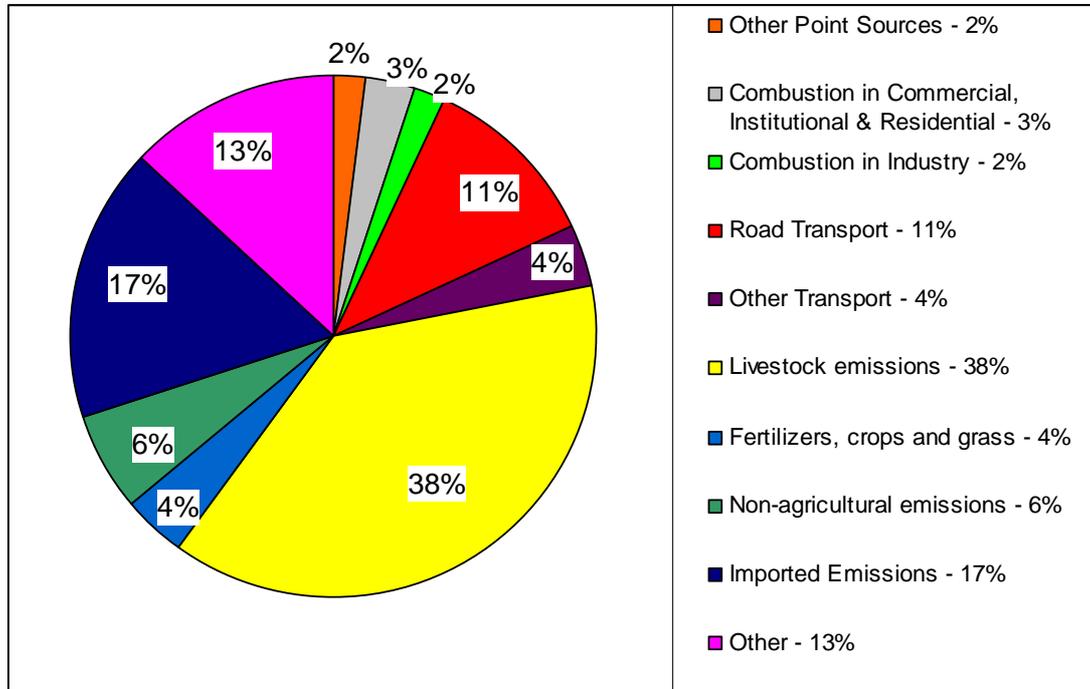
2010 Background Level of Nitrogen Deposition – **13.4 kg/ha/yr**

Feature	Critical Load – Kg N/ha/yr	Exceedance
Very wet mires often identified by an unstable `quaking` surface	10-20	Below maximum critical load but above the minimum critical load.
Rivers with floating vegetation often dominated by water-crowfoot	No critical load information	
White-clawed (or Atlantic stream) crayfish	No critical load information	
Sea lamprey	No critical load information	
Brook lamprey	No critical load information	
River lamprey	No critical load information	
Allis shad	No critical load information	
Twaite shad	No critical load information	
Atlantic Salmon	No critical load information	
Bullhead	No critical load information	
Otter	No critical load information	

Tanat and Vyrnwy Bat Sites

2010 Background Level of Nitrogen Deposition – **28.6kg/ha/yr**

Sources of Nitrogen emissions:



Feature	Critical Load – Kg N/ha/yr	Exceedance
Lesser horseshoe bat – based on habitat type of broadleaved mixed woodland.	10-15	Critical load exceeded

Information on Acidification for Special Areas of Conservation (SACs) in Powys.

Introduction

This information is taken from the Air Pollution Information System (APIS) website (<http://www.apis.ac.uk/index.html>). It looks at levels of acid deposition in the Special Areas of Conservation (SACs) across Powys (excluding Brecon Beacons National Park). Particular attention is given to the critical loads of the qualifying habitats of each of the SACs. This provides a brief overview on how many of the internationally important sites, species and habitats are at risk from acid deposition in Powys.

A Critical Load is defined as:

“The threshold level for the deposition of a pollutant above which harmful indirect effects can be shown on a habitat or species, according to current knowledge.”

The common biological effects caused by of an exceedance of the Acid deposition critical load.

Pollutant	Exceedance Impacts
Acid deposition	<p>Terrestrial Impacts</p> <ul style="list-style-type: none"> • Terrestrial - Leaching will cause a decrease in soil base saturation, increasing the availability of Al_3^+ ions, mobilisation of Al_3^+ may cause toxicity to plants and mycorrhiza, and have a direct effect on lower plants (bryophytes and lichens). <p>Freshwater Impacts</p> <ul style="list-style-type: none"> • Freshwater - Increase Al_3^+ concentration associated with freshwater acidification, impact on invertebrate populations, toxicity to fish.

(http://www.apis.ac.uk/overview/issues/overview_Cloadslevels.htm)

Deposition of sulphur, as sulphate (SO_4^{2-}), and nitrogen, as nitrate (NO_3^-), ammonium (NH_4^+) and nitric acid (HNO_3^-), can cause acidification and both sulphur and nitrogen compounds must be taken into account when assessing acidification of soils.

SAC - Berwyn & South Clwyd Mountains

Feature	Exceedance
Blanket Bog	Critical load for acidification exceeded due to high levels of nitrogen deposition. Levels of sulphur are above what has been set for minimum critical load.
Dry Heath	Below maximum critical levels but above the

	minimum levels set for acidification caused by both nitrogen and sulphur deposition.
Semi-natural dry grasslands and scrubland facies: on calcareous substrates	Below critical load thresholds
Transition mires and quaking bogs	Critical load for acidification exceeded due to high levels of nitrogen deposition. Levels of sulphur are above what has been set for minimum critical load.
Calcareous and calcshist screes of the montane to alpine levels	Habitat not sensitive to acidification.
Calcareous rocky slopes with chasmophytic vegetation	Below maximum critical levels but above the minimum levels set for acidification caused by both nitrogen and sulphur deposition.

SAC – Coedydd Llwr-y-glyn

Feature	Exceedance
Sessile oak woodland	Critical load for acidification exceeded due to high levels of nitrogen deposition.

SAC – Drostre Bank

Feature	Exceedance
Purple moor grass meadows	Critical load for acidification exceeded due to high levels of nitrogen deposition.
Alder woodlands on floodplains.	Habitat not sensitive to acidification.

SAC – Elan Valley Woods

Feature	Exceedance
Western acidic oak woodland	Below maximum critical levels but above the minimum levels set for acidification caused by nitrogen deposition.
Mixed woodland on base-rich soils associated with rocky slopes	Below maximum critical levels but above the minimum levels set for acidification caused by nitrogen deposition.
Dry Heath	Below maximum critical levels but above the minimum levels set for acidification caused by both nitrogen and sulphur deposition.

SAC – Elenydd

Feature	Exceedance
Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels	No critical load information
Dry Heath	Below maximum critical levels but above the minimum levels set for acidification caused by sulphur deposition.
Grasslands on soils rich in heavy metals	Below critical load thresholds
Blanket Bog	Critical load for acidification exceeded due to high levels of nitrogen deposition.
Floating water plantain	No critical load information

SAC – Granllyn

Feature	Exceedance
Great crested newt	No critical load information

SAC – Lleyn Peninsula and the Sarnau

Feature	Exceedance
Atlantic salt meadows	Habitat not sensitive to acidification.
Estuaries	Habitat not sensitive to acidification.
Otter	No critical load information
Glasswort and other annuals colonising mud and sand	Habitat not sensitive to acidification.
Intertidal mudflats and sandflats	Habitat not sensitive to acidification.

SAC – Montgomery Canal

Feature	Exceedance
Floating water plantain	No critical load information

SAC – Mynydd Epynt

Feature	Exceedance
Slender green feather-moss	Critical load for acidification exceeded due to high levels of nitrogen deposition. Below maximum critical levels but above the minimum levels set for acidification caused by sulphur deposition.

SAC – Rhos Goch

Feature	Exceedance
Purple moor-grass meadows	Below maximum critical levels but above the minimum levels set for acidification.
Active raised bogs	Critical load for acidification exceeded due to high levels of nitrogen deposition.
Very wet mires often identified by an unstable `quaking` surface	Critical load for acidification exceeded due to high levels of nitrogen deposition.
Bog Woodland	Critical load for acidification exceeded due to high levels of nitrogen and sulphur deposition.
Alder woodland on floodplains	Not sensitive to acidification

SAC – River Usk

Feature	Critical Load – Kg N/ha/yr	Exceedance
Rivers with floating vegetation often dominated by water-crowfoot	No critical load information	
Brook lamprey	No critical load information	
River lamprey	No critical load information	
Sea lamprey	No critical load information	
Allis shad	No critical load information	
Twaite shad	No critical load information	
Atlantic Salmon	No critical load information	
Bullhead	No critical load information	
Otter	No critical load information	

SAC – River Wye

2010 Levels of Nitrogen Deposition – **13.4 kg/ha/yr**

Feature	Exceedance
Very wet mires often identified by an unstable `quaking` surface	Critical load for acidification exceeded due to high levels of nitrogen deposition. Below maximum critical levels but above the minimum levels set for acidification caused by sulphur deposition.
Rivers with floating vegetation often dominated	No critical load information

by water-crowfoot	
White-clawed (or Atlantic stream) crayfish	No critical load information
Sea lamprey	No critical load information
Brook lamprey	No critical load information
River lamprey	No critical load information
Allis shad	No critical load information
Twaite shad	No critical load information
Atlantic Salmon	No critical load information
Bullhead	No critical load information
Otter	No critical load information

SAC - Tanat and Vyrnwy Bat Sites

Feature	Exceedance
Lesser horseshoe bat – based on habitat type of broadleaved mixed woodland.	Critical load for acidification exceeded due to high levels of nitrogen deposition.