Pennon

Carolyn Cadman

Chief Sustainability and Natural Resources Officer

South West Water

resilience in the water sector

The water cycle…

The social water cycle…

More extreme weather events

- Fivefold increase for heavy rainfall events
- 17% increase in extremely wet days
- Increasing risk of flooding

Hotter and drier summers

- Reservoir levels lower
- River abstraction reduced equivalent to supplying 250,000 people
- Raw water quality impacted

Rising sea levels

- Large coastal population
- 1/5 of our treatment works at risk
- 100's kilometres of network

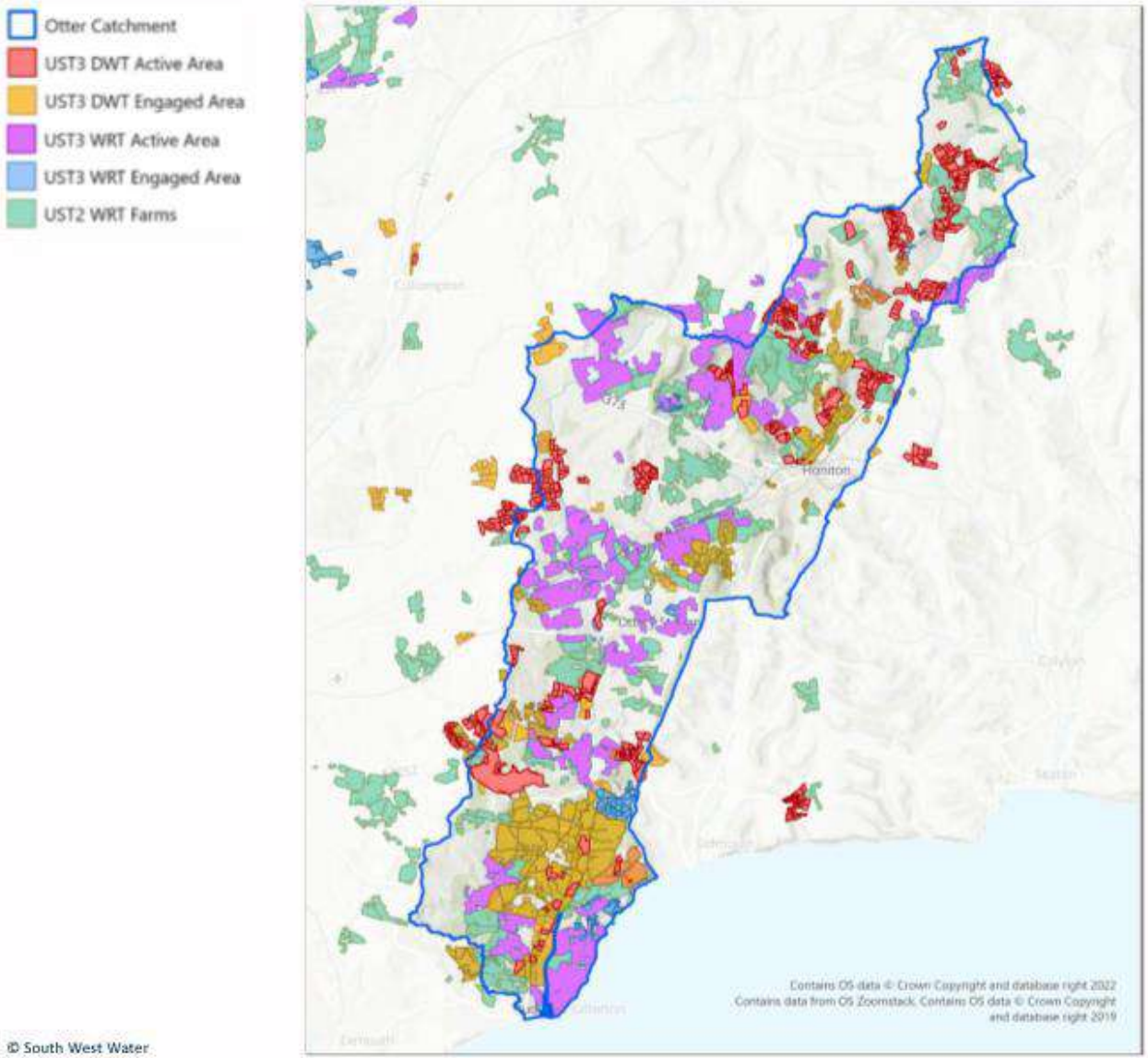
Growing population

- Another half a million residents by 2050
- 10 million tourists visit the region every year

why does resilience matter?

slowing the flow

Our Upstream Thinking investment in the Otter Valley



- Farm infrastructure
- Farm tracks
- Spreader calibration
- Sediment fencing
- Porous pots

Devon

0 5 10 Kilometers

“do the green bits first”

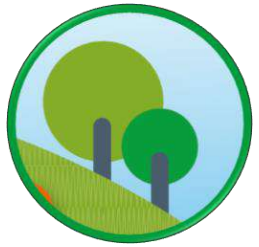
Our Green First Approach

Taking a catchment view
We know that by looking at the whole catchment using a Green First approach we may also solve other challenges, such as pollution or flooding reduction.

Green First assumes that a nature-based (green) solution will be considered from the outset.

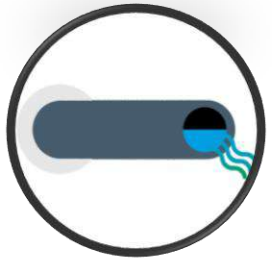
We will make best value decisions to determine if the solution needs to be adapted and amended from this starting point.

This approach will maximise the potential to prioritise nature-based solutions to resolve business needs.



Green Solutions
- ✓ Slowing the flow
- ✓ Ecologically-driven processes
- ✓ Wider benefits for people & place

Blue Solutions
- ✓ Managing the flow
- ✓ Reducing or removing rainfall, inflow and infiltration
- ✓ Avoiding pumping & treatment



Grey Solutions
- ✓ Storing the flow
- ✓ Increasing speed through the system
- ✓ Increasing treatment capacity


Sidmouth

Natural Catchment Management Plans

South West Water is leading a pilot programme to develop shared understanding and action plans to tackle water management challenges in 15 natural catchments with local partners and communities.

Digital Twin

Working with experts we have created a prototype digital twin of the Trevaunance Cove catchment in St Agnes in Cornwall finding new ways to engage local communities and residents in the water management challenges in their area.

Layers of local evidence on biodiversity, wastewater, topography, residential development

These layers are gathered to diagnose local issues and determine solutions in partnership with the local community and landowners which feed into the digital twin.

Green First

The workshop discussions also identify local opportunities to use natural processes and nature-based solutions – e.g. slowing the flow of water into the sewerage network through tree-planting and other natural techniques.

Below **Workshops in Sidmouth, Devon and St Agnes, Cornwall**

Below **Prototype digital twin of St Agnes, layers of evidence for the St Agnes Natural Catchment Management Plan**

Natural Catchment Overview

Landscape, society & culture

The River Sid is one of Devon's smallest and most compact rivers, being only ~10km (6 miles) in length. It rises 190m (620ft) above sea level and flows through a predominantly rural catchment. It flows through the villages of Sidbury and Sidford before reaching the sea at Sidmouth.

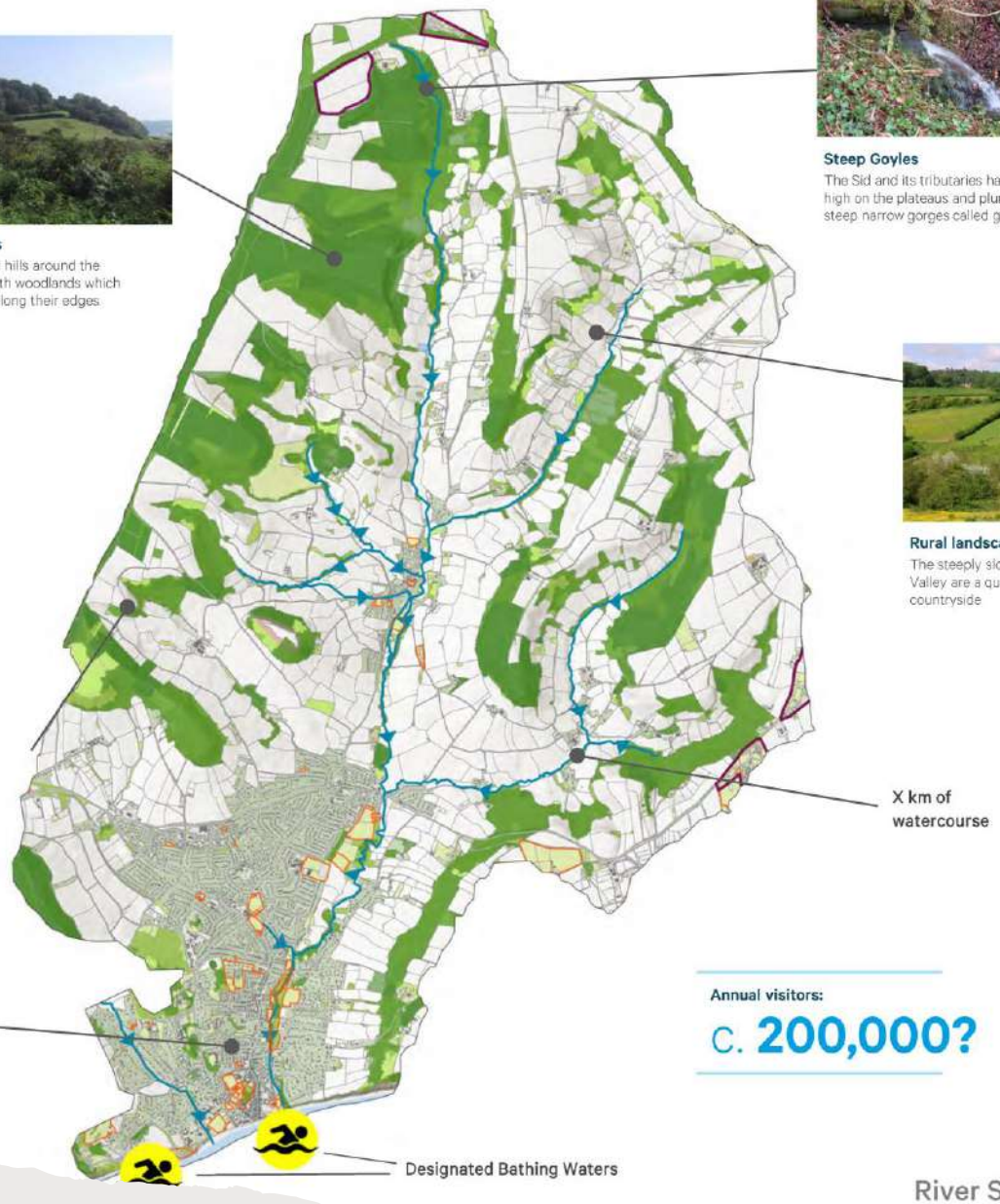
Wooded Hill Tops
The high flat-topped hills around the valley are capped with woodlands which have many springs along their edges.

Steep Goyles
The Sid and its tributaries have their sources high on the plateaus and plunge down into steep narrow gorges called goyles

Rural landscape
The steeply sloping sides of the Sid Valley are a quintessential rolling Devon countryside

Population:
C. **14,377**

Population centres
Sidmouth, Sidford, Sidbury



Annual visitors:
C. **200,000?**

Key stakeholders

Sid Valley Biodiversity Group

SIDMOUTH TOWN COUNCIL

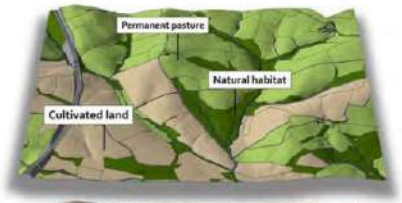
++ residents, businesses, visitors, professional bodies, catchment partnership, etc

River Sid Catchment

Natural water system

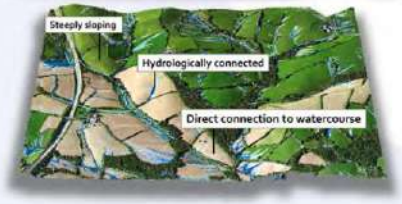
Structure and function

The natural water system involves the continuous cycling of water through processes like evaporation, condensation, and precipitation, maintaining the Earth's water balance.



Landcover / Land use

Soil character and health



Hydrological connectivity

Surface Water Flow Paths
- Small Tributaries
- Main Streams

Agricultural land use
These areas should be permeable and promote infiltration of water if they are in good condition.

Surface watercourses

High hydrological connectivity
Areas where there is an elevated likelihood of surface runoff

Soil Type

NSRI Soilscapes
- Slightly acid loamy and clayey soils with impeded drainage
- Freely draining slightly acid loamy soils
- Slowly permeable seasonally wet acid loamy and clayey soils

River Sid Catchment

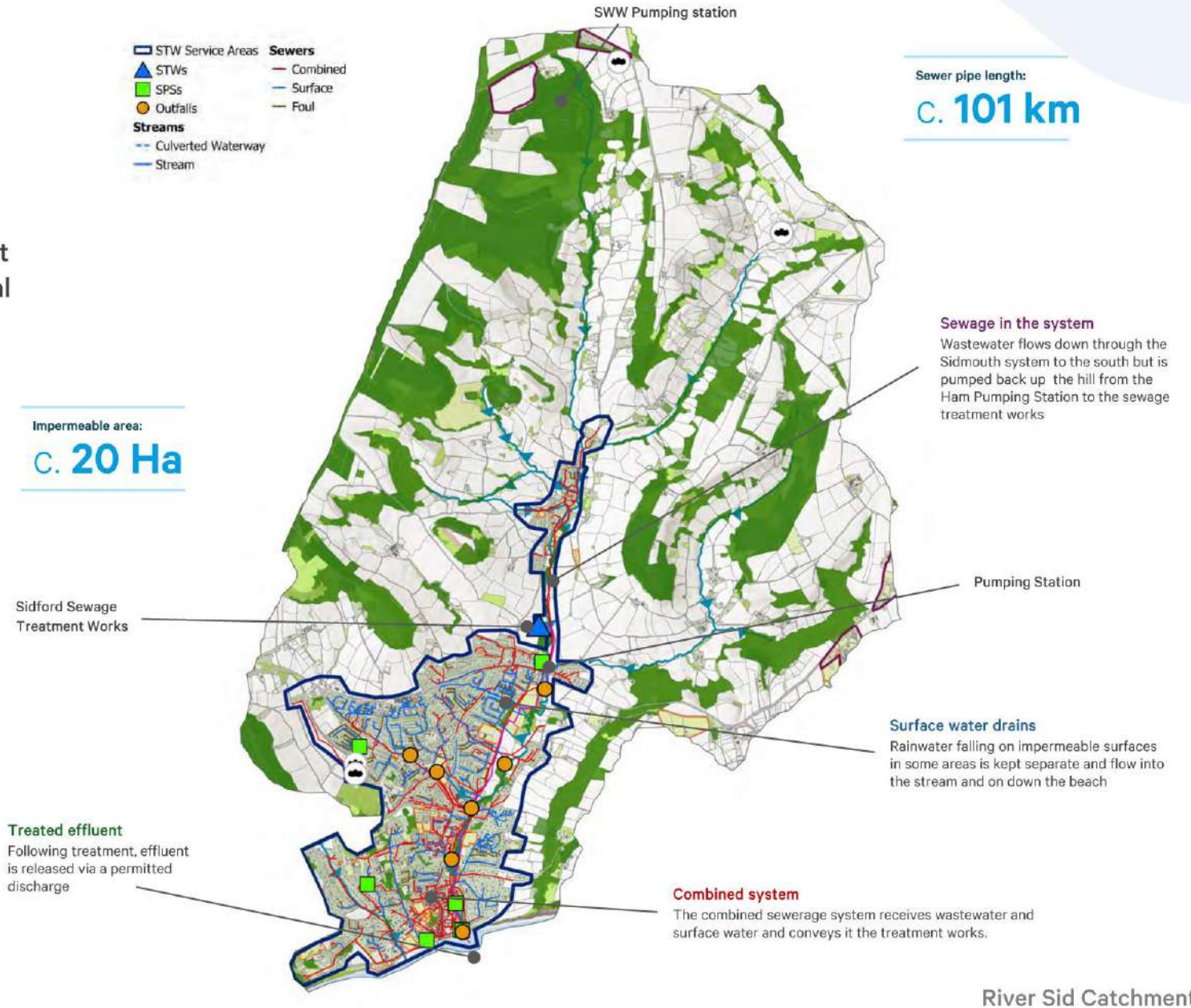
Human water system

Structure and function

The human water system involves the management, distribution, and use of water resources by societies.

It includes activities such as water extraction, treatment and distribution for domestic, agricultural, and industrial purposes, and drainage and wastewater treatment and management.

More detailed view of the drainage and sewerage network in Sidmouth



Water management challenges

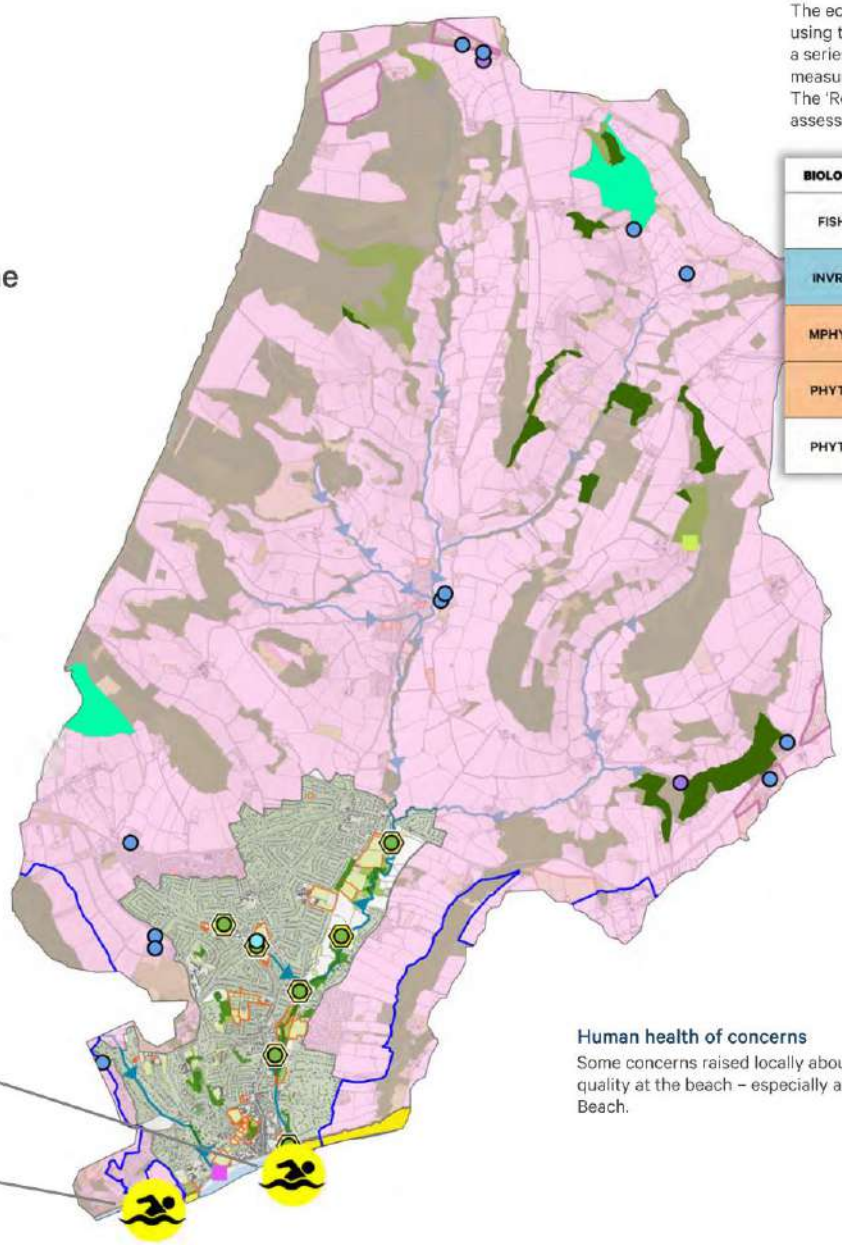
Priorities, drivers and problems

To understand the water management challenges faced in a natural catchment, we first identify the priorities and drivers that relate to the landscape and then determine what impact the performance or health of the water system is having on them.

Ecological health of watercourses

The ecological health of watercourses is assessed using the WFD Classification system, which looks at a series of biological and physicochemical measures to assess the overall condition (status). The 'Reasons for Not Achieving Good' are also assessed where failures are recorded

BIOLOGY	PHYS-CHEM	HYD-MORPH	CHEMISTRY
FISH	TEMP	HYDRO	CHEM STATUS
INVRT	DIS-O	MORPH	
MPHYT	pH	INNS	
PHYTB	PHOS	ECO STATUS	OVERALL STATUS
PHYTP	SPEC		



Overflow Spills

Sewer overflows are monitored and spills number and duration are reported to the Environment Agency each year

Other events

Bathing Water Classification

Bathing water monitoring and assessments are carried out by the Environment Agency between May and September.

2021	2022	2023
E	E	E

2021	2022	2023
E	E	E

'E' = Excellent Status

Human health of concerns

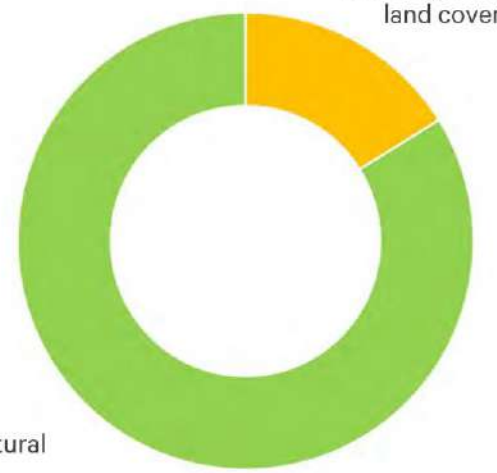
Some concerns raised locally about water quality at the beach – especially at Town Beach.

Diagnosing the issues

Sources and mechanisms: **land management**

Farming practices can also have an impact on way water moves through the catchment and can influence both the amount of water that ends up in rivers and streams and how long it takes to get there.

- Soil erosion and sediment
- Fertilisers – nutrients
- Pesticides, herbicides, and other chemicals
- Slurry and manure



Imagery reflects farming land use since 2019

Arable farming

Area of arable:
500Ha

Area of grassland:
2,600Ha

Grassland / livestock

Our infrastructure investment in Sidmouth

Sidmouth Programme outcomes

The Ham PS overflows	Reduce to 10 spills/year • 2 spills/bathing season
Fortescue CSO	Reduce to 10 spills/year • Installation of new screen
Manstone CSO	Reduce to 10 spills/year • Installation of new screen
Tipton St John PS overflow	Reduce to 10 spills/year • Installation of new screen

Target is to substantially outperform Compliance Date of March 2028

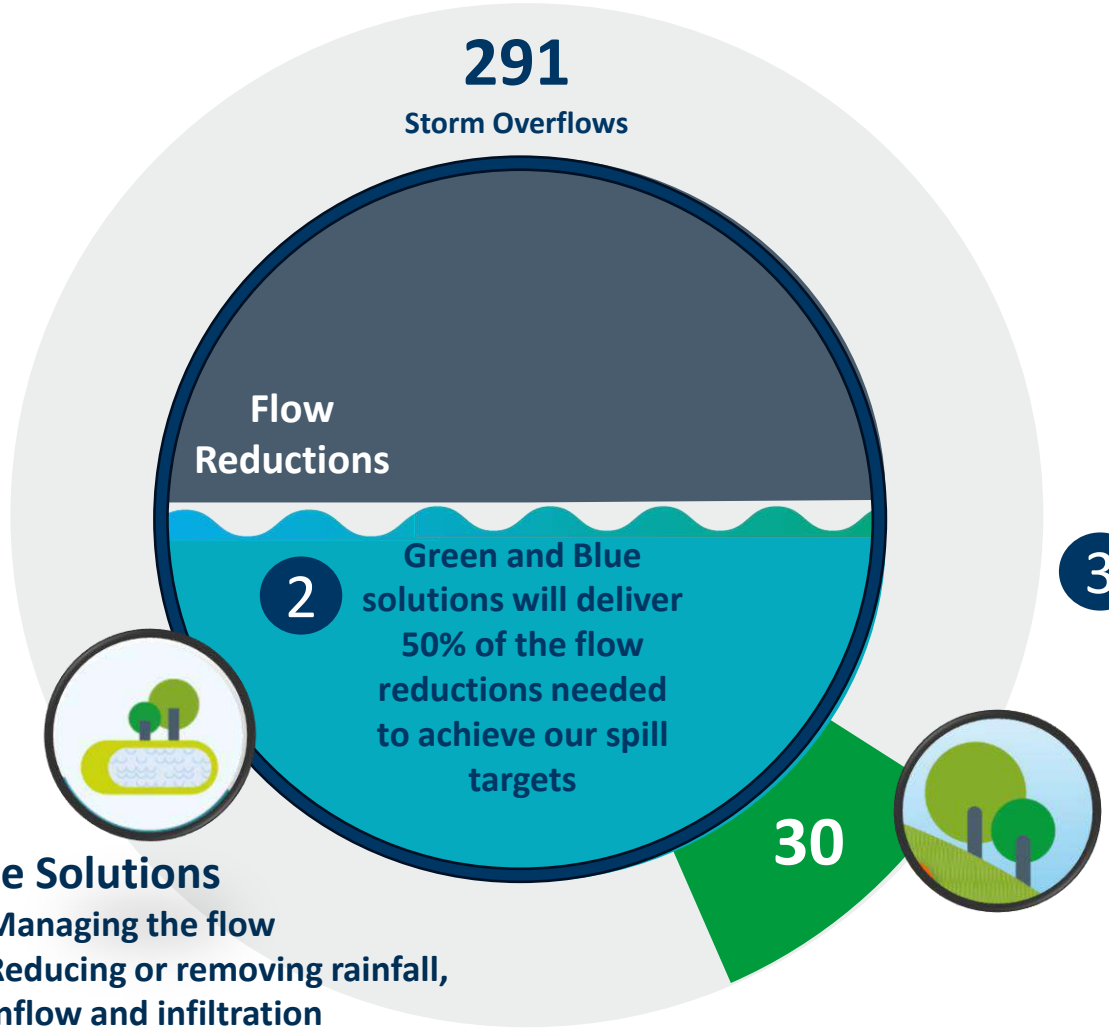
Our AMP8 Targets for Green First

Delivering spill reductions

Decision-making Framework

AMP8 Storm Overflow Programme

1 **We'll triage our full AMP8 programme to look for opportunities to deliver green & blue solutions**



Blue Solutions

- ✓ Managing the flow
- ✓ Reducing or removing rainfall, inflow and infiltration
- ✓ Avoiding pumping & treatment

3 **We'll demonstrate Green solutions at 30 overflows in AMP8**

Green Solutions

- ✓ Slowing the flow
- ✓ Ecologically-driven processes
- ✓ Wider benefits for people & place

Green Solutions - Rural

Eliminate flows → Reduce flows → Attenuate flows → Increase network capacity

Green Solutions

- ✓ **Slowing the flow**
- ✓ **Ecologically-driven processes**
- ✓ **Wider benefits for people & place**

Upstream catchment management

- Ponds
- On contour swales
- Leaky dams

Green & Blue Solutions - Urban

Eliminate flows → Reduce flows → Attenuate flows → Increase network capacity

Green Solutions

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- ✓ **Ecologically-driven processes**
- ✓ **Wider benefits for people & place**

Blue Solutions

- ✓ **Managing the flow**
- ✓ **Reducing or removing rainfall, inflow and infiltration**
- ✓ **Avoiding pumping & treatment**

Sustainable Urban Drainage

- Rain Gardens
- Tree pits
- Swales & Ponds
- Permeable Paving
- Surface water disconnection

Infiltration Reduction

- Sewer Repair
- Sewer Relining

Green & Blue Solutions – Property level

Eliminate flows → Reduce flows → Attenuate flows → Increase network capacity

Green Solutions

- ✓ **Slowing the flow**
- ✓ **Ecologically-driven processes**
- ✓ **Wider benefits for people & place**

Blue Solutions

- ✓ **Managing the flow**
- ✓ **Reducing or removing rainfall, inflow and infiltration**
- ✓ **Avoiding pumping & treatment**

Rainwater Harvesting

- Smart water butts
- Leaky water butts
- Community-scale approaches
- Commercial premises

Soakaways

Raised planters

Green & Blue Solutions – Increase network capacity

Eliminate flows → Reduce flows → Attenuate flows → Increase network capacity

Green Solutions

- ✓ **Slowing the flow**
- ✓ **Ecologically-driven processes**
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Blue Solutions

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Houghside Combined Sewer Overflow (CSO)

Treatment Wetlands

Pennon

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