



The Impact of Water Environment Considerations on the Development of Mineral Sites in the UK

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Introduction/Background

Introduction

- Changes to regulatory regime (abstraction licencing)
- Dewatering
- Impact of changes on site development and need for industry-wide approach
- This presentation is about large-scale water resource issues not about local/site-specific considerations

Regulatory Regime

Planning

Route:

- Planning process / EIA

Controlling body:

- MPA
- Consultees

Considerations:

- Flood risk
- Changes in water levels/flows
- Changes in water quality
- Impacts on “receptors”
 - Water users
 - GWDTEs
 - Spring flows
 - Waterbody ecology

Permitting/Consents

Route:

- EPR
- Land Drainage Act

Controlling body:

- EA – Discharge permit, Flood Risk Activity Permit (FDC)
- Council - Land Drainage Consent

Considerations:

- Flood risk
- Changes in water levels/flows
- Changes in water quality
- Impacts on “receptors”
 - Water users
 - GWDTEs
 - Spring flows
 - Waterbody ecology

Abstraction Licencing

Route:

- Abstraction licencing regime

Controlling body:

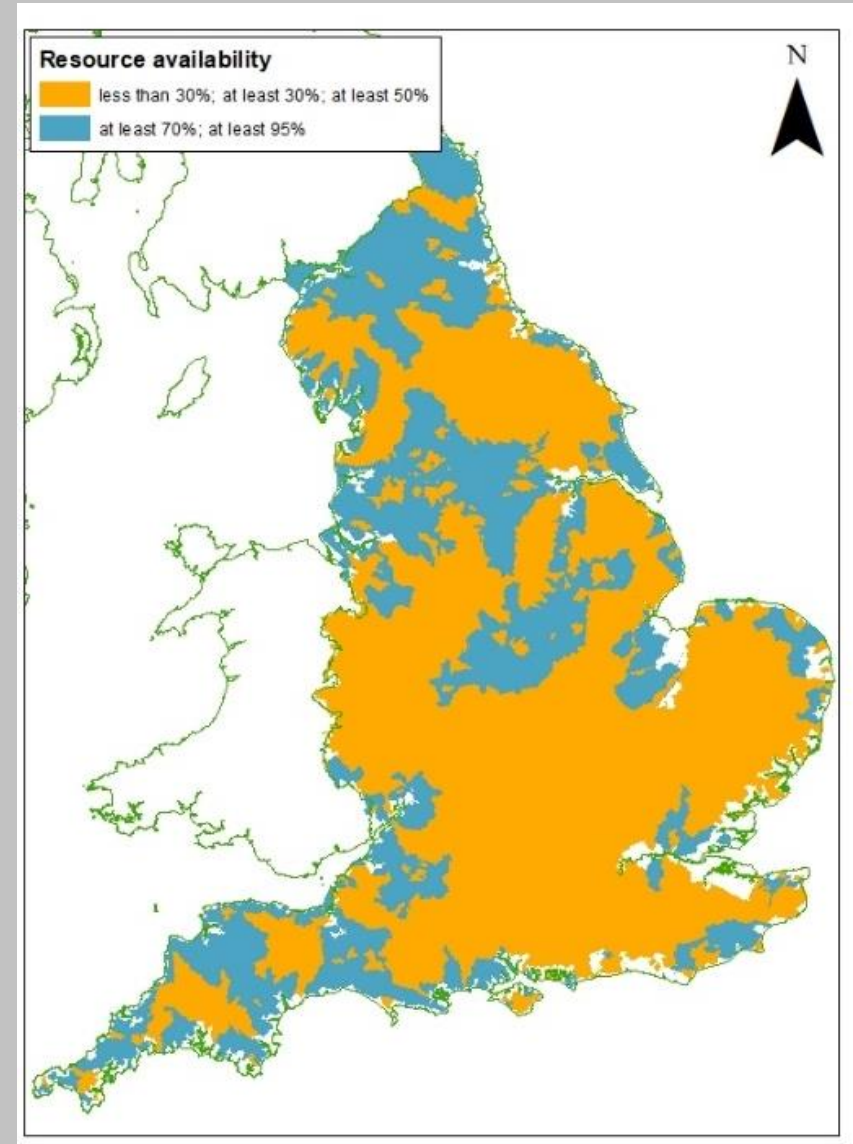
- EA

Considerations:

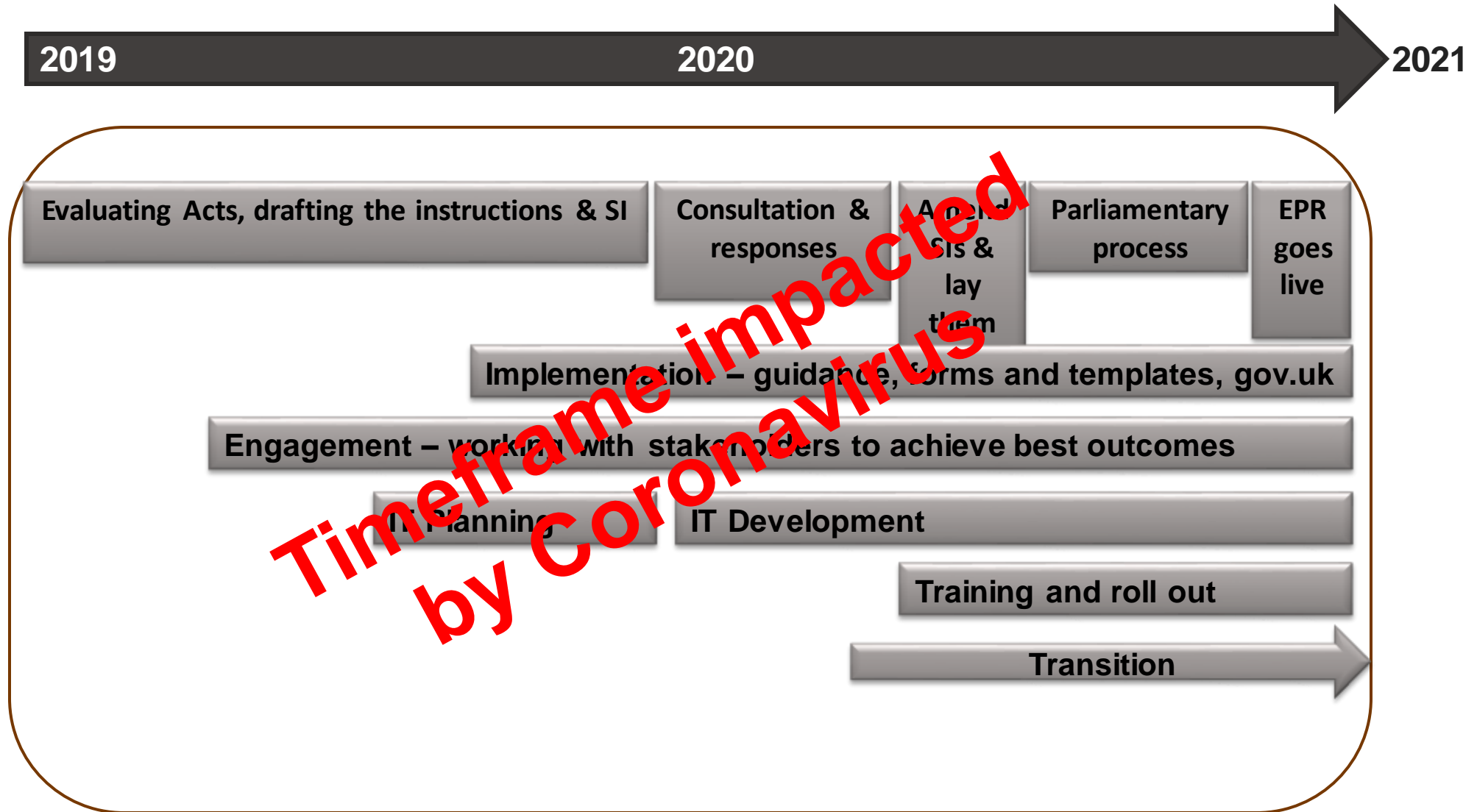
- WFD water body status
- Water availability
- Serious damage
- “EIA considerations”

Implications

- Effective sterilisation of large areas nationally
- Nationwide changes to work practices



The Move to EPR



WFD

STATUTORY INSTRUMENTS

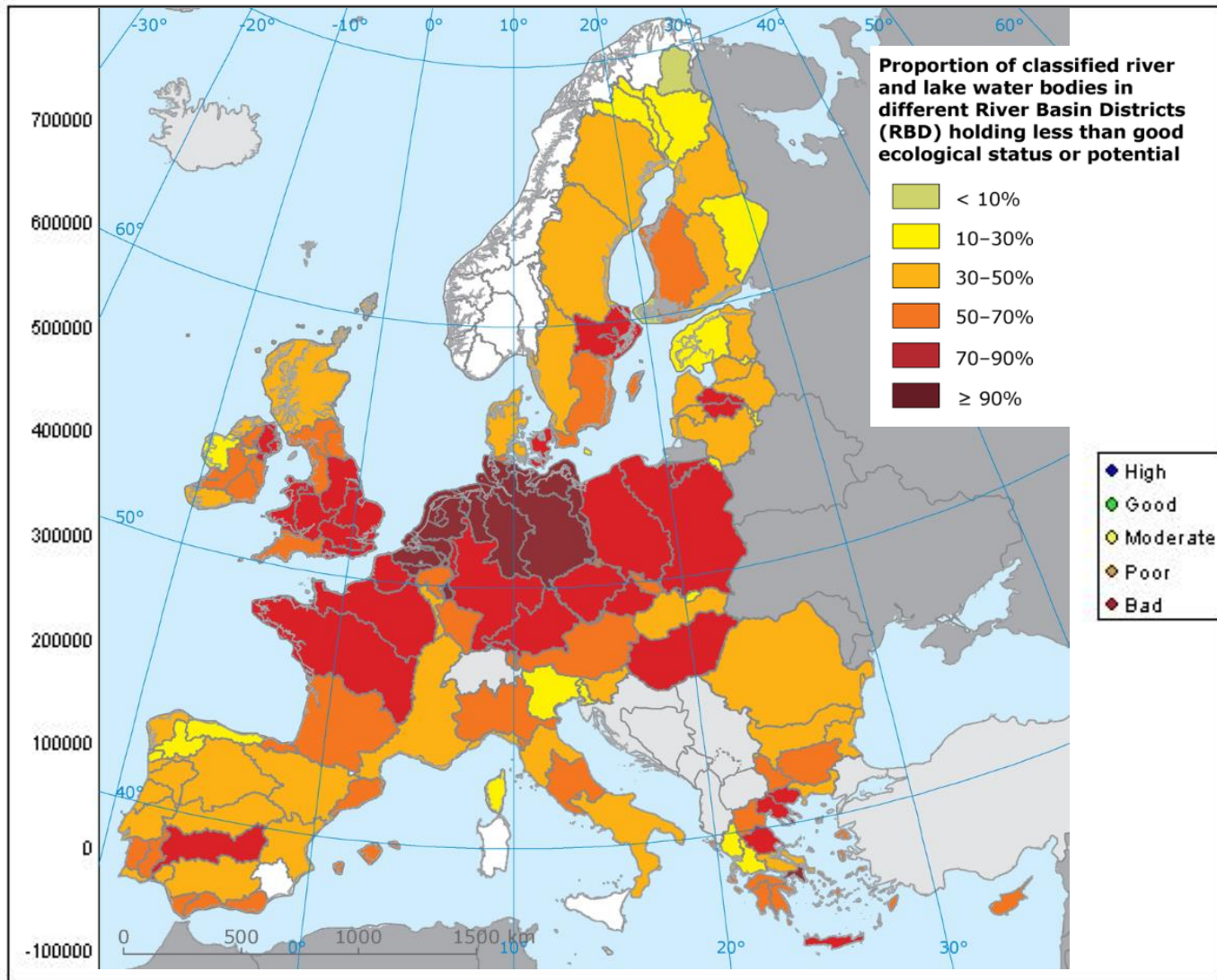
2017 No. 407

WATER RESOURCES, ENGLAND AND WALES

The Water Environment (Water Framework Directive) (England
and Wales) Regulations 2017

<i>Made</i>	- - - -	<i>15th March 2017</i>
<i>Laid before Parliament</i>		<i>16th March 2017</i>
<i>Laid before the National Assembly for Wales</i>		<i>16th March 2017</i>
<i>Coming into force</i>	- -	<i>10th April 2017</i>

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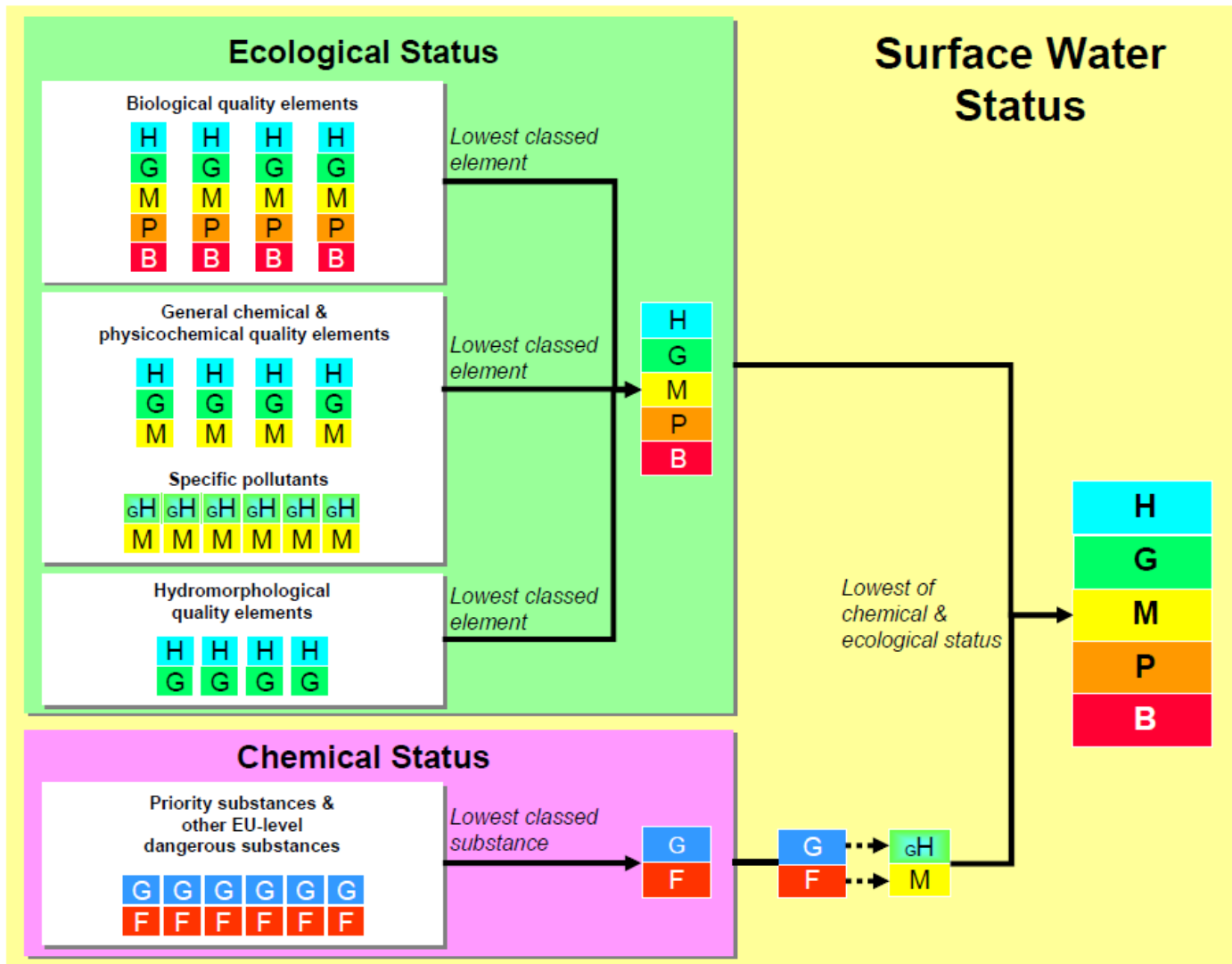


What does the WFD aim to do?

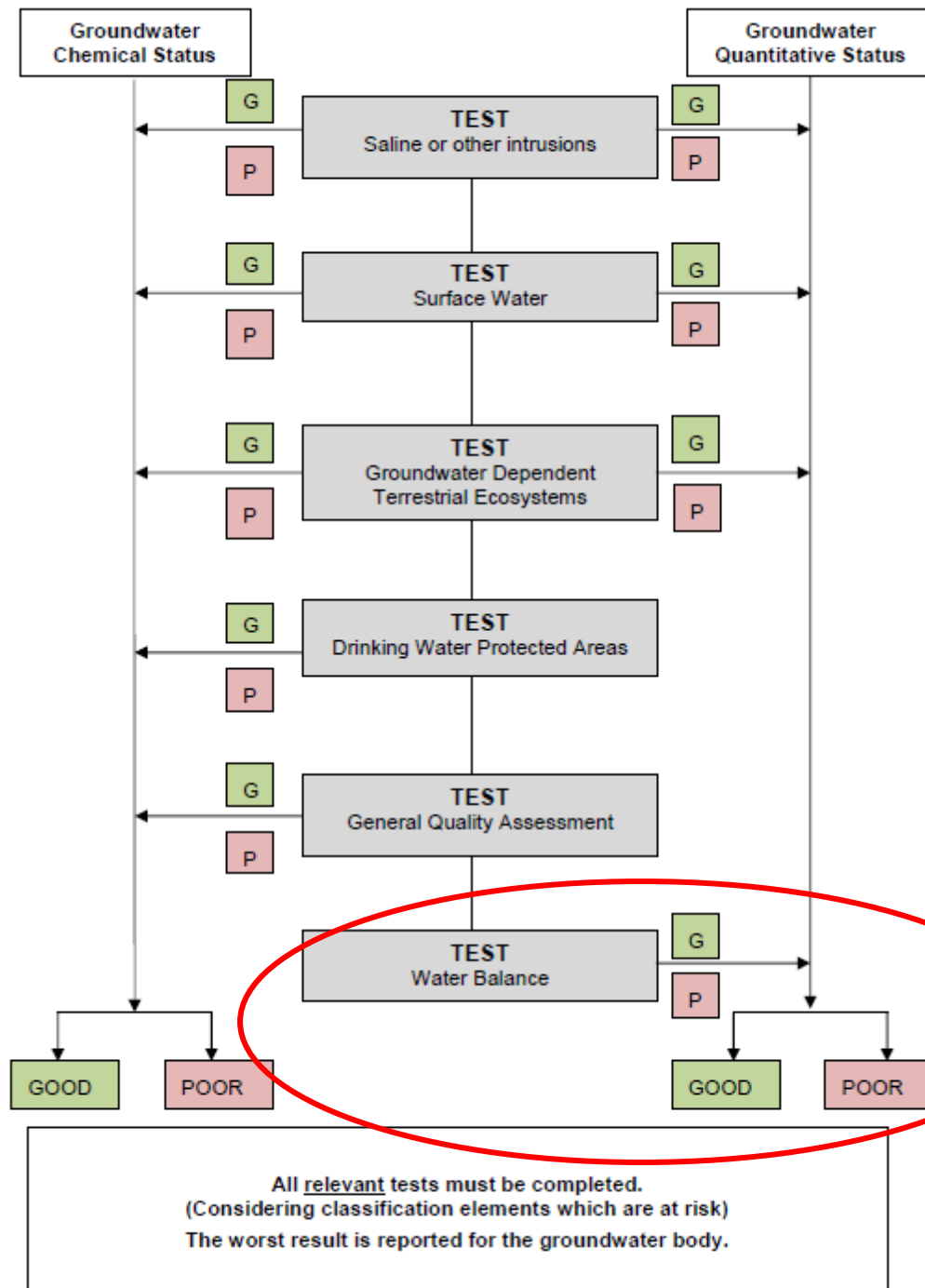
Objectives

- Prevent deterioration
- Achieve good ecological and chemical status in all water bodies by Dec 2021

Surface Water Classification



1. Lowest scoring element determines overall status (one out all out)



Groundwater body status

“For groundwater, we will use the four WFD quantitative tests as the baseline evidence of current pressure and deterioration risk. “

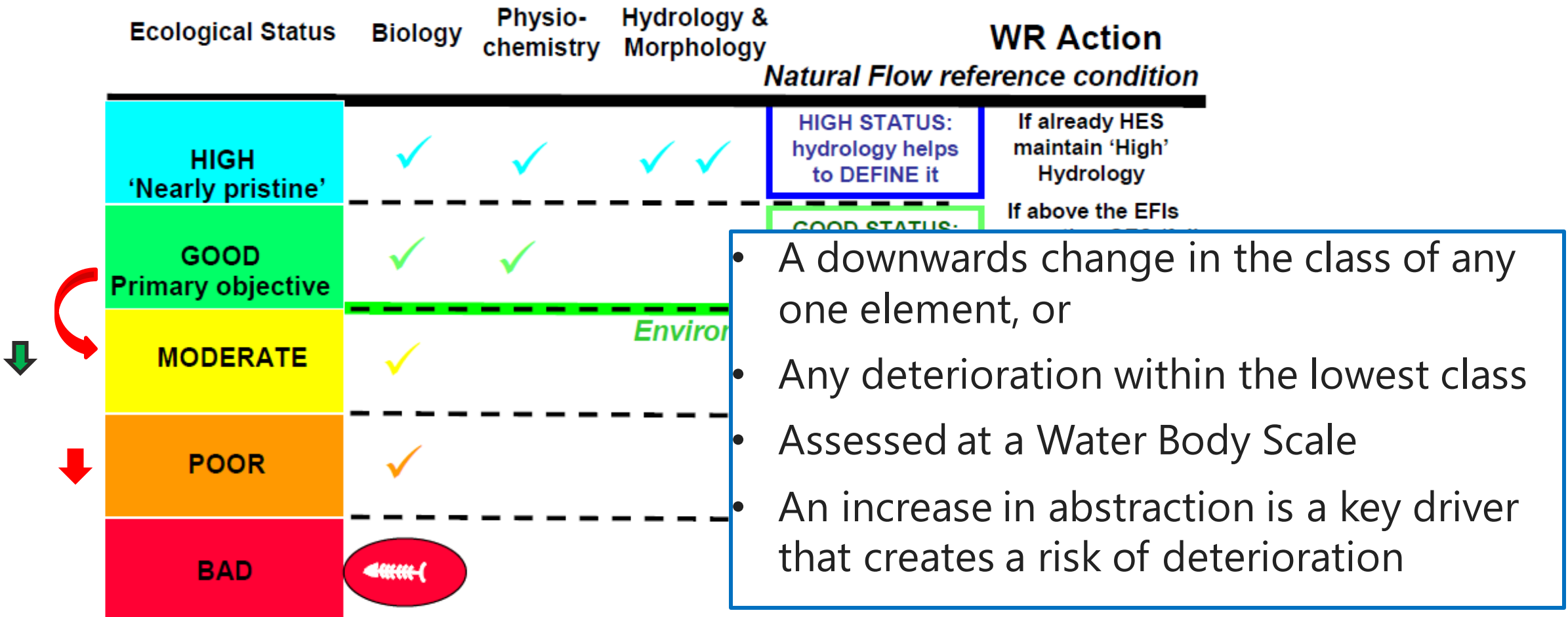
“There is a presumption against increased abstraction within unsustainable groundwater bodies (actual or fully licensed). This includes any increased abstraction to alleviate other environmental issues, for example, river augmentation to achieve flow compliance.”

Environment Agency, 2017
 Approach to Managing Groundwater
 High Level Principles

EA's view of groundwater balance test 2019

- *The WFD Groundwater Quantitative assessment provides evidence for sustainable abstraction to focus on environmental deterioration and damage. Of the four tests, the Groundwater Balance Test is a large scale assessment and is not directly linked to environmental deterioration. Therefore, some have challenged the purpose of the Groundwater Balance Test if the testing of environmental issues is within the other three WFD Groundwater Quantitative Tests.*
- *The Groundwater Balance Test is important as it focuses on other issues not identified through the WFD assessments. Such issues include impact on lakes and level dependent marshes, groundwater levels to maintain springs and river accretion, as well as discharges to the coast to maintain the saline interface and marine ecology.*
- *The Groundwater Balance Test also allows for sensitivity testing around prolonged periods of dry weather. By adjusting the average recharge rate within the groundwater balance allows a quick methodology to interpret if groundwater is in deficit and there is a potential for the environment to be impacted.*

What is deterioration?



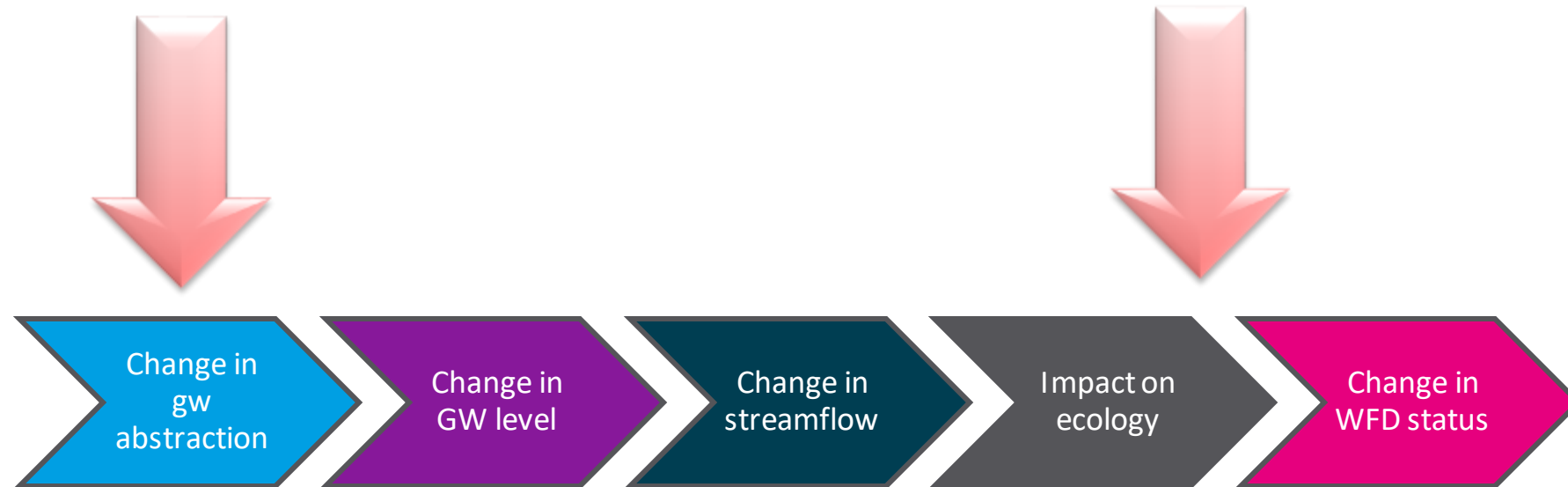
Deterioration

- The Environment Agency (EA) has stated '*The EA will not ... support a proposed change to an existing abstraction ... if it would be likely to lead to a risk of deterioration of water body status (under WFD)*' [even where this increase is within the existing licence constraints]
- EA is concerned with the risk of deterioration (i.e. forward looking) as well as the actual status change. Currently likely to assess risk by considering Fully Licensed rates
- Understanding future risk requires models:
 - Groundwater models to predict effect of abstraction on levels and flows
 - Hydro-ecological models to predict resultant impact on WFD status

Managing the risk of deterioration – surface water bodies

**Key to Risk of
Deterioration**

**Where Deterioration in
WFD status happens**



Easy to
measure
and track

More complex to allocate cause and effect

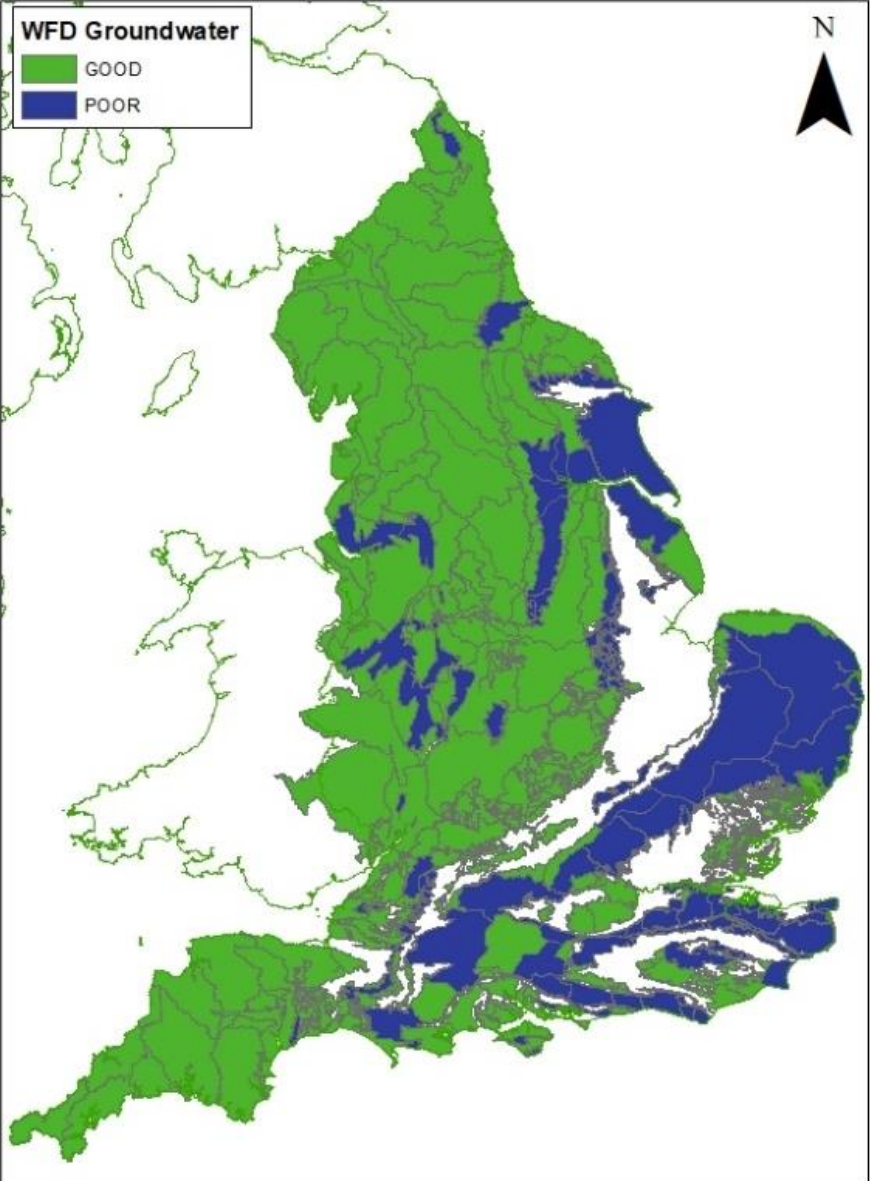


Will take years/decades to materialise
Increasingly other pressures are controlling
status

Lines of Evidence for groundwater bodies

- Conceptual understanding of the aquifer system;
- Connectivity between surface waterbodies [and GWDTEs] and the groundwater body;
- Analysis of groundwater trends;
- Performance during prolonged dry periods;
- Stress testing the groundwater balance under different climatic conditions.

WFD Status



Water availability

Water Availability, HoFs/HoLs

- CAMS = Catchment Abstraction Management Strategy
- Assessment of water availability for licencing (surface water and groundwater)
- HoF = Hands off Flow
- HoL = Hands off Level



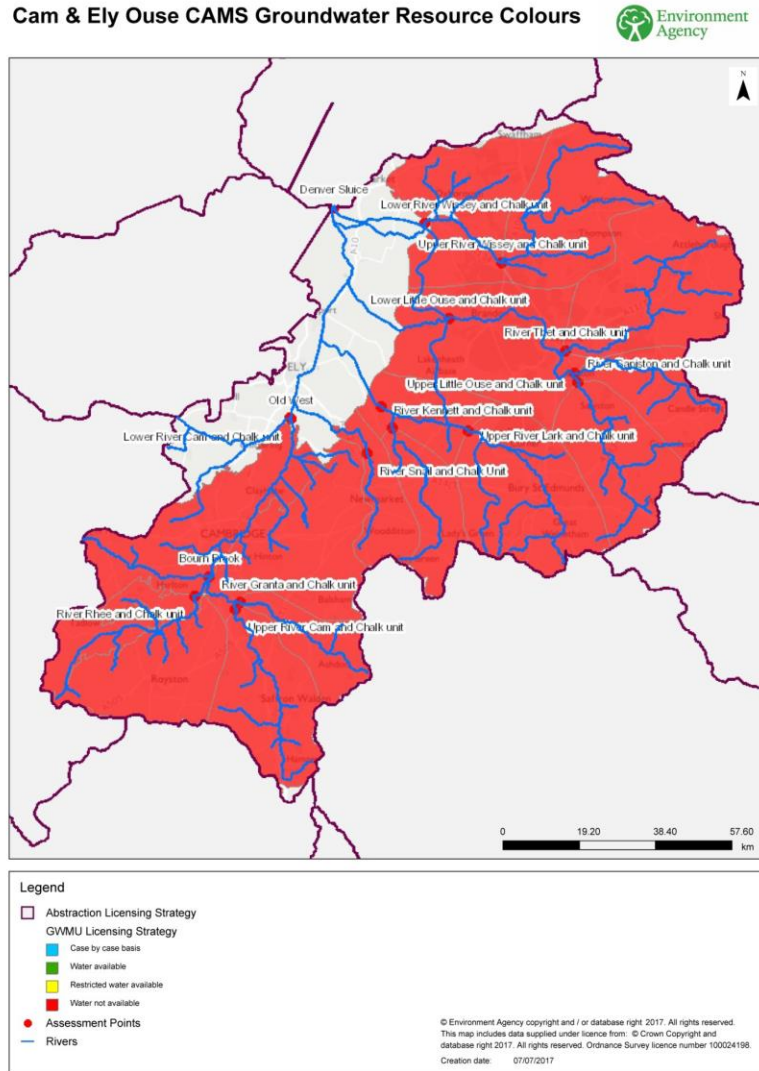
Cam and Ely Ouse abstraction licensing strategy

A strategy to manage water resources sustainably

227_10_SD01 version 7

8 May 2017

Water Availability, HoFs/HoLs



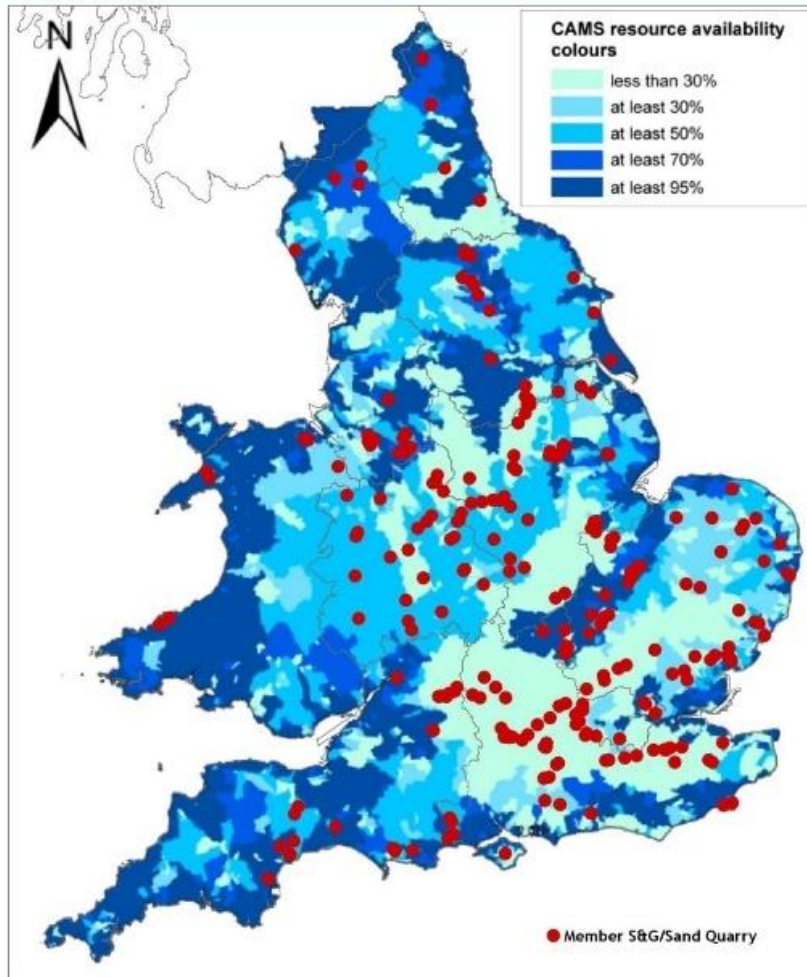
Map 1e. Water resource availability colours in the Cam and Ely Ouse Abstraction Licensing Strategy, specifically for groundwater.

Table 1. Water resource availability colours and their implications for licensing.

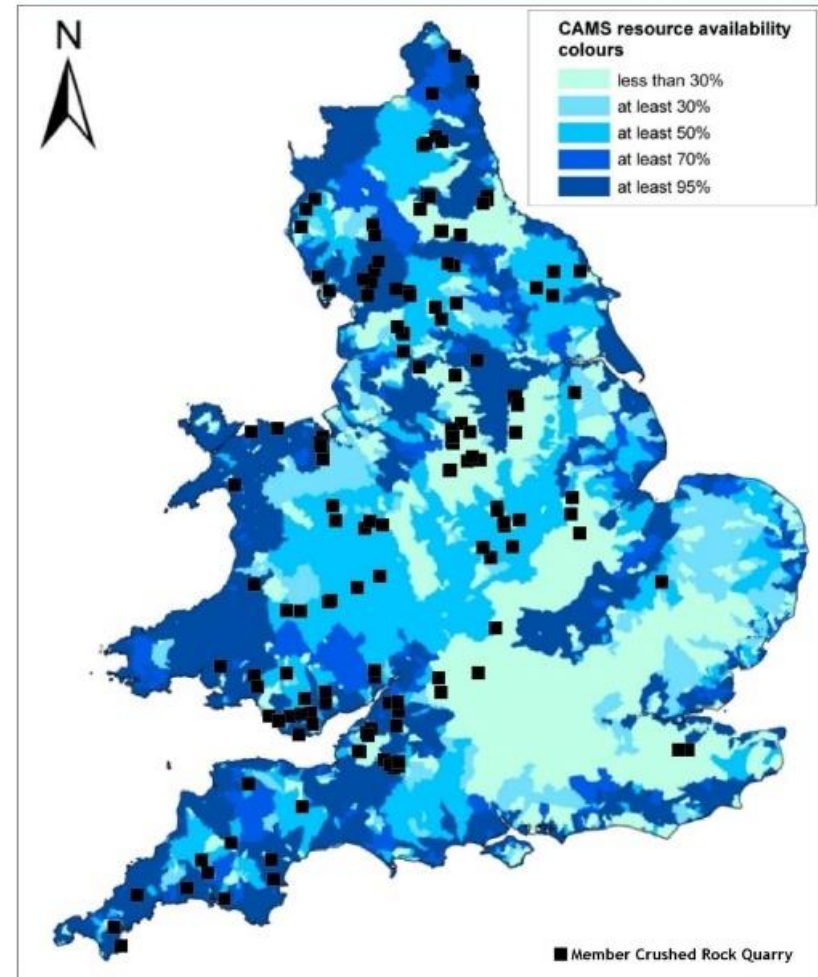
Water resource availability colour	Implication for licensing
High hydrological regime	There is more water than required to meet the needs of the environment. However, due to the need to maintain the near pristine nature of the water body, further abstraction is severely restricted.
Water available for licensing	There is more water than required to meet the needs of the environment. New licences can be considered depending on local and downstream impacts. Some time limited licence renewals may require changes to reflect historic annual usage in order to manage the risk of deterioration to the environment. Abstractions for non-consumptive uses can still be permissible in catchments where there are sustainability issues.
Restricted water available for licensing	Full Licensed flows fall below the Environment Flow Indicators (EFIs). If all licensed water is abstracted there will not be enough water left for the needs of the environment. No new consumptive licences would be granted. Some time limited licence renewals may require changes to reflect historic annual usage in order to manage the risk of deterioration to the environment. It may also be appropriate to investigate the possibilities for reducing fully licensed risks. Water may be available if you can 'buy' (known as licence trading) the entitlement to abstract water from an existing licence holder. Abstractions for non-consumptive uses can still be permissible in catchments where there are sustainability issues.
Water not available for licensing	Recent actual flows are below the EFI. This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status/Potential (GES/P) (as required by the Water Framework Directive). Note: we are currently taking action in water bodies that are not supporting GES / GEP). No further consumptive licences will be granted. Some time limited licence renewals may require changes to reflect historic annual usage in order to manage the risk of deterioration to the environment. Water may be available if you can buy (known as licence trading) the amount equivalent to recently abstracted from an existing licence holder. Abstractions for non-consumptive uses can still be permissible in catchments where there are sustainability issues.
HMWBs (and /or discharge rich water bodies)	These water bodies have a modified flow that is influenced by reservoir compensation releases or they have flows that are augmented. These are often known as 'regulated rivers'. They may be managed through an operating agreement, often held by a water company. The availability of water is dependent on these operating agreements. More detail if applicable can be found in section 4.2.1 Surface Water. Some time limited licence renewals may require changes to reflect historic annual usage in order to manage the risk of deterioration to the environment. There may be water available for abstraction in discharge rich catchments, you need to contact the Environment Agency to find out more. Abstractions for non-consumptive uses can still be permissible in catchments where there are sustainability issues.

Water Availability, HoFs/HoLs

Members' Briefing



Members' Briefing



Serious Damage

Serious Damage

- No formal definition – Defra/WG compensation withdrawal consultation response (Nov 2012)
- Referred to in Water Act 2003 Section 27:



Withdrawal of compensation for certain revocations and variations

(1) This section applies where—

(a) a licence to abstract water is revoked or varied on or after 15th July 2012 in pursuance of a direction under section 54 or 56 of the WRA (which provide for the Secretary of State to direct the [\[F1 appropriate agency\]](#) to revoke or vary a licence in certain circumstances);

(b) the licence was granted before the coming into force of section 19 of this Act;

(c) the licence is one which is expressed to remain in force until revoked; and

(d) the ground for revoking or varying the licence is that the Secretary of State is satisfied that the revocation or variation is necessary in order to protect from **serious damage**—

(i) any inland waters,

(ii) any water contained in underground strata,

(iii) any underground strata themselves,

or any flora or fauna dependent on any of them.

(2) Where this section applies, no compensation is payable under section 61 of the WRA in respect of the revocation or variation of the licence.

(3) Expressions used in sub-paragraphs (i), (ii) and (iii) of subsection (1)(d) are to be construed in accordance with section 221 of the WRA; and “waters”, in relation to a lake, pond, river or watercourse which is for the time being dry, includes its bottom, channel or bed.

Serious Damage

Principle 1: establish the extent and magnitude of the damage; this describes the physical scale of the damage – it can be described as an area of water or habitat, a length of river, the reduction in numbers of individuals in a population or percentage decrease in the size of a population.

Principle 2: establish the qualitative nature of the damage; this describes why what is being damaged is considered important – it can be the status of a river or the designation of a habitat or population.

Principle 3: establish if the damage is reversible and how long recovery may take; this will describe whether the damage is temporary or whether more lasting effects are expected.

Serious Damage

Principle 1: establish the extent and magnitude of the damage

Examples to demonstrate how damage may be assessed to identify whether it is serious damage for Principle 1.	
damage – but not serious	serious damage
A measurable reduction in surface water flow below natural flows.	Complete loss of flow in any river caused by an abstraction.
Substantial loss of flow that has only a localised effect e.g. less than 1km of river.	Substantial reduction in flows e.g. over 60 per cent lower than natural flows and over more than one km of river.
A small loss of habitat attributable to abstraction.	Loss of main groundwater supply to a wetland indicated through cessations of springs and seepages.
Localised destruction of habitat which supports fish or other water-dependent species.	Substantial loss of habitat (e.g. more than 10 per cent of a site).
Low numbers of mortality, not thought to have adverse effects on a local population	Substantial change in habitat type e.g. over more than 30 per cent of a defined site.
	Substantial loss of individuals (e.g. 100 dead juvenile fish, 100 dead crayfish) or large adverse effects on a wildlife population (e.g. more than 10 per cent of a local population).

Table 1: Examples to demonstrate how damage may be assessed to identify whether it is serious damage for Principle 1.

Serious Damage

Principle 2: establish the qualitative nature of the damage

Examples to demonstrate how damage may be assessed to identify whether it is serious damage for Principle 2.

damage – but not serious	serious damage
<p>Deterioration in flow as a supporting element of WFD status, but no measurable change in overall WFD classified status.</p> <p>WFD Groundwater body status remains above poor and drawdown effects are localised.</p> <p>Damage to flora and fauna notified under section 28 the Wildlife and Countryside Act 1981 or protected by the Habitats Regs; but that is considered localised and does not affect the integrity of the protected flora/fauna and site²¹.</p> <p>Damage to modified (agriculturally improved) or degraded land.</p> <p>Localised damage to native flora and fauna not thought to affect viability of the species at that site.</p>	<p>Deterioration in WFD water body classified status which is caused by an abstraction pressure.</p> <p>Deterioration in WFD groundwater body status overall to poor.</p> <p>Damage to flora and fauna notified under section 28 the Wildlife and Countryside Act 1981 or protected by the Habitats Regs where the level of damage has an adverse effect on the integrity of the protected flora/fauna and/or site²².</p> <p>Destruction or major damage to part of a statutory protected site.</p> <p>Extinction of a protected species or habitat from a specific area.</p> <p>Extensive damage to habitat, or death of native flora or fauna typical to the habitat.</p> <p>Extensive damage to Biodiversity Action Plan (BAP) species (on any stage of the life cycle) or habitat.</p>

Table 2: Examples to demonstrate how damage may be assessed to identify whether it is serious damage for Principle 2.

Serious Damage

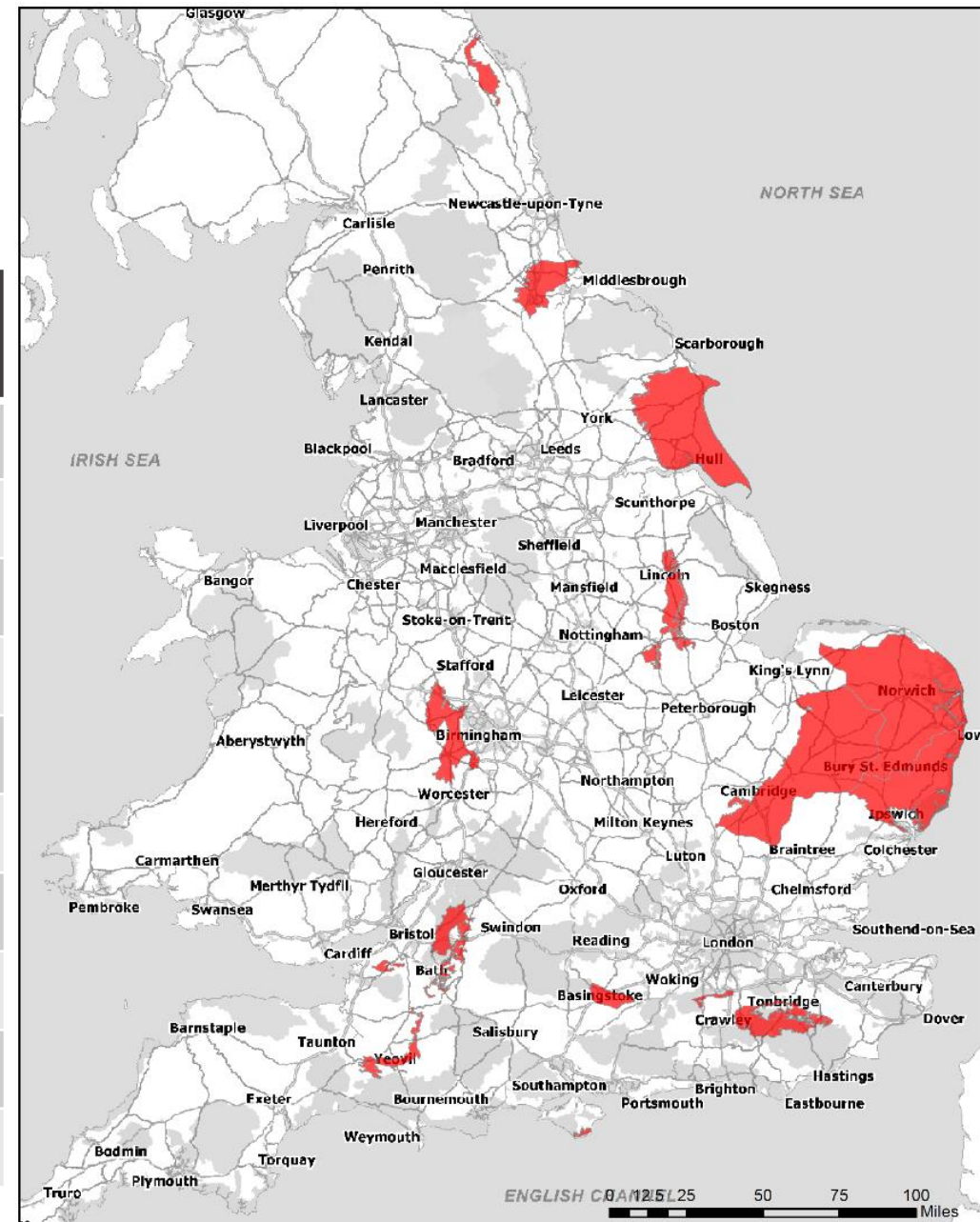
Principle 3: establish if the damage is reversible and how long recovery may take

Examples to illustrate how damage may be assessed to identify whether it is serious damage for Principle 3.	
damage – but not serious	serious damage
<p>Substantial loss of flow seen only during drought conditions.</p> <p>Substantial, but temporary, loss of flow where any effects are reversed after a short period of time.</p> <p>Short-term loss of habitat but outside of key life stages of fauna dependant on that habitat.</p>	<p>Substantial loss of flow which is visible outside of drought periods.</p> <p>Reduction of flow outside of drought periods which restricts fish movement during key life stages – for example upstream / downstream migration or loss of juvenile holding areas.</p> <p>Permanent loss of native species or habitat.</p> <p>Short-term loss of habitat during key life stages not caused by drought. For example</p>
	<p>drying out of pools during or after amphibian spawning or lowering of water levels and drying of marginal river habitat during or after fish spawning.</p> <p>Reduced long term distribution and abundance of populations.</p> <p>Reduced capacity for natural regeneration.</p>

Table 3: Examples to illustrate how damage may be assessed to identify whether it is serious damage for Principle 3.

Serious Damage

EA Area	No. of groundwater bodies
Cambridgeshire and Bedfordshire	1
Essex Norfolk and Suffolk	2
Kent and South London	2
Lincolnshire and Northamptonshire	3
Northumberland Durham and Tees	2
Shropshire Herefordshire Worcestershire and Gloucestershire	1
Solent and South Downs	1
Wessex	4
West Thames	1
Yorkshire	1



Serious Damage Groundwater bodies

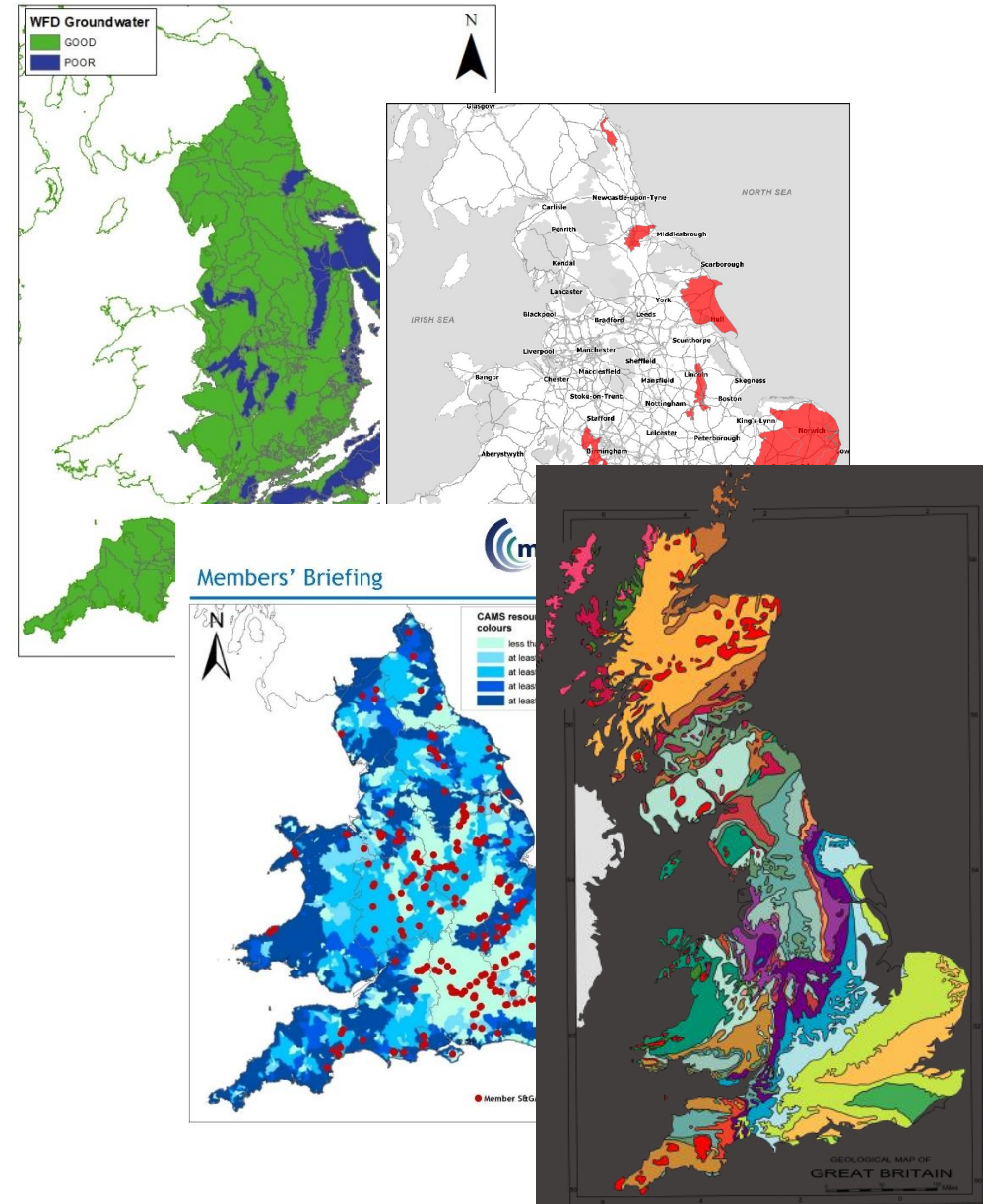


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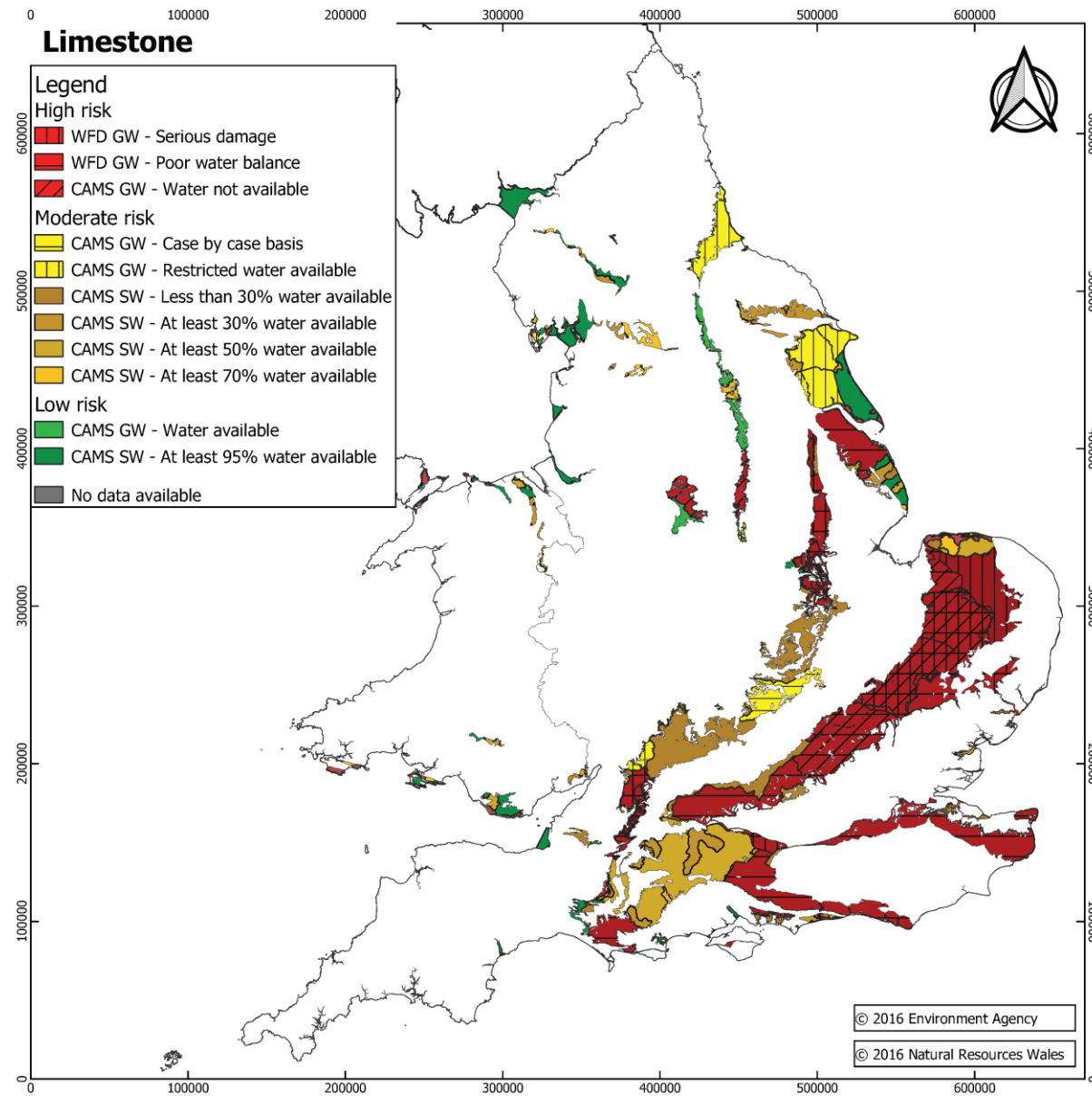
Risk Assessment

Risk Assessment – Approach and Methodology

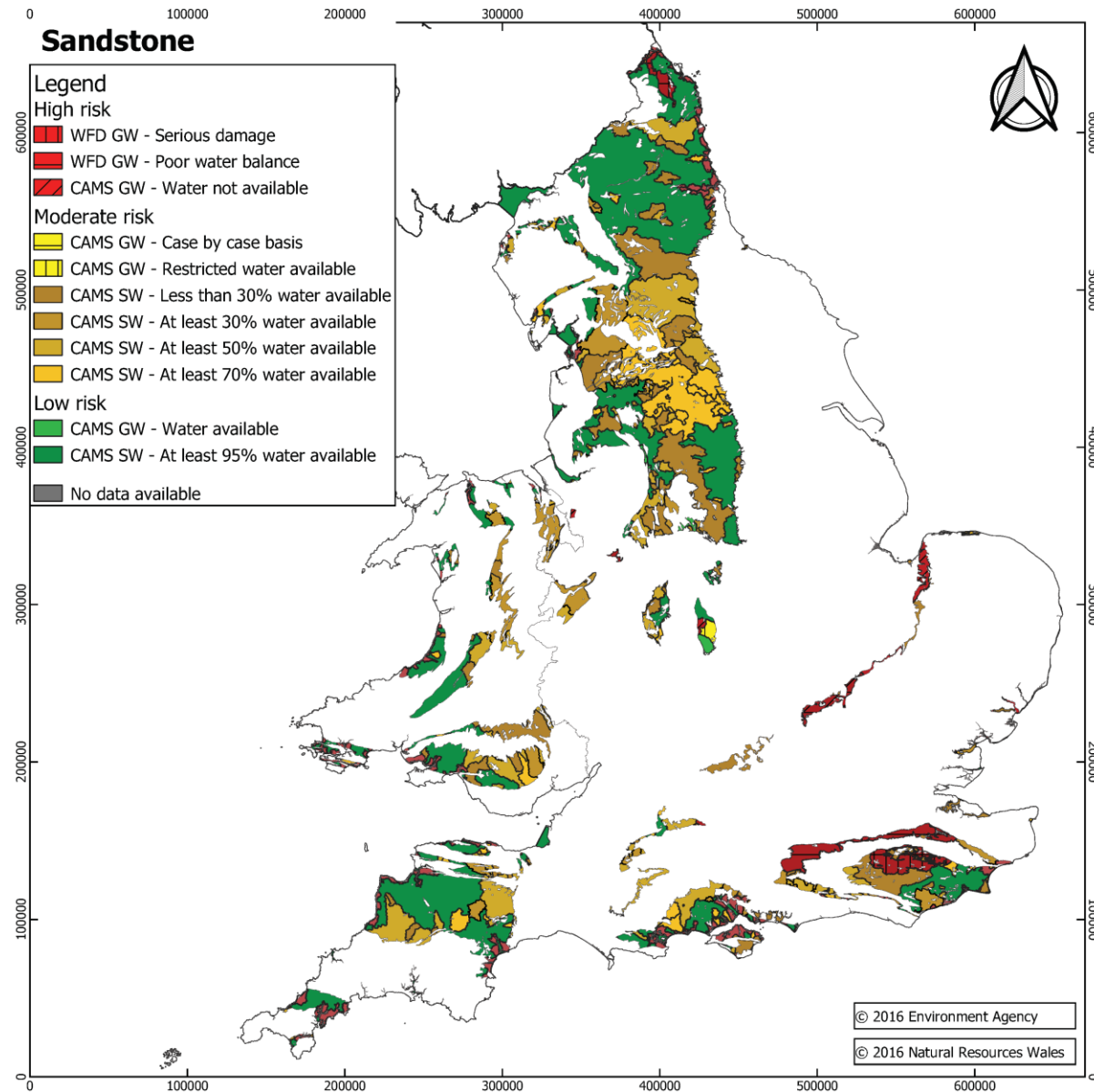
- Purpose:
 - How do new water resources considerations affect development risk nationally?
 - What is the scale of the issue?
- Consider “new” nationwide datasets
- Clip to geology/location of mineral
- First pass/screening assessment
- Assign risk class:
 - **High risk** = low to zero chance of securing a licence (no water available or Serious Damage or poor WB)
 - **Moderate risk** = moderate chance of securing a licence or high risk of restrictions (restricted water availability)
 - **Low risk** = high chance of securing a licence (water available)
 - **Unknown** – Insufficient data to determine risk class



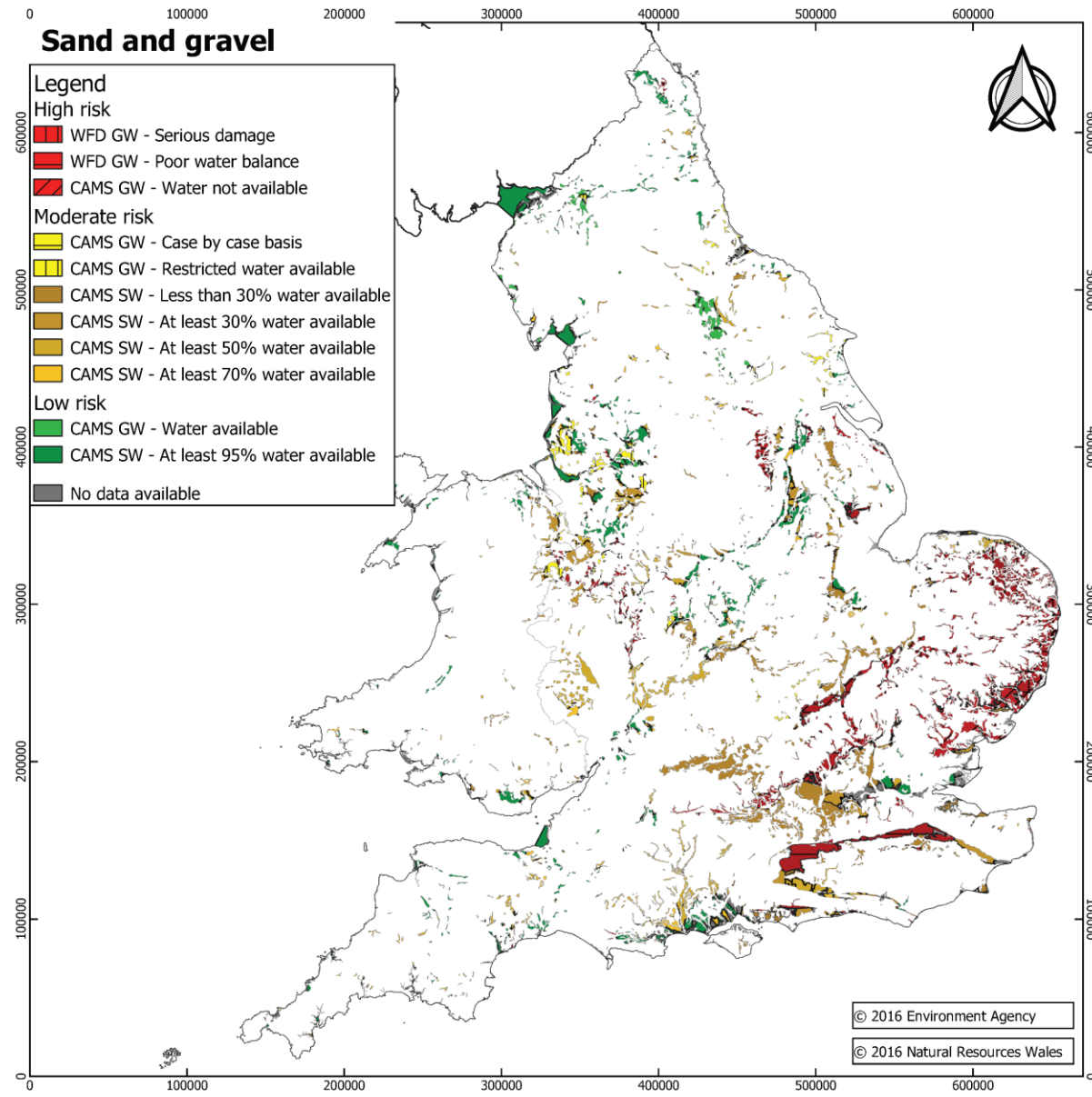
Risk Assessment - Results



Risk Assessment - Results

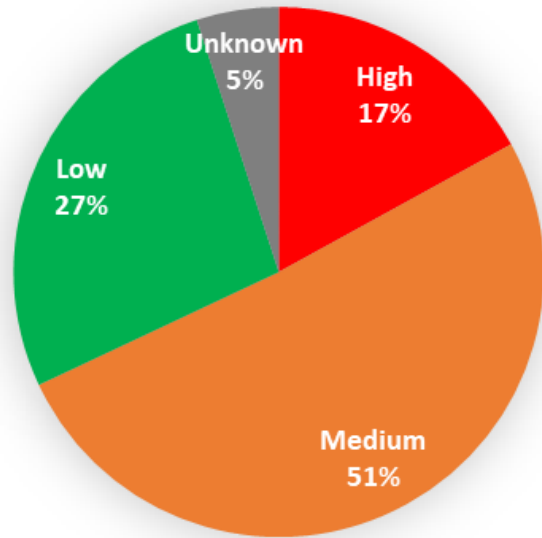


Risk Assessment - Results

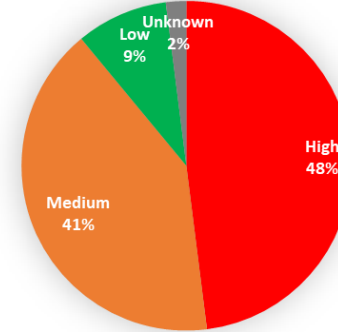


Risk Assessment

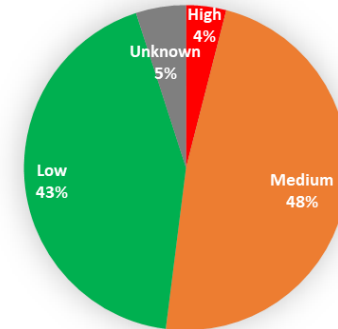
Total (% Area)



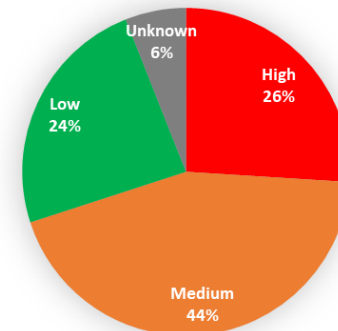
Limestone (% Area)



Sandstone (% Area)



Sand and Gravel (% Area)



Solutions

Solutions – Licence Trading

- Agreement to hand over part or all of a water right
- Application to EA.
- Check local environment data and maps or contact EA to find potential trading partners.
- Types:
 - Whole, permanent
 - Whole, temporary
 - Part, permanent
 - Part, temporary
- Issues
 - Lack of suitable partners
 - Timeframes (EA, partner negotiations)
 - Financial risk
 - Uncertain outcome



Solutions – Working Wet

- No dewatering – mineral excavated below water
- No licence, avoids resource issues
- Issues
 - Depth of mineral and shallow water table
 - Type of mineral (hard rock v. S&G; unsuitable for fine sands)
 - Requires suitable platform for plant
 - Reduced bucket recovery
 - Additional draining time and re-handling
 - Increased costs



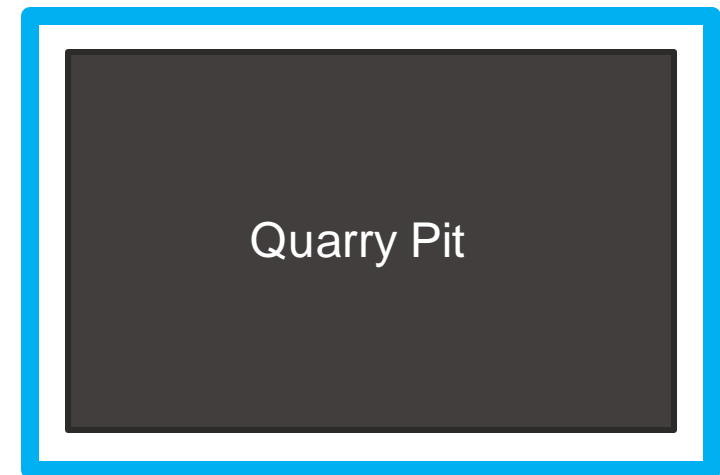
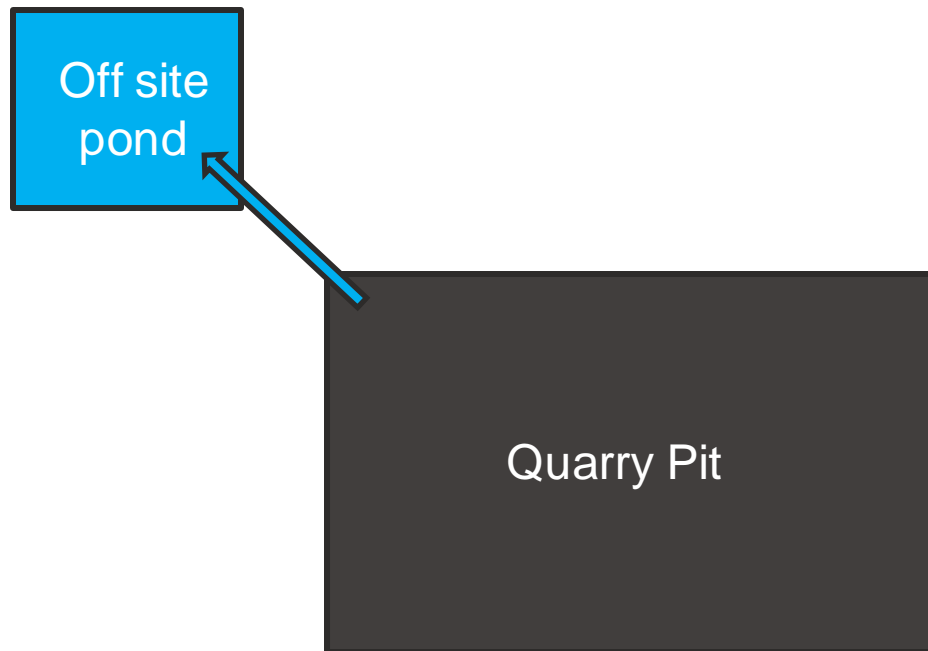
Solutions – Infiltration

- Dewater but return water to aquifer
- Requires abstraction licence but net zero (almost) loss of groundwater resource
- Issues
 - Still requires abstraction licence
 - May require discharge permit
 - Location and space
 - Potentially increased pumping
 - Infiltration capacity/hydraulics



Solutions – Infiltration

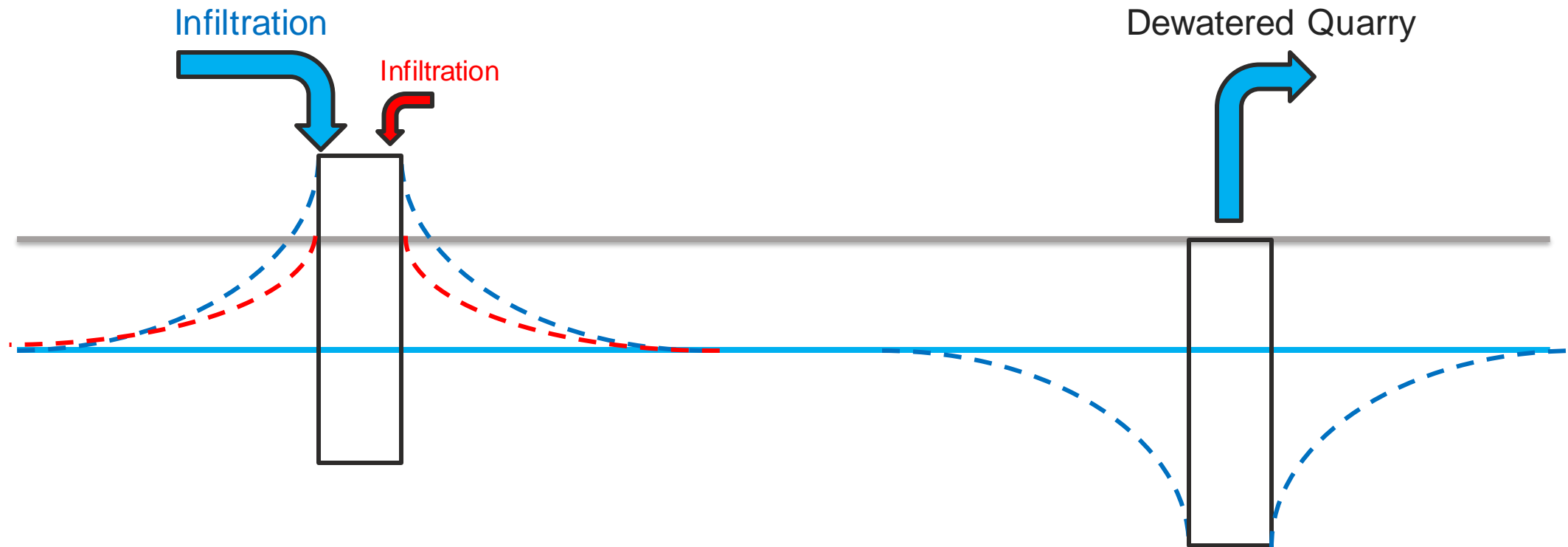
- Location
 - New sites vs existing/extensions
 - Space



Perimeter infiltration trench

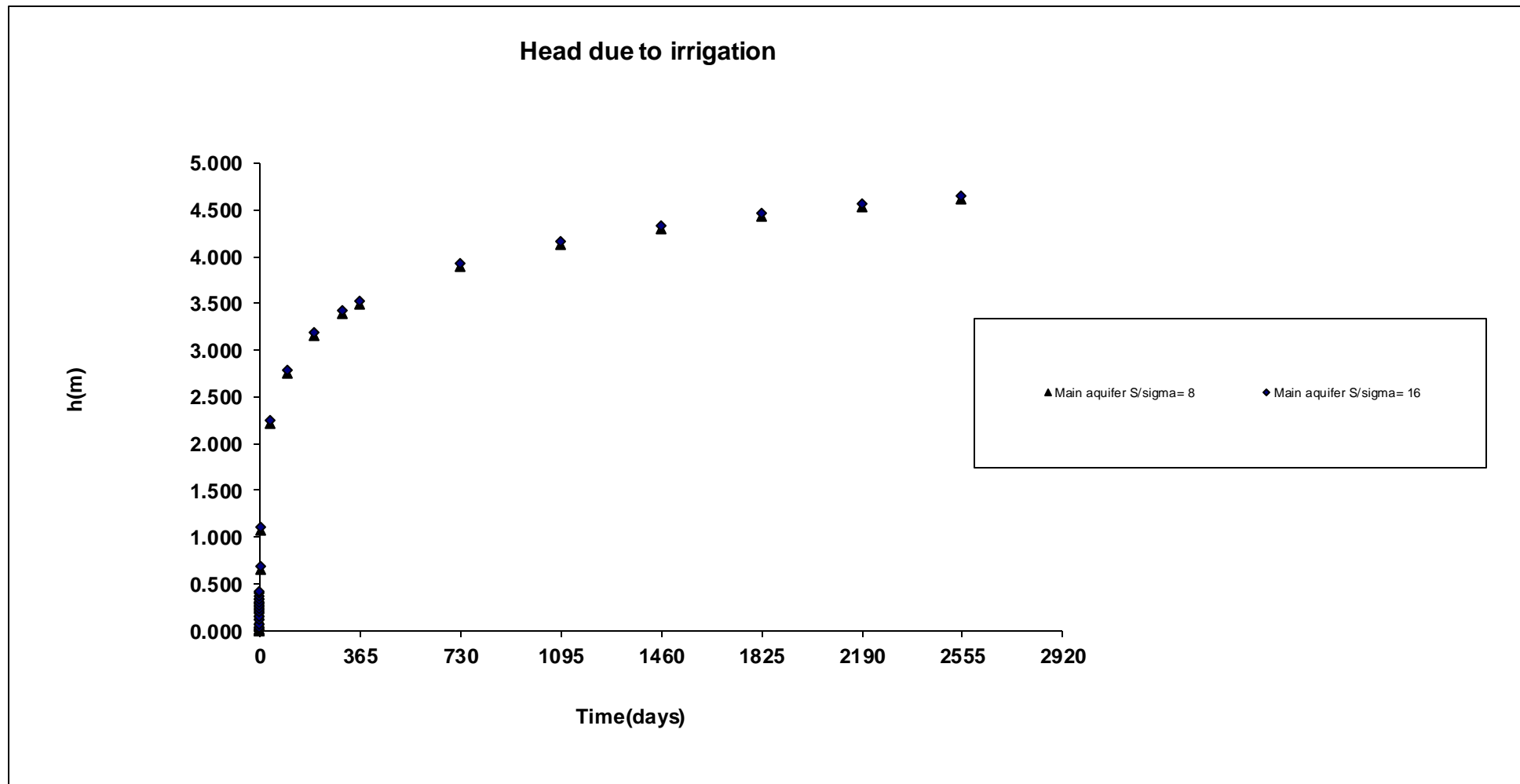
Solutions – Infiltration

- Infiltration capacity – infiltration testing (long-term vs short term capacity)
- Upconing/Mounding
 - Geometry dependent
 - Location dependent
 - Unsaturated zone thickness



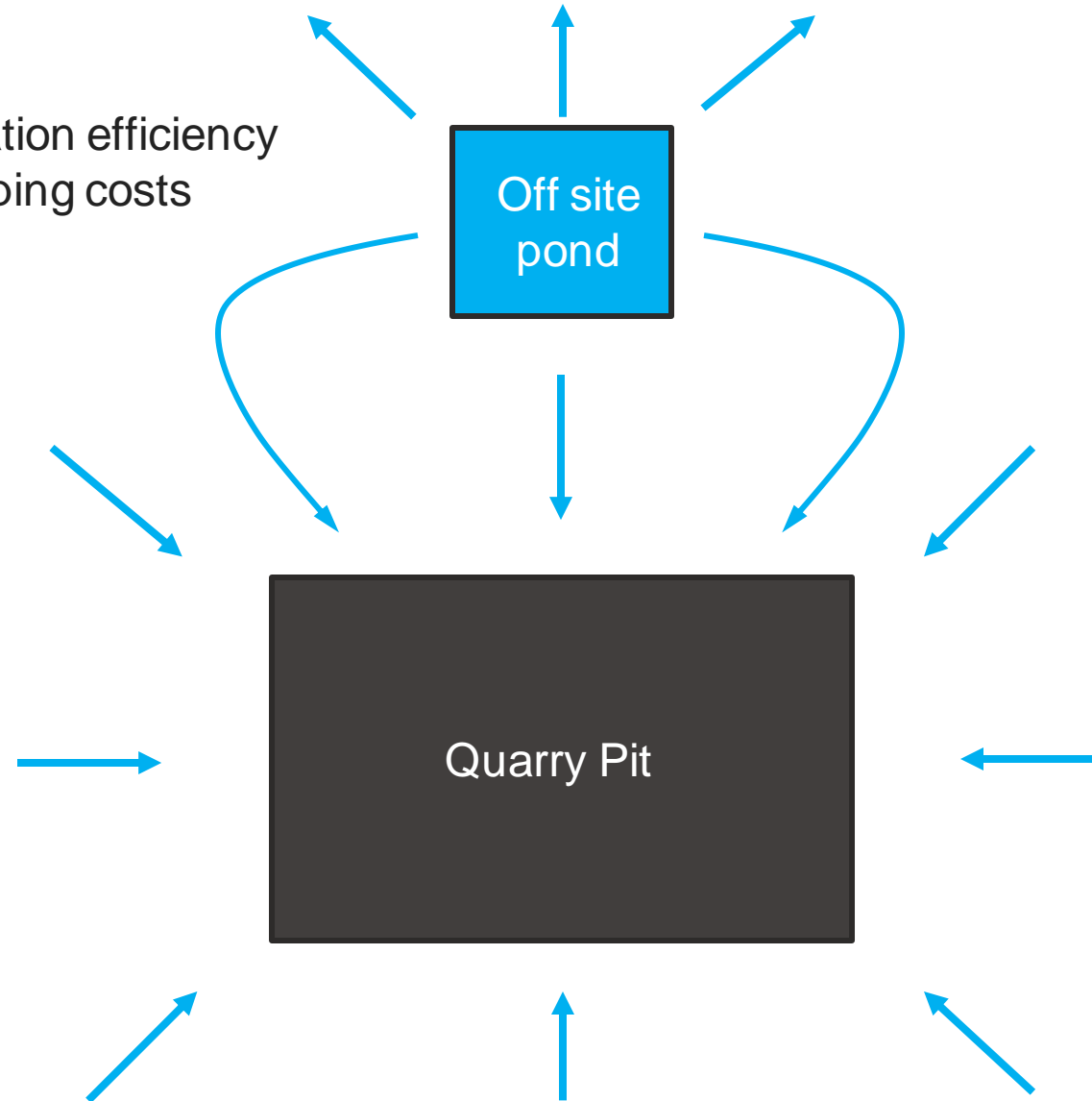
Solutions – Infiltration

- Time dependent level/rate



Solutions – Infiltration

- Recirculation
 - Reduced infiltration efficiency
 - Increased pumping costs



Solutions – Regulatory



The way forward

The way forward

- Water resource/licencing considerations – significant risk
 - No-go areas
 - Increased costs
 - Impact on ability to deliver mineral/replenishment
 - Industry and regulator are in learning process
 - **It's already impacting / preventing development**
- Consider early – twin track planning/permitting (licencing)
- No easy, one size fits all solutions
- Requires industry-wide response and regulator engagement
- Refined risk assessment/GIS tools for planning (e.g. depth to water table)
- Potential for development of industry guidelines for dealing with dewatering (who pays?)

Q & A

