

# Wiltshire Council Groundwater Management Strategy 2016



Tidworth 2014

Edition	Prepared by	Checked by	Date of issue
1 <sup>st</sup> Draft	P Weston/R Malton	D Everett	31.03.15
2 <sup>nd</sup> Draft	P Weston/R Malton	Wessex Water	20.04.15
3 <sup>rd</sup> Draft	P Weston/R Malton	D Everett	10.06.15
4 <sup>th</sup> Draft	P Weston/R Malton	Environment Agency Guy Parker	17.06.15
5 <sup>th</sup> Draft	P Weston/R Malton	D Everett	July 2015
6 <sup>th</sup> Draft	P Weston/R Malton	Thames Water	13.08.15
7 <sup>th</sup> Draft	P Weston/R Malton	D Everett	September 2015
8 <sup>th</sup> Draft	P Weston/R Malton	D Everett	October 2015

## Executive Summary

This document summarises the Council's Ground Water Strategy. The Strategy will be classed as a living document, and will be updated periodically when government legislation is amended or after a period of flooding when more information is available

In 2012 groundwater levels rose significantly in the Salisbury area, and there were concerns about the possibility of flooding in the south west of the county. Fortunately levels reduced in the spring. However, in 2013/14 the groundwater levels rose to their highest levels recorded, and there was flooding at many locations, especially in the south.

The current approach focuses on the areas that are known to be susceptible to groundwater flooding.

As a unitary authority Wiltshire Council is the Lead Local Flood Authority (LLFA) for the county and has prepared a local flood risk assessment management strategy to describe its approach to flooding, and how it will work with other organisations to manage the flood risk within the county.

The Environment Agency (EA) have produced maps detailing Areas Susceptible to Groundwater Flooding, but the level of confidence in the accuracy of the information means that maps should only be used to identify broad areas at risk rather than individual properties.

Flood risk in Wiltshire is often a complex interaction between, river, surface and ground water. The geology within Wiltshire plays a significant factor as the northern part of the county is predominately clay, where flooding is caused generally by river or excessive surface water runoff, although there are some areas that are susceptible to groundwater flooding where they are underlain by sand and gravel deposits. Whereas the south and east of the county sits above chalk aquifers, and consequently has a greater potential risk of flooding from groundwater.

This strategy aims to clarify the challenges caused by ground water and how Wiltshire Council is aiming to identify areas at risk, and who can help in partnership approach.

The Groundwater Strategy should be read in conjunction with the Preliminary Flood risk Assessment (PFRA), Local Flood Risk Management Strategy (LFRA), Strategic Flood risk Assessment (SFRA) and will assist with dealing with ground water issues as outlined in the county's Developers Guide (2015).

The Council's Ground Water strategy seeks to: -

- Identify the level of detail required for site specific Flood risk Assessments (FRA's),
- Give guidance on areas within Wiltshire susceptible to Ground Water Flooding.
- Determine the level of detail required when development is within Ground Water areas.
- Outline methods for dealing with Ground Water by resolving flow path and receptor routes.
- Give guidance and specifications for future development.
- Highlight the responsibility for ground water flooding.
- Safeguard water quality where development are proposed within ground water areas.
- Highlighting the key partnerships, with roles and responsibilities.

Wiltshire Council cannot deliver the aims and objectives of this strategy on its own, and will work with other risk management authorities and stakeholders, including the Environment Agency, Water and Sewage Companies, local town and parish councils, community groups and members of the public.

Co-ordination of the response to ground water issues will be through the Wiltshire Council Strategic Flood Risk Management Group, which is chaired by Council Cabinet member and portfolio holder for flooding, Jonathon Seed, and by the Operational Flood Working Groups (OFWG), chaired by Simon Jacobs in the north, Mike Hewitt in the south and Richard Clewer in Salisbury.

These operational groups cover the whole of the county and are broadly based on the Environment Agency river catchment areas. The groups meet bi-monthly in each area and are attended by stakeholder partners, including the Environment Agency, Wessex Water, Thames Water, Highways England, Network Rail, Country Landowners Association and Wiltshire Fire and Rescue. Other statutory agencies which have an interest in flooding are also invited, including town and parish councils within Wiltshire.

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# 1. Introduction

## 1.1. Reasons for a Groundwater Management Strategy (GWMS)

Groundwater flooding occurs when prolonged rainfall causes the underlying aquifer to fill up with water and with nowhere else to go the water rises to the surface. Various mechanisms may have an influence on the different characteristics of groundwater flooding.

- 1.1.2 Historical and present events in Wiltshire have demonstrated that a significant number of flooding incidents can be attributed to groundwater emergence.
- 1.1.3 Defra has recognised that there is an established risk from groundwater flooding and as a result has established in its “Early Outcomes”, a programme for Surface Water Management Plans (SWMP) which should be developed to specifically address groundwater flood risk.
- 1.1.4 As a unitary authority the council is responsible for producing a Surface Water Management Plan to cover the whole of the county with regard to flooding whereas in most counties the district or borough councils would be the responsible authority tasked with producing these.
- 1.1.5 Groundwater’s unique mechanisms which explained in Section 7 and how they influence the impact of flooding, regarding the duration and impacts of the events, particularly in areas remote from those normally affected by fluvial or surface water flooding.
- 1.1.6 These unique characteristics are the reason why groundwater flooding requires a specific strategy to address groundwater flood risk and its management.
- 1.1.7 The GWMS will be applied primarily where the boundaries of the chalk are defined in the southern area of the county. Other types of groundwater flooding are defined and described in this document may also occur outside of those boundaries but in the main are associated with fluvial and surface water flooding which are addressed in the main SWMP.
- 1.1.8 Generic solutions will be applied as the characteristics of groundwater allow this to be done, and where no significant gains can be identified e.g. from making specific local drainage conveyance improvements, or where these have already been undertaken, a large number of actions in any settlement action plans, are those required to address the residual risk.

## 2. Roles, Responsibilities and Policy

- 2.1.1 Key legislation with regard to policy and guidance for Flood Risk Management (FRM) in England can be found in Wiltshire’s SWMP.
- 2.1.2 Wiltshire Council has published for consultation the Wiltshire Surface Water Management Plan (SWMP). This “overarching” document provides the detail

on how the key documents for development planning and flood risk management relate to each other and legislation, policy and guidance.

2.1.3 The SWMP also sets out and describes more fully, roles and responsibilities within the SWMP's specifically for:-

- Wiltshire Council and other Lead Local Flood Risk Authorities (LLFRA)
- The Environment Agency (EA)
- Water & Sewerage Companies (WASCs)
- Riparian Owners
- Other agencies with an interest in water management

### **3. Establishing Partnerships**

#### **3.1 Principles and Governance**

3.1.1 Within Wiltshire the SWMP sets out the principles for governance and partnership to be adopted.

3.1.2 At a strategic level key stakeholders are represented at the Wiltshire strategic flood risk group which is chaired by cabinet member and portfolio holder, Councillor Jonathon Seed. He in turn works closely with the three operational flood working groups currently chaired by:-

- Councillor Mike Hewitt – South
- Councillor Simon Jacob – North
- Councillor Richard Clewer – Salisbury

3.1.3 These multi agency groups aim to ensure stakeholders are kept up to date with the different aspects of flood risk legislation as well as working together to ensure a holistic and joint approach in discharging responsibilities under the Flood and Water Management Act (FWMA) and FRM across the county.

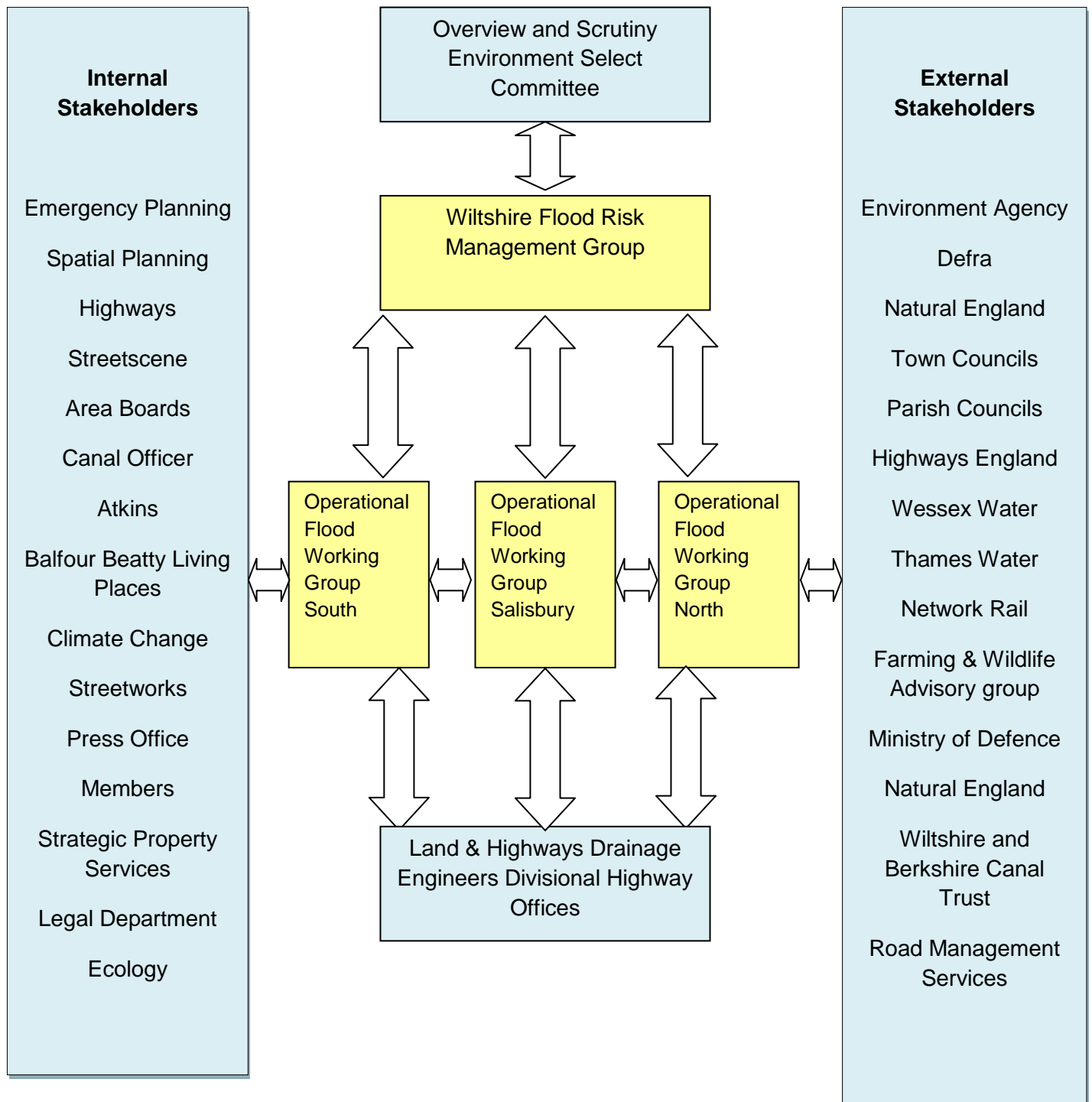
3.1.4 The north and south operational flood working groups cover the whole of the county, excepting Salisbury which has its own group and are based broadly on the EA river catchment areas.

3.1.5 The meetings are held bi-monthly in each area and are attended by representatives from the EA, Wessex & Thames Water, Highways England, Network Rail, Wiltshire Fire & Rescue, Canal & Waterways Trust, Country Landowners Association and other organisations that may have an interest in flooding and drainage matters including Town and Parish Councils.



# Flood Risk Management Governance Structure within Wiltshire

(Figure 3.1)



## **4 Background to Groundwater Management Strategy**

### **4.1 Structure of GWMS**

4.1.1 The GWMS combines elements of the strategic, intermediate and detailed SWMP's. It is broadly set out in accordance with the technical guidance provided by the Department for Environment, Food and Rural Affairs (DEFRA) in 2010, although this is also set in the context of the SWMP in place by Wiltshire Council. It is not for example intended to reproduce information already available in the overarching SWMP, rather to add information specific to groundwater flood risk management.

### **4.2 How the GWMS relates to the SWMP**

4.2.2 Wiltshire Council's SWMP provides a single concise and consolidated reference on matters relating to surface water flooding and flood risk across Wiltshire. It provides a review of relevant guidance documents and legislation to be considered as part of any SWMP. It identifies and sets out the responsibilities of the various different organisations with a role in the management of flood risk and provision and maintenance of flood water infrastructure. It also sets out in line with DEFRA guidance the four stage process (preparation, risk assessment, mitigation options and implementation) to be followed in the preparation of SWMP's for different areas at different scales.

### **4.3 Level of Assessment**

4.3.1 The Defra guidance sets out the strategic, intermediate and details stages of assessment.

4.3.2 Work already undertaken by the EA allows a more detailed level of assessment to be carried out, including the development of more targeted action plans.

4.3.3 It has therefore been recognised that the GWMS should:-

- Provide a policy that is compatible with other SWMP's including the production of a joint action plan specific to groundwater flooding.
- Target those settlements which are most at risk with more detailed action plans.

### **5.1 Aims, Objectives and Scope**

5.1.1 The scope of the GWMS should not be different from a SWMP and following the DEFRA guidance should focus on:-

- Establishing an engagement plan
- Identify the level of assessment
- Set aims and objectives
- Identify the information available.

5.1.2 Subsequently the brief issued by Wiltshire Council for the GWMS sets out its specific aims and objectives which are as follows:-

- Develop a joint action plan to identify actions to be taken by the relevant authorities in the partnership and other stakeholders.
- Develop proposals to address groundwater risk locations based on identified high risk areas.
- Identify and make recommendations for maintenance and management of winterbournes and other drainage systems that take groundwater flow and development of (or enhancement of existing) plans to manage groundwater flow that cannot be accommodated by these systems
- Make recommendations for areas where soakaway/infiltration drainage should be avoided.
- Make recommendations for improvement to flood warden schemes and other self help programmes such as the improvement of flood action plans.
- Develop action plans influenced by engagement with local communities local and development of a framework for ongoing awareness raising and engagement.
- Set out the warning signs that herald the onset of groundwater flooding, including clarification of the coverage offered by the groundwater flood warning service provided by the EA and work with them to enhance this service where possible.
- Identify what if any generic measures may be adopted to mitigate the effects of groundwater flooding.

## **5. GWMS Partnership**

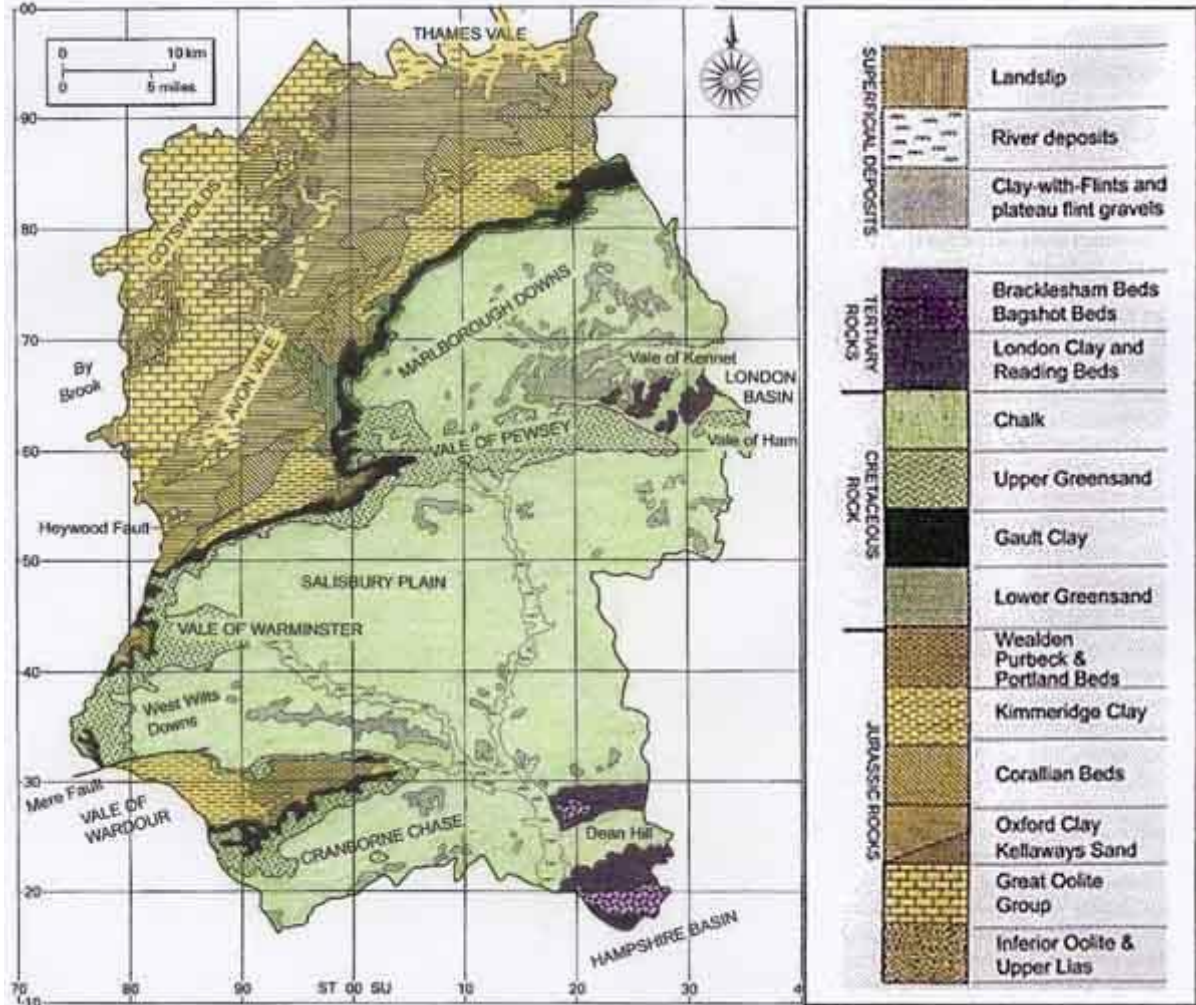
- 5.1 Partnership arrangements for the SWMP are already in place and these will be adopted by the GWMS. A more targeted specific engagement plan will however need to be developed with these partners. At a more local level engagement will initially be undertaken through the council's drainage team and OFWG. Further engagement at a more local level may also be required as individual risk assessments and action plans are developed. These documents will be available for comment on Wiltshire Council's website and will be published through the media actions such as press releases etc.

## **6. Roles and responsibilities for groundwater flooding in Wiltshire**

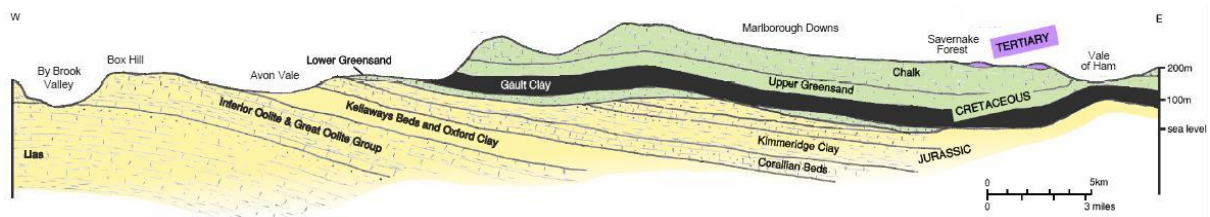
- 6.1 Detail of roles and responsibilities are set out within the SWMP which include groundwater flooding.

## 7. Area Study Characteristics

### Regional characteristics



Geological Map of Wiltshire Source: The Wiltshire Geology Group



Cross-sectional view of the Geology of Wiltshire Source: The Wiltshire Geology Group

Fig 7.1 Illustration of Wiltshire council geological data

- a. The occurrence, extent and impact of groundwater flooding are dictated by the regional topography, soils, geology and hydrology as well as by rainfall events thus it is essential to understand these when evaluating groundwater flood risk.

## 7.2 Groundwater flooding in Wiltshire

- 7.2.1 The groundwater flooding in Wiltshire is primarily due to flooding mechanisms in the chalk and occurs mainly in the south and south east of the county (see fig 1.1). Typically groundwater flooding may be defined as the emergence of groundwater at the ground surface away from perennial river channels, under conditions where the “normal” ranges of groundwater level and groundwater flow are exceeded.
- 7.2.2 Exceptionally large flows from perennial springs or large flows from intermittent or dormant springs may also be defined as groundwater flooding and can cause both localised flooding in the vicinity of the springs and down gradient where surface water drainage channels may not be adequate.
- 7.2.3 High groundwater levels can have a large effect on many rivers within the catchment causing higher than normal base flow, increasing the risk of fluvial flooding, although impacts from this increase in fluvial flow are not considered as groundwater flooding.
- 7.2.4 The chalk aquifer can take several weeks or months to become saturated and it is worth noting that that an extreme rainfall event like the 60mm that was recorded in 12 hours on the on the 23<sup>rd</sup> December 2013 at Compton Abbas can raise groundwater levels very sharply illustrating that rapid reaction can occur in heavily fractured chalk leading to localised flooding. (Compton Abbas Figure 2 shows the water sharply rising to a peak of 3.75 metres within 6 hours & whilst Figure 3 at Ashmore also rose quicker than expected). The EA also recorded a 16m rise in 24 hrs rise in West Dorset in July 2012. Once the groundwater level has reached the surface, flooding can last for several months. Often there is little that can be done to prevent groundwater flooding, and protecting properties at risk of this type of flooding can be both difficult and expensive.

Figure 7.2

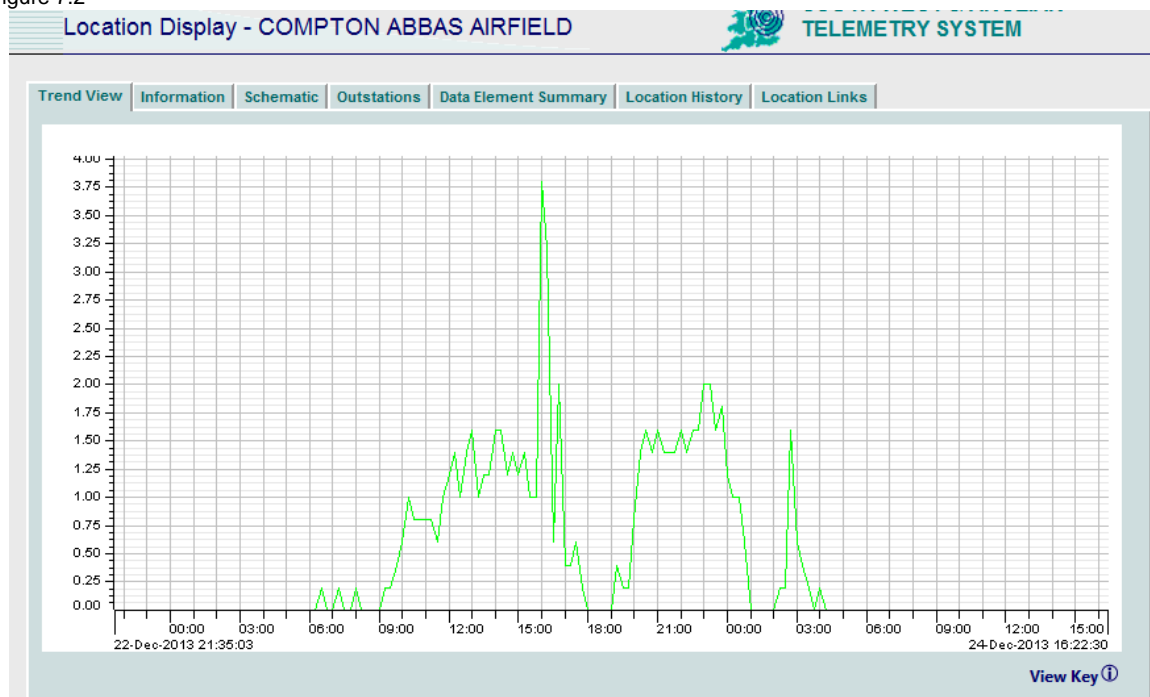
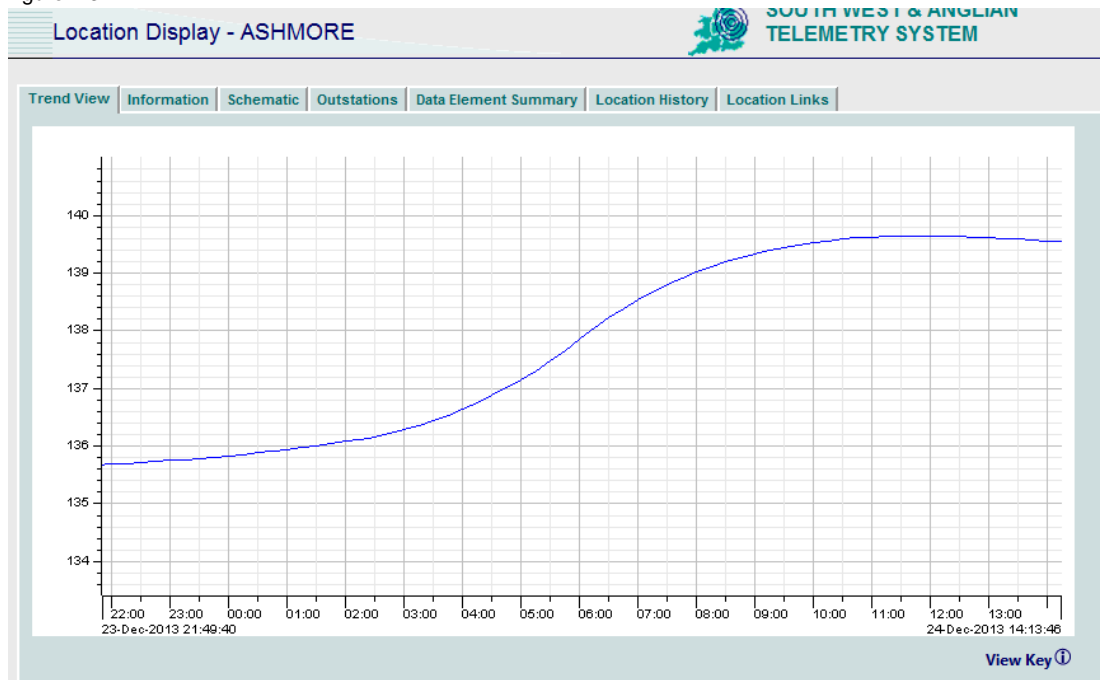


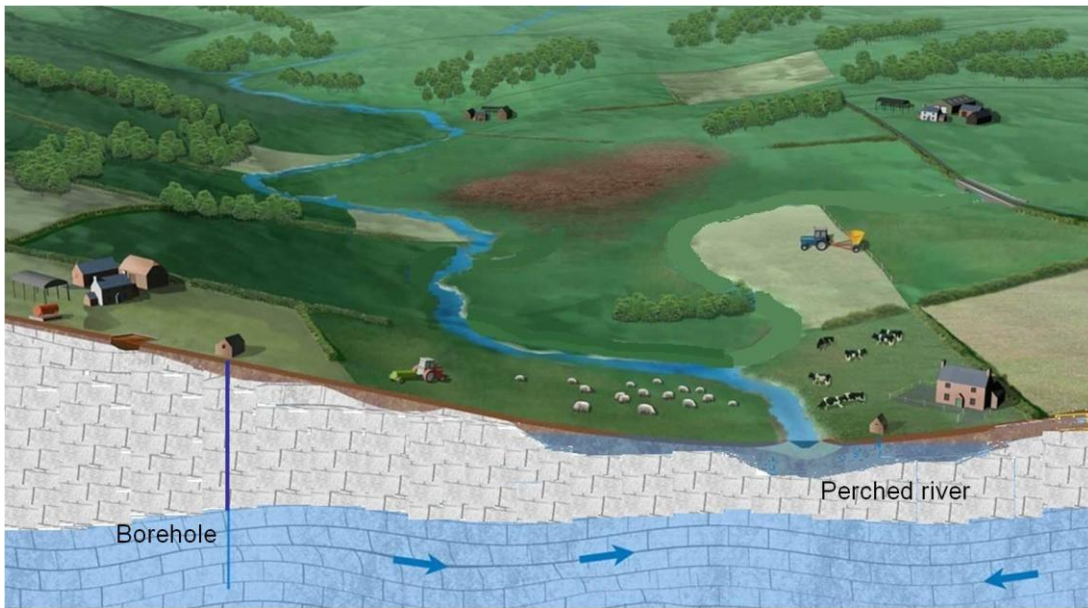
Figure 7.3



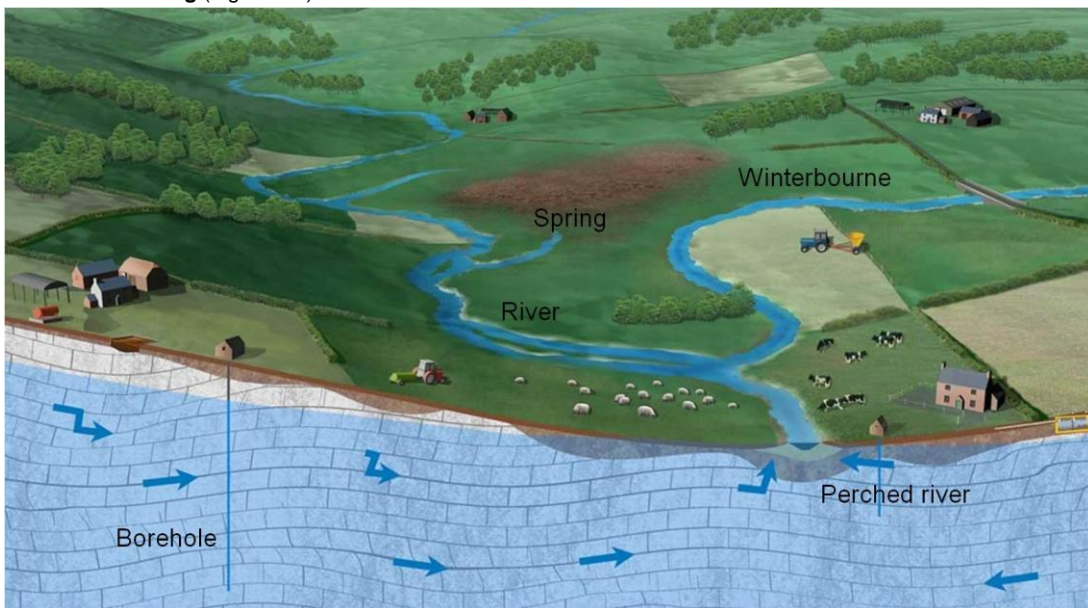
- 7.2.5 The Hampshire Avon, including the Nadder, Wylde, Till, Bourne, Ebble and Nine Mile River have tributaries within Wiltshire. This catchment is 96km long and includes most of the south of the county. Much of this system has a typical chalk stream character, with winterbournes in the upper reaches. The Nadder and some of the upper reaches of the Avon are fed from clay catchments and can rise and fall quickly in response to rainfall. Communities in Wiltshire alongside the river include Upavon, Durrington, Amesbury and Salisbury, all of which have previously been affected by flooding.
- 7.2.6 The faulted nature of chalk and its division into regional and semi regional “blocks”, bounded by faults with different properties which include permeability, degree of fracturing and geological structure causes different behaviour and responses to flooding in extreme rainfall events across the county. Additional factors may also contribute to these regional differences including topography, catchment shape, land use, soil and superficial deposits cover.
- 7.2.7 As a result of all of these factors, similar conditions of rainfall and antecedent groundwater levels, there will be different timings to both the onset and duration of groundwater flooding.
- 7.2.8 Historical groundwater flooding has been caused both directly by water levels rising above ground level, or indirectly as high groundwater causing flooding of rivers which are dominated by water emerging from aquifers (base flow).
- 7.2.9 The main characteristic feature of groundwater flooding events is the long durations compared to fluvial flooding.



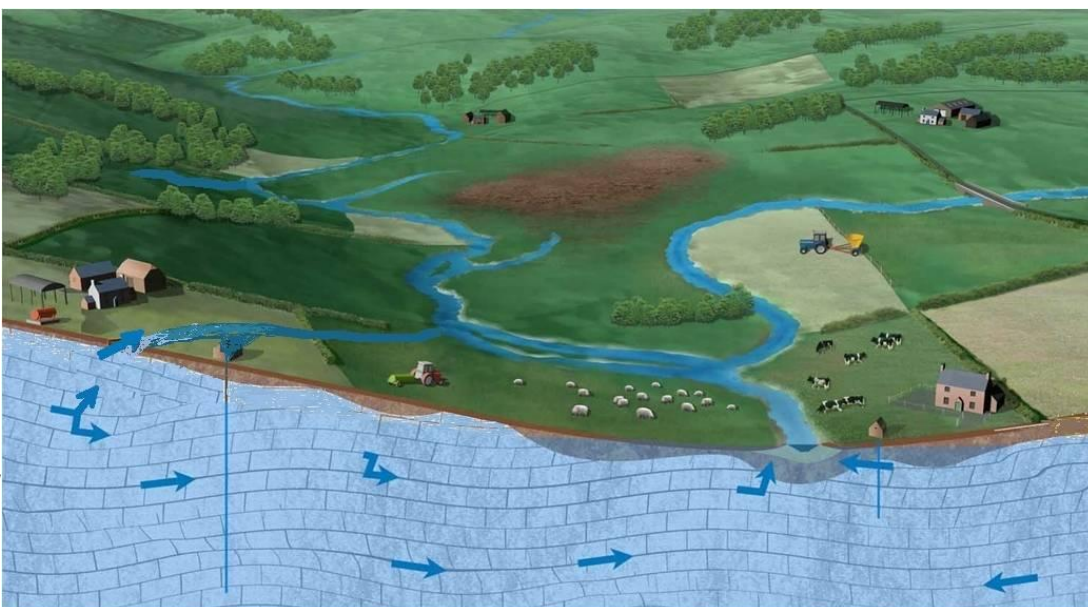
Groundwater during dry conditions (Figure 7.4)



Groundwater rising (Figure 7.5)



Groundwater emergence (Figure 7.6)





## **7.3 Groundwater flooding from permeable superficial deposits**

- 7.3.1 In non-chalk areas, where groundwater flooding occurs the mechanisms are shallower seated. In these cases the groundwater flooding is associated with rise in groundwater level within the permeable superficial deposits, such as river terrace gravels, typically found in river valleys.
- 7.3.2 Groundwater from these deposits emerges at the surface in low lying areas normally isolated from the impacts of fluvial flooding, causing flooding. Such flooding is usually associated with fluvial flooding events, although it may both precede the onset and last longer.
- 7.3.3 There are a few specific examples of groundwater flooding in permeable superficial deposits in the county, which contribute in part as such events are often rapidly overwhelmed by the effects of fluvial or surface water flooding.

## **7.4 Environmental and ecological designations**

- 7.4.1 There are a number of local, national and international designations with respect to ecology, landscape and other areas protected by UK policy or legislation that occur within Wiltshire.
- 7.4.2 A separate environmental report is provided in the main SWMP

# **8. Infrastructure**

## **8.1 Critical infrastructure**

- 8.1.2 Critical infrastructure can be defined as those facilities, systems, sites and networks that are necessary for the county to function and enable the delivery of essential services on which the county depends on.
- 8.1.3 The sectors generally recognised as critical are:- energy, flood, water, transportation, communications, emergency services, health care, financial services and government.
- 8.1.4 As a unitary authority, Wiltshire retains local records of critical infrastructure and other facilities which also include less immediately critical facilities included such as department stores, hotels and public houses.
- 8.1.5 For the purposes of this strategy, key infrastructure data has been extracted from these records and mapped. Infrastructure considered to be key will be included in the mapping are:-
- Emergency services facilities such as hospitals, police stations and fire and rescue services.
  - Key transport links e.g. airfield, bus and rail stations.
  - Communication centres e.g. telecoms facilities
  - Energy facilities e.g. power stations and sub stations.
- 8.1.6 This data and its coincidence with recorded groundwater flooding incidents was used when considering the groundwater flood risk and is to be referred where relevant in each individual action plan.

- 8.1.7 As groundwater flooding emerges slowly and may last over an extended period of time the consideration of critical infrastructure relates less to the needs of emergency planning and evacuation, but more to the how critical infrastructure may be affected e.g. by long term immersion in water and limitations to access.
- 8.1.8 Groundwater issues in relation to sewage and highway are discussed in section 12

## **9. Initial risk assessment for groundwater flooding**

### **9.1 Historic and existing flooding incidents**

9.1.2 Within Wiltshire there are a number of recorded sources of groundwater flood incidents, the main sources being:-

9.1.3 Historical records:-

- Amesbury
- Downton
- Durrington
- Salisbury
- Shrewton
- Pitton
- Tilshead
- Upavon

9.1.4 Additional information can also be found from:-

- Wiltshire Councils PFRA
- The SWMP
- Ward based assessments in the LFRMs
- Town and parish flood plans
- Water and Sewerage companies
- British Geological Survey
- Environment Agency Hydrometry & Telemetry

### **9.2 Site selection and intermediate level assessment**

9.2.1 Groundwater flood risk will be evaluated at a level of detail based on what is available, the data may be at ward, community, village or town or other determined level (e.g. community groupings related to hydrological rather than administrative boundaries).

9.2.2 The first step in the risk assessment process is an initial comparison needs to be identified between the sites identified at highest risk of groundwater flooding in the LFRMS, based on the economic cost of groundwater flooding by ward.

9.2.3 As part of the initial assessment the selection process will allow a focus on the most at risk communities.

9.2.4 Other factors that need to be taken into account in selecting these sites for further more detailed risk analysis and action plan are:

- Is flooding primarily attributable to groundwater as opposed to fluvial flooding?
- Have any mitigation works been undertaken that may have addressed or reduced the level of groundwater flood risk?
- Is there any additional data gathered that informs the flood risk such as the frequency of occurrence?
- Do any other factors need to be considered such as critical infrastructure which would include key roads, impacts on sewage provision or environmental impacts?
- Are there any other flood risks such as surface water that also need to be taken into account and which may impact on the overall cumulative flood risk?
- Can communities be grouped together and considered as a single unit with respect to both actions and risk?

### **9.3 Future and potential groundwater flood risk**

9.3.1 Records of historic flooding due to clearly identified occurrences of groundwater flowing will form the best means of evaluating future groundwater flood risk.

9.3.2 While this GWMS will focus on areas of chalk, groundwater flooding associated with shallow superficial depots such as river terrace deposits; gravels etc will need to be supplemented by further information in order for us to fully understand these processes.

### **9.4 Understanding future flood risk from groundwater**

9.4.1 Our understanding of the mechanisms of groundwater flood risk is in its infancy and to date prediction of future events is unsophisticated when compared to the modelling of fluvial or surface water flood events. This is primarily because of the lack of data and complexity of groundwater flow behaviour and emergence.

9.4.2 Currently there is no standard method to predict the future risk of groundwater flooding and existing approaches have tended to look at areas susceptible to this type of flooding.

9.4.3 Predictive models can be developed, however they require good quality and site specific data. Even then the results produced have a high degree of uncertainty attached. Most existing models that utilise appropriate data sets are designed for regional water resource management and are often unsuitable to forecasting groundwater flood risk at a local level without significant changes. However the EA are working to gain a better understanding of these issues.

### **9.5 Impacts from climate change**

9.5.1 Most climate change models indicate we are likely to experience drier summers with more intense rainfall when it occurs and wetter winters.

9.5.2 Groundwater flooding has primarily occurred as a response to extended periods of rain during late autumn and early winter. Climate change may affect what is already a complex relationship between rainfall, recharge, groundwater storage and flow and we are currently unable to predict what effect this may have in respect of groundwater flood risk.

## **9.6 Measures and settlement risk assessment**

9.6.1 This section looks at what actions might be taken to address or mitigate the risk and deals with generic actions that may be applied and suggests which organisation or body might be best placed to deliver them.

9.6.2 We are becoming more and more aware that subterranean voids are being created naturally by ground water movements.

## **9.7 Generic measures – overall approach**

9.7.1 A range of generic measures can be used to address and manage groundwater flood risk such as:-

- Installation of structural resistance and resilience measures.
- Installation of dewatering systems at local or household levels.
- Maintenance and improvement of drainage infrastructure
- Emergency planning
- Development of flood warning system
- Development management
- Infiltration Reduction Plans (IEP)

9.7.2 A good understanding of the groundwater mechanisms in the areas of concern will benefit the development of these measures.

9.7.3 The understanding of the groundwater mechanisms will be based on:-

- Geology including bedrock and superficial deposits
- Topography
- Surface water drainage including fluvial and manmade drainage networks such as house and road drainage systems.
- Groundwater levels and flow
- Foul drainage networks
- Local flood history
- Key flood receptors such as properties including basements, roads and other significant infrastructure
- Flow paths and receptors during flood events

9.7.4 This allows the potential cost and benefits of any measures to be set in context of this local analysis.

# **10 Groundwater flood planning**

## **10.1 Developing management**

10.1.1 A groundwater flood risk assessment should be undertaken for all proposed new developments within any area that may include a high risk of groundwater flooding. This assessment should include as much site specific information and data which would include local sources such as historical records, parish councils, flood action groups and Bore Hole records.

10.1.2 It is essential for planning management to control inappropriate new development and drainage in areas that may be prone to groundwater. This can be done by:-

- Allowing infiltration drainage only where it can be demonstrated that it does not contribute to the overall risk of groundwater flooding e.g. by appropriate mitigation or management of that risk is included in the drainage design. This would include appropriate ground water level monitoring.
- Restrictions in use of private sewerage systems such as septic tanks which utilise soakaways.
- Requiring sealed foul drainage systems, together with increased level of testing in compliance with Building Regulation (for private systems) and current edition of Sewers for Adoption (where system is to adopted as part of the public sewer system by the WASC)
- Prevention of storm discharges to foul systems.
- A presumption against the construction of basements - although the owners or developers of the basement may be the most likely to suffer from groundwater flood risk it should be recognised that the deeper foundations associated with basement could impede groundwater flow beneath the surface and encourage it to emerge, potentially increasing the flood risk for other receptors.
- Controls on the development of all sub surface structures which include foundations.
- Ensuring access routes will remain free of groundwater flooding and do not constrain the free flow of emergent groundwater.
- Requirements for specification of materials which are resilient to long term exposure to flooding.
- Consultation with local communities on groundwater flooding and emergence, this can be included as part of Wiltshire's existing public consultation process or as part of the planning consultation process with the LLFA for an application.

10.1.3 As a minimum these measures should be required in all areas, in particular where there are records of previous local groundwater flooding and where this occurs in the same catchment.

10.1.4 It is also suggested that unless local conditions, records or lines of evidence can be used to demonstrate otherwise these measures should also be applied to areas which are:-

- Covered by the groundwater flood alert service from the EA
- Have been identified with a groundwater flood susceptibility of > than 75% (according to the EA groundwater susceptibility mapping).

## 11 Local planning

11.1 Groundwater flood risk should also be a consideration when preparing local plans and the kinds of potential restrictions on development mentioned above must be taken into consideration. Where it is necessary and where these areas cannot for other reasons be avoided, the additional cost of developing mitigation which would include appropriate flood risk management infrastructure should be recognised in the plans.

### 11.2 Soakaways and infiltration drainage

11.2.1 Infiltration may be identified as the preferred drainage option under the FWMA and SUDS.

11.2.2 In areas susceptible to groundwater flooding infiltration drainage which may be part of a SuDs scheme for new developments should not be permitted unless it can be demonstrated to be appropriate by means of a local groundwater flood risk assessment including ground water level monitoring and a full FRA may be needed on all ground water sites.

11.2.3 The creation of soakaways in areas with chalk strata will attract large flows of water to specific points and this can lead to the chalk being eroded thus leading to the formation of subterranean voids (and in the extreme the collapse of the surface). As a result there is a need to monitor the immediate area around these features for signs of surface distress.

11.2.4 Unless a developer can demonstrate through the groundwater flood risk assessment that infiltration drainage has either no adverse impact on groundwater flood risk or could lead to improvements in all types of flood risk there should be a presumption against infiltration drainage in those areas. This may need works off site to address ground water flooding.

11.2.5 In areas of high ground water affected areas it is unlikely that any connection would be encouraged from the new developments into the existing drainage systems.

11.2.6 A planning condition may be applied for areas of new development in areas of high ground water risks to specify a higher Building Regulation Inspection levels for private drainage systems to prove any new drainage assets (pipes, manholes, wet wells etc) are watertight from outside ground water.

11.2.7 Where soakaways/infiltration are to be considered there is a need to comply with the requirements of the Water Framework Directive (WFD).  
<http://www.legislation.gov.uk/ukxi/2003/3242/contents/made>

11.2.8 Where new pipework etc. forms part of an adoption agreement (under S104 Water Industry Act 1991) then it is recommended that the WASC undertake a similar increased level of inspection for pipework, etc. covered by that agreement.

### 11.3 Maintenance of drainage infrastructure

11.3.1 Conveyance

11.3.2 The damage caused by emergent groundwater may be managed by:-

- improved conveyance/flow paths and receptors
- clearance of drainage pathways
- retaining water within drainage channels
- reducing the potential for back up in water course
- moving flood water away from potential receptors

11.3.3 This also includes appropriate management of:-

- Ordinary watercourses
- Other surface water drainage (public and private)
- Highway ditches and drains
- Clearance and maintenance of culverts.

11.3.4 Carrying out land drainage maintenance may also help reduce levels within the groundwater catchment.

11.3.5 Increased conveyance which includes maintaining the upper parts of the natural watercourse will help drain the groundwater body and bring down the levels through encouraging natural recession or upstream storage in certain locations.

11.3.6 Any method of improving the conveyance should be undertaken with the knowledge that this has the potential to increase downstream flood risk as flows pass through the catchment. Using this approach should be integrated as a catchment approach.

11.3.7 The maintenance and clearance of channels for rivers or ordinary watercourses, highway drainage, minor channels and land drains is set out in the Local Flood Risk Management Strategy.

11.3.8 Fluvial and surface water flood events could be addressed by providing additional flood storage within the flood plain. This storage serves to retain peak flows and would help reduce downstream risk in certain locations.

11.3.9 Unfortunately the lack of a peak flow in groundwater derived flood flow, and its slow rate of recession, is such that use of storage within a wider floodplain is unlikely to reduce by any significant amount the downstream flood risk.

11.3.10 Improved conveyance may address some of the issues of groundwater flooding once it has emerged at the surface and in essence becomes a surface flow problem. There are however some basic characteristics that cannot be solved by conveyance improvement such as:-

- The location of groundwater emergency may be new or previously unrecorded and there is no established drainage pathway to discharge the water.
- Groundwater emergency may occur directly beneath properties through floorboards or into basements or other receptors.
- The surcharging of sewers, septic tanks, cesspits, soakaways and other sub surface drainage.



11.3.11 Different circumstances will need different actions amongst which developing resistance or resilience measures and the use of dewatering or other groundwater methods could be used.

#### **11.4 Groundwater flood resilience and resistance**

11.4.1 Whilst it is almost impossible to completely flood proof a property, steps can be taken to reduce the impact of any flooding and assist in the recovery once the flood event has passed. Many of the measures used for fluvial and surface water flooding can also be used for groundwater. However traditional methods such as the use of sandbags are unlikely to be effective as the water can rise up through the floor and behind sandbags and remain for a longer period of time.

11.4.2 The impact and long duration of groundwater flooding compared with surface or fluvial flooding is different. These include structural impacts on foundations, sub surface drainage with regard to main and local sewer systems.

11.4.3 Although the length of time a property may remain flooded from groundwater is problematic, it does take time to build up and there is generally a greater timescale in which to move valuable items or undertake an evacuation.

11.4.4 Resistance measures which are designed to limit entry of water to a building may be effective and include measures such as:-

- Installing waterproof floors, sealing walls, including making good any rendering or pointing.
- Sealing/tanking basements and using sump pumps for clearing water if ingress cannot be prevented, but not discharging to foul drainage systems as this could lead to flooding from that system due to overloading from pumped flows.
- Covering points which are susceptible to ingress of water such as air bricks, and weep and cable holes.
- Non-return valves, toilet and pipe bungs may also prevent the ingress of flooded sewers.
- Sump and pump is a method of using drains around a property to intercept rising groundwater and direct it to a sump, from where it can be pumped away to an appropriate point of discharge.
- Flooding and known point of discharge for pumps.

11.4.5 Resilience involves modifying the interior of a building to make it more resilient to water ingress. This can be done by using materials that are less vulnerable to damage by flood water/and or dry quickly so that any cleaning up will be easier, quicker and cheaper. These methods are also used for fluvial and/or surface water flooding. Suitable measures might include:-

- Moving electrical sockets, fixtures and fittings to a higher level above the expected height of any flood water.
- Using solid floors such as tile rather than fitted carpets – rugs can always be taken up.
- Raise portable equipment such as kitchen fittings to a higher level; install wood or stainless steel units rather than fibreboard.

- Use plaster and other materials that are more resistant to longer periods of immersion, and fit plaster boards horizontally rather than vertically.

11.4.6 Various organisations which include the Environment Agency, National Flood Forum, Association of British Insurers and English Heritage provide a wealth of information and advice on preparing for all types of flooding including groundwater.

## **11.5 Dewatering**

11.5.1 Dewatering can be used to alleviate groundwater flooding for single property or area wide:-

11.5.2 Single Property

- Continually pumping out a flooded basement to an appropriate discharge point (not a foul sewer) to prevent further damage.
- Installing a groundwater control system around a property such as French drains and a sump & pump to prevent groundwater from emerging underneath a building or floor – again discharging to an appropriate point.
- By well pointing, brine freezing, electro osmosis etc.

11.5.3 The responsibility for the above rests with the property owner to install and maintain.

## **11.6 Area Wide**

- Installing specific abstraction wells to reduce the local levels from within a valley floor
- Over pumping existing water supply wells to draw down groundwater on a more regional basis. However this will only work if the supply wells are close enough to reduce groundwater levels beneath the impacted receptors.

11.6.1 For use of dewatering on area wide basis, aside from over pumping existing supply wells, there must always be a route to enable the disposal of any abstracted water. Unfortunately in most cases groundwater flooding often occurs when surface water systems are also overwhelmed so finding a suitable place to discharge the pumped water may be an issue.

11.6.2 If the floodwater can be disposed of, dewatering may only be suitable for highly sensitive receptors or structures such as electricity sub stations whose stability could be affected by groundwater flooding.

11.6.3 Aside from simple pumping within basements, most of the dewatering approaches also require a significant design effort to ensure they work appropriately. They require a desk top study, detailed site investigations and a monitoring programme to establish a viable design. This design would need to consider dedicated pumps, permanent boreholes, power supply, compound location of suitable discharge points capable of taking the flow and routes of pumping main between the pumps and discharge point

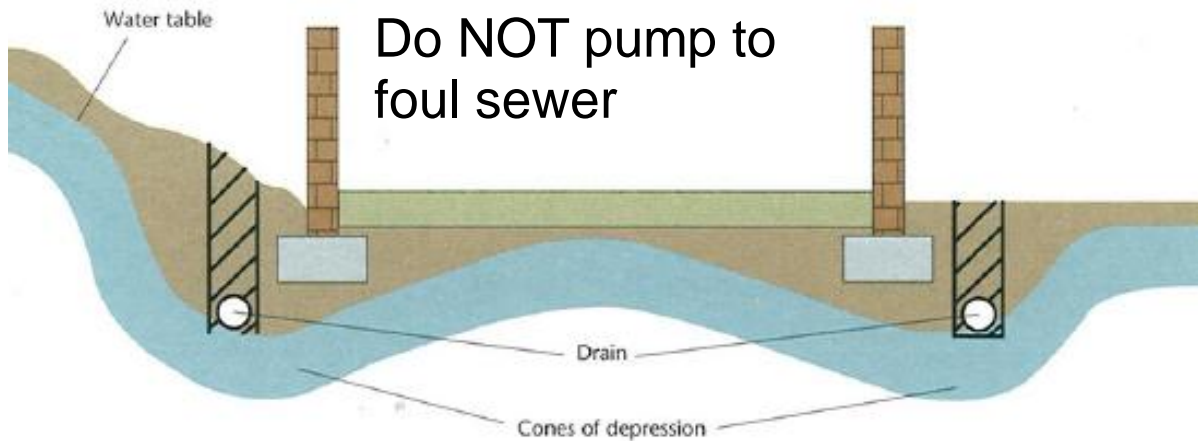


Figure 11.1

11.6.4 In both of these cases unless the wells are in the immediate vicinity of the area affected they are unlikely to have any impact.

11.6.5 Based on the above issues it is considered that area wide dewatering is difficult and costly to achieve, with a cost to benefit ratio of which is very questionable, thus it is felt more appropriate to allow the ground water to reach its natural level and provide mitigating actions to reduce its impact.

## 11.7 Storing of Ground Water

11.7.1 Storing the water is unlikely to be a practical solution due to the long duration of groundwater flooding events and the difficulty in providing a suitable volume of storage on an area wide basis.

## 11.8 Ground water induced sewer flooding 'management'.

11.8.1 In times of high intensity or prolonged rainfall events the capacity of the sewer systems can be exceeded, with consequent problems.

11.8.2 They can also be affected by groundwater entering the systems.

11.8.3 In fact as the groundwater level rises it will encounter the sewers well before reaching the surface leading to increased likelihood of ground water induced sewer flooding even though it would appear not to be an issue to the general public and other infrastructure, due to the water level not reaching the surface,

11.8.4 The public sewer systems in Wiltshire are owned and operated mainly by Thames Water, and Wessex Water with whom the council works with regarding sewer levels related flood incidents and the early identification of the onset of rising ground water.

11.8.5 It should be noted that ownership of the private drainage systems rests with the property owners.

- 11.8.6 There have been groundwater related flooding incidents in recent years in both the Thames Water and Wessex Water areas.
- 11.8.7 Sewer flooding may be managed through the use of one way valves and sealed systems within individual systems, cess pits or septic tanks for individual properties but where mains drainage is involved it will require a much larger undertaking.
- 11.8.8 Recent events within Wiltshire highlighted the flooding of foul sewerage in number of areas where public systems were overloaded which resulted in them discharging causing foul water flooding. Within Wiltshire there are areas where this occurs on a frequent basis and householders are unable to flush toilets, manhole covers pop and sewage flooding occurs within the community often impacting on local watercourses.
- 11.8.9 Wessex Water and Thames Water have procedures in relation to Infiltration Reduction Plans (IRP) or Drainages Strategies in place (or in the process of being formed) detailing how they will respond to groundwater sewage infiltration issues and developing or have developed appropriate mitigation and control measures for each site where there are known issues.
- 11.8.10 Locating infiltration can only be done **during a short period** when the groundwater table is above the pipe but has not inundated it.



Figure 11.2

- 11.8.11 These plans include site specific information and are updated as new information is identified. Where actions are planned to address flood risk it is important that consideration is given to all aspects of drainage including the foul system.
- 11.8.12 Sewage companies within Wiltshire have undertaken (or are undertaking) the following actions in such cases:-
- Produced action plans which identify the “cause” of the flooding.
  - Identify medium to long term solutions to prevent infiltration into their systems.
  - Identify areas within the private drainage system with defective pipes allowing infiltration to discharge to their sewers – and may seek assistance from the council to resolve the defective private systems.
  - Identify and action short term measures such as tankering from their sewers at key points within their system to alleviate pressure (this is often expensive and man/vehicle intensive especially over long periods which can result from groundwater flooding) or to pump direct from the

downstream end of the system directly into a watercourse which then has the potential to cause pollution problems.

- Wessex and Thames Water have indicated that evidence gathered from previous over pumping operations has demonstrated that the contents of the sewer networks are so diluted with ground water that there is no material impact on water course quality.
- Over pumping should be recognised as a last resort emergency mitigation to prevent property flooding and associated public health issues and initiated swiftly to avert sewerage on the streets.
- In relation to this latter measure Wessex inform the EA of the emergency mitigation action (over pumping) and copied into up and down stream water quality sample results used to demonstrate that no material pollution is occurring.
- Where such over pumping discharges occur there is a possible need to undertake clean-up operations. Such action is included in Wessex Water's operational mitigation plans
- Thames Water are currently developing catchment specific drainage strategies which will cover the above arrangements, as appropriate, which they intend to publish on their website when available.
- Whilst the sewerage undertakers can identify and rectify issues with the public drainage systems, the amount of pipe work was greatly increased on 1<sup>st</sup> October 2011 following legislation transferring formerly private sewers and lateral drains into their responsibility there still exists private drainage within the individual property curtilage.
- Responsibility to maintain the private drainage in good structural working order rests with the property owner. However if it is discovered to be unsound and contributing to the ground water ingress to the sewer the council, under its Building Regulations may use their powers to enforce appropriate action to remedy the issue.
- The problem is to determine where the defective private drainage is located. Wiltshire Council and the WASCs will endeavour to work together to ensure private drains are adequately maintained where there is evidence of infiltration.
- The council and WASC's look to individuals, parish and town councils and other stakeholders to report such instances of illegal use of the foul drainage systems (as defined in Section III of the Water Industry Act 1991).

## **12 Road traffic and highway ground water flooding management**

12.1 The priority with regards to highway flooding is to ensure that high speed roads are kept clear of standing water as far as possible for safety reasons, but in extreme and long duration flood events (such as groundwater flooding) the highway network can be disrupted by wide spread flooding. In recent flood events it became necessary to temporarily close some roads until the flood levels reduced and use active traffic management to reduce speeds and bow waves.

12.1.2 Currently highway drains are not designed or constructed to be sealed hence are susceptible to infiltration from ground water thus giving rise to capacity issues and flooding from gullies due to the rising ground water levels.

12.1.3 In areas of high ground water levels it is likely that the existing road drainage will become overwhelmed and may in fact become the preferred route of flow

for any water during an event. It can also cause significant damage to the surface and undermine the structure of the road and verges.

- 12.1.4 Groundwater flooding of roads may require diversions for several weeks or months impacting significantly on rural communities with respect to access to property, emergency services or critical services.



Figure 11.3

- 12.1.5 In addition to requiring diversions it may also be necessary for road traffic to pass through areas of shallow flooding which in turn has its own risk which include:-

- Driver safety
- Bow waves which increase the propensity of the floodwater to enter property.
- The impact of large vehicles such as tankers driving through flooded villages.

- 12.1.6 The introduction of temporary traffic calming measures has been used and will continue to be used within Wiltshire to address these issues e.g. Police Due Care or Police Flood warning signs.

## 13 Action plan and settlement risk assessment

- 13.1 A detailed action plan will be produced for each area at high risk of groundwater flooding which will address the potential risk of groundwater flooding in each identified community, likely damage to property and any mitigation that has been carried out along with any further actions and mitigation proposed or considered.

## 12 Residual Risk

- 12.1 Although the community specific plans may identify a number of physical steps that can be taken e.g. improving the conveyance or reactive measures, the nature and characteristics of groundwater means that an element of unpredictability and risk remains that cannot be addressed in any way.

- 12.1.1 These residual risks may be mitigated by a range of awareness measures that could for example be:-

- Promotion of the EA's groundwater flood alert service.
- Development of community plans.
- Personal flood plans.

- Encouraging local residents at risk to install their own resistance and/or resilience measures.

## **12.2 EA floodwater warning system**

12.2.1 The EA has three types of warning to help people prepare for flooding and take action.

12.2.2 However, as groundwater rises more slowly than fluvial flooding there is a lesser requirement for immediate action and risk to life.

12.2.3 The EA warning system for ground water flooding is still in its infancy and is reliant on a network of monitored boreholes and consists of a number of elements which include:-

- Provision of advice on overall groundwater conditions through monthly regional situational reports.
- More specific advice on groundwater levels through briefing notes.
- A targeted groundwater flood warning service through issue of groundwater alerts for specific communities and locations.
- WASCs providing notification as they become aware of issues with their systems due to the rising level of the ground water

12.2.4 The groundwater warning service is available in parts of Wiltshire in particular those with a known history of groundwater flooding.

Information can be found at [www.environment-agency.gov.uk](http://www.environment-agency.gov.uk)

## **12.3 Flood Forecasting Centre (FFC) and guidance statement**

12.3.1 The Flood Forecasting Centre was established in 2009 and issues advice on a daily basis regarding the flood risk through the Flood Guidance Statement (FGS). This provides an overview of the flood risk across England and Wales over a 5 day period and is issued to Category 1 & 2 responders to assist with emergency planning and decision making.

12.3.2 The FGS highlights risk for all types of flooding in one place which includes tidal/coastal, river, surface and ground water flood risk. It includes any current warnings in place and a judgement on what may happen. This service is not available to the public, is issued at least once daily and up to 3 times per day when flood risk is high on a scale of very low, low, medium and high.

## **12.4 Community Schemes**

### **12.4.1 Flood plans**

12.4.2 Wiltshire Council has been working with towns, parishes and communities to develop community emergency plans. Where communities are at risk or have flooded previously they are encouraged to draft up plans that incorporate actions to take as and when flooding occurs (and where possible determine the type of flooding, e.g. fluvial or ground water).

12.4.3 Within Wiltshire communities that have flood plans are better able to cope and return to normal quicker than those that don't have plans.



12.4.4 As part of the having a flood plan communities are offered the opportunity to join the Parish Emergency Assistance Scheme (PEAS) whereby Wiltshire Council will supply them with a basic emergency flood kit.

12.4.5 There is no charge for this however parishes are expected to complete a flood plan, and have a contact within the parish who will liaise with the council in a weather emergency situation. They are also advised to draw up a sandbag policy so that residents clearly understand how any supplies will be used.

## **12.5 Town and Parish asset recording**

12.5.1 Parishes are also given maps and GPS data logging kit so they can map and identify land and highway drainage assets/systems within their community. This information is fed into the councils GPS mapping system allowing pin point accuracy in identifying assets requiring maintenance/repair or replacement to reduce the risk of flooding within their community.

12.5.2 Representatives with flood plans/wardens attend the OFWG meetings and are able to bring particular issues to these groups.

12.5.3 Flood wardens are encouraged to report instances of ground water flooding separately to enable more detailed information to be gathered by the EA and LLFA in an effort to make their warnings more accurate.

## **13 Environment Assessment**

13.1 A Strategic Environmental Assessment (SEA) has been carried out as part of the GWMS. This will be based largely on the SEA undertaken for the LFRMS, and targeted towards the GWMS. The SEA will also take into account the requirement of the Water Framework Directive (WFD) <http://www.legislation.gov.uk/ukxi/2003/3242/contents/made> and the habitats and bird directive. An environmental report will be produced as part of the SEA. Any environmental constraints or opportunities will be added to the GWMS if applicable.

### **13.2 Strategic Environmental Assessment (SEA)**

13.2.1 SEA appraises the potential impacts of any policies, strategies and programmes before they are approved to ensure that any implications for the environment are fully and openly considered before any final decisions are taken. This is a requirement of a European Directive (2001/42EC). This directive is implemented throughout England via the environmental assessment of the plans and programmes regulation (SI 1633 2004) and makes SEA a legal requirement on certain plans and programmes which may have a significant effect on the environment.

13.2.2 A GWMS is not a statutory plan and local authorities have to decide if their FWMP requires a SEA. Whether to do this or not is dependent on a number of factors including, its environmental effects, its statutory status and the area it covers.

- 13.2.3 The environmental report summarises the baseline for the county looking at issues that are specifically relevant to the risk of groundwater flooding. It will also consider the cumulative environmental effects of flood risk from ground water sources and also that from surface, ordinary watercourse, Main River and sewerage network where relevant.
- 13.2.4 An environmental baseline has been used to develop the objectives for SEA which is designed to help protect the environment. These objectives have been used to assess the environmental effects of the GWMS and the result used to help chose Wiltshire's approach to ground water management meets environmental objectives and complies with our legal obligation to protect the environment.
- 13.2.5 Designated sites for nature conservation, landscape or cultural heritage importance, critical infrastructure and potential sources of pollution such as landfill sites have been identified. They are mentioned in any action plan they relate in order to show the potential constraints and opportunities for ground water management measures.
- 13.2.6 The majority of the measures identified within the GWMS are likely to be found within the SEA and to have a positive effect on the environment.
- 13.2.7 It should be noted however that effects on any of the receptors are difficult to predict at a strategic level as impacts are more likely and specific to certain locations and the design details of the GWMS mitigation measures.
- 13.2.8 Any environmental assessment appraisal should be fed into the choice and location of any locally based schemes and include any measures to mitigate adverse effects e.g. through Construction Environmental Management Plans. (CEMPs).
- 13.2.9 English Heritage is the statutory consultee's for SEA along with the EA and Natural England also key stakeholders will have the opportunity to comment on findings.

### **13.3 Water framework directive (WFD)**

- 13.3.1 The Water Framework Directive is a European directive which has introduced new strategic planning processes to manage, protect and improve the water environment. It was transposed into UK law in 2003 and aims to help protect and enhance:-
- Surface freshwater (including lakes, streams and rivers)
  - Groundwater
  - Groundwater dependent ecosystems
  - Estuaries
  - Coastal water out to one mile from low water
- 13.3.2 The WFD ensures there is a framework for the protection on water bodies which includes terrestrial ecosystems and wetlands directly dependent on them and aims to:-

- Prevent deterioration in the classification statutes of aquatic ecosystems, protect them and improve the ecological condition of the water.
- Achieve at least a good status for all waters by 2015. Where not possible good status should be achieved by 2021 or 2027.
- Promote sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants
- Contribute to mitigating the effects of floods and droughts.

13.3.3 The GWMS should be assessed for WFD compliance to ensure any local measures to reduce flood risk comply with the WFD and contributes to its objectives.

13.3.4 The EA has advised that WFD assessment can be incorporated into the SEA for a LFRMS. The same approach has therefore been taken for the GWMS, i.e. a detailed WFD has not been undertaken. The SEA objectives covering water quality, resource availability and hydro morphology and their underlying assessment criteria are designed in order to fulfil the requirements of WFD.

13.3.5 The spirit of the WFD is to work with natural processes or soft engineering solution to flood management, rather than hard engineering and the GWMS may need to consider this in relation to its policies and action plans.

## **14 Options, evaluation, implementation and recommendations**

### **14.1 Generic measures**

#### **14.1.2 Planning**

14.1.3 Generic measures will need to be integrated into the planning process.

14.1.4 Advice may be sought from the council's land drainage engineers or specialists such as hydrologists from Atkins (Wiltshire Council's term consultants) or the EA when advice and information is required in evaluating a groundwater flood risk assessment which supports a planning application.

14.1.5 Stakeholder groups such as sewage undertakers and town and parish councils will be consulted during the planning process, particularly if new infrastructure needs to be installed to ensure the right decisions are made.

14.1.6 Where groundwater flood risks have been identified there will be a need to review routine processes, such as inspection and monitoring and/or specific reactive measures developed.

14.1.7 These actions may require additional cost, although some of this could be carried out by the allocation of locally based resources such as inspection by local street scene coordinators or technicians.

- 14.1.8 There is potential for private funding of schemes where a private individual or company would benefit the most from any proposed measures. Developer contribution, Local Enterprise Partnership (LEP) and other funding associated with development has the potential to provide funding for groundwater flood risk reduction measures, especially where significant development is proposed.
- 14.1.9 Sewerage undertakers have ongoing Infiltration Reduction Plans (or Drainage Strategies) and these should be taken forward to address issues relating to groundwater surcharging of sewers and the associated flooding. These plans should be coordinated with the Council as well as the EA to ensure all actions are focussed on those communities at highest risk.
- 14.1.10 The importance of effective communications between partners and stakeholders is paramount to ensure that the implications of any mitigation actions are clearly understood.

## **14.2 Promotion of measures**

14.2.1 Wiltshire Council and the EA will continue to promote the adoption of generic measures through established channels such as the OFWG meetings and local resilience forums. These would include:-

- Continuing to encourage the maintenance of ordinary watercourses by riparian owners with the support of the parish and town councils through the "Ditch project". (A suite of letters and advice is available for them to use in approaching landowners where ditches and watercourses have been identified as requiring maintenance to prevent or reduce the flood risk within the town or parish).
- Encouraging residents to sign up for the ground water flood warning service.
- Through the flood warden system encourage them to gather information forms on groundwater emergence, flow, depth and timescales.
- Encourage homeowners to install resistance and/or resilience measures

## **14.3 Site specific measures**

14.3.1 Additional site specific risk assessments may identify specific localised measures at settlements most at risk from groundwater flooding.

14.3.2 Some measures may require the implementation of capital expenditure such as the installation of new highway drainage, culverts, and channels, separation of combined systems and should be subject to appropriate cost to benefit ratio analysis. This analysis must also take into account the higher costs of damages associated with groundwater flooding such as duration.

14.3.3 Where a more intensive scheme is proposed it is important to ensure risks to downstream receptors are not increased and essential that any potential environmental impact is also taken account of, such as excavations requiring archaeological surveys and local constraints that have been identified in each site specific action plan.

## 15 Review and monitoring

### 15.1 Updates and ongoing review

15.1.1 The GWMP is a live document and will require updating and reviewing as additional information becomes available. This would include any new ground water flooding incidents, or sewage flooding brought on by groundwater emergence and flow. Any changes to legislation will also need to be taken into account such as the National SuDS Standards (SuDS) which could lead to pressure to introduce infiltration drainage which must be reviewed with regard to the GWMP.

### 15.2 Collection and maintenance of groundwater flooding incident data

15.2.1 The council will work with other organisations in order to get a better understanding of groundwater flood risk within Wiltshire and will support the EA with regards collecting information, studies and surveys where there is a common interest in understanding the cause of the flooding

15.2.3 As part of its responsibilities the EA collects and interprets data on groundwater levels from an extensive network of borehole, wells and springs monitoring sites. They collate this data on their various systems.

15.2.4 As the lead local authority for flood risk the council is required to investigate the causes and effects of any significant flooding incidents and to make recommendations to avoid future risk (Section 19 of the Flood & Water Management Act).

### 15.3 Current process

15.3.1 As part of its local flood risk management strategy Wiltshire Council residents are able to record and report incidents of flooding within the county in a variety of ways which may include:-

- Visits made by the drainage team to the affected communities which may include “walk around” with local parish councillors/flood wardens and residents to look in detail and gather information on the affected areas.
- The completion of detailed maps with GIS coordinates showing extent of flow, depth, paths and causes by residents, flood wardens or parish councillors.
- Use of the EA and Wiltshire Council Flood recording form to gather detailed information from residents about their flooding incident ([link to follow](#))
- Report via the Wiltshire App.  
<http://www.wiltshire.gov.uk/parkingtransportandstreets/roadshighwaysstreetcare/mywiltshirereport.htm>
- Town and parish councils organising drop in sessions to collect flooding information.

## 15.4 Future process

15.4.1 In 2007 DEFRA identified that the use of a trained/aware person to collect data in a flooding event and using a standard pro forma offers the best method for obtaining information and enable an improved record for analysis of any future events.

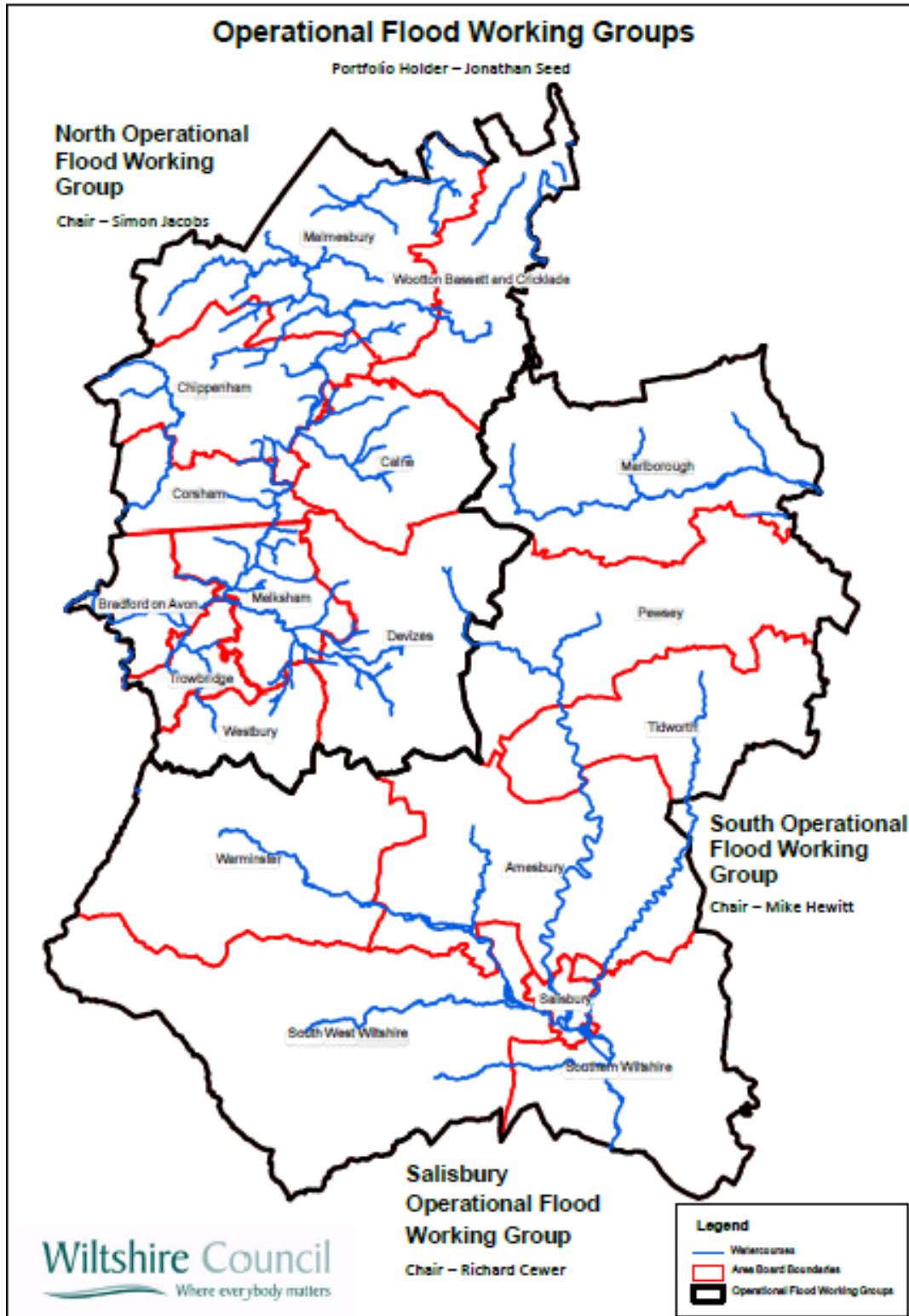
15.4.2 Where groundwater flooding is a known risk it is suggested that in addition to the above, within Wiltshire, the flood wardens, town and parish councils will be encouraged to:-

- Use a standardised form for reporting the emergency and behaviour of groundwater emergence and flooding.
- Review and amend community emergency/flood plans following any incidents if appropriate.

The monitoring of groundwater during an event is different than other forms of flooding particularly with regard to duration and extent so it is important that local flood characteristics are monitored to enable a better understanding of the event.

# Appendix 1 – Plans and areas of responsibility

## 1A Plan of Wiltshire Council Areas

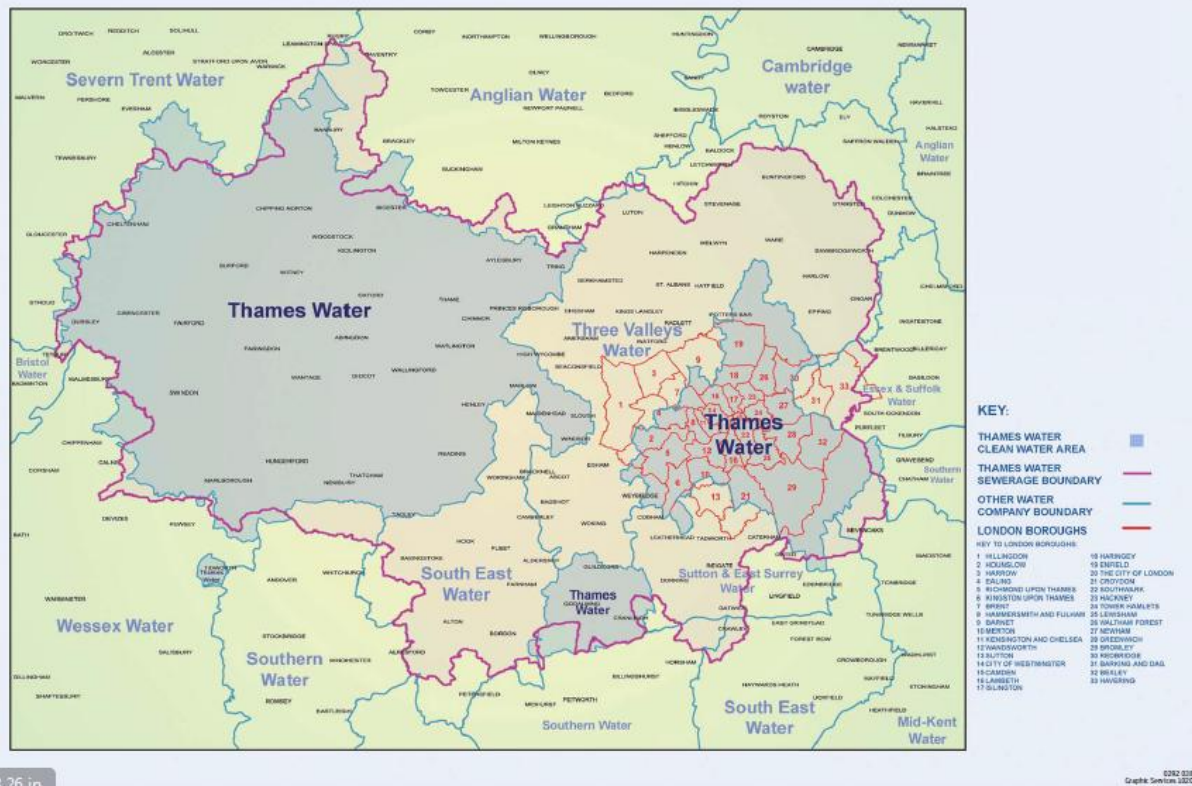


1B Plan of Wessex Water Areas





### THAMES WATER SEWERAGE AND CLEAN WATER BOUNDARY MAP



0.26 in

1 E Plan of Environment Agency Office Areas – Awaiting from Stakeholder

## Appendix 2 – Flood Risk Management Stakeholders

<b>Stakeholder</b>	<b>LFRM Role</b>	<b>Method of Engagement</b>
Area Board	Represent town and parish councils as a group to the county council	Area Board meetings, advice and information as required
Association of British Insurers	Represent the insurance industry and work with government, regulation and policy makers	Advice and comments where necessary
Businesses	Employment and economic aspects	Consultation as required
Canal & River Trust	Ownership and maintenance of waterways in England & Wales as well as associated assets	Standing invitation to OFWG and consultation on schemes
Country Landowners Association	Represents landowners at local and national level	Standing invite to OFWG and consultation where necessary
DEFRA	Department for Rural Affairs and responsibility for setting policy for FRM	Consultation and enquiry
English Heritage	Government advisor on historic places and heritage	Consultation and enquiry
Environment Agency	Responsible for main rivers, catchment management plans and flood risk	Standing invite to OFWG and consultation where necessary
Highways England	Responsible for M4/A303 & A419 through Wiltshire	Standing Invite to OFWG and consultation where necessary
Housing Associations	Social housing accommodation providers	Providing and sharing information on vulnerable properties and advice
Land owners/estates	Maintenance of flow of water as riparian owners	Consultation with regard to flow or access to land for schemes
Local Government Association (LGA)	Lobbying and support of local authorities	Sharing best practice
Met Office	Provision of weather alerts and flood guidance statements	Liaison through LRF and Emergency response team
National Farmers Union	Represents farmers at local and national level	Consultation as requested
Natural England	Advise the government on safeguarding England's natural environment	Consultation as required
National Flood Forum	Support and advice to communities and individuals	Consultation as required
Neighbouring Authorities	LFRM authorities and sharing information on river catchments	Consultation as required
Network Rail	Responsible for rail network which includes assets such as culverts and bridges	Standing invite to OFWG meetings. Consult on Schemes as required
Regional Flood & Coastal Committees	Bring together LFRM authorities, administer local levy for flood defence schemes	Applications for funding, consult as necessary
Town and Parish councils	Source of local knowledge and consultee's in planning process	Standing invite to OFWG meetings. Consultation as required
Water & Sewage companies (WASC)	Assistance with water and sewage issues affecting communities particularly during a flood event	Standing invite to OFWG and consultation as required

Wiltshire Fire & Rescue	Assistance to communities and individuals during a weather emergency	Standing invite to OFWG meetings. Consultation as required
Universities	Develop and assist with knowledge and projects	Consultation as required
Utility companies	Other than water companies assist in flood alleviation work to protect assets	Consultation as required

## **Appendix 3 – Wiltshire Medium Term Groundwater Strategy**

(To be agreed and inserted)

## **Appendix 4 Flood Risk Management Legislation**

The Flood & Water Management Act 2010 (FWMA)

The Conservation of Habitats & Species Regulations 2010

The Flood Risk Regulations 2009 (FRR)

Civil Contingencies Act 2004

EU Water Framework Directive 2000 (WFD)

Environment Act 1995

Land Drainage Act 1991

Wiltshire Council Drainage Bye Laws

Wiltshire Council Developers Guide

The National Planning Policy Framework (NPPF)

Surface Water Management Plan Technical Guidance

Strategic Flood Risk Assessments (SFRM)

Catchment Flood Management Plan (CFMP)

River Basement Management Plans (RBMP)

## Appendix 5 Abbreviations and Acronyms

Acronym	Definition
CEMP	Construction Environmental Management Plan
DEFRA	Department for Environment, Flood and Rural Affairs
EA	Environment Agency
EIA	Environmental Impact Assessment
FRM	Flood Risk Management
FFC	Flood Forecasting Centre
FGS	Flood Guidance
FWMA	Flood and Water Management Act
GWMS	Ground Water Management Strategy
IRP	Infiltration Reduction Plan
LEP	Local Enterprise Partnership
PFRA	Preliminary Flood Risk Management Assessment
LRF	Local Resilience Forum
LLFRA	Lead Local Flood Risk Authority
PEAS	Parish Emergency Assistance Scheme
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment
SuDS	Sustainable Urban Drainage
SWMP	Surface Water Management Plan
WASC	Water and Sewerage Companies
WFD	Water Framework Directive

