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Stoke-on-Trent Stage 1 Water Cycle Study

Final

Prepared for

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This report describes work commissioned by Stoke-on-Trent City Council, by an instruction dated 5 January 2026. The Client's representative for the contract was Melanie Hughes of Stoke-on-Trent City Council. Freya Nation and Sue Jones of JBA Consulting carried out this work.

Purpose and Disclaimer

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The methodology adopted and the sources of information used by JBA in providing its services are outlined in this Report. The work described in this Report was undertaken between January 2026 and July 2026 and is based on the conditions encountered and the information available during the said period. The scope of this Report and the services are accordingly factually limited by these circumstances.

The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by JBA has not been independently verified by JBA, unless otherwise stated in the Report.

Acknowledgements

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Abbreviations

1D	One Dimensional (modelling)
AMP	Asset Management Plan
AMP7	Seventh Asset Management Plan period (runs 2020-2025)
AMP8	Eight Asset Management Plan period (runs 2025-2030)
AONB	Area of Outstanding Natural Beauty
BFI	Base Flow Index
BNG	Biodiversity Net Gain
BOD	Biological Oxygen Demand
BRE	The Building Research Establishment
CAMS	Catchment Abstraction Management Strategy
CAPEX	Capital Expenditure
CFMP	Catchment Flood Management Plan
CIL	Community Infrastructure Levy
CIRIA	Construction Industry Research and Information Association
CIWEM	The Chartered Institution of Water & Environmental Management
CSO	Combined Sewer Overflow
DCG	Design and Construction Guidance
DEFRA	Department of the Environment, Food and Rural Affairs (formerly MAFF)
DrWPA	Drinking Water Protected Areas
DS	Downstream
DWMP	Drainage and Wastewater Management Plan
DYAA	Dry Year Annual Average
EA	Environment Agency
EDM	Event Duration Monitoring
EU	European Union
FCT	Favourable Condition Targets
FRA	Flood Risk Assessment
FWMA	Flood and Water Management Act
GEP	Good Ecological Potential
GES	Good Ecological Status
GI	Ground Investigations
GIS	Geographical Information System
GWDTE	Groundwater Dependent Terrestrial Ecosystem

GWMU	Groundwater management unit
HMWB	Heavily Modified Water Body
HoF	Hands-off flow: river flow below which an abstractor may be required to stop or reduce abstraction
HoL	Hands-off-Level
ID	Identifier
IWM	Integrated Water Management
JNCC	Joint Nature Conservation Committee
LAA	Land Availability Assessment
LLFA	Lead Local Flood Authority
LNR	Local Nature Reserve
LNRS	Local Nature Recovery Strategies
LPA	Local Planning Authority
MHRA	Mining High Risk Area
MODA	Multi-Objective Decision Analysis
NBS	Nature Based Solutions
NE	Natural England
NERC	Natural Environment Research Council
NFM	Natural Flood Management
NPPF	National Planning Policy Framework
OEP	Office for Environmental Protection
OfWAT	Water Services Regulation Authority
PE	Potential Evaporation
PM	Project Manager
PPG	Planning Practice Guidance
PR	Percentage Runoff
PTP	Package Treatment Plant
RBD	River Basin District
RBMP	River Basin Management Plan
rdWRMP	Revised Draft Water Resource Management Plan
REUL	Retained EU Law
SABs	SuDS Approval Bodies
SAC	Special Area of Conservation, protected under the EU Habitats Directive
SEA	Strategic Environmental Assessment
SFRA	Strategic Flood Risk Assessment

SoTCC	Stoke-on-Trent City Council
SPA	Special Protection Area for birds, protected under the EU Habitats Directive
SPG	Strategic Planning Group
SPZ	Source Protection Zones
SSD	Small Sewage Discharge
SSSI	Site of Special Scientific Interest
STW	Severn Trent Water
SuDS	Sustainable Drainage Systems
SWMI	Significant Water Management Issue
SWMP	Surface Water Management Plan
TAL	Technically Achievable Limit
UKWIR	UK Water Industry Research Ltd
uPBT	Ubiquitous, Persistent, Bioaccumulative or Toxic
UWWTD	Urban Wastewater Treatment Directive
US	Upstream
WaSC	Water and Sewerage Company
WCS	Water Cycle Study
WFD	Water Framework Directive
WINEP	Water Industry National Environment Programme
WRMP	Water Resource Management Plan
WRW	Water Resources West
WRZ	Water Resource Zone
WwTW	Wastewater Treatment Works

Definitions

Term	Description
Abstraction Point	The location where water is either taken or extracted from either a surface or groundwater waterbody.
Agricultural Management	The farming techniques and practices used to produce food and manage livestock.
Abstraction Licencing Strategy	The Abstraction Licencing Strategy sets out the Environment Agency's approach to managing new and existing abstraction and impoundments within their river management catchments.
Asset Management Plan (AMP) Period	Price limit periods in the water sector are sometimes known as Asset Management Plan (AMP) periods. The current period (2025-30) is commonly known as AMP 8 because it is the eighth price review period since privatisation of the water industry in 1989. AMP periods are five years in duration and begin on 1 April in the years ending in 0 or 5. Every five years the industry submits a Business Plan to OfWAT for a Price Review (PR). These plans set out the companies' operational expenditure (OPEX) and capital expenditure (CAPEX) required to maintain service standards, enhance service (for example where sewer flooding occurs), to accommodate growth and to meet environmental objectives defined by the Environment Agency. OfWAT assesses and compares the plans with the objective of ensuring what are effectively supply monopolies and operating efficiently.
Aquifer	An aquifer is a rock and/or sediment body that holds groundwater.
Determinand	In a water quality assessment, a water sample may be tested to determine one or more properties of the sample or the environment it is taken from. The properties measured are called determinands. A determinand defines both the result that is measured (for example a concentration of ammonia), and the method for carrying out the measurement, including its unit.
Domestic purposes	As defined by Section 218 of the Water Industry Act 1991. "…*references to domestic purposes in relation to a supply of water to any premises or in relation to any cognate expression, are references to the drinking, washing, cooking, central heating and sanitary purposes for which water supplied to those premises may be used*."
Dry Weather Flow	Dry weather flow is the average daily flow of wastewater to a wastewater treatment works during a period without rain.
Drainage and Wastewater Management Plan	Drainage and Wastewater Management Plans are statutory documents that all sewerage undertakers must produce at least every five years. They must address the current capacity, future demands and resilience of the drainage and sewerage system;

Term	Description
Effluent	Effluent discharge is the liquid waste produced from residential, commercial and industrial processes.
Environmental Permit	A legal authorisation issued by the EA allowing water companies to treat and / or discharge wastewater under controlled and monitored conditions. Environmental Permits are defined by the Environmental Permitting (England and Wales) Regulations 2016.
Lead Local Flood Authority	A county council or unitary authority which leads in managing local flood risks (i.e., risks of flooding from surface water, ground water and ordinary (smaller) watercourses). Their duties are outlined in the Flood and Water Management Act.
Per Capita Consumption	The per capita consumption is the average volume of water used by one person in a day. It is defined as the sum of the measured household consumption of clean water and unmeasured household consumption of clean water divided by the total household population. This is often expressed in litres per person per day (l/p/d).
Pollution load	The total amount of pollutants found in wastewater.
Storm Overflow 'rainfall target' (EA, 2023)	Storm overflows will not be permitted to discharge above an average of 10 rainfall events per year by 2050. "The EA will apply an industry standard measure to translate rainfall events to discharges from Storm Overflows. This means that any discharge from a Storm Overflow within a maximum of 12 hours will be counted as related to one rainfall event for the purposes of the target. For long duration discharges that occur beyond the initial 12-hour period, it will be counted as an additional rainfall event for the subsequent 24 hours and each 24

Term	Description
	hours after that for the purposes of the target. When an overflow has ceased to discharge for a 24-hour period, the counting mechanism will reset."
Sustainable Drainage Systems (SuDS)	Sustainable drainage systems are drainage solutions that provide a natural alternative to the direct channelling of surface water through an artificial network of pipes and sewers to nearby watercourses.
Technically Achievable Limit (TAL)	The concentrations that effluent can be realistically treated to using the best available technology. For phosphates this is 0.25mg/l and nitrates 10mg/l (Nutrient Neutrality & Habitats Regulations Assessment Update letter, 2022).
Waterbodies	Water bodies constitute areas of water – both salt and fresh, large and small – which are distinct from one another in various ways. All surface waters (including rivers, lakes, estuaries and stretches of coastal water) and groundwaters have been divided up into discrete units called water bodies. Water bodies are the basic unit that are used to assess the quality of the water environment and to set targets for environmental improvements.
Water Framework Directive (WFD)	The Water Framework Directive is a river basin management planning system which was implemented to help protect and improve the ecological health of the UK's rivers, lakes, estuaries and coastal and groundwaters.
Water Framework Directive Classification Status	Rivers, lakes, estuaries and coastal waters can be awarded one of five WFD statuses: High, Good, Moderate, Poor or Bad Groundwater can be awarded one of two statuses: Good or Poor.
Water Framework Directive – Reasons for not achieving good (RNAG)	Where a WFD element is classified as being at less than good status, a reason for the failure to meet the good status is attributed, including the sector deemed responsible or a pressure affecting a biological element.
Water Framework Directive objectives	The Water Framework Directive objectives are set out in Regulation 12 and Regulation 8 of the Water Environment Regulations 2017.
Water Industry National Environment Programme	The Water Industry National Environment Programme is the programme of work in which water companies in England must meet their obligations from environmental legislation and UK government policy.
Water Resource Management Plan (WRMP)	Water Resource Management Plans are statutory documents that all water companies must produce at least every five years. They set out how the water company intends to achieve a secure water supply for their customers while protecting and enhancing the environment.

Term	Description
Water Resource Zone (WRZ)	A Water Resource Zone is an area in which the abstraction and distribution of water is self-contained and is used to meet demand within that area.
Water Treatment Works (WTW)	A Water Treatment Works is the place where raw water is treated to bring it up to a potable standard so it can be delivered into the drinking water supply.
Wastewater Treatment Works (WwTW)	A Wastewater Treatment Works receives flows from the sewerage system and treats it so it can be discharged back into a river. They may also be called Sewage Treatment Works (STWs) or Water Recycling Centres (WRCs).

Executive Summary

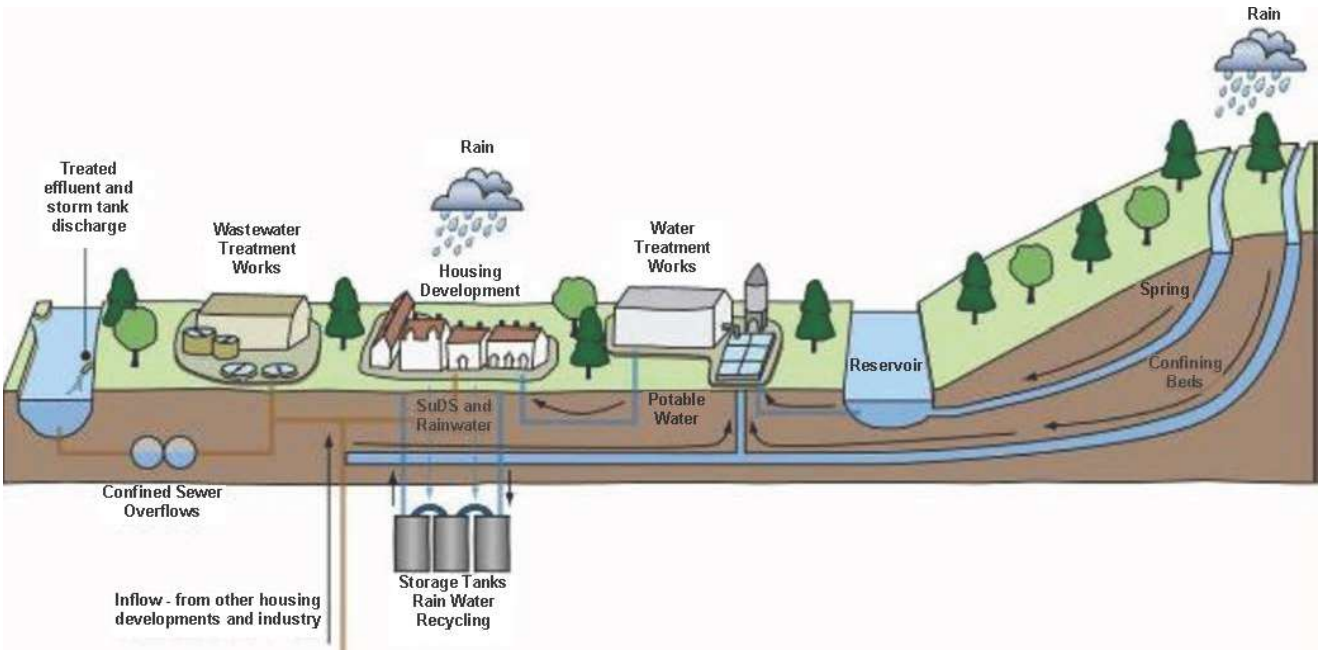
JBA was commissioned by Stoke-on-Trent City Council (SoTCC) to undertake a Water Cycle Study (WCS) for the administrative area of the city of Stoke-on-Trent.

This report is the first stage in the WCS. The purpose of the WCS is to form part of a comprehensive and robust evidence base to inform the preparation of the emerging Stoke-on-Trent Local Plan.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capability. A WCS will provide the required evidence, together with an agreed strategy to ensure that planned growth occurs within environmental constraints, with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable.

New homes and employment land require the provision of clean water, safe disposal of wastewater and protection from flooding. The allocation of development in certain locations may result in the capacity of existing available infrastructure being exceeded, a situation that could potentially cause service failures to water and wastewater customers, adverse impacts to the environment, or high costs for the upgrade of water and wastewater assets being passed on to the bill payers.

In addition to increased demands from housing and employment development, future climate change presents further challenges to the existing water infrastructure network, including increased intensive rainfall events and a higher frequency of drought events. Sustainable planning for water must now take this into account. The water cycle can be seen in the figure below and shows how the natural and artificial processes and systems interact to collect, store or transport water in the environment.



Source: Environment Agency – Water Cycle Study Guidance (January, 2009)

This WCS will assist Stoke-on-Trent City Council to select and develop sustainable development allocations where there is minimal impact on the environment, water quality, water resources, infrastructure and flood risk.

The Water Cycle Study has been carried out in co-operation with Severn Trent Water (STW), the Environment Agency (EA) whilst also using information from the neighbouring Local Planning Authorities (LPAs).

At the time of preparing the WCS, the Stoke-on-Trent Draft Local Plan was being consulted on, and a Call for Sites was in progress. Therefore the draft sites used in this assessment may not reflect the final site allocations in the adopted Local Plan. Section 2 sets out the approach used to assess planned growth within Stoke-on-Trent and neighbouring LPAs as part of the WCS.

Within Stoke-on-Trent's draft Local Plan, priority is given to maximising the use of brownfield sites within the existing urban area. In combined sewerage systems, often found in previously developed areas, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections and reducing infiltration. This can be achieved by discharging surface water via SuDS to groundwater, watercourses or surface water sewers.

Relevant environmental and water industry policy and legislation is presented in Section 3 to provide context for the following sections. The report is then divided into sections assessing the impact of growth on each topic in the water cycle.

Water resources and supply

Stoke-on-Trent receives its water resources from Severn Trent Water. The study area includes the upstream reach of the River Trent which flows from north-east to south-west through the centre of Stoke-on-Trent. Fowlea Brook and Lyme Brook, tributaries of the Trent within the study area, are both designated as main rivers by the Environment Agency. The study area is covered wholly by the North Staffs Water Resource Zone (WRZ).

If growth during the period up to 2050 follows the same distribution as existing properties, then there are estimated to be approximately 60,097 new properties in the North Staffs WRZ. STW's Water Resources Management Plan 2024 (WRMP24) forecasts growth in the North Staffs WRZ (between 2025 and 2050) to be 31,310 dwellings. Therefore, the estimate calculated within this WCS exceeds STW's forecast by approximately 28,787 dwellings. This difference suggests that planned combined demand from growth is likely to be ahead of WRMP24 demand forecasts. Regarding additional water demand resulting from growth, STW commented that all extra housing growth is already accounted for in the WRMP24. Any additional business demand identified as the WRMP29 is developed can be accounted for at that stage. In line with WRMP guidelines, and based on the methodology followed by STW when producing the WRMP24 (see Section 4.4.3), local plan projections, including major strategic housing and growth locations, New Towns and Garden Communities, should be included when calculating the WRMP baseline and forecast future population growth.

The Water Industry National Environment Programme (WINEP) is a set of actions that the EA have requested all water companies operating in England to complete in a particular Asset Management Period (AMP) as part of their environmental commitments. WINEP actions relating to water resources in surface water and groundwater bodies in Stoke-on-Trent are presented in Appendix A and show that there is an early investigation into options appraisals or feasibility studies for measures identified within the WRMP to meet regional planning requirements that do not fit with Water Framework Directive (WFD) driver requirements across the STW Company Boundary. There are also actions to protect / ensure no deterioration in WFD status within the Staffordshire Trent Valley - PT Sandstone Staffordshire groundwater body.

The Staffordshire Trent Valley Abstraction Licensing Strategy (ALS) indicate varying levels of water availability across these catchments under different flow conditions (Q30–Q90), with areas of restricted or unavailable water identified in specific locations.

Severn Trent Water has reviewed its infrastructure charges for 2026/27, increasing water infrastructure charges to £385 and sewerage infrastructure charges to £499. The company continues to offer incentives for water efficiency with £350 per property offered where homes are built to use 85 litres or less per person per day.

It is important that new development does not result in an unsustainable increase in water abstraction. This can be done in several ways from reducing the water demand from new dwellings through to achieving ‘water neutrality’ in a region by offsetting a new development's water demand by improving efficiency in existing buildings. In Stoke-on-Trent, there is a particular need for water efficiency as the North Staffs WRZ is classified by the EA as being "seriously water stressed". Additionally, water efficiency in the home also leads to costs and carbon savings where the volume of water heated is reduced. It is therefore recommended that the Council consider a household water efficiency policy aligned with the 100 l/p/d recently consulted on by Defra. Additionally, it is recommended that non-household development meet, as a minimum, three credits in the BREEAM WAT01 measure (a 40% reduction in water consumption from the baseline).

Wastewater network and treatment

As shown in Appendix D, 37 storm overflows in Stoke-on-Trent exceeded the Storm Overflow Assessment Framework (SOAF) operations per year investigation threshold averaged over 2023 to 2025. They require an investigation under the SOAF 2025 and action to meet the long-term target.

Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on customers, and increasing the likelihood of storm overflow operation. Early engagement with developers and STW is recommended to allow time for the strategic infrastructure required to serve development forecast in the Local Plan to be planned. Further modelling of the network may also be required by STW at the planning application stage.

Unmitigated development within Stoke-on-Trent could cause the frequency or duration of operation of storm overflows to increase. There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, particularly within brownfield sites, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing developed areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

A headroom assessment was carried out comparing the current flow from each Wastewater Treatment Works (WwTW), making allowance for growth already planned, with the permit limit. This provides an estimate of the spare capacity in wastewater treatment infrastructure in Stoke-on-Trent.

Once growth from adopted plans and existing commitments, recently completed growth, windfall, potential allocations and future growth from neighbouring authority Local Plan allocations is taken into account, Checkley and Strongford WwTWs are forecast to remain within their dry weather flow permit conditions. For planning purposes, headroom has been assessed based on the 80th exceedance percentile. Permit compliance is assessed by the Environment Agency using the 90th percentile statistic which in general results in a lower value than the 80th percentile. Compliance of WwTWs is not within the scope of the WCS and the assessment should not be used to infer non-compliance.

Consideration should be given to using capacity in existing permits as this provides a lower carbon cost than upgrading capacity at existing WwTW or building new treatment works.

There is one storm tank overflow within Stoke-on-Trent, at Strongford WwTW. The storm tank overflow at Strongford WwTW is poorly performing and needs investigation based on the average of available data. Growth could also result in an increase in the operation of the overflow, contributing to a worsening of water quality in the area. Action should be taken by the Severn Trent Water to address the overflow prior to an increase in wastewater demand being generated by new development.

The WINEP actions in place from the 2024 Price Review (PR24) at Strongford include certifying the overflow operation monitor and moving to 2 minute flow monitoring.

Water quality and environmental impact

The Reasons for Not Achieving Good (RNAG) dataset indicates that the main categories for watercourses not achieving good status in this area include: urban and transport, water industry (sewerage discharge) and mining and quarrying (associated with abandoned mines). There are also several instances in the study area where no sector is responsible, or the sector is under investigation.

Causeley Brook from Source to River Trent and Ford Green Brook from Source to R Trent have a 'moderate' WFD invertebrate status due to pollution from abandoned mines. The Lyme Brook catchment has a 'moderate' WFD invertebrate status due to physical modifications associated with coal mining. Mine water issues are discussed further below.

The water quality analysis suggests that waterbodies downstream of Checkley and Strongford WwTW may be moderately sensitive to increases in the discharge of treated wastewater (as a result of growth) for Ammonia, Biochemical Oxygen Demand (BOD) and Phosphate. Therefore modelling does not indicate any WFD class changes in watercourses adjacent to WwTWs. Improvements in treatment to TAL reduce these deteriorations and result in improvements to water quality.

Results of the Good Ecological Status (GES) assessment show that proposed development will not prevent good ecological status being achieved for ammonia and BOD. Within the watercourse adjacent to Checkley WwTW, there is sufficient environmental capacity for BOD. However, for ammonia, a tighter permit or upgrade would be required. This is achievable with current technology. Within the watercourse adjacent to Strongford WwTW, there is sufficient environmental capacity for ammonia and BOD. Within the watercourses adjacent to Checkley and Strongford WwTWs, GES for phosphate is not currently being achieved in the baseline scenario and could not be achieved even after upgrades to the technically achievable limit. It is therefore not growth that will prevent GES being achieved in the future. SoTCC should ensure that proposed growth does not cause significant deterioration downstream of Checkley and Strongford WwTWs.

There is one source protection zone within Stoke-on-Trent which is classified as Zone 3 Pollution in Zone 3 can eventually reach the groundwater source. The potential impact of development on groundwater quality and at protected sites such as SAC and SSSIs within, or downstream of the study area should be carefully considered in future plan making. Development sites within the study area could be sources of diffuse pollution from surface runoff.

SuDS are required on all development sites. Their design should consider both water quantity and water quality and site level investigations should be undertaken to define the most appropriate SuDS types for each specific development. Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.

Stoke-on-Trent City Council should be consulted at an early stage of development to ensure that SuDS are implemented and designed in response to site characteristics and policy factors. In the wider area, opportunities exist to implement NFM techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

The impact of increased wastewater discharges, as a result of the growth shown in the local plan, on protected sites downstream of Stoke-on-Trent has been assessed. Results indicate a 2% deterioration, associated with phosphate in two locations; upstream of Cannock Chase (SSSI and SAC) and upstream of the Old River Dove, Marston-on-Dove (SSSI). However, these deteriorations can be prevented by improvements in treatment to the Technically Achievable Limit (TAL).

1 Introduction

1.1 Terms of reference

JBA was commissioned by Stoke-on-Trent City Council (SoTCC) to undertake a Water Cycle Study (WCS) for the administrative area of the city of Stoke-on-Trent.

The purpose of the WCS is to form part of a comprehensive and robust evidence base to inform the preparation of the emerging Stoke-on-Trent Local Plan.

Unmitigated future development and climate change can adversely affect the environment and water infrastructure capability. A WCS will provide the required evidence, together with a strategy to ensure that planned growth occurs within environmental constraints, with the appropriate infrastructure in place in a timely manner so that planned allocations are deliverable.

1.2 Structure of report

The requirements and objectives of the WCS are set out in the section below. Planned growth in and around Stoke-on-Trent is characterised in Section 2 of the report, before relevant environmental and water industry policy and legislation is presented in Section 3 to provide context for the following assessment. The report is then divided into sections assessing the impact of growth on each topic in the water cycle study.

1.3 The Water Cycle

Planning Practice Guidance on Water Supply, Wastewater and Water Quality (2019) describes a water cycle study as:

"a voluntary study that helps organisations work together to plan for sustainable growth. It uses water and planning evidence and the expertise of partners to understand environmental and infrastructure capacity. It can identify joined up and cost-effective solutions, that are resilient to climate change for the lifetime of the development.

The study provides evidence for Local Plans and sustainability appraisals and is ideally done at an early stage of plan-making. Local authorities (or groups of local authorities) usually lead water cycle studies, as a chief aim is to provide evidence for sound Local Plans, but other partners often include the Environment Agency and water companies."

The Environment Agency's guidance on WCS (2021) recommends a phased approach:

- Stage 1: Scoping study, identifies if the water infrastructure capacity could constrain growth and if there are any gaps in the evidence you need to make this assessment. The scoping study will identify:
  - The area and amount of proposed development;
  - the existing evidence;
  - main partners to work with; and

- evidence gaps and constraints on growth.

- Stage 2: Detailed study, to provide the evidence to inform an integrated water management strategy. It will identify the water and flood management infrastructure that will mitigate the risks from too little or too much water. It will also identify what you need to do to protect and enhance the water environment.

As a WCS is not a mandatory document, Local Planning Authorities (LPAs) are advised to prioritise the stages of the WCS to integrate with their Local Plan programme. Due to the constraints of the Local Plan timetable, the Water Cycle Study will be produced in one stage combining the elements of both Stage 1 and Stage 2. Figure 1-1 below shows the main elements that the Water Cycle is comprised of.

The natural water cycle describes the continuous transfers of water around the planet, from atmosphere to surface and back via evaporation, transpiration and precipitation, and the various flows and storage processes that occur. The artificial water cycle looks at the availability of water resources for human consumption, its treatment and supply to homes and business, its use and consequently the generation of wastewater. It then looks at how wastewater is taken away, treated, and finally what happens when it is returned to the environment.

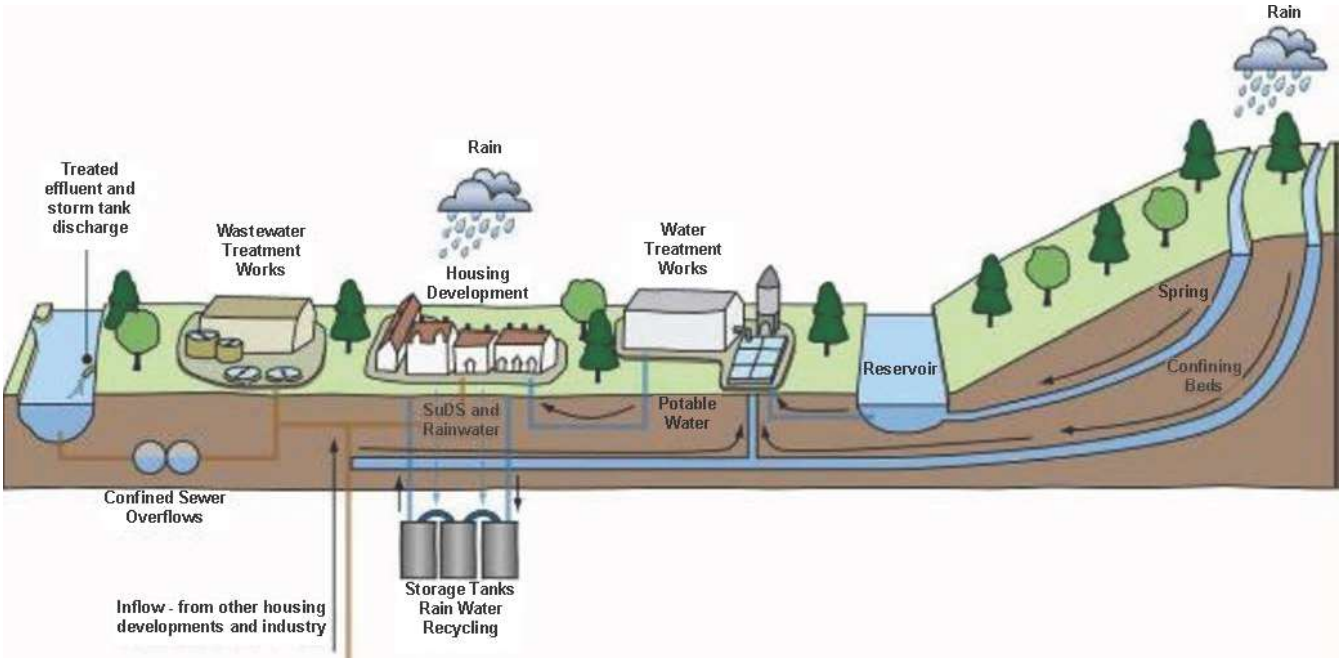


Figure 1-1 The Water Cycle

1.4 Impacts of Development on the Water Cycle

New homes require the provision of clean water, safe disposal of wastewater and limitation of flood risk. It is possible that allocating large numbers of new homes at some locations may result in the capacity of the existing available infrastructure being exceeded. This situation could potentially lead to service failures to water and wastewater customers, have adverse impacts on the environment or cause the high cost of upgrading water and wastewater assets being passed on to bill payers. Climate change presents further challenges such as increased intensity and frequency of rainfall and a higher frequency of drought events that can be expected to put greater pressure on the existing infrastructure. Development, when planned correctly, can also offer opportunities to reduce flood risk to existing properties and increase community resilience, contribute to nature recovery, and allow a collaborative approach to infrastructure.

1.5 Objectives

This WCS report is written to support the preparation of the emerging Stoke-on-Trent Local Plan.

The overall objective of the WCS is to understand the environmental and physical constraints of development and identify opportunities for more sustainable planning and improvements that may be required to achieve the required level of development.

This WCS will consider the following issues:

- Water resources, demand, and supply.
- Wastewater infrastructure and treatment.
- Water quality and environmental impact.

1.6 Study Area

The administrative area of the city of Stoke-on-Trent covers approximately 93.4 km^2 in the West Midlands. The Local Planning Authority (LPA) for the city is Stoke-on-Trent City Council (SoTCC). Stoke-on-Trent is the largest settlement in Staffordshire and one of the largest cities in the Midlands with a population of 258,369 (based on the 2021 census data).

Stoke-on-Trent is a polycentric city made up of six towns: Tunstall, Burslem, Stoke, Hanley, Fenton and Longton. The River Trent rises approximately 4.5 km north of the city's administrative boundary and flows from north-east to south-west through the centre of Stoke-on-Trent. Two of the Trent's tributaries also lie within the city's administrative area. Fowlea Brook and Lyme Brook are both designated as main rivers by the Environment Agency (EA). Lyme Brook originates in the neighbouring district of Newcastle-under-Lyme.

Water supply and wastewater services across Stoke-on-Trent are provided by Severn Trent Water (STW).

1.7 Authorities responsible for Water Resources and Wastewater Management in Stoke-on-Trent

Within Stoke-on-Trent there are a number of authorities and regulators responsible or involved in supplying, managing, and overseeing water supply, wastewater and the environment. Table 1-1 below explains the responsibilities of various bodies within the local plan area.

Table 1-1 Responsibilities of authorities within Stoke-on-Trent

Authority Name	Key Responsibilities of Different Authorities
Environment Agency	The Environment Agency (EA) are the environmental regulator in the UK with responsibilities for water quality, flood risk and administering licences for water abstraction. They are a statutory consultee for many development plan documents and for some planning applications. They advise on environmental and infrastructure capacity issues across the water cycle.
Natural England	Natural England are the Government's advisors on the natural environment, which they have a responsibility to protect and enhance. In a WCS they may provide information on the conservation objectives, and guidance on, the protection of designated sites.
Ofwat	Ofwat, also known as the Water Services Regulation Authority, are responsible for the economic regulation of the privatised water and sewerage industry in England and Wales. They are a non-ministerial government department whose duties include protecting consumers' interests and determining the appropriate level of investment.
Severn Trent Water	Severn Trent Water (STW) is the water supplier for the whole study area. As the water supplier for Stoke-on-Trent, STW have a responsibility to maintain an efficient and economical system of water supply. Severn Trent is also the sewerage undertaker for the study area. As the sewerage undertaker for Stoke-on-Trent, STW have the responsibility to improve and extend a system of public sewers (for both domestic and non-domestic flows) and to make provision for the emptying of those sewers.
Retail suppliers to non-household customers	Businesses and other non-household customers are supplied via non-household water and wastewater service retailers. The "wholesale supplier" remains the local supplier of water and/or wastewater services in that area. Retail suppliers were introduced with the intention of providing competition in the monopolistic water market.

1.8 Record of Engagement

1.8.1 Overview

Preparation of a WCS requires significant engagement with stakeholders, within the Local Planning Authority area, with water and wastewater utilities, with the Environment Agency, and where there may be cross-boundary issues, with neighbouring local authorities. This section forms a record of engagement for the WCS.

Further engagement will take place, if necessary, as the Local Plan progresses.

1.8.2 Engagement

The preparation of this WCS was supported by the following engagement:

Inception meeting

Engaged Parties	Details
Stoke-on-Trent City Council (LPA)	Scope of works and data collection requirements.

Neighbouring authorities

Engaged Parties	Details
Newcastle-under-Lyme Borough Council Staffordshire Moorlands District Council Stafford Borough Council	Request and receipt of planned growth information

Collaboration with Water Companies and Risk Management Authorities

Engaged Parties	Details
Severn Trent Water (STW) Environment Agency (EA) Stoke-on-Trent City Council (as LLFA)	Scope of works and data collection requirements.

2 Future growth in Stoke-on-Trent

2.1 Overview

The emerging Stoke-on-Trent Local Plan will direct future growth and associated infrastructure across the city of Stoke-on-Trent administrative area and will include new housing and employment requirements. The Local Plan will cover the period 2020 to 2040. The following section summarises the current planned development in Stoke-on-Trent, which allows a forecast to be created that can be used to predict the volume of water and wastewater required in the future and the resulting pressure on water infrastructure.

The forecast consists of:

- Commitments, completions and windfall for Stoke-on-Trent.
- Committed development sites with full or outline planning permission, currently in the planning system as of January 2026.
- Recent completions - sites completed from 2024 to 2025 that may not yet appear in flow data provided by the water companies.
- Neighbouring authority growth – growth served by infrastructure within or shared with the study area.
- Potential allocations

Forecasted development in Stoke-on-Trent as outlined above is summarised in Table 2-1.

It should be noted that due to Local Plan timescales, Stoke-on-Trent City Council are not able to provide a final list of Local Plan site allocations. Subsequently, draft potential allocations provided have been used in assessments for this WCS.

Within Stoke-on-Trent's draft Local Plan, priority is given to maximising the use of brownfield sites within the existing urban area. In combined sewerage systems, often found in previously developed areas, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections and reducing infiltration. This can be achieved by discharging surface water via SuDS to groundwater, watercourses or surface water sewers.

2.2 Growth within Stoke-on-Trent

2.2.1 Trajectory

For residential and employment sites where a temporal projection of how the site will be developed was not available, the following assumptions were made:

- For all allocated sites, trajectory was assumed to be evenly spread across the relevant plan period.
- For committed sites in the planning system (both full and outline permission), trajectory was assumed to be evenly spread over the next five years (2025/26 to 2029/30).

2.2.2 Windfall

Windfall sites are sites that are not specifically allocated in the Local Plan or neighbourhood plans. Local Plans usually provide an allowance to cover this circumstance, consistent with the National Planning Policy Framework (NPPF). The windfall allowance of 187 dwellings per annum, from 2027 onwards, was advised by SoTCC to use as an estimate to inform the WCS. This may be different in the published Local Plan and may change as a result of subsequent monitoring. To assign windfall development to WwTWs in Stoke-on-Trent, the percentage of growth already assigned to each treatment works was used to distribute the windfall allowance across the Local Plan period.

2.2.3 Assigning Growth to a Wastewater Treatment Works

For this study, eastings and northing were provided for each development site which were used to assign each site to the appropriate WwTW. The majority of growth in Stoke-on-Trent will be served by the largest WwTW covering the settlement, Strongford.

2.2.4 Summary

Table 2-1 shows a summary of growth expected during the Local Plan period. 545 dwellings and 70,702m^2 of employment floor space were completed in 2024/25 and there are 1,129 dwellings currently under construction. There are also 4,069 dwellings and 281,053m^2 of employment floorspace already in the planning system and assumed to be completed during the next five years. Beyond this, the potential allocations provide a capacity of up to 15,772 dwellings to be delivered within the remaining plan period alongside 813,134m2 of employment floorspace. In addition, 2,431 dwellings are expected to be delivered from windfall development.

Table 2-1 Summary of the growth forecast across the Stoke-on-Trent Local Plan Period (2020 to 2040)

Type of Growth	Number of Dwellings	Employment floorspace (m^2)
Windfall	2,431	N/A
Commitments	4,069	281,053
Under construction	1,129	N/A
Completions (2024 to 2025)	545	70,702
Draft potential allocations	15,772	813,134
Total	**23,946**	**1,164,889**

2.3 Growth outside Stoke-on-Trent

2.3.1 General approach

Where growth within a neighbouring Local Planning Authority (LPA) area may be served by infrastructure within or shared with Stoke-on-Trent, the LPA were contacted as part of a Duty to Cooperate request to provide information on:

- The latest growth forecast (housing and employment) for the local plan area.
- Details of future growth within the catchments of WwTW which serve part of their council area and Stoke-on-Trent.

The neighbouring authorities to Stoke-on-Trent are shown in Figure 2-1.

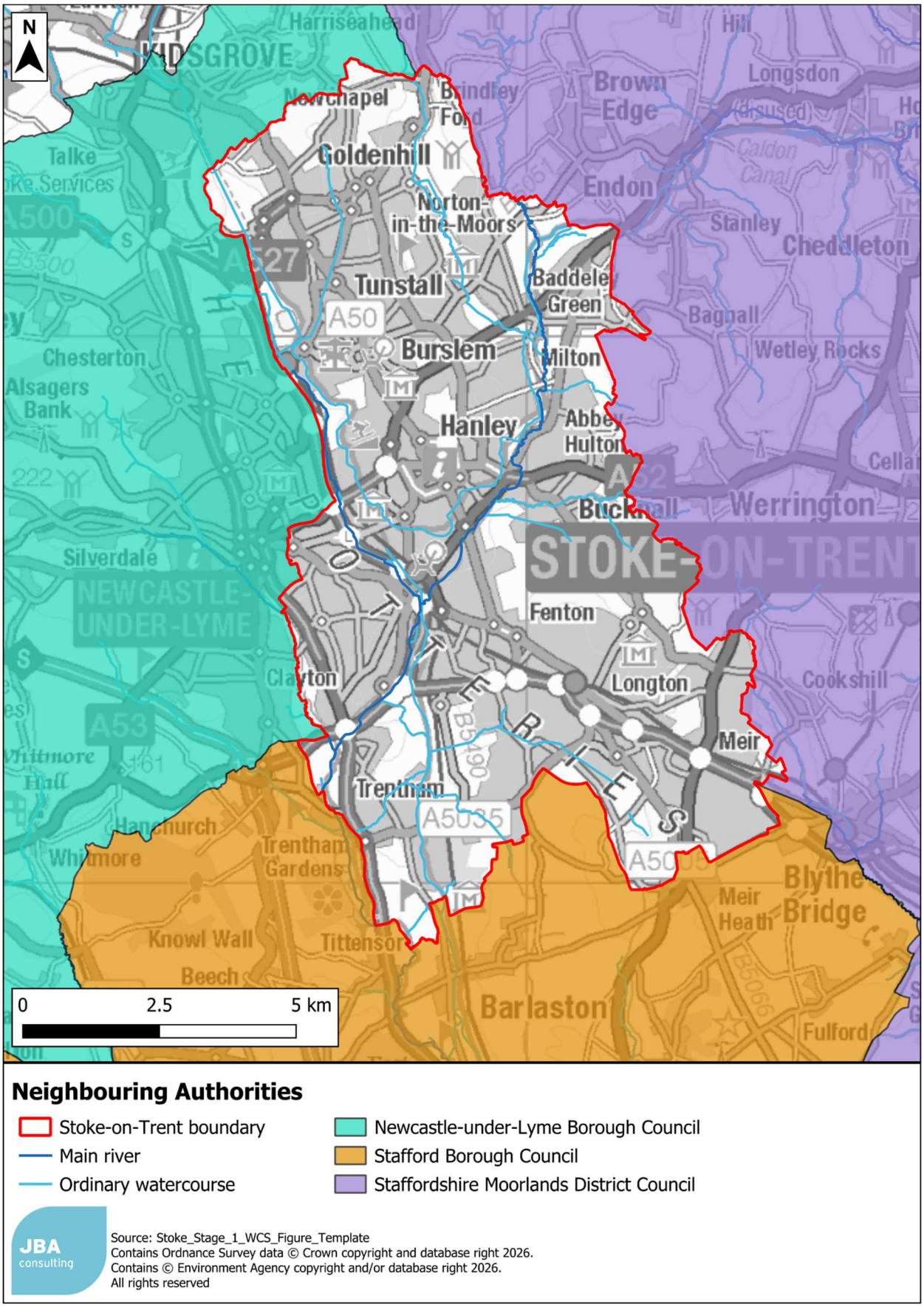


Figure 2-1 Neighbouring authorities to Stoke-on-Trent

2.3.2 Newcastle-under-Lyme Borough Council

The Newcastle-under-Lyme planning team has provided information on housing and employment allocations in their draft local plan (2020 to 2040). The sites which share infrastructure with Stoke-on-Trent have been included in the Stage 1 WCS assessment and are summarised below. It should be noted that examination documents with updated capacity and trajectory for NULBC's local plan allocations uploaded to the council's website have been used to update the site information for Newcastle-under-Lyme borough.

Table 2-2: Summary of growth in Newcastle-under-Lyme served by infrastructure shared with Stoke-on-Trent

WwTW	Proposed number of dwellings	Potential Employment Space ($m^{2)}$	Period
Strongford	4,862	132,660	To 2040
Checkley	0	0	To 2040

2.3.3 Staffordshire Moorlands District Council

The Staffordshire Moorlands planning team has provided information on housing and employment allocations in their adopted local plan (2014 to 2033). The sites which share infrastructure with Stoke-on-Trent have been included in the Stage 1 WCS assessment and are summarised below.

Table 2-3: Summary of growth in Staffordshire Moorlands served by infrastructure shared with Stoke-on-Trent

WwTW	Proposed number of dwellings	Potential Employment Space ($m^{2)}$	Period
Strongford	622	22,000	To 2033
Checkley	1,354	17,080	To 2033

2.3.4 Stafford Borough Council

Stafford Borough Council planning team provided information on housing and employment allocations in their adopted local plan (2011 to 2031). However, the site allocations do not share wastewater infrastructure with Stoke-on-Trent and therefore have not been included in this WCS assessment.

2.4 Growth and Water Demand

2.4.1 Overview

A forecast of the impact of the planned housing and employment growth in and around Stoke-on-Trent on water demand was prepared as follows:

2.4.2 Water demand from housing

Data from Severn Trent Water's Water Resources Management Plan (WRMP24) Data Tables was used. The forecast for water demand is based on per-capita consumption for the year 2021-2022, as published in the draft WRMP24. As a result, the forecast represents the baseline "business-as-usual" scenario (though includes the impact of Covid), not accounting for any further water efficiency or metering interventions from 2025/26 onwards. Water efficient design is explored further in Section 3.4, while measures set out in the WRMP24 are reviewed in Section 4.2.

2.4.3 Water demand from employment sites

Demand from employment sites was calculated assuming a rate of 100l/d per employee. This value has been taken from the table of loadings for sewage treatment systems in British Water's Flows and Loads report and is the flow per person per day expected for an office with a canteen. Where the forecast number of employees for a site was not specified by the LPA, employment floorspace and assumed density based on employment use classes was used to calculate an indicative number of employees for a site. Table 2-4 below outlines the assumed densities of employment space derived from the Homes and Communities Agency (2015) Employment Density Guide 3rd edition. This guide pre-dates recent changes in working practices as a result of the Covid-19 pandemic, technological changes to support working from home and automation.

Emerging industries such as data centres and hydrogen production as well as more traditional industries such as farming can result in a large demand for water. The water companies have a statutory duty to provide a connection to supply clean water for domestic purposes (for example staff toilets), but they do not have to provide a water supply for industrial uses.

Table 2-4 Employment use classes and assumed densities used to calculate water demand

Use class	Description	Density (m^2/employee)
A1	Retail	15
A3	Restaurants and cafes	15
B1a	Offices	8
B1b	R&D space	40
B1c	Light industrial	47
B2	Industrial and manufacturing	36
B8	Storage and distribution	70
C1	Hotels	Requires bed count (one room treated as one dwelling)
C2	Residential institutions	Requires bed count (one room treated as one dwelling)
D1	Learning and non-residential	36
D2	Leisure	65

2.4.4 Business-as-usual water demand forecast

The impact of planned growth across the Stoke-on-Trent Local Plan period on water demand is summarised in Figure 2-2 below, displaying demand from each source of growth outlined in Table 2-1. Additional water demand from planned development is forecast to grow by approximately 10.7 Ml/d across the Local Plan period (2020 to 2040) and beyond to 2045.

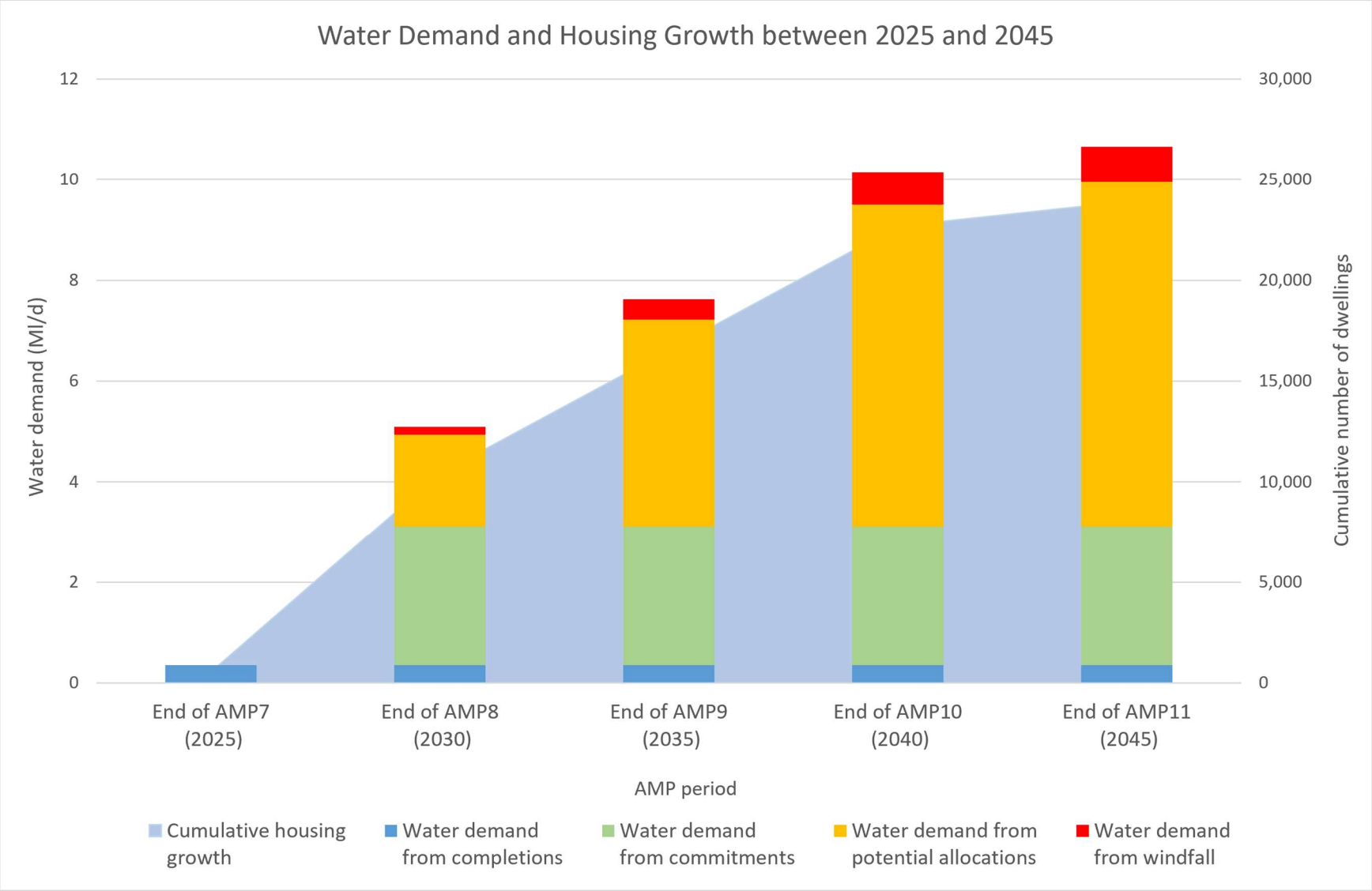


Figure 2-2: Cumulative water demand driven by additional dwellings forecast across the Local Plan period

3 Policy and legislation

3.1 Introduction

This section introduces national, regional, and local policies relevant to water and wastewater services and the water environment, that should be considered by the LPA, water companies, and developers during plan-making and planning applications. Key extracts from these policies are presented as well as links to the full text. Whilst care has been taken to ensure that the information presented in this report was up to date at the time of writing, policy and guidance can change rapidly and the reader should ensure that the most up to date information is sought.

3.2 Plan-making

The National Planning Policy Framework (NPPF) (Ministry of Housing, Communities and Local Government, last updated February 2025) was originally published in 2012, as part of reforms to make the planning system less complex and more accessible, to protect the environment and to promote sustainable growth.

Local Plans are the primary mechanism by which plan-led spatial planning is implemented in England. Local Plans must be prepared by Local Planning Authorities (LPAs) and include:

- Strategic policies which set out the "overall strategy for the pattern, scale and design duality of places", including for the provision of infrastructure, transportation and community facilities.
- Non-strategic policies, which "set out more detailed policies for specific areas, neighbourhoods or types of development. This can include allocating sites, the provision of infrastructure and community facilities at a local level."

Under the Localism Act (HM Government, 2011) new rights were provided to allow local communities to come together and shape the development and growth of their area by preparing Neighbourhood Development Plans, or Neighbourhood Development Orders, where the ambition of the neighbourhood is aligned with strategic needs and priorities for the area. Neighbourhood Plans can make non-strategic policies, aligned to the strategic policies of the Local Plan. As neighbourhoods draw up their proposals, LPAs are required to provide technical advice and support to communities.

Consultation on proposed reforms and further changes to the NPPF were conducted between 16th December 2025 and 10th March 2026. At the time of writing, analysis of the consultation feedback is in progress. The draft new NPPF contains changes to the structure of the NPPF as well as additional changes to reflect updates to Planning Practice Guidance.

Guidance discussing the draft process of creating a local plan under the new plan-making system was published in November 2025. Under the new plan-making system, LPAs must prepare a single local plan and should adopt it within 30 months.

3.3 Water and the Planning System

3.3.1 National Planning Policy Framework and water

The NPPF (2024) provides guidance to planning authorities to take account of flood risk and water and wastewater infrastructure delivery in their Local Plans.

Key paragraphs include:

- **Paragraph 35**: "*Plans should set out the contributions expected from development. This should include setting out the levels and types of affordable housing provision required, along with other infrastructure (such as that needed for education, health, transport, flood and water management, green and digital infrastructure). Such policies should not undermine the deliverability of the plan*."
- **Paragraph 162**: "*Plans should take a proactive approach to mitigating and adapting to climate change, taking into account the long-term implications for flood risk, coastal change, water supply*..."
- **Paragraph 187e**: "*…preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans*."

As discussed in Section 3.2, a draft new NPPF has recently been consulted on and analysis of the consultation feedback is currently in progress. Therefore, paragraph numbers quoted above are likely to change once the new NPPF is published.

3.3.2 Planning Practice Guidance overview

Planning Practice Guidance (PPG) was originally issued in 2014 by the Department for Communities and Local Government, with the intention of providing guidance on the application of the NPPF. The individual guidance documents are updated periodically. The following guidance documents are particularly relevant to a WCS:

- Water Supply, Wastewater and Water Quality (HM Government, 2019)
- Housing - Optional Technical Standards (HM Government, 2015a)
- Flood Risk and Coastal Change (HM Government, 2022)

3.3.2.1 PPG - Water Supply, Wastewater and Water Quality

Two key passages from the water supply, wastewater and water quality (2019) guidance in the PPG (Para 002) provide an overview of what needs to be considered by plan-making authorities, and provide a basis for the work contained in a WCS or an Integrated Water Management Strategy (IWMS):

- "*Early discussions between strategic policy-making authorities and water and sewerage companies can help to ensure that proposed growth and environmental objectives are reflected in company business plans. Growth that requires new water supply should also be reflected in companies' long-term water resources management plans. This will ensure that the necessary infrastructure is funded through the water industry's price review* (ofwat.gov.uk)."
- "*Strategic policy-making authorities will also need to consider the objectives in the government's 25 Year Environment Plan* (gov.uk) *to reduce the damaging abstraction of water from rivers and groundwater, and to reach or exceed objectives for rivers, lakes, coastal and ground waters that are specially protected*."

A summary of the advice for plan-makers and for planning applications is contained below, but it is recommended that the full text is reviewed, particularly as it may change with future updates to the PPG.

Plan-making considerations - Infrastructure (Paragraph 005)

- Identification of suitable sites for new or enhanced infrastructure, including the location of existing and proposed development.
- Consider whether new development is appropriate near to water and wastewater infrastructure (for example due to odour concerns).
- Phasing new development so that water and wastewater infrastructure will be in place when needed. Infrastructure should also be in place before any environmental effects occur on designated sites of importance for biodiversity.

Plan-making considerations - Water quality (Paragraph 006)

- How to help protect and enhance local surface water and groundwater in ways that allow new development to proceed and avoids costly assessment at the planning application stage.
- The type or location of new development where an assessment of the potential impacts on water bodies may be required.
- Whether measures to improve water quality, for example Sustainable Drainage Systems (SuDS) schemes, can be used to address water quality in addition to flood risk.

Plan-making considerations - Wastewater (Paragraph 007)

- The sufficiency and capacity of wastewater infrastructure.
- The circumstances where wastewater from new development would not be expected to drain to a public sewer (such as via a package treatment Sewage Treatment Works (STW) or septic tank).
- The capacity of the environment to receive effluent from development in different parts of a strategic policy-making authority's area without preventing relevant statutory objectives being met.

Early engagement with the LPA, the EA, and relevant water and sewerage companies can help establish whether any particular water and wastewater issues need to be considered.

Considerations for planning applications - Water supply (Paragraph 016)

Water supply planning would normally be addressed through the LPA's strategic policies and reflected in the water companies WRMPs. Water supply is therefore unlikely to be a consideration for most planning applications. However, some exceptions might include:

- Large developments not identified in plans that are likely to require a large volume of water; and/or
- Significant works required to connect the water supply; and/or
- Where a plan requires enhanced water efficiency in new development as part of a strategy to manage water demand locally.

Considerations for planning applications - Water quality (Paragraph 016)

Water quality is only likely to be a significant planning concern where a proposal would:

- Involve physical modifications to a water body such as flood storage areas, channel diversions and dredging, removing natural barriers, construction of new locks, new culverts, major bridges, new barrages or dams, new weirs, and removal of existing weirs; and/or
- Indirectly affect water bodies, for example:
    - as a result of new development such as the redevelopment of land that may be affected by contamination, mineral workings, water and wastewater treatment, waste management facilities and transport scheme including culverts and bridges;
    - result in runoff into surface water sewers that drain directly, or via a combined sewer, into sensitive waterbodies e.g., waterbodies with local, national or international habitat designations;
    - through a lack of adequate infrastructure to deal with wastewater;
    - where development occurs in an area where there is strategic water quality plan e.g., a nutrient management plan, River Basin Management Plan (RBMP), WCS, diffuse water pollution plan or

sewerage undertakers' drainage strategy which set out strategies to manage water quality locally and help deliver new development.

3.3.2.2 PPG - Housing: optional technical standards

The guidance on Housing: optional technical standards (2015) advises planning authorities on how to gather evidence to set optional requirements, including for water efficiency. It states that (Paragraph 014):

- "*All new homes already must meet the mandatory national standard set out in the Building Regulations (of 125 litres /person /day). Where there is a clear local need, LPAs can set out Local Plan policies requiring new dwellings to meet the tighter Building Regulations optional requirement of 110 litres/person/day*."

Planning authorities are advised to consult with the EA and water companies to determine where there is a clear local need, and also to consider the impact of setting this optional standard on housing viability. The evidence for adopting the optional requirements is outlined in Section 4.6. Viability is reviewed in section 3.4.43.4.4.

3.3.2.3 PPG - Flood risk and coastal change

The guidance on flood risk and coastal change (2025) sets out how spatial planners, planning authorities and developers should manage flood risk to and from proposed developments, including assessing risk, avoiding flood risk, controlling, managing and mitigating flood risk.

Full details of the 2025 PPG updates are set out in the SFRA.

3.3.2.4 PPG - Climate change

The guidance on climate change (2019) advises how to identify suitable mitigation and adaptation measures in the planning process to address the impacts of climate change. Planning can help increase resilience to climate change through the location, mix and design of development. There is a statutory duty on LPAs to include policies in their Local Plan to tackle climate change and its impact.

3.3.3 Levelling-up and Regeneration Act 2023

The Levelling-up and Regeneration Act 2023 aims to support the government's commitment to reducing geographical disparities between different parts of the UK. Within the Act there are several parts relating to the water environment.

Part 7 relates to nutrient pollution standards. Where the Secretary of State considers that a habitats site that is wholly or partly in England is in an unfavourable condition by virtue of pollution from nutrients in water comprising phosphorus or compounds, or nitrogen or compounds, the Secretary of State may designate the catchment area for the habitats site as a phosphorus or nitrogen sensitive area.

It requires sewerage undertakers in England to upgrade phosphorus or nitrogen significant plants in its sewerage system by 2030 in order to meet phosphorus or nitrogen pollution standards.

A phosphorus or nitrogen significant plant is defined as one that discharges treated effluent into a sensitive catchment area and is not exempt in relation to the pollution standard. Unless otherwise defined, the treatment standard for phosphorus is 0.25 mg/l, and for nitrogen is 10 mg/l.

3.4 Water and design

3.4.1 Building Regulations

The Building Regulations (2010) Part G was amended in 2015 to require that all new dwellings must ensure that the potential water consumption must not exceed 125 litres per person per day (l/p/d), or 110 l/p/d where required under planning conditions (HM Government, 2015) (see Section 3.3.2.2).

The Environmental Improvement Plan (EIP) (2023), discussed in Section 3.7, contains a commitment to consider a new standard for new homes in England of 105 l/p/d and 100 l/p/d where there is a clear local need, such as in areas of serious water stress. While this new standard is only under consideration, it demonstrates the direction of travel for water efficiency standards, and it is highly likely that this or a similar standard will be adopted.

3.4.2 Building Research Establishment

The Building Research Establishment (BRE) publish an internationally recognised environmental assessment methodology for assessing, rating, and certifying the sustainability of a range of buildings.

New homes are most appropriately covered by the Home Quality Mark (BRE, BRE, 2023a), and commercial, leisure, educational facilities and mixed-use buildings by the Building Research Establishment Environmental Assessment Methodology (BREEAM) UK New Construction Standard (BRE, BREEAM, 2018b).

Using independent, licensed assessors, BREEAM/HQM assesses criteria covering a range of issues in categories that evaluate energy and water use, health and wellbeing, pollution, transport, materials, waste, ecology, and management processes.

In the Homes Quality Mark, 400 credits are available across 11 categories and lead to a star rating. 18 credits are available for water efficiency and water recycling. A greater number of credits are awarded for homes using water efficient fittings (with the highest score achieving 100l/p/d or less), and further credits are awarded for the percentage of water used in toilet flushing that is either sourced from rainwater or from grey water.

The BREEAM New Construction Standard awards credits across nine categories, four of which are related to water: water consumption, water monitoring, leak detection and water efficient equipment. This leads to a percentage score and a rating from “Pass” to “Outstanding”.

Through the Local Plan, the Council has the opportunity to seek BREEAM or HQM status for all new, residential, and non-residential buildings.

3.4.3 Energy and Water

In 2024, 17% of the UK’s domestic energy was used for water heating (Energy consumption in the UK, Department for Energy Security & Net Zero). If less water was used within the home, for instance through more water efficient showers, less water would need to be heated, and overall domestic energy usage would be reduced.

The government recently published the results of a 2023 consultation on The Future Homes and Buildings Standards which involved changes to Part 6, Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for dwellings and non-domestic buildings and seeking evidence on previous changes to Part O (overheating). Water efficiency and water scarcity were out of scope for this consultation. However, there is an important link between water use and energy use, and therefore between water use and the whole-life carbon cost of developments.

3.4.4 Viability

The evidence for the costs of meeting the optional 110l/p/d water efficiency target in new homes indicate that the costs are minimal:

- A 2014 study into the cost of implementing sustainability measures in housing found that meeting a standard of 110 litres per person per day would cost only £12 (at 2023 prices) for a four-bedroom house (EC Harris, 2014).
- The Committee on Climate Change report - UK Housing: Fit for the Future - stated that the cost of "requiring all homes in England to be built to 110 l/p/d is possible under Part G of regulations and would be no additional cost." (Committee on Climate Change, 2019)
- Heating water accounts for 17% of energy used in the home (Department for Energy Security & Net Zero, 2025) This would cost a 2-3 person, 3-bed household an average of £352 per year in energy at 2023 costs (British Gas, 2023). Water efficiency is therefore not only viable but of positive economic benefit to both private homeowners and tenants.

There is less evidence available on the costs of going below 110l/p/d. The Sussex North Water Neutrality Strategy (JBA Consulting, 2022) found that the additional cost to meet 85l/p/d using water efficient fittings would be between £349 and £431 per

dwelling, or £1,049 to £1,531 where white-goods appliances would not otherwise have been installed in the dwelling (2022 prices).

3.5 The Water Industry

3.5.1 The Water Industry in England

Water and sewerage services in England and Wales are provided by eleven Water and Sewerage Companies (WaSCs) and five 'water-only' companies. The central legislation relating to the industry is the Water Industry Act 1991. The companies operate as regulated monopolies within their supply regions, although very large water users and developments are able to obtain water and/or wastewater services from alternative suppliers - known as inset agreements.

The Water Act 2014 aims to reform the water industry to make it more innovative and to increase resilience to droughts and floods. Key measures that could influence the future provision of water and wastewater services include:

- Non-domestic customers being able to switch their water supplier and/or sewerage undertaker;
- New businesses being able to enter the market to supply these services;
- Measures to promote a national water supply network; and
- Enabling developers to make connections to water and sewerage systems.

The water industry is primarily regulated by three regulatory bodies:

- **Economic regulation:** Water Service Regulation Authority (Ofwat) are the economic regulator. They have a statutory duty to protect the interests of consumers, ensuring water companies carry out their functions (customer service standards, environmental rules, drinking water standards etc) and can finance them. Part of this role is setting the limits on pricing of water and sewerage services.
- **Environmental regulation:** The EA are the environmental regulator. They are responsible for monitoring the impact of the water industry (as well as others) on the environment and issuing permits for abstraction of water and discharge of wastewater.
- **Drinking water regulation:** Finally, the Drinking Water Inspectorate implement standards for drinking water and can take enforcement measures against water companies if those standards are not met.

As a result of the Independent Water Commission, the Government have announced that Ofwat would be abolished and replaced by a new regulator taking responsibility for water functions across Ofwat, Environment Agency, Natural England and Drinking Water Inspectorate (UK Government, 2025). This is described in more detail in Section 3.5.7.

3.5.2 Planning and funding of the water industry

The water industry works on a five-year cycle called the Asset Management Plan period or AMP periods. Every five years a water company submits a Business Plan to Ofwat for a Price Review. These plans set out the companies' operational expenditure (OPEX) and capital expenditure (CAPEX) required to maintain service standards, enhance service (for example where sewer flooding occurs), to accommodate growth and to meet environmental objectives defined by the Environment Agency. Ofwat assesses and compares the plans with the objective of ensuring what are effectively supply monopolies are operating efficiently, and that the company is meeting its obligations. It then sets the allowable price increase for consumers based on the retail prices index, the business plan, and taking into consideration affordability for consumers.

The current AMP period is AMP 8 (2025-2030), and the price of water for this period was set by Ofwat in 2024 in a process referred to as Price Review 24 (PR24). The new price came into effect in April 2025. The next price review will be 2029 (PR29) and will set prices from 2030 to 2035, coming into effect in April 2030. This system gives stability in pricing. Within this price review process there may also be incentives and penalties on the water company for exceeding or failing to meet targets.

When considering investment requirements to accommodate growing demand, water companies are required to ensure a high degree of certainty that additional assets will be required before funding them. Longer term growth is, however, considered by the companies in their internal asset planning processes and in their 25-year Strategic Direction Statements and WRMPs.

The Water Industry National Environment Programme (WINEP) is a set of actions that are defined by the EA and given to all water companies operating in England for completion during a particular AMP period. The aim of the programme is to support the objectives in the Environment Act, Water Framework regulations, Habitats regulations and other environmental objectives. Examples of typical actions could include investigations into the sustainability of an abstraction, a reduction in an abstraction to support river flows, or new permit limits at a WwTW.

Water and wastewater infrastructure requires significant lead-times to plan, obtain planning and other permissions, finance and construct. The time required to provide new or upgraded infrastructure to serve a development or a larger spatial plan is highly locally specific. Table 3-1 is provided as an indicative guide to lead-times.

Table 3-1: Indicative lead-times (years) for new infrastructure to serve development

Scale of development	Water supply	Water resources	Wastewater network	Wastewater treatment
Minor	1	N/A	1	N/A
Major	1-3	5-10	1-5	3-5
Strategic / Plan	3-5	10-20	5-10	5-10

3.5.3 Planning for Water

Water resource management plans

WRMPs are 25-year strategies that water companies are required to prepare, with updates every five years. In reality, water companies prepare internal updates more regularly. WRMPs are required to assess:

- Future demand (due to population and economic growth);
- Future water availability (including the impact of sustainability reductions);
- Demand management and supply-side measures (e.g., water efficiency and leakage reduction, water transfers and new resource development);
- How the company will address changes to abstraction licences;
- How the impacts of climate change will be mitigated;
- where necessary, the requirements for developing additional water resources to meet growing demand and describe how the balance between water supply and demand will be balanced over the period 2015 to 2040;
- Using cost-effective demand management, transfer, trading and resource development schemes to meet growth in demand from new development and to restore abstraction to sustainable levels; and
- In the medium to long term, that sufficient water continues to be available for growth and that the supply systems are flexible enough to adapt to climate change.

Severn Trent Water's final WRMP is published on their website (www.severntrent.com) and is discussed further in Section 4.4.4.

Drought Plan

Linked to the WRMP is a water company's drought plan. This is a requirement under the Water Industry Act 1991 (as amended by the Water Act 2003). A water company must state how it will maintain a secure water supply and protect the environment during dry weather and drought. The plan will contain:

- **Drought triggers** - these are points where a water company will take action to manage supply and demand. They are based on monitoring of rainfall levels, river flows, groundwater levels, and reservoir stocks.

- **Demand management actions** - how a water company will reduce demand for water during a drought. Actions that save water before taking more water from the environment must be prioritised. These could include:
    - reducing leakage;
    - carrying out water efficiency campaigns with customers;
    - reducing mains pressure; and
    - restricting water use, for example through temporary use band which limit hosepipe and sprinkler use.
- **Supply management actions** - how a water company will maintain water supply during a drought. Actions that have the least effect on the environment must be prioritised. This could include:
    - carrying out engineering work to improve its supply;
    - transferring water in bulk from other water companies;
    - using drought permits and drought orders to abstract more water;
    - using desalination - permanent or temporary plants; and
    - using tankers to supply customers with water directly.
- **Extreme drought management actions** - the actions it could take in an extreme drought. These could delay the need to use emergency restrictions standpipes and rota cuts.
- **Communicating during a drought** - a water company must set out how it will communicate in a clear and timely way during a drought with customers, partners or other stakeholders.
- **Environmental assessment, monitoring and mitigation** - a drought plan must include:
    - an environmental assessment;
    - an environmental monitoring plan for each supply management action; and
    - details of mitigation measures the company plans to take for each supply management action.
- **End of a drought** - a water company must explain how it will identify when a drought is over or ending and the actions it will take during this stage, communicate this information to customers, and review its performance.

Regional water resource planning

Water resource planning is taking an increasingly regional focus, recognising the need for collaboration between water companies and sectors in order to address the challenges of climate change, increasing demand for water and protecting the water environment. Five regional groupings having been formed, including the Water Resources West (WRW) group which covers Stoke-on-Trent City Council. An advisory group consisting of their regulators (Environment Agency and Ofwat) and Defra regularly attend meetings of WRW.

WRW prepared a final regional water plan, published in 2025, which will inform the latest round of company WRMPs, set to be published in 2030. As part of this process, in 2020, they published an initial resource position document which set out the water resources challenges and opportunities within the region.

3.5.4 Planning for Wastewater

21st Century Drainage

The UK Water Industry Research (UKWIR) "21st Century Drainage" programme has brought together water companies, governments, regulators, local authorities, academics, and environmental groups to consider how planning can help to address the challenges of managing drainage in the future. These challenges include climate change, population growth, urban creep and meeting the Water Framework Directive.

The group recognised that great progress has been made by the water industry in its drainage and wastewater planning over the last few decades, but that, in the future, there needs to be greater transparency and consistency of long-term planning. The Drainage and Wastewater Management Plan (DWMP) framework (Water UK, 2018) sets out how the industry intends to approach these goals. Companies were required to published finalised DWMPs in 2023 to inform their business plans for the 2024 Price Review.

Drainage and Wastewater Management Plans

Drainage and Wastewater Management Plans (DWMPs) are consistently structured plans delivered at three spatial scales; company-wide, regional groupings and individual wastewater catchments. The framework defines drainage to include all organisations and all assets which have a role to play in drainage, although, as the plans will be water company led, it does not seek to address broader surface water management within catchments.

The first cycle of DWMPs were published in 2023, following a consistent national framework, to inform their business plans for the 2024 Price Review.

The Environment Agency has set out new guidance for the second cycle of DWMPs to be published for public consultation in 2027.

LPAs and LLFAs are recognised as key stakeholders and are invited to join, alongside other stakeholders, the Strategic Planning Groups (SPGs) organised broadly along river basin district catchments.

DWMPs aim to provide more transparent and consistent information on sewer flooding risks and the capacity of sewerage networks and treatment works, and this should be taken into account in SFRAs, Water Cycle Studies, as well as in site-specific FRAs and Drainage Strategies.

Severn Trent Water's final DWMP is reviewed in detail for the study area in Section 6.3.1.

3.5.5 Developer Contributions and connection charges

A significant part of water company business is the interface with developers to facilitate connection to the public water supply and sewerage systems, through their developer services functions. Developments with planning permission have a right to connect to the public water and sewerage systems, where this is for domestic use. However, there is no guarantee that the capacity exists to serve a development.

Developers may requisition a water supply connection or sewerage system, or alternatively, self-build and offer them for adoption by the water company or sewerage undertaker. Self-build and adoption are usually practiced for assets within the site boundary, whereas requisitions are normally used where an extension of upgrading the infrastructure requires construction on third party land. The cost of requisitions is shared between the water company and developer as defined in the Water Industry Act 1991.

The above arrangements are third party transactions, because the Town and Country Planning Act Section 106 agreements and Community Infrastructure Levy agreements may not be used to obtain funding for water or wastewater infrastructure.

Ofwat published revised charging rules covering how water and wastewater companies may charge customers for new connections. (Ofwat, 2021) These rules have applied to all companies in England since April 2018. The key changes are listed below.

- **Increased transparency** - More charges will be fixed and published on water company websites. This will provide greater transparency to developers and will also allow alternative connection providers to offer competitive quotations more easily.
- **Fixed infrastructure charges** - There will be a fixed infrastructure charge for water and one for wastewater.
- **Revised approach to network reinforcement costs** - The costs of network reinforcement will no longer be charged directly to the developer in their connection charges. Instead, the combined costs of all of the works required on a company's networks, over a five-year rolling period, will be covered by the infrastructure charges paid for all new connections.
- **Updated definition of network reinforcement -** The definition of network reinforcement has changed and will now apply only to works required as a direct consequence of the increased demand due to a development. Where the water company has not been notified of a specific development, for example when developing long-term strategic growth schemes, the expenditure cannot be recovered through infrastructure charges.

Severn Trent Water (STW) publish their charging arrangements annually on their website.

For the period 1 April 2026 to 31 March 2027 the infrastructure charges per property are as follows:

- £385.36 water infrastructure charge
- £499.62 sewerage infrastructure charge
- £48.65 water environmental component
- £43.11 waste environmental component

The environmental component charges are used to fund environmental incentives to encourage good design by developers, including water efficiency and flood prevention incentives for home builders.

Water efficiency incentives can be applied for where developers can demonstrate they have built a premises with a domestic water usage of 100l/p/d or less and specified criteria are met. The incentives offered are:

- Water usage of 100 litres per person per day or less: £250 per property,
- Water usage of 90 litres per person per day or less: £300 per property,
- Water usage of 85 litres per person per day or less: £350 per property.

STW will also allow non-household premises with domestic usage only to apply for the 100 l/p/d water efficiency incentive.

STW also offer incentives for flood prevention measures. Where specified conditions are met, the following incentives are offered:

- Installation of a rain garden: £100 per property,
- Use of permeable surfaces for driveways or parking spaces that attenuate water to the sewer network: £150 per property,
- Use of permeable surfaces for driveways or parking spaces that infiltrate and do not connect to the network: £275 per property.

3.5.6 Water companies and the planning system

Water companies are currently not statutory consultees to planning applications, although they do monitor planning applications and respond to potentially significant applications, or where requested to do so by the LPA. Defra are intending to consult on making water companies statutory consultees for some applications (Department for Environment, Food & Rural Affairs, 2023).

Where a water company is concerned that a new development may impact upon their service to customers or the environment (for example by causing foul sewer flooding or pollution) they may request the LPA to impose a Grampian condition, whereby the planning permission cannot be implemented until a third-party secures the necessary upgrading or contributions.

Defra has issued National Policy Statements (NPSs) on Nationally Significant Infrastructure Projects (NSIPs) for wastewater (Department of Environment, Food &

Rural Affairs, 2012) and water (Department of Environment, Food & Rural Affairs, 2023), to be used as the primary basis when considering applications for Development Consent Orders (DCOs).

3.5.7 The Independent Water Commission

The Independent Water Commission was set up in October 2024 to provide recommendations to government on reforms to the water sector. The objectives are to ensure a sufficiently robust and stable regulatory framework in order to:

- attract the investment needed for the future;
- speed up infrastructure delivery; and
- restore confidence in the sector.

Chaired by Sir John Cunliffe, the resulting report which was published in June 2025 is often referred to as the 'Cunliffe Report'.

The full report can be found on the gov.uk website. It contains 88 recommendations centred around seven themes:

- Chapter one: Strategic direction for the water system.
- Chapter two: Planning.
- Chapter three: Legislative framework.
- Chapter four: Regulator reform.
- Chapter five: Regulation reform.
- Chapter six: Company structures, ownership, governance, and management.
- Chapter seven: Infrastructure and asset health.

It should be noted that the recommendations in the Cunliffe report are not mandatory, and the government will respond to the report in due course. In the meantime, these recommendations should be treated with the caution.

A simplification of the water planning system is recommended, with a comprehensive systems planning framework for England and Wales with responsibility for integrated and holistic water system planning. It goes on to recommend a review and update to the current legal framework, along with clearer targets to allow water companies to be held to account.

Chapter four of the Cunliffe report is designed to restore the confidence of both the public and regulated water companies in the regulatory framework. It recommends that the UK government should establish a new integrated regulator in England. This should combine the functions of Ofwat, DWI, and water functions from the EA and Natural England (NE). Changes were also recommended to economic and environmental regulations, including strengthening abstraction permitting.

Following the recommendations set out in the Cunliffe Report, the government announced that Ofwat would be abolished and replaced by 'a new, single, powerful

regulator' with the objective of cutting water pollution in England's rivers, lakes and seas, and protecting families from large increases in their water bills.

The new regulator will take responsibility for the water functions across Ofwat, EA, NE and Drinking Water Inspectorate. During the transition to the new regulator, Ofwat will remain in place, and following its creation, the EA and NE will retain their non-water role.

Until there is more information on the role of the new regulator and which other recommendations will be adopted by government, the LPA should assume the current regulatory environment will continue.

3.5.8 A New Vision for Water: White Paper

On 20 January 2026 A New Vision for Water white paper was presented to Parliament by the Secretary of State for Environment, Food & Rural Affairs. The white paper responds to the 88 recommendations made in the Cunliffe Report and puts forward a "*once-in-a-generation plan to transform the water system for good*".

Changes proposed in the white paper include:

- Expanding the price review system to capture the 25-year planning horizon with further details provided in five-year periods.
- A Chief Engineer will sit inside the new single water regulator. Their job will be to bring back hands-on checks of water infrastructure.
- The regulator will introduce a new inspection approach for water companies, requiring health checks on pipes, pumps, and other assets. Self-monitoring will come to an end.
- Where companies fall short, a new Performance Improvement Regime will give the regulator the power to act fast and fix failures so that underperforming water companies recover faster, protecting customers and the environment and giving stability to investors.
- The price control process will reflect a focus on maintenance and resilience. Ringfenced budgets will ensure there's enough funding for maintenance and renewal alongside building new assets.
- Improve joined-up regional planning by requiring regional plans that will set out investment priorities to meet national objectives.
- Work with existing groups such as catchment partnerships to design a new regional planning framework with Defra, set to be implemented in 2027.
- Confirms the roll out of smart metering and mandatory efficiency labels on white goods.

Recommendations in the Cunliffe Report that the white paper does not pick up include:

- Updated legislation to provide a clear framework for approving nature based solutions.
- Mandatory SuDS for new developments in England.

It should be noted that white papers set out the Government's proposals for future legislation, providing a basis for further consultation and discussion to allow final changes to be made before a Bill is formally presented to Parliament. The white paper states that a 2026 Transition Plan will set out the path to this new system and a new water reform Bill will bring forward the legislation needed to enable the system to take effect.

3.6 Flood Risk and Surface Water

3.6.1 Flood and Water Management Act 2010

The Flood and Water Management Act (FWMA) aims to improve both flood risk management and the way water resources are managed (HM Government, 2010).

The FWMA has created clearer roles and responsibilities and helped to define a more risk-based approach to dealing with flooding. This included the creation of a lead role for LAs, as LLFAs, designed to manage local flood risk (from surface water, ground water and ordinary watercourses) and to provide a strategic overview role of all flood risk for the EA.

The content and implications of the FWMA provide considerable opportunities for improved and integrated land use planning and flood risk management by LAs and other key partners. The integration and synergy of strategies and plans at national, regional, and local scales, is increasingly important to protect vulnerable communities and deliver sustainable regeneration and growth.

Schedule 3 of the FWMA 2010 will provide a framework for the approval and adoption of drainage systems, a SuDS Approving Body (SAB) within unitary and county councils, and national standards on the design, construction, operation, and maintenance of SuDS for the lifetime of the development. The previous government affirmed its commitment for enacting Schedule 3. However, it is currently unknown whether the new government intends to do this or what the proposed timescales would be.

3.6.2 Local Flood Risk Management Strategy (LFRMS)

Local Flood Risk Management Strategies set out how Lead Local Flood Authorities (LLFA) will manage local flood risk from surface water runoff, groundwater and ordinary watercourses, for which they have a responsibility as LLFA. They also set out the work that other Risk Management Authorities are doing to manage flood risk within the area.

The Stoke-on-Trent City Council Local Flood Risk Management Strategy sets out the following objectives:

1: Improving knowledge and understanding of local flood risk in Stoke-on-Trent

By building on and improving existing knowledge SoTCC will identify areas at risk and causes of local flood risk within the City.

2: Adopt a collaborative approach to managing local flood risk

Building-on and maintaining effective partnerships within SoTCC, RMAs, local communities and neighbouring LLFAs will ensure a collaborative approach is taken to managing local flood risk.

3: Manage local flood risk and new development in a sustainable manner

The LPA plays a key role in ensuring flood risk considerations are taken into account to make sure sustainable development delivers economic, social and environmental benefits to the city. Planning policy sets out to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk; to mitigate the impact of surface water runoff. SoTCC will set out to secure the use of Sustainable Drainage Systems (SuDS) in new developments.

4: Become more flood resilient

By engaging with local communities, SoTCC will seek to inform Risk Management Authorities of their role so we can work together to collectively manage and reduce flood risk and be better prepared for flood events.

5. Reduce flood risk and encourage sustainable regeneration and growth

Effective flood risk management can have multiple benefits including reducing the impact of flooding to local residents and business and free up land for development.

6: Enhance the natural and historic environment

Using a more sustainable approach to enhance the natural and built landscape of the city will provide multiple benefits for improving the environments for residents and businesses, improving biodiversity and local habitats for wildlife, encouraging sustainable development and protecting our cultural heritage.

7: Secure funding to deliver the strategy

It is important that SoTCC identifies the most appropriate sources of funding available to deliver the objectives set out in this Strategy.

8: Promote riparian responsibilities

SoTCC aims to raise awareness of the roles and responsibilities we all have to maintain man-made and natural drainage systems throughout the city.

3.6.3 Strategic Flood Risk Assessment (SFRA)

All LPAs are required, under NPPF, to prepare a SFRA, which forms a key part of the evidence base for their Local Plan. The SFRA must consider flood risks from all sources, collating up-to-date flood risk data and in some cases developing new flood risk modelling. The SFRA is used to inform the Sequential Test, by which Local Plan allocations should be sequentially selected to direct development towards areas of

lower flood risk, taking into consideration the vulnerability to flooding of the proposed land use. Stoke-on-Trent City Council's current SFRA was published in 2020. At the time of writing a Level 1 and Level 2 SFRA is in the process of being prepared to support the new Local Plan for Stoke-on-Trent and will be published in due course.

3.6.4 Surface Water Management Plan

Surface Water Management Plans (SWMPs) outline the preferred surface water management strategy in a given location and establish a long-term action plan to manage surface water. SWMPs are undertaken, when required, by LLFAs in consultation with key local partners who are responsible for surface water management and drainage in their area. At the time of writing a SWMP for Stoke-on-Trent is being prepared to align with the SFRA and WCS.

3.6.5 Sustainable Drainage Systems

From April 2015, LPAs were given the responsibility for ensuring that sustainable drainage is implemented on all major developments, including developments of ten or more homes, or commercial developments creating 1,000m^2 of new floor space.

Previously SuDS guidance was developed by Defra to sit alongside the NPPF PPG and provide non-statutory standards as to the expected design and performance for SuDS.

As of July 2025, the Defra National standards for sustainable drainage systems (SuDS) were brought in to comply with the principles of surface water drainage design.

The national standards contain two sets of standards. The first type (standard one) is known as the hierarchy standard and sets the criteria for the prioritisation of final surface water runoff destinations. The other standards (standards two to seven) detail the minimum design criteria that SuDS should satisfy alongside how they are to be appropriately built, maintained, and operated.

These National Standards form a material consideration for LPAs when assessing planning applications. These standards aim to reflect and reinforce good practice and use of SuDS, reflecting the four pillars of SuDS design. All appropriate planning applications should demonstrate how the national standards have been met in the site design (principle ten).

Standard one: runoff destinations

Runoff from development shall be discharged to the following final destinations, to the maximum extent practicable, in accordance with the below hierarchy:

- Priority one: collected for non-potable use (rainwater harvesting)
- Priority two: infiltrated to ground
- Priority three: discharged to an above ground surface water body

- Priority four: discharged to a surface water sewer, or another piped surface water drainage system
- Priority five: discharged to a combined sewer.

Non-potable use

There is potential for rainwater harvesting for non-potable uses to decrease the water demand from new developments and help improve water efficiency.

Rainwater harvesting shall be considered in all circumstances where any of the following apply:

- There is a demand for non-potable water and available contributing catchment area that will deliver safe and efficient water savings.
- Examples include industrial, commercial, horticultural, educational, public sector, residential and multiple-occupancy buildings.
- There is a need for landscape irrigation.
- The development is in an area identified as seriously water stressed.

Stoke-on-Trent City Council are the LLFA and play a key role in ensuring that the proposed drainage schemes for all new developments comply with technical standards and policies in relation to SuDS.

An updated version of the Construction Industry Research and Information Association (CIRIA) SuDS Manual was published in 2015. The guidance covers the planning, design, construction and maintenance of SuDS for effective implementation within both new and existing developments. The guidance is relevant for a range of roles with the level of technical detail increasing throughout the manual. The guidance does not include detailed information on planning requirements, SuDS approval and adoption processes and standards, as these vary by region and should be checked early in the planning process. The manual itself can be found on the CIRIA website (ciria.org).

CIRIA also published 'Guidance on the Construction of SuDS' (C768) (ciria.org), which contains detailed guidance on all aspects of SuDS construction, with specific information on each SuDS component available online as a downloadable chapter, free to CIRIA members.

Severn Trent Water provides SuDS guidance on their website including:

- General Design Manual,
- Landscape Specification,
- Planting Schedule,
- Landscape Maintenance Guidance,
- Flow Control Chamber Details,
- Sewer Connection Detail, and
- Gully Abandonment Detail.

Severn Trent Water worked in partnership with other stakeholders, including SoTCC, as part of the Stoke and Urban Newcastle Rediscovering Its Secret Environment

(SUNRISE) programme to retrofit SuDS and restore urban green space (DWMP Level 1 Non-Technical Report, 2023).

3.6.6 Design and Construction Guidance

The Design and Construction Guidance (water.org.uk) forms part of a new Codes for Adoption covering the adoption of new water and wastewater infrastructure by water companies. The Design and Construction Guidance contains details of the water sector's approach to the adoption of SuDS, which meet the legal definition of a sewer. This replaces the formerly voluntary Sewers for Adoption. The new guidance came into force in April 2020 and compliance by water companies in England is mandatory.

The previous standards, up to and including Sewers for Adoption Version 7, included a narrow definition of sewers to mean below-ground systems comprising of gravity sewers and manholes, pumping stations, and rising mains. This excluded the adoption of SuDS by water companies, except for below-ground storage comprising of oversized pipes or chambers.

The new guidance provides a mechanism for water companies to secure the adoption of a wide range of SuDS components which are now compliant with the legal definition of a sewer. There are however several non-adoptable components such as green roofs, pervious pavements, and filter strips. These components may still form part of a drainage design so long as they remain upstream of the adoptable components.

The Design and Construction Guidance states that the drainage layout of a new development should be considered at the earliest stages of design. It is hoped that the new guidance will lead to better managed and more integrated surface water systems which incorporate amenity, biodiversity, and water quality benefits.

3.7 Environmental Protection and Biodiversity

3.7.1 The Environment Act 2021

The Environment Act (HM Government, 2021) came into UK law in November 2021 with the aim of protecting and enhancing the environment. The Act has objectives to improve air and water quality, biodiversity, waste reduction, and resource efficiency. The implementation of the policies within the Environment Act has begun, and legally binding environmental targets are being developed. This will be enforced by the Office for Environmental Protection (OEP). More information is available on the OEP website (theoep.org.uk).

The Environment Act (Part 5) contains policies concerning improvements to the water environment. These policies have the following aims:

- Effective collaboration between water companies through statutory water management plans;

- Minimise the damage that water abstraction may cause on environment; and
- Modernise the process for modifying water and sewerage company licence conditions.

Further to this, there is specific legislation regarding storm overflows aiming to reduce the discharge of untreated sewage into waterways. This plan includes requirements for water companies to:

- Report on the discharges from storm overflows;
- Monitor the quality of water potentially affected by discharges;
- Progressively reduce the harm caused by storm overflows; and
- Report on elimination of discharges from storm overflows.

3.7.2 25-year Environment Plan

The Environmental Improvement Plan (EIP) is the first revision of the 25-year environment plan (25YEP) published in 2018 and updated in 2023. It contains ten goals which are shown in Figure 3-1. The government must review and revise the plan, if needed, every five years to ensure continued progress against the ten 25YEP goals.

Of particular importance to a WCS is Goal 3 - Clean and plentiful water.

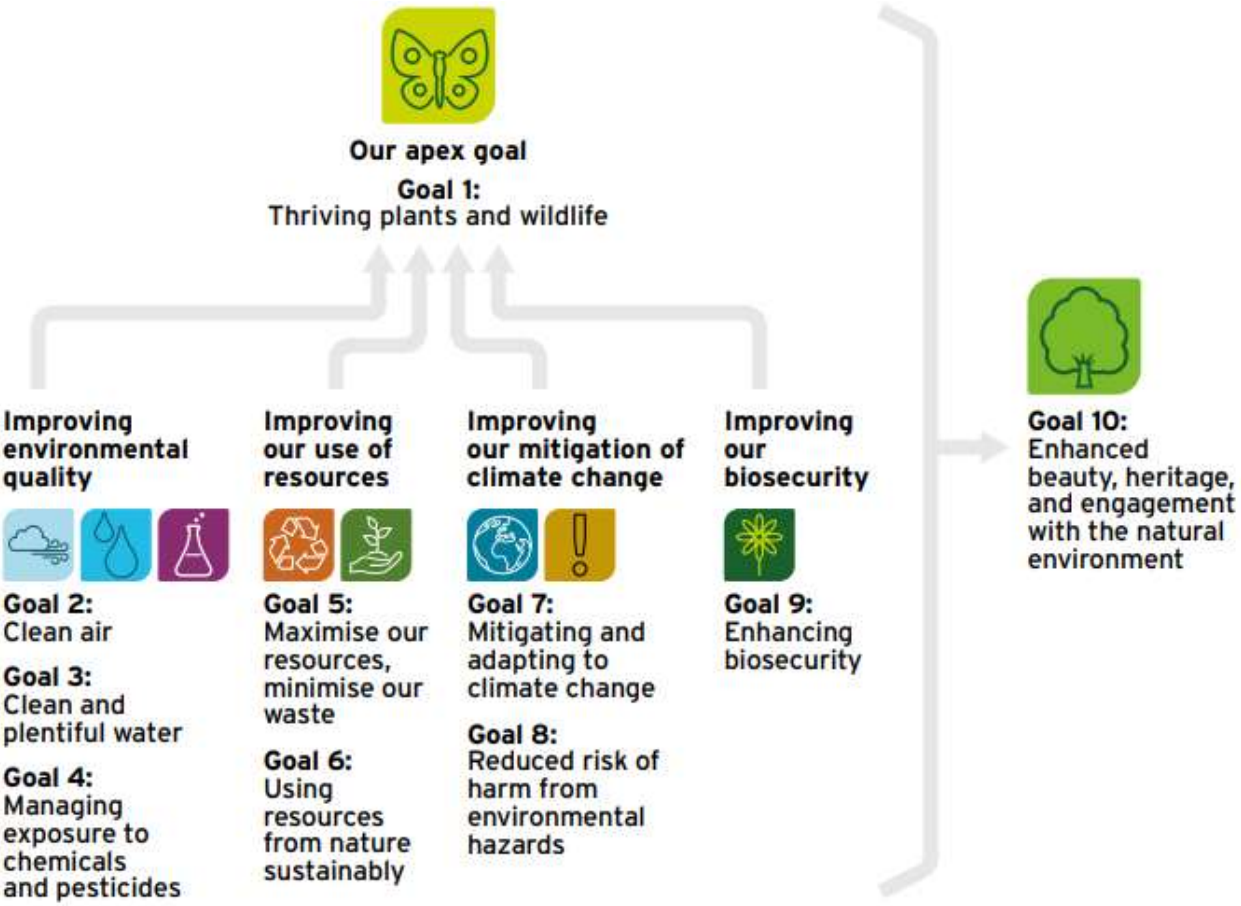


Figure 3-1 The 10 Environmental Improvement Plan goals

Under Goal 3 - Clean and plentiful water, there are eight sets of targets and commitments relating to different aspects of the water environment:

- "Reduce nitrogen, phosphorus, and sediment pollution from agriculture into the water environment by at least 40% by 2038, compared to a 2018 baseline, with an interim target of 10% by 31 January 2028, and 15% in catchment containing protected sites in unfavourable condition due to nutrient pollution by 2028.
- Reduce phosphorus loadings from treated wastewater by 50% by 2028 and 80% by 2038 against a 2020 baseline.
- Halve the length of rivers polluted by harmful metals from abandoned mines by 2038, against a baseline of around 1,500km (approximately 930 miles).
- Reduce the use of public water supply in England per head of population by 20% from the 2019-20 baseline, 2038, with interim targets of 9% by 2027 and 14% by 2032, and to reduce leakage by 20% 2027 and 30% by 2032.
- Restore 75% of our water bodies to good ecological status.
- Require water companies to have eliminated all adverse ecological impact from sewage discharges at all sensitive sites by 2035, and at all overflows by 2050.
- Target a level of resilience to drought so that emergency measures are needed only once in 500-years."

To deliver these goals, the EIP outlines action across these areas:

- Improving wastewater infrastructure and water company environmental performance;
- Reducing pressures on the water environment from agriculture;
- enabling the sustainable use of water for people, business and the environment;
- Tackling pressures from chemicals and pollutants;
- Restoring natural function and iconic water landscapes; and
- Joined-up management of the water system.

Progress towards delivering the EIP will be monitored annually.

3.7.3 Defra Plan for Water

Defra's Plan for Water (Department for Environment, Food & Rural Affairs, 2023) provides further detail on the actions towards achieving Goal 3 of the EIP23 It promotes an integrated approach to water management as the foundation of the plan. While many of the actions contained within the Plan for Water are outside of the responsibilities of areas of influence of the LPAs, the following summarises those actions that LPAs should have regard to:

- Require standardised SuDS in new housing developments in 2024, subject to final decisions on scope, threshold, and process following consultation in 2023.
- Designate all chalk catchments as water stressed and high priority under the sewer overflows reduction plan, driving action to improve water management.
- The plan reflects the predicted four billion litre per day (4,000 ml/d) gap between supply and demand across England and contains measures to both boost supply and reduce demand. Of interest to LPAs is the plan to reduce demand which will address half of the gap.
- A key component in reducing demand for water is improving water efficiency and there is a target under the Environment Act to reduce the use of public water supply in England per head of population by 20% by 2038. A road map on water efficiency in new developments and retrofits has been developed with ten actions to improve water efficiency:
    - **Action one -** Implement schedule 3 to the Flood and Water Management Act 2010. The 2024 consultation will consider rainwater harvesting in developing the statutory SuDS National Technical Standards.
    - **Action two -** Review the Water Supply (Water Fittings) Regulations 1999, the Water Supply (Water Quality) Regulations 2016 and/or any other relevant legislation to address wasteful product issues with toilets and enable new water efficient technologies.
    - **Action three -** Develop clear guidance on ‘water positive’ or ’net zero water’ developments and roles for developers and water companies.
    - **Action four -** Review water efficiency options in planning, building regulations and through voluntary schemes for non-household buildings.
    - **Action five -** Work with Ofwat to ensure the water industry can play a central role in retrofitting water efficient products in households, businesses, charities and the public sector.
    - **Action six -** Work across government to integrate water efficiency into energy efficiency advice and retrofit programmes.
    - **Action seven -** Review the Building Regulations 2010, and the water efficiency, water reuse and drainage standards including considering a new standard for new homes in England of 105 l/p/d and 100 l/p/d where there is a clear local need.
    - **Action eight -** Mandatory water efficiency labelling scheme.
    - **Action nine -** Investigate dual pipe systems (rainwater harvesting) and water reuse options for new housing development as part of the review of the planning framework.
    - **Action ten -** Enable innovative water efficiency approaches in buildings, including technologies and approaches to funding and maintenance.

3.7.4 Biodiversity Net Gain

Biodiversity net gain (BNG) is designed to contribute to the recovery of nature while developing land. The principle is that the natural environment is in measurably better state after development than it was before. The Environment Act 2021 has, since 2024 required all planning permissions granted in England to achieve 10% BNG.

Defra publishes a biodiversity metric tool, the latest version of which must be used for calculating the BNG deriving from a proposed development.

3.7.5 Local Nature Recovery Strategy

The Environment Act (HM Government, 2021) also established a duty to prepare, by March 2025, Local Nature Recovery Strategies (LNRS), recognising that England is one of the most nature-depleted countries in the world. Staffordshire County Council are the local authority responsible for preparing the LNRS In the study area. They are tasked with working with local partners to agree priorities for nature recovery and identify "practical, achievable proposals" (Department for Environment Food & Rural Affairs, 2023) to address these priorities. The LNRS should also co-ordinate with neighbouring strategies to form a national Nature Recovery Network.

A draft version of the Staffordshire and Stoke-on-Trent LNRS has been published and was open for public consultation until February 2026. The final version is expected to be published in late May 2026.

There is a close linkage with BNG, as developments proposing to create, enhance or recover habitat in locations mapped by the LNRS receive a higher value in the biodiversity metric calculator than in other locations.

3.7.6 Storm Overflow Reduction Plan

The Environment Act 2021 placed a legal duty on water companies to progressively reduce the adverse impacts of discharges from storm overflows. The storm overflow discharge reduction plan sets the following targets:

- By 2035, water companies will have: improved all overflows discharging into or near every designated bating water; and improved 75% of overflows discharging to high priority sites.
- By 2050, no storm overflows will be permitted to operate outside of unusually heavy rainfall or to cause any adverse ecological harm.

There is also an expectation that water companies ensure their infrastructure keeps pace with increasing external pressures, such as urban growth and climate change, without these pressures leading to greater numbers of discharges.

3.7.7 The Water Framework Directive (WFD) and Water Environment Regulations

Introduction

The European Union WFD 2000 is currently transposed into English and Welsh law by the Water Environment Regulations 2017. They apply to all waterbodies (watercourses, canals, lakes, estuaries and coastal waters), with the objective of meeting Good Ecological Status (GES) or, where heavily modified, Good Ecological Potential (GEP). To meet GES or GEP, a water body must achieve a good or high score for all elements - in the case of surface water, these are biological, physico-chemical, specific pollutants and hydromorphology. These elements are shown in Figure 3-2, which is from the webpage on how to use the Catchment Data Explorer (environment.data.gov.uk). UK policy remains to meet GES or GEP for all waterbodies by 2027.

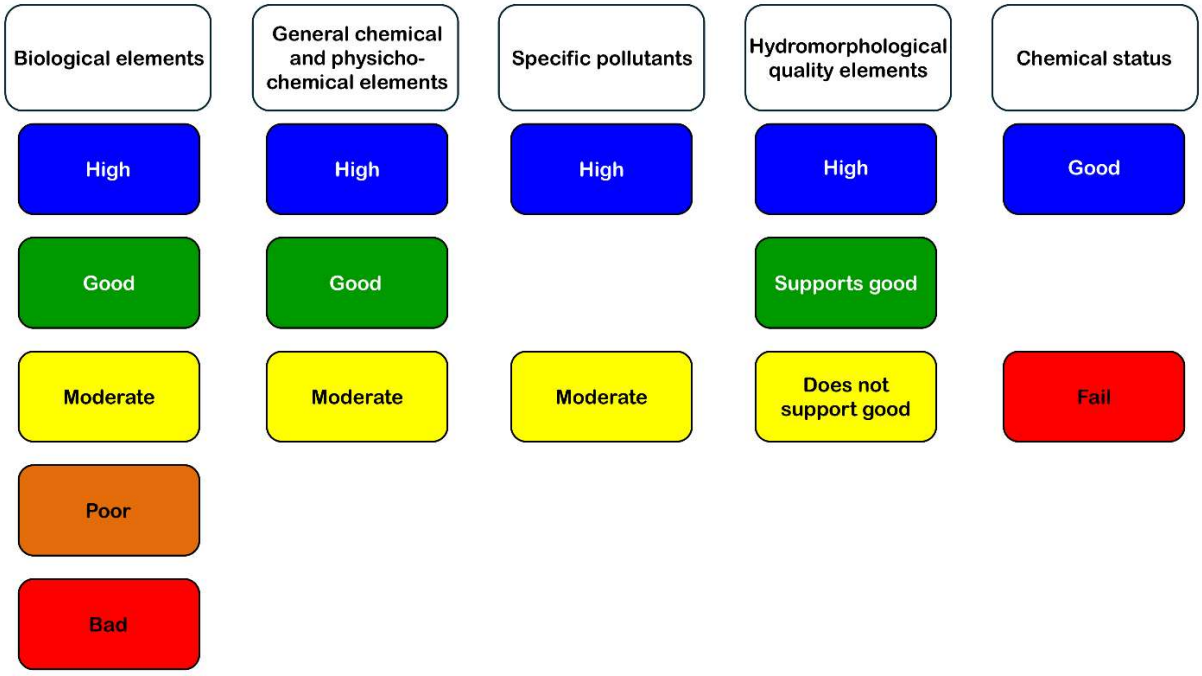


Figure 3-2: Status classification for surface water (EA, 2023)

Chemical Status is separately assessed. The WFD and the EA recognise a group of ubiquitous chemicals which are persistent, bioaccumulative or toxic (uPBT), and without which over 90% of England's waterbodies would achieve Good Chemical Status. Mercury, Perfluorooctanesulfonic acid (PFOS) and Polybrominated diphenyl ethers (PBDE) are the most ubiquitous causes of failures. Due to the persistent nature of these chemicals, the date for getting all waterbodies to Good Chemical Status is set for 2063.

River Basin Management Plans

River Basin Management Plans (RBMP) are required under the WFD and document the baseline classification of each waterbody in the plan area, the objectives, and a programme of measures to achieve those objectives. Stoke-on-Trent falls within the Humber RBMP- GOV.UK. The third cycle RBMPs were published in 2022. A primary

WFD objective is to ensure 'no deterioration' in environmental status, therefore all water bodies must meet the class limits for their status class as declared in the Humber RBMP. Another equally important objective requires all water bodies to achieve good ecological status. Future development needs to be planned carefully so that it helps towards achieving the WFD and does not result in further pressure on the water environment and compromise WFD objectives.

The WFD objectives as outlined in the updated RBMP are summarised below:

- Preventing deterioration of the status of surface waters and groundwater
- Achieving objectives and standards for protected areas
- Aiming to achieve good status for all water bodies
- Reversing any significant and sustained upward trends in pollutant concentrations in groundwater
- Cessation of discharges, emissions and losses of priority hazardous substances into surface waters
- Progressively reducing the pollution of groundwater and preventing or limiting the entry of pollutants

LPAs must have regard to the WFD as implemented in the RBMP. It is of primary importance when assessing the impact of additional wastewater flows on local river quality.

Alongside the RBMP documents, the data behind them can be explored further using the Catchment Data Explorer (environment.data.gov.uk) and map viewer (environment.maps.arcgis.com).

Protected Area Objectives

The Water Environment Regulations specify that areas requiring special protection under other EU Directives, and waters used for the abstraction of drinking water, are identified as protected areas. These areas have their own objectives and standards.

Some areas may require special protection under more than one piece of European Union-derived legislation or may have additional (surface water and/or groundwater) objectives. In these cases, all the objectives and standards must be met.

The types of protected areas are:

- Areas designated for the abstraction of water for human consumption (Drinking Water Protected Areas);
- Areas designated for the protection of economically significant aquatic species (Freshwater Fish and Shellfish);
- Bodies of water designated as recreational waters, including Bathing Waters;
- Nutrient-sensitive areas, including areas identified as Nitrate Vulnerable Zones under the Nitrates Directive or areas designated as sensitive under Urban Waste Water Treatment Regulations; and

- Areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection including relevant National sites.

3.7.8 Conservation of Habitats Regulations 2017 (as amended)

The Conservation of Habitats and Species Regulations 2010 (commonly referred to as the Habitats Regulations) consolidated the Conservation (Natural Habitats, &c.) Regulations 1994 and transposed the EU Habitats Directive in England and Wales which was aimed at protecting plants, animals and habitats that make up the natural environment. The regulations were further amended in 2017.

The Habitats Regulations define the requirement for a Habitats Regulations Assessment (HRA) to be carried out. The purpose of this is to determine if a plan or project may affect the protected features of a "habitats site". These include:

- A Special Area of Conservation (SAC) or candidate SAC.
- A Site of Community Importance (SCI).
- A site hosting a priority natural habitat type or priority species protected in accordance with Article 5(4) of the Habitats Directive.
- A Special Protection Area (SPA) or potential SPA.
- Ramsar sites.

All plans and projects (including planning applications) which are not directly connected with, or necessary for the conservation management of a habitat site require consideration of whether the plan or project is likely to have significant effects on that site.

This is referred to as the "Habitats Regulations Assessment screening" and should take into account the potential effects of both the plan/project itself and in combination with other plans or projects.

Part 6 of the conservation of Habitats and Species Regulations 2017 states that where the potential for likely significant effects cannot be excluded, a competent authority must make an appropriate assessment of the implications of the plan or project for that site, in view of the site's conservation objectives.

The competent authority may agree to the plan or project only after having ruled out adverse effects on the integrity of the habitats site.

If adverse effects cannot be ruled out, and where there are no alternative solutions, the plan or project can only proceed if there are imperative reasons of over-riding public interest and if the necessary compensatory measures can be secured.

The "People over Wind" ECJ ruling (C-323/17) clarifies that when making screening decisions for the purposes of deciding whether an appropriate assessment is required, competent authorities cannot take into account any mitigation measures. This must be part of the appropriate assessment itself.

The implementation of the Conservation of Habitats Regulations have had particular significant implications in two areas related to water and planning:

- Nutrient Neutrality. Natural England (NE) has identified a number of catchment areas where Habitats Sites are in unfavourable condition due to eutrophication (an excess of the nutrients phosphorous and/or nitrogen in water). NE have advised that developments in these catchments must demonstrate that they do not cause harm, and that one way to do this is to introduce mitigation measures in the catchment area which offset the additional nutrients emitted as a result of the development, an approach known as nutrient neutrality. There are no parts of the study area which are currently within a nutrient neutrality catchment area, however NE may designate additional areas in the future.
- Water Neutrality: In 2021, NE issued a position statement that it could not conclude with sufficient certainty that groundwater abstractions in the Arun Valley, West Sussex are causing no adverse effect on Habitats Sites. NE advised that developments in Sussex North Water Resource Zone (WRZ) must demonstrate that they do not cause harm, and that one way to do this is to introduce mitigation measures in the zone which offset the additional water consumed as a result of the development, an approach known as water neutrality. The position statement was withdrawn in October 2025, following agreement that that a reduction in the licence cap on water abstraction will ensure with sufficient certainty that development will not adversely impact the protected habitats. This does, however, emphasise the requirement upon Local Planning Authorities, as competent authorities, to demonstrate no adverse impacts through their Habitats Regulations Assessments. There are no parts of the study area which are currently within a water neutrality zone, however NE may designate additional areas in the future.

Both nutrient and water neutrality designations have resulted in significant impacts on the granting of planning permission in the designated areas.

3.7.9 Wildlife and Countryside Act

Sites of Special Scientific Interest (SSSI) are designated and legally protected under the Wildlife and Countryside Act 1981, Section 28G places a duty to take reasonable steps, consistent with the proper exercise of the authority's functions, to "further to the conservation and enhancement of the flora, fauna or geological or physiographical features by reason of which the site is of special scientific interest." (HM Government, 1981).

The Government's 25-year Environment Plan has a target of "*restoring 75% of our one million hectares of terrestrial and freshwater protected sites to favourable condition, securing their wildlife value for the long term*." In line with this, and the Wildlife and Countryside Act 1981, Local Authorities should look put forward options

that contribute to conservation or restoration of favourable condition, and at the very least must not introduce policies that hinder the restoration of favourable condition by increasing existing issues.

A site is said to be in “favourable condition” when the designated feature(s) within a unit are being adequately conserved and the results from monitoring demonstrate that the feature(s) in the unit are meeting all the mandatory site-specific monitoring targets set out in the favourable condition targets (FCT).

3.7.10 Ramsar

The Convention on Wetlands of International Importance, more commonly known as the Ramsar convention, aims to protect important wetland sites. Member counties commit to:

- 'Wise use' (ramsar.org) of all their wetlands, defined under the convention as 'the maintenance of their ecological character, achieved through the implementation of ecosystem approaches, within the context of sustainable development';
- Designating sites for the Ramsar list of 'Wetlands of International Importance' (Ramsar Sites) and their conservation; and
- Cooperating on transboundary wetlands and other shared interests.
- In the UK, Ramsar Sites are designated by the Joint Nature Conservation Committee (JNCC).

In general, the designation of UK Ramsar sites is underpinned through prior notification of these areas as SSSIs. Additionally, the NPPF states, (Paragraph 194), that Ramsar sites should be given the same protection in the planning process as sites designated under the European Union Habitats Directive.

3.7.11 Bathing Water Regulations

The Bathing Water Directive was first published in 2006 and are currently transposed into English and Welsh law through the Bathing Water Regulations 2013. The aims of the directive are the protection of public health whilst bathing, standardisation of publicly available water quality information and to improve management practices at bathing waters.

The UK has over 600 designated bathing waters defined as areas of inshore waters designated for public swimming, these areas are typically characterised by large numbers of swimmers and visitors per year. The Environment Agency are required to monitor water quality at these sites regularly (usually weekly) throughout the Bathing Water season, between 15th May and 30th September.

Water quality standards are based on the incidence of potentially harmful bacteria, E. coli and intestinal enterococci and are categorised as ‘excellent’, ‘good’, ‘sufficient’ or ‘poor’ on the basis of bacteria levels. Sites are rated annually and on a short-term basis in response to any temporary pollution incidents.

Achieving compliance with the Bathing Water Directive has driven some £2.5bn of investment by UK water companies since the early 1990s to reduce the impact of sewerage systems and treated wastewater discharges. Measures have included storage and surface water management to reduce storm overflow spills, moving or extending effluent outfalls and improving wastewater treatment, including ultra-violet (UV) treatment of final effluent.

In contrast to some other European nations, the UK has not previously designated stretches of river as bathing waters. However, following consultation (gov.uk), 27 proposed sites were added to a list of designated bathing waters from the 2024 bathing season. Consultation on the designation of a further 13 proposed bathing water sites was completed in March 2026. At the time of writing, analysis of the responses and supporting evidence are currently under review. Across England there are numerous campaigns by NGOs and members of the public to designate other stretches of river. Defra has published guidance on applying for bathing water status, including a requirement for at least 100 bathers per day during the season.

3.7.12 Environmental Permitting Regulations

Environmental permitting is a process used to manage and regulate activities which may cause harm to the environment. The Environmental Permitting Regulations 2016 were introduced in order to streamline a wide-ranging number of environmental permitting laws under one set of regulations. These include permits for emissions to air, water and land, and cover a range of industrial sectors and waste management streams.

Of particular relevance to this study are the regulations for permitting sewage effluent discharges to surface waters and groundwaters, known as water discharge activities.

- The regulations are used to permit discharges from water company and private WwTW, and for sewer overflows.
- The EA will usually object to applications for a new private Package Treatment Plan (PTP) or septic tank where it is feasible to connect the development to a public sewerage system. A general rule of 30m per dwelling is used to define a reasonable distance from the site boundary to a public sewer. Hence a development of ten homes should connect to a public sewer within 300m of the boundary, unless there are significant barriers, such as a river or motorway.
- Where an existing or new development treats its own wastewater, a PTP must be installed if the discharge is directly to surface water. Where the discharge is to ground, a PTP or septic tank may be used, but must be connected to a suitably designed drainage field.

3.7.13 Groundwater protection

Under the regulations, the EA have published a set of position statements on protecting groundwater from various activities (Environment Agency, 2018). The position statements that are relevant to this study with regard to discharges to groundwaters, include surface water drainage and the use of SuDS, discharges from contaminated surfaces (e.g., lorry parks) and from treated sewage effluent.

The EA also maintain a set of maps of Source Protection Zones (SPZs) to help identify high risk areas within which pollution prevention measures should be implemented. The SPZs show the risk of contamination to public water supplies from activities that may cause pollution in the area, the closer the activity, the greater the risk:

- **Zone 1 (Inner protection zone)** This zone is designed to protect against the transmission of toxic chemicals and water-borne disease. It indicates the area in which pollution can travel to the borehole within 50 days from any point within the zone and applies at and below the water table. There is also a minimum 50 metre protection radius around the borehole.
- **Zone 2 (Outer protection zone)** This zone indicates the area in which pollution takes up to 400 days to travel to the borehole, or 25% of the total catchment area, whichever area is the largest. This is the minimum length of time the Environment Agency think pollutants need to become diluted or reduce in strength by the time they reach the borehole.
- **Zone 3 (Total catchment)** This is the total area needed to support removal of water from the borehole, and to support any discharge from the borehole.
- **Zone of special interest** This is defined on occasions, usually where local conditions mean that industrial sites and other polluters could affect the groundwater source even though they are outside the normal catchment.

3.8 Summary of key new and emerging policy and legislation

The policy and legislation covering the water environment, water and wastewater services and planning is wide and frequently changing. The new and emerging policy and legislation below have been identified as particularly important for consideration in the development of the Local Plan.

- In July 2024 a new Government was formed and committed to reform the planning system, including a new standardised method of calculating local housing need.
- The Water (Special Measures) Act 2025, which received Royal Assent in February 2025, gives regulators stronger powers to act swiftly against water companies that harm the environment or fail customers. It allows Ofwat to ban executive bonuses if firms fall short on environmental, customer service, or financial standards. Other measures include automatic penalties to speed up enforcement, independent monitoring of

all sewage outlets, and mandatory real-time reporting of emergency overflows within an hour of a spill.

- The Storm Overflow Assessment Framework (SOAF) was updated in 2025. This guidance builds on the implementation of the SOAF during the PR19 period (2020 to 2025) to improve and make the process more effective. Changes since the first framework include: a reduction in the trigger threshold for high spill frequency overviews to reflect requirements to improve storm overflow performance; linking to the most up to date process for water quality modelling investigations; and updates to related documentation including that on the process of the cost benefit assessment.
- The Independent Water Commission report (AKA The Cunliffe Report) recommended a simplification of the water planning system is recommended, with a comprehensive systems planning framework for England and Wales with responsibility for integrated and holistic water system planning. In response, the government announced that Ofwat would be abolished and replaced by 'a new, single, powerful regulator'.
- As of July 2025, the Defra National standards for SuDS were brought in to comply with the principles of surface water drainage design.
- Schedule 3 of the Flood and Water Management Act will designate LLFAs as SuDS Approval Bodies (SABs) with a duty to adopt new SuDS and removing the automatic right to connect to public sewers. The previous Government affirmed its commitment for enacting Schedule 3; however, it is currently unknown whether the current Government intends to do this or what the proposed timescales would be.
- Defra has recently consulted on a revised national water efficiency standard for new homes of 105 l/p/d or 100 l/p/d where there is a clear local need.
- All developments are now expected to demonstrate at least a 10% biodiversity net gain.

4 Water resources

4.1 Introduction

4.1.1 Objectives

The aim of the water resources assessment is to identify whether sufficient water is available in the region to serve the proposed level of growth, and that it can be abstracted without a detrimental impact on the environment, both during the plan period and into the future. The assessment characterises the study area, identifying the key surface water and groundwater bodies, and local geology. It highlights the pressures on water resources in the region, identifies existing constraints on abstraction, and provides evidence for adopting tighter water efficiency targets.

4.1.2 Water resources in the UK

It is important to set water resources in Stoke-on-Trent within the context of the overall national picture.

The EA (Environment Agency, 2024) published a summary of England's revised draft regional and water resources management plans (gov.uk) which includes their view on the overall state of water resources in the UK and the challenges the country faces. They state that:

'In England, our climate is changing, our population is growing, and as a nation we want an improved environment along with a thriving economy, enabled by resilient water supplied. Action is required now to meet these objectives'.

'The scale of the challenge we face increases with time, and, by 2050, we are looking at a shortfall of nearly 5 billion litres of water per day between the sustainable water supplied available and the expected demand.'

'Demand reductions are crucial, particularly in the short term. The Environment Act 2021 sets a target to reduce the use of public water supply in England, per head of population, by 20% by 2037-38 from the 2019-20 baseline.'

'Government will be looking to water companies to act quickly and take significant steps forward on installing smart meters and delivering on their wider water efficiency commitments and reducing leakage. This will happen alongside the introduction of a mandatory water label which will enable water efficient decisions across the country. The government has also committed to review water efficiency requirements of building regulations which will be a key action to ensure new homes are water efficient.'

There have been several important documents published in recent years, all highlighting the growing awareness and concern about this issue. The National Water Resources Framework led to the creation of the regional water resources

planning groups and defined the objective to achieve an average household water efficiency of 110 l/p/d by 2050 (including existing housing).

The Government's 2023 Environmental Improvement Plan (gov.uk) contains a roadmap for improving water efficiency in new developments and retrofits.

4.2 Environmental characteristics of the study area

4.2.1 Introduction

This section aims to review the geological and hydrogeological setting of Stoke-on-Trent (the "study area") and the aquifer properties of the groundwater bodies, which will both supply and receive water discharges from the area and be affected by continued development.

4.2.2 Study Area

The study area, comprising the administrative area of the city of Stoke-on-Trent covers approximately 93.4 km^2 in the West Midlands. Stoke-on-Trent is the largest settlement in Staffordshire and one of the largest cities in the Midlands with a population of 258,369 (based on the 2021 census data).

As seen in Figure 4-1, the River Trent flows from north-east to south-west through the centre of Stoke-on-Trent. Two of the Trent's tributaries also lie within the study area. Fowlea Brook and Lyme Brook are both designated as main rivers by the Environment Agency (EA). Lyme Brook originates in the neighbouring district of Newcastle-under-Lyme. Water supply and wastewater services across Stoke-on-Trent are provided by Severn Trent Water (STW).

4.2.3 Topography

The topography of the study area is shown in Figure 4-2. Ground elevations decrease from around 200 metres above ordnance datum (mAOD) in the northern highest areas (Goldenhill, Turnhurst, Packmoor) and 220mAOD in the western highest areas (Longton, Fenton, Lightwood, Park Hall area), to roughly 100mAOD within the River Trent floodplain.

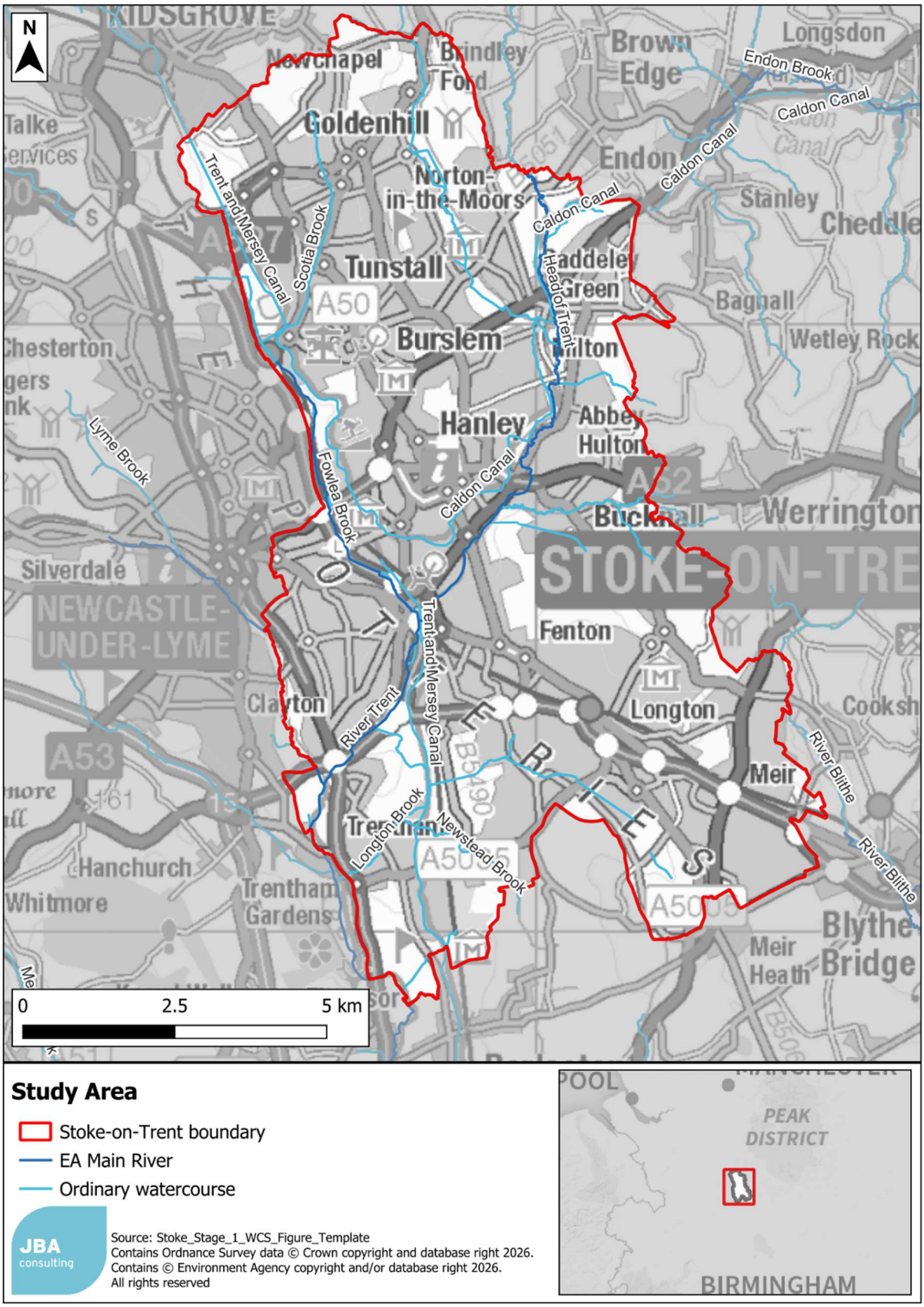


Figure 4-1: Stoke-on-Trent Study Area

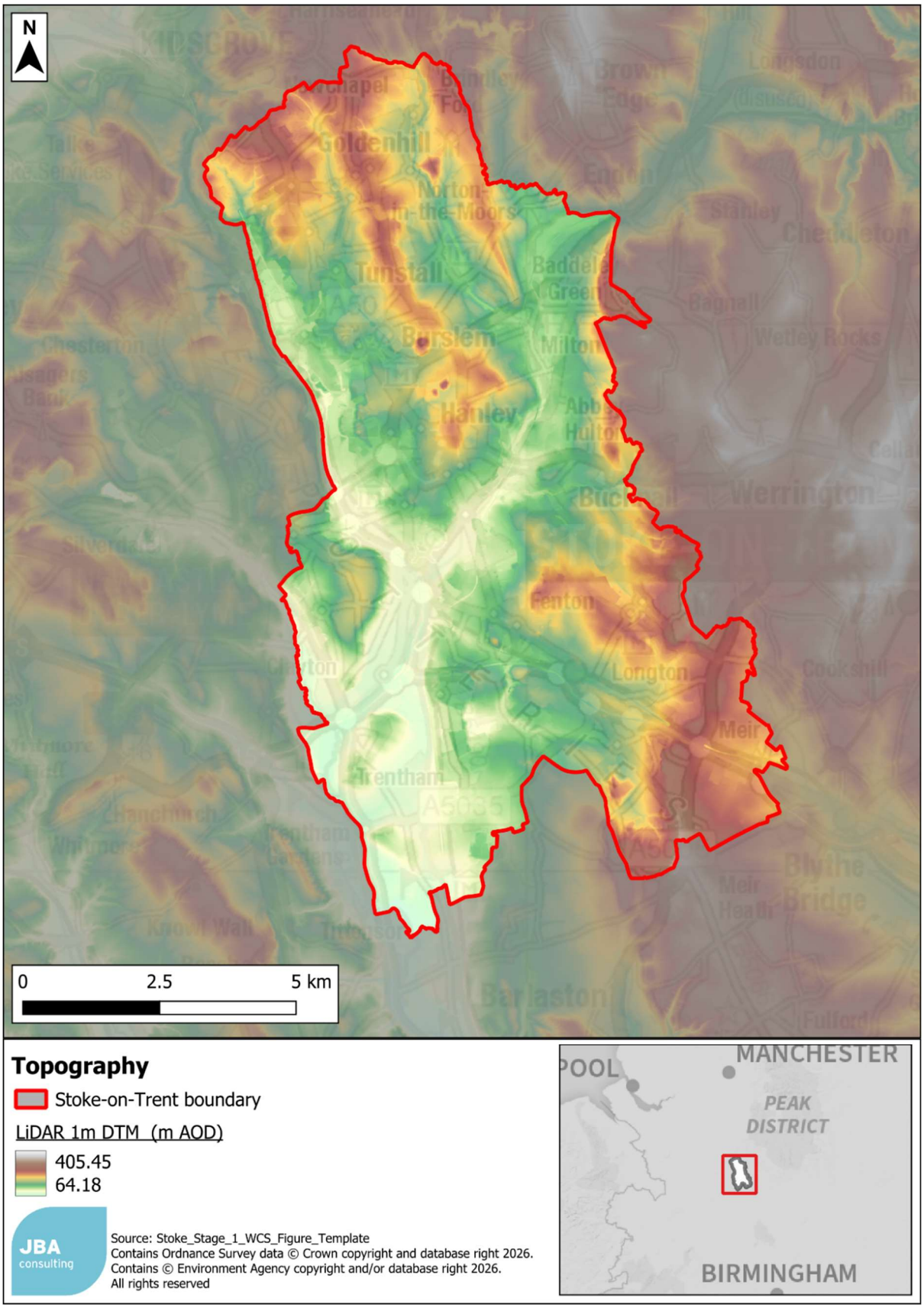


Figure 4-2: Stoke-on-Trent Topography

4.2.4 Catchment

There is one EA gauging station identified from the UK Hydrometric Register (2008) within the study area; on the River Trent at Stoke-on-Trent. The data provided by the station give the Baseflow Index (BFI) of 0.44. The Baseflow Index (BFI) is the proportion of total streamflow made up of baseflow (groundwater input). This suggests that 44% of the local watercourses in Stoke-on-Trent are made up of groundwater baseflow and are mostly reliant on short term surface water flow (rainfall).

The study area is largely within the Trent - Source to Sow Rivers Operational Catchment, for which there are 10 individual water body catchments within the study area. The southeastern corner of the study area, containing the suburb of Meir, is within the Blithe Rivers and Lakes Operational Catchment. From the EA gauging station on the River Trent, the Standard Annual Average Rainfall (SAAR) is summarised in Table 4-1 below.

Table 4-1: Standard Annual Average Rainfall within study area

Gauging Station	SAAR period 1941 1970	SAAR period 1961 1990	SAAR period 1991 2020
Trent at Stoke-on-Trent (Station: 28040)	878 mm/yr	861 mm/yr	894 mm/yr

The SAAR is the average rainfall across a catchment over a 30-year period derived from the National River Flow Archive. Annual rainfall has generally increased across the three periods, reflecting wider trends observed across the UK. Stoke on Trent receives slightly less rain than average compared to the majority of the West Midlands of the UK, according to the Met Office 50-year average annual rainfall datasets.

4.2.5 Surface Water Hydrology

Several Environment Agency-designated main rivers flow through the Stoke-on-Trent study area, forming a critical component of the district's hydrological infrastructure. Figure 4-3 shows the river waterbodies within the study area.

The source of the River Trent is located approximately 2.5km north of the study area. The Trent from Source to Ford Green Brook, Trent - Ford Green Bk to Fowlea Bk and River Trent from Fowlea Brook to Tittensor all flow through the study area from northeast to southwest.

Ford Green Brook from Source to R Trent flows from the north of the study area in a southeasterly direction to join the Trent at Milton. Fowlea Brook from Source to River Trent comprises two reaches: one originating at Turnhurst within the study area and

one beginning adjacent to the A500 Queensway to the west. It flows southwards before joining the River Trent.

Causeley Brook from Source to River Trent flows through the eastern side of the study area before joining the River Trent. Blithe from Source to Tad Brook runs along part of the eastern boundary of the study area, near Weston Coyney. Longton Bk - source to R Trent emerges in Longton and flows in a westerly direction before joining the River Trent near Trentham.

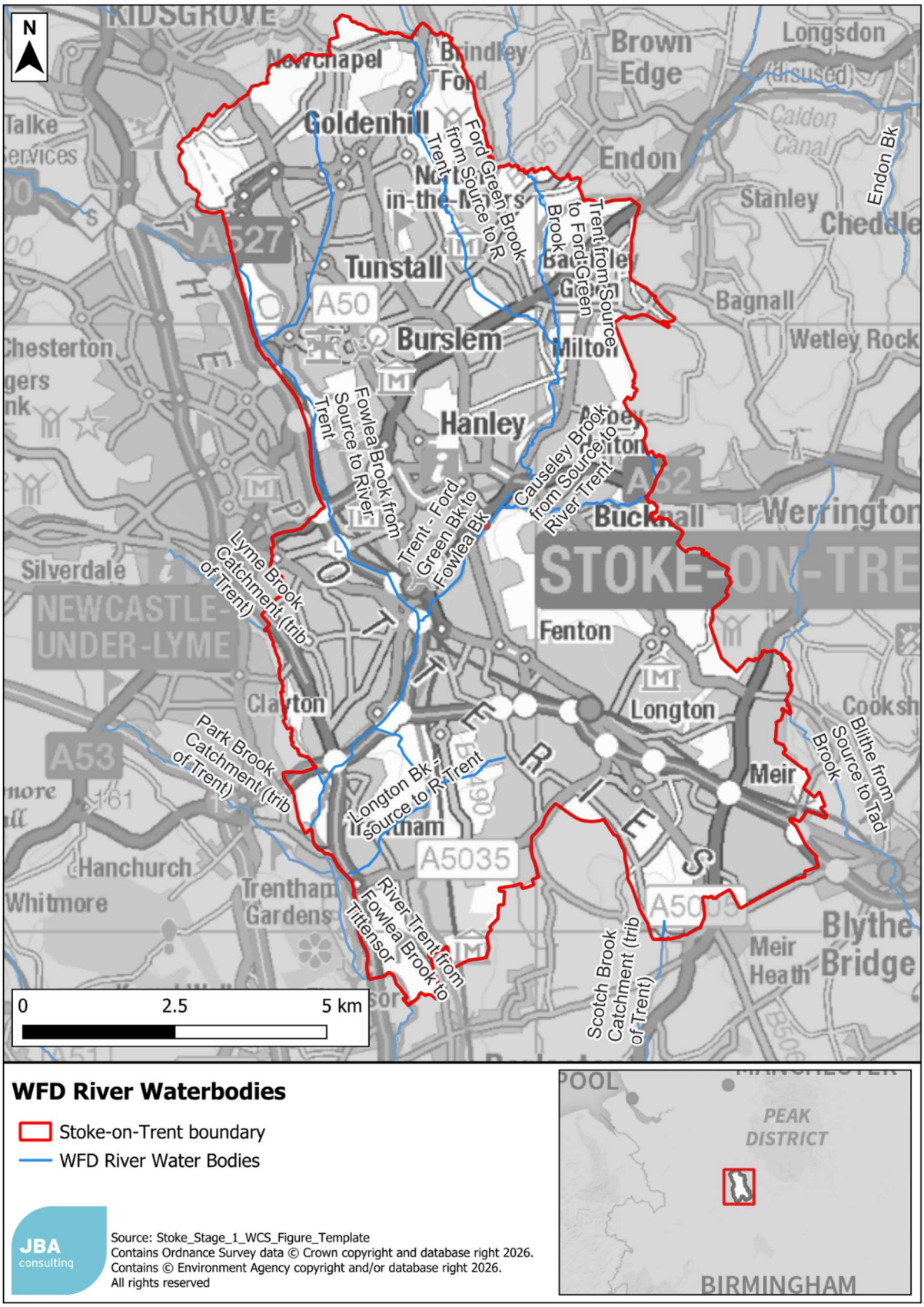


Figure 4-3: River waterbodies in and around Stoke-on-Trent

4.2.6 Groundwater Hydrology

A WFD groundwater body represents a distinct body of groundwater flow with a coherent flow unit including recharge and discharge areas with little flow across the boundaries. There are four groundwater bodies within the study area which are shown in Figure 4-4 and their corresponding WFD classification is summarised in Table 4-2 below.

The Staffordshire Trent Valley - PT Sandstone Staffordshire groundwater body has good chemical status but poor quantitative status, resulting in a poor overall status. This poor status is attributed to groundwater and surface water abstraction as well as abandoned mines and poor nutrient management. The Manchester and East Cheshire Carboniferous Aquifers groundwater body has good quantitative status but poor chemical status, resulting in a poor overall status. This poor status is attributed to private sewage treatment, poor nutrient and livestock management and septic tanks. The Staffordshire Trent Valley Mercia Mudstone East & Coal Measures and Coal Measures Stoke groundwater bodies have good overall status.

Table 4-2: WFD status of groundwater bodies

Groundwater Body	WFD Quantitative status	WFD Chemical status	WFD Overall status	Reasons for Not Achieving Good status (RNAG)
Staffordshire Trent Valley - PT Sandstone Staffordshire	Poor	Good	Poor	Groundwater abstraction Abandoned mine Poor nutrient management Surface water abstraction
Staffordshire Trent Valley - Mercia Mudstone East & Coal Measures	Good	Good	Good	N/A
Staffordshire Trent Valley - Coal Measures Stoke	Good	Good	Good	N/A
Manchester and East Cheshire Carboniferous Aquifers	Good	Poor	Poor	Private sewage treatment Poor nutrient management Poor livestock management Septic tanks

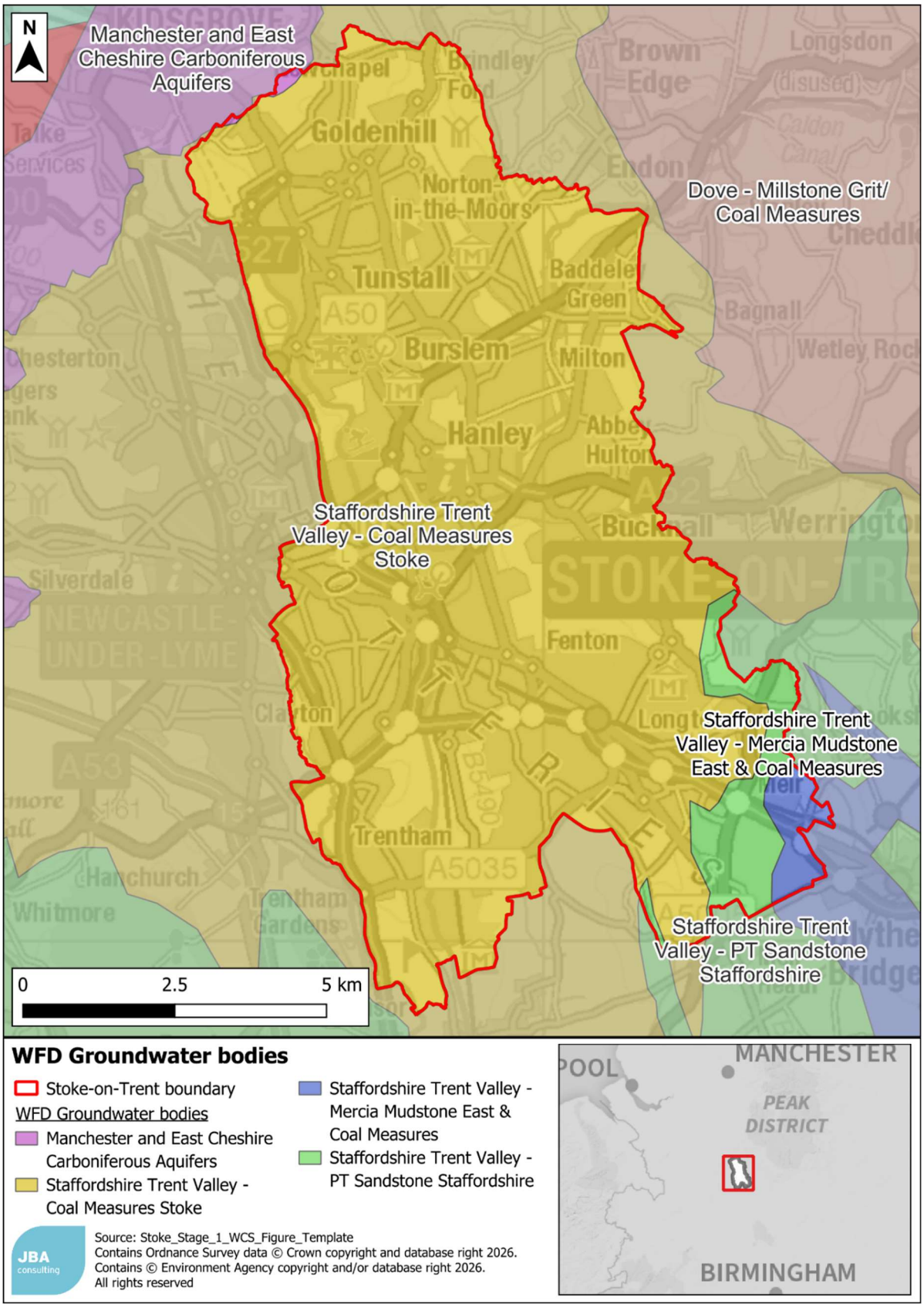


Figure 4-4: Groundwater bodies within Stoke-on-Trent study area

4.2.7 Geology summary

The geology of the catchment can be an important influencing factor in the way that water runs off the ground surface, and also locally on the type of SuDS that is appropriate for development sites. This is primarily due to variations in the permeability of the surface material and bedrock stratigraphy.

Information on the geology of the study area has been derived from 1:625,000 British Geological Survey geology mapping (BGS online map viewer), BGS Solid & Drift Geology Map Sheet 123, 1:50000 scale (1994) and the BGS online borehole archive. The geology underlying the site is summarised in Table 4-3 and shown in Figure 4-6 and Figure 4-7.

Table 4-3: Stratigraphy of lithologies underlying the study area

Age	Group	Unit	Description	Thickness (m)
Quaternary	Topsoil	Soilscape 17 (covers ~60% of study area)	Slowly permeable seasonally wet acid loamy and clayey soils*. Landcover is seasonally wet pastures and woodlands. Main risks are associated with overland flow from compacted or poached fields.	0.3 - 0.4m***
Quaternary	Topsoil	Soilscape 24 (~10% study area)	Restored soils mostly from quarry and opencast spoil. Many sites suffer from compaction, run off and erosion. Potential acid seepage on certain restored mining sites.*	0.1-0.9m***
Quaternary	Topsoil	Soilscape 20 (~10% study area)	Loamy and clayey floodplain soils with naturally high groundwater*. Limited extent around existing riverbanks and immediate floodplains.	Variable- borehole logs limited due to presence of river and made ground
Quaternary	Topsoil	Soilscape 8	Slightly acid loamy and clayey soils with impeded drainage*.	Unknown.
Quaternary	Topsoil	Soilscape 18	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils*. Landcover is seasonally wet arable grassland and some woodland.	0.1-0.4m***
Quaternary	Topsoil	Soilscape 6	Freely draining slightly acid loamy soils.	Unknown
Quaternary	Superficial deposits	Alluvium	Unconsolidated clay, silt, sand and gravel river deposits.**	0.9-2m***

Age	Group	Unit	Description	Thickness (m)
Quaternary	Superficial deposits	River Terrace deposits	Undifferentiated sands and gravels locally with lenses of silt, clay or peat.	Unknown, no shallow borehole logs available.
Quaternary	Superficial deposits	Till	Overconsolidated, unsorted clay, sand, gravel, boulders**	0.3-0.7m-***
Triassic	Bedrock	Triassic Rocks (Undifferentiated)-Mudstone	Mudstone, siltstone and sandstone. Notable formations in this area include the Mercia Mudstone and Chester formations.	Variable by each formation (1:50k)
Triassic	Bedrock	Triassic Rocks (Undifferentiated)-Sandstone	Interbedded sandstone and conglomerate. Notable formations in this area include the Hulme Member-Conglomerate and Halesowen Formation	Variable by each formation (1:50k)
Carboniferous	Bedrock	Warwickshire Group - Siltstone	Siltstone and sandstone with subordinate mudstone. Red-bed formations and the relatively coal-poor, grey formations that overlie the Pennine Coal Measures Group.	Variable, between 600-1225m
Carboniferous	Bedrock	Warwickshire Group - Mudstone	Mudstone, siltstone, sandstone, coal, ironstone and ferricrete	Variable, between 600-1225m
Carboniferous	Bedrock	Pennine Upper Coal Formation	Interbedded grey mudstone, siltstone and pale grey sandstone, commonly with coal seams, but no mudstones containing marine fossils present.	350m across North Staffordshire**
Carboniferous	Bedrock	Pennine Middle Coal Formation	As above but containing marine fossils within a bed of mudstone at the base.	~200m across the northwest of England**

Age	Group	Unit	Description	Thickness (m)
Carboniferous	Bedrock	Pennine Lower Coal Formation	Undifferentiated Mudstone, siltstone, sandstone, coal, ironstone and ferricrete**	Up to 650m across North Staffordshire**

Sources:
*Soil Landscapes Online Viewer
**BGS Online Lexicon of Named Rock Units
***BGS Borehole Records (thickness of strata estimated from a small sample)

4.2.7.1 Topsoil

Soil classification by the Soil Landscapes Online Viewer (DEFRA, 2022) has classified the soils throughout the study area into six types (see Table 4-3), predominantly Soilscapes 17, which covers approximately 60% of the study area across the northern half. This soil is slowly permeable, seasonally wet acid loamy and clayey, with seasonally wet pasture and woodland landcover. The main risks of erosion and deterioration are associated with overland flow from compacted or poached fields. The second most widespread soil in the study area is Soilscape 24, which is a unique restored soil mostly from quarry and opencast spoil and is limited to the outer borders of the study area. It is noted that many sites covered with this soil type, suffer from compaction, runoff and erosion with potential acid seepage on certain restored mining sites.

The remaining four soils types are sparse in coverage, with patches of Soilscape 8 and 18 within the south of the study area, (both slightly acidic loamy and clayey soils with impeded or slow drainage), Soilscape 6 to the southwest (freely draining, also slightly acidic soil) and Soilscape 20 entirely limited to the River Trent immediate banks and floodplain running north to south through the centre of the study area. This floodplain soil is described as loamy and clayey with naturally high groundwater.

4.2.7.2 Artificial (Made) Ground

The BGS GeoIndex indicates that Artificial Made and Infilled Ground is distributed across the majority of the study area, mainly underlying and surrounding the existing towns and buildings (Figure 4-5). Made Ground will be associated with all building footprints, roads and railways within the study area, for which buildings alone (without surrounding hardstanding and infrastructure) account for 12% of the total land area (1,205ha of 9,343ha). There are multiple areas across the south and north with no buildings or roads that are marked by the BGS as 'artificial deposits', which represent infilled ground associated with quarries that have restricted construction of buildings in these areas.

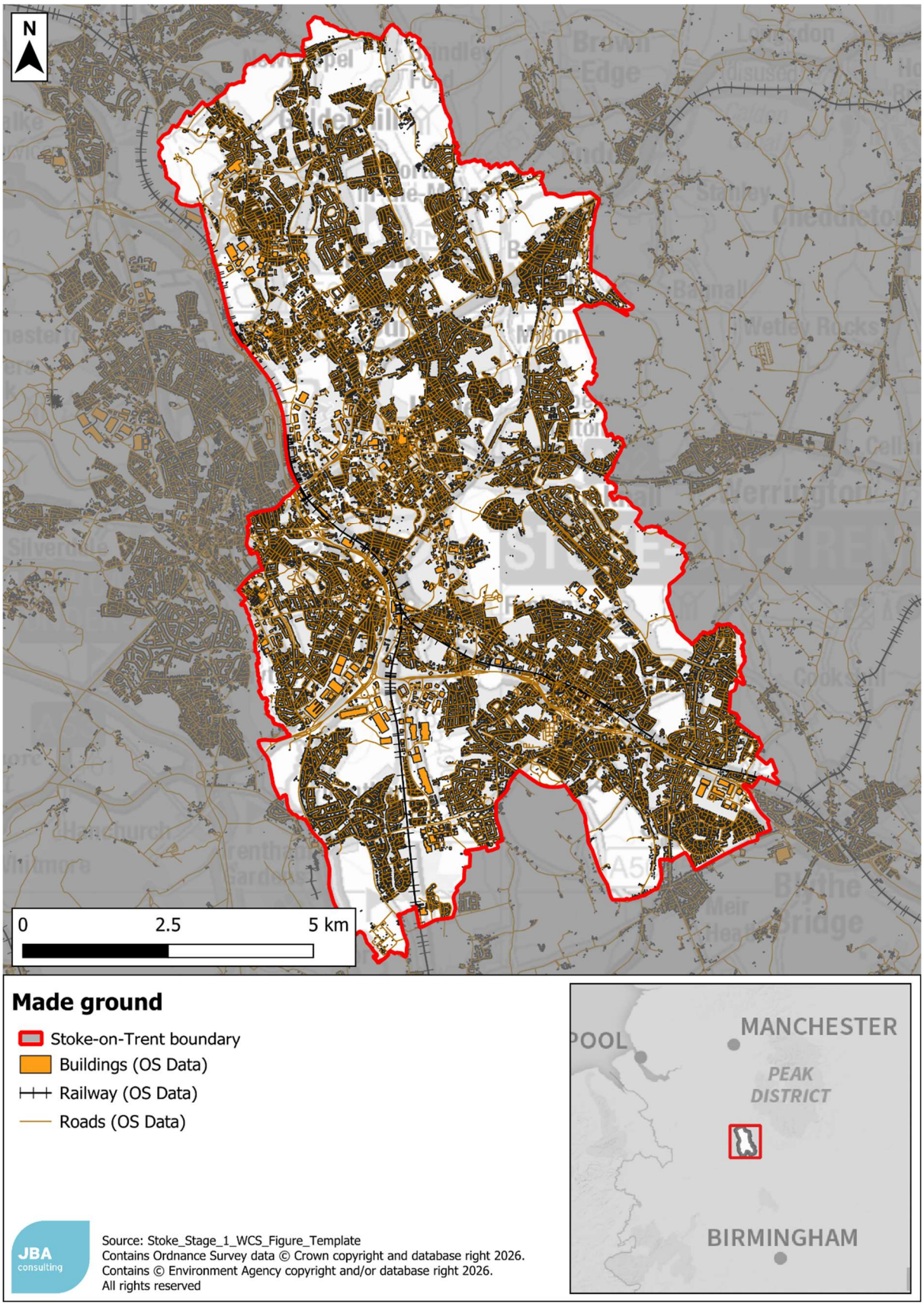


Figure 4-5: Building footprints and Artificial Ground in Stoke-on-Trent

4.2.7.3 Superficial Deposits

The superficial deposits underlying the study area and the surrounding local area are shown in Figure 4-6. The BGS GeoIndex (1:625k) indicates that the main superficial deposits in the study area consist of Alluvium and Till, with minor areas along the River Trent floodplain of River Terrace deposits.

- The Till underlies in the east and west of the study area, is generally up to 1.5m thick and consists of over-consolidated, unsorted clays, sand, gravel and boulders of varying sizes. It is deposited by a glacier and often found on valley floors.
- The Alluvium is generally up to 10m thick and consists of sands, silts and clays with some bands of gravel. It is found in the buried valleys and forms sinuous tracts localised along the southern river valley floors across the centre of the study area.

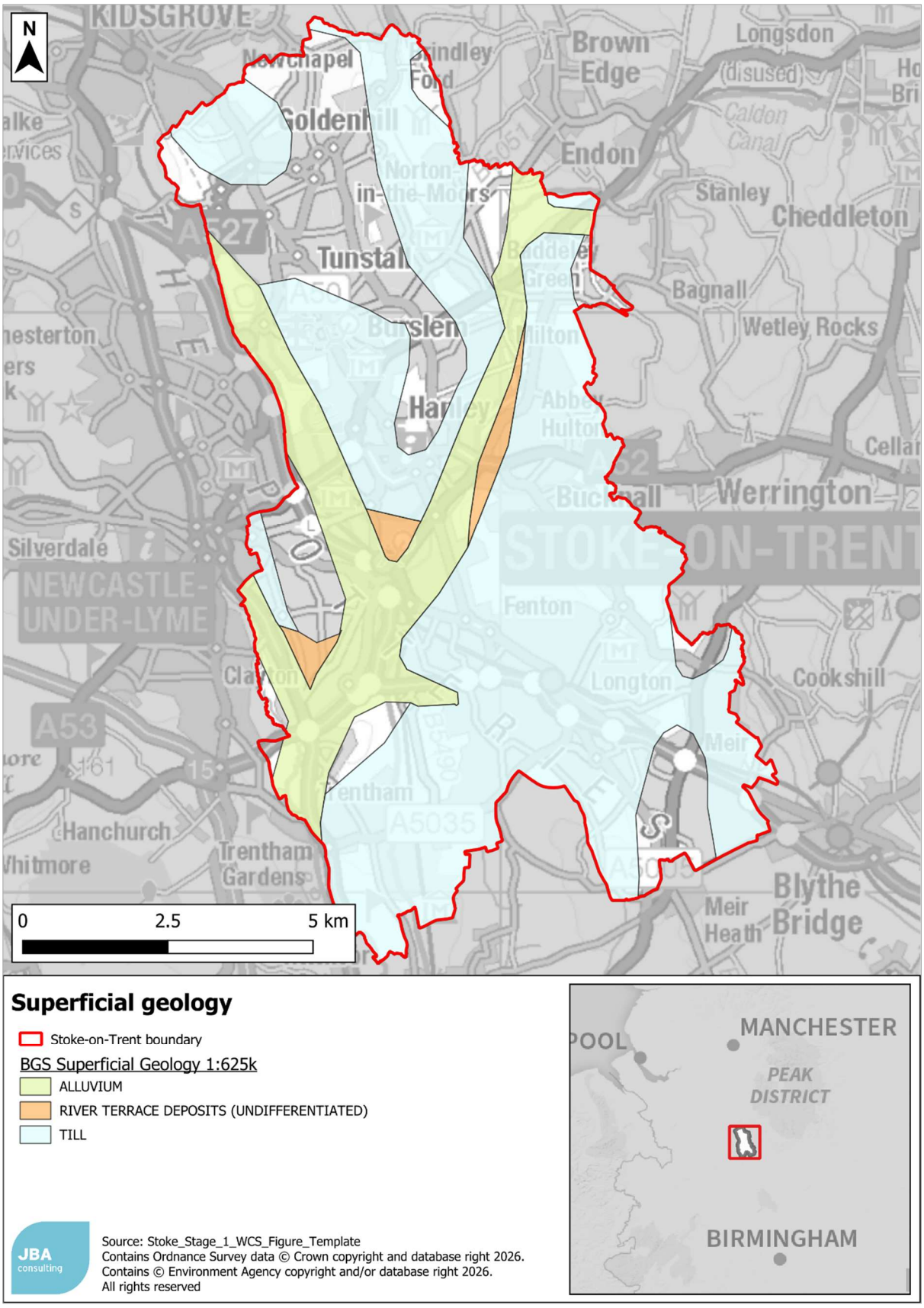


Figure 4-6: Superficial deposits within Stoke-on-Trent

4.2.7.4 Bedrock Geology

The BGS 1:625k geology mapping shows that the bedrock geology of the study area comprises two main lithological groups: the Pennine Coal Measure Formations in the northeast (Upper, Middle and Lower) and the Warwickshire Group to the south of the study area. There is also an outcrop of "undifferentiated" Triassic bedrock within the southeastern corner of the study area, and a small section of the Milstone Grit Group to the northeast. These lithologies can be seen in Figure 4-7.

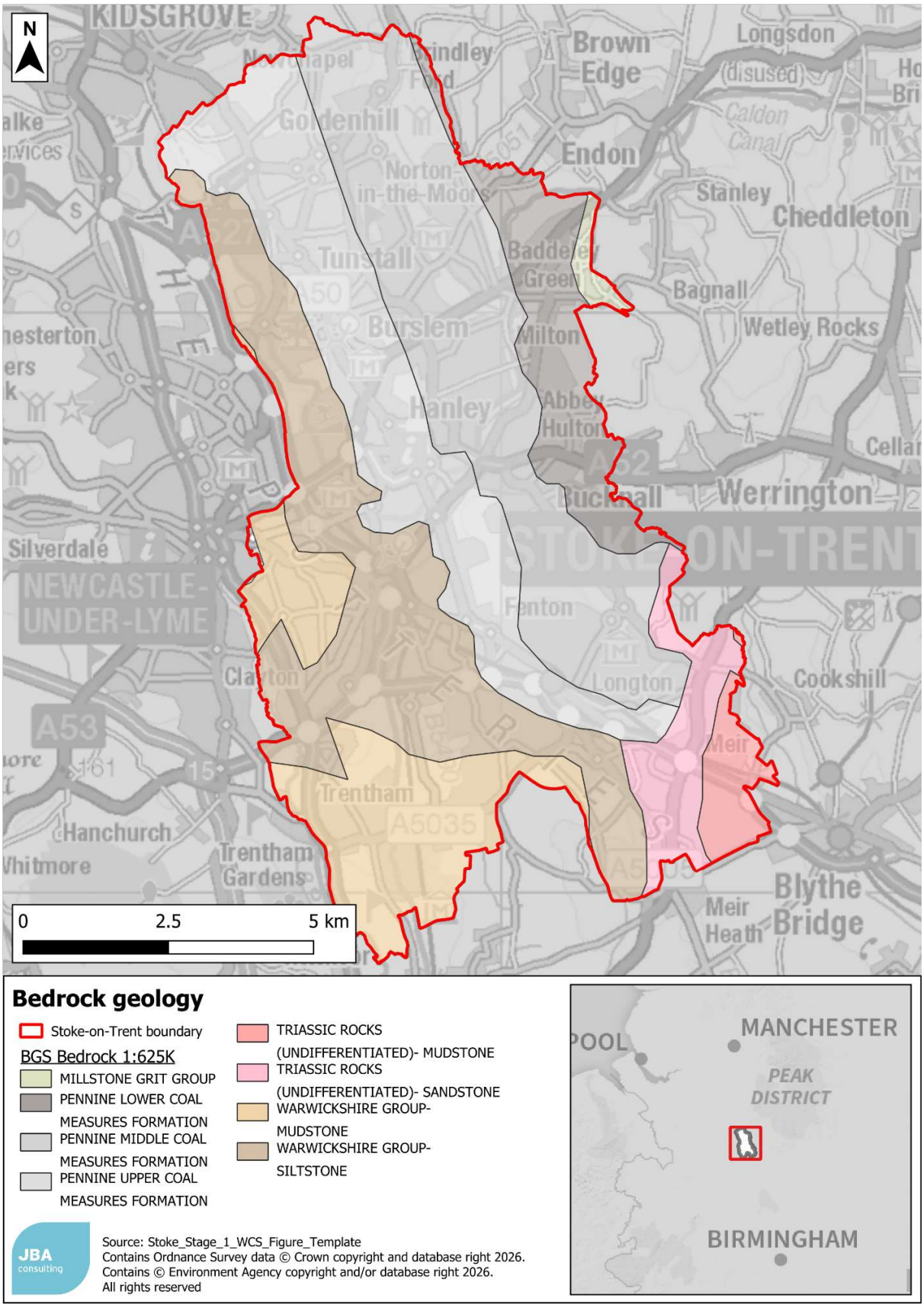


Figure 4-7: Bedrock Geology in Stoke-on-Trent

4.2.7.5 Mining Risk Areas

Due to the Pennine Coal Formation bedrock underlying the study area, extensive past mining activities are present within Stoke-on-Trent. Data from the Mining Remediation Authority shows that Development High Risk Areas (DHRA's) cover the majority of the study area with a very high density of potential shaft and Adit entry points (see Figure 4-8)

DHRA's are areas where one or more recorded mining-related features, which have the potential for instability or a degree of risk to the surface, are present (Mining Remediation Authority, 2025). This often includes mine entries, shallow coal workings (recorded and probable), recorded mine gas sites and other features.

If a site is within the Development High Risk Area, for most planning applications a Coal Mining Risk Assessment will need to be submitted to the local planning authority (Stoke-on-Trent City Council).

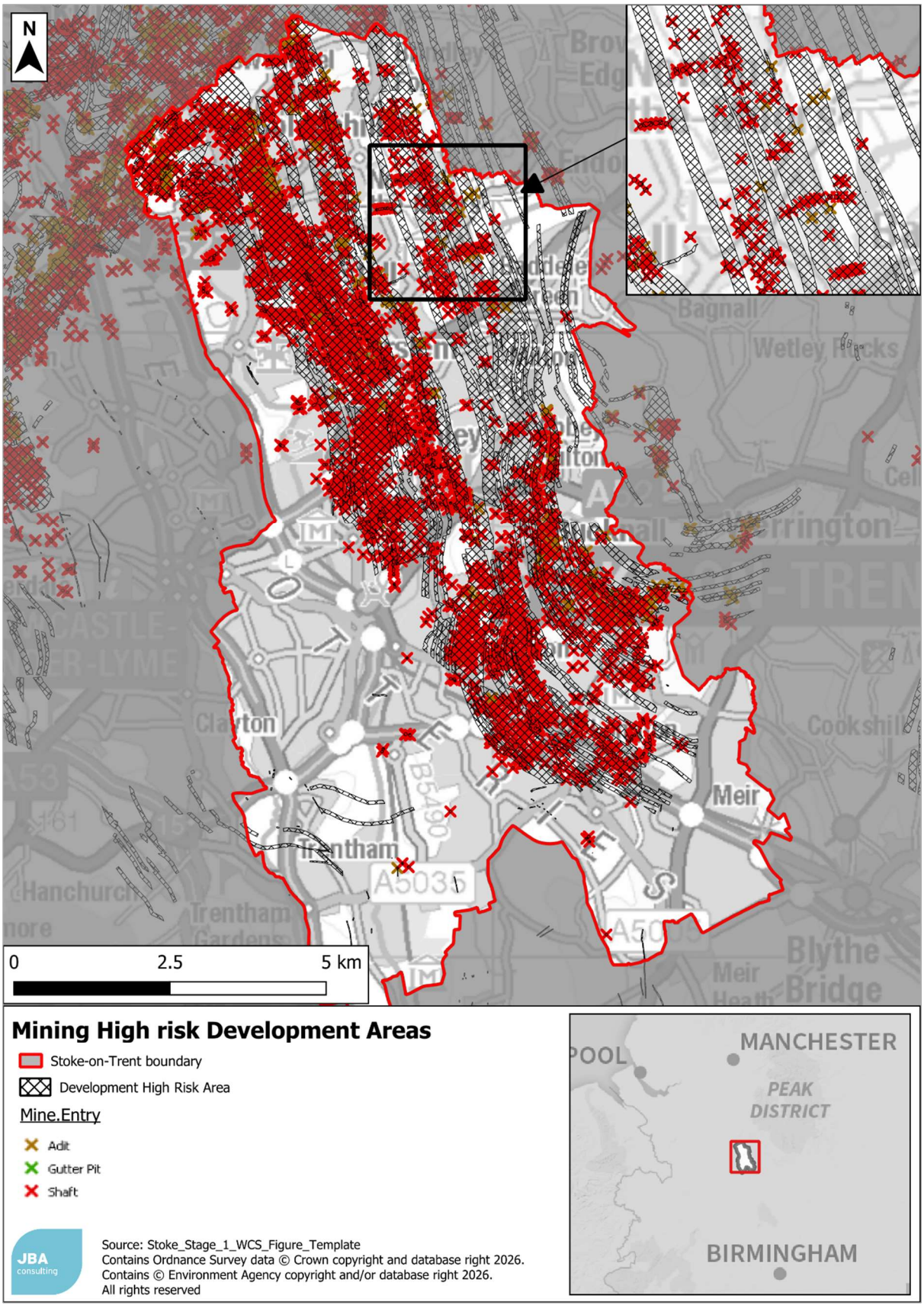


Figure 4-8: Development High Risk Areas (mining) in Stoke-on-Trent

4.2.8 Hydrogeology

4.2.8.1 Aquifer classification

Table 4-4 summarises the Environment Agency's (EA) hydrogeological classification of the bedrock and superficial deposits underlying the study area.

The Till superficial deposits (across majority of study area) and the minor patches of River Terrace deposits are designated Secondary undifferentiated aquifers. This is used when it is not possible to attribute either category A or B to a strata type, and in most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the strata.

The Alluvium superficial deposits (lining the River Trent through the centre of the study area) are designated Secondary A Aquifers. Secondary A Aquifers comprise permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases, forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The underlying bedrock units of Warwickshire Formation, Pennine Coal Measure Formation, Lower, Middle, and Upper are classified as Secondary A Aquifers, covering the majority of the study area. These are moderately productive (local water supply supporting) interbedded mudstone, siltstone, pale grey sandstone and common coal seams up to 600m thick. From BGS Hydrogeology 625k mapping data, aquifer flow is virtually all through fractures and discontinuities described with moderate yields from sandstones.

The undifferentiated Triassic rock present within the southeast of Stoke-on-Trent is classified as a Principal Aquifer. These aquifers are high-yielding, strategically important and support significant abstraction for public supply, industrial and agricultural use. They also provide important flows to connected rivers and wetlands, and are designated as critical water resources by the EA. Despite being overlain by superficial till deposits (variable permeability) in Stoke-on-Trent, which provide a thin layer of natural protection, potential developments in these areas will need to prevent any potential contamination from reaching the groundwater in the Triassic bedrock beneath (for example, if deep excavation works are required).

Table 4-4: Aquifer classifications

Drift/Bedrock	Unit	Environment Agency Aquifer Classification
Superficial (drift) deposits	Alluvium	Secondary A aquifer
Superficial (drift) deposits	River Terrace Deposits	Secondary Undifferentiated
Superficial (drift) deposits	Till	Secondary Undifferentiated
Bedrock	Undifferentiated Triassic Rocks	Principal aquifer - highly productive
Bedrock	Warwickshire Group	Secondary A aquifer - Moderately productive
Bedrock	Upper Pennine Coal Measures	Secondary A aquifer - Moderately productive
Bedrock	Middle Pennine Coal Measures	Secondary A aquifer - Moderately productive

Explanation of aquifer classes (from Environment Agency website)

Principal aquifers - "may support water supply and/or baseflow to rivers on a strategic scale."

Secondary A aquifers - "permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers."

Secondary B aquifers - "predominantly lower permeability layers which may store and yield limited amounts of groundwater."

4.2.8.2 Aquifer Vulnerability

The BGS's groundwater vulnerability mapping (available on Magic Map) indicates underlying bedrock units of the study area to be highly varied, with low to medium-low vulnerability across the southern centre, and medium-high across the northern half. The medium and low vulnerability areas across the centre are 'medium priority' groundwater resources that have intermediate natural protection of groundwater to pollution due to low-leaching soils and/or the presence of low-permeability superficial deposits. This results in a medium-low pollution risk to groundwater from surface activities.

Medium-high to high vulnerability is designated across the southeastern corner of the area, which reflects the underlying Triassic sandstone bedrock (principal aquifer). There are also some small, localised areas (<1km^2) of medium to high groundwater vulnerability near Hanford and Baddeley Edge. As mentioned above, despite being overlain by superficial till deposits which offer a thin layer of natural protection (but

are still permeable), operations or activities in these areas will require additional measures over and above good practice pollution prevention requirements to ensure that groundwater isn't impacted.

4.2.8.3 Groundwater Source Protection Zones

Source Protection Zones (SPZs) are used to protect areas of vulnerable groundwater that are used for abstraction and where water quality is of high importance (such as drinking water abstractions). SPZs are categorised into three zones, 1-3, with 1 being most sensitive to pollution, and 3 representing the lowest risk, but still within the groundwater catchment of the abstraction. There is one SPZ within the southeast of the study area, categorised as zone 3 (see Figure 4-9). Whilst Zones 1 and 2 are the most sensitive to pollution and limit potential development of these areas, only Zone 3 is present in the southeast corner of the study area.

In the event of an incident, widespread groundwater contamination is less likely but still possible in these areas; potential developments in these areas will still need to consider preventative precautions to avoid contamination of the potable groundwater source in the connected SPZ 1.

4.2.8.4 Ecological Designations

Sites of Special Scientific Interest (SSSIs) are the finest sites for wildlife and natural features, supporting many characteristics, rare and endangered species, habitats, and natural features.

There are two SSSIs within the study area and ten local nature reserves, which are depicted in Figure 4-9. There are no Special Protection Areas (SPA), Special Area of Conservation (SAC) or RAMSAR sites within the study area. Ecological designation sites of relevance within the study area and downstream are discussed further in Section 9.

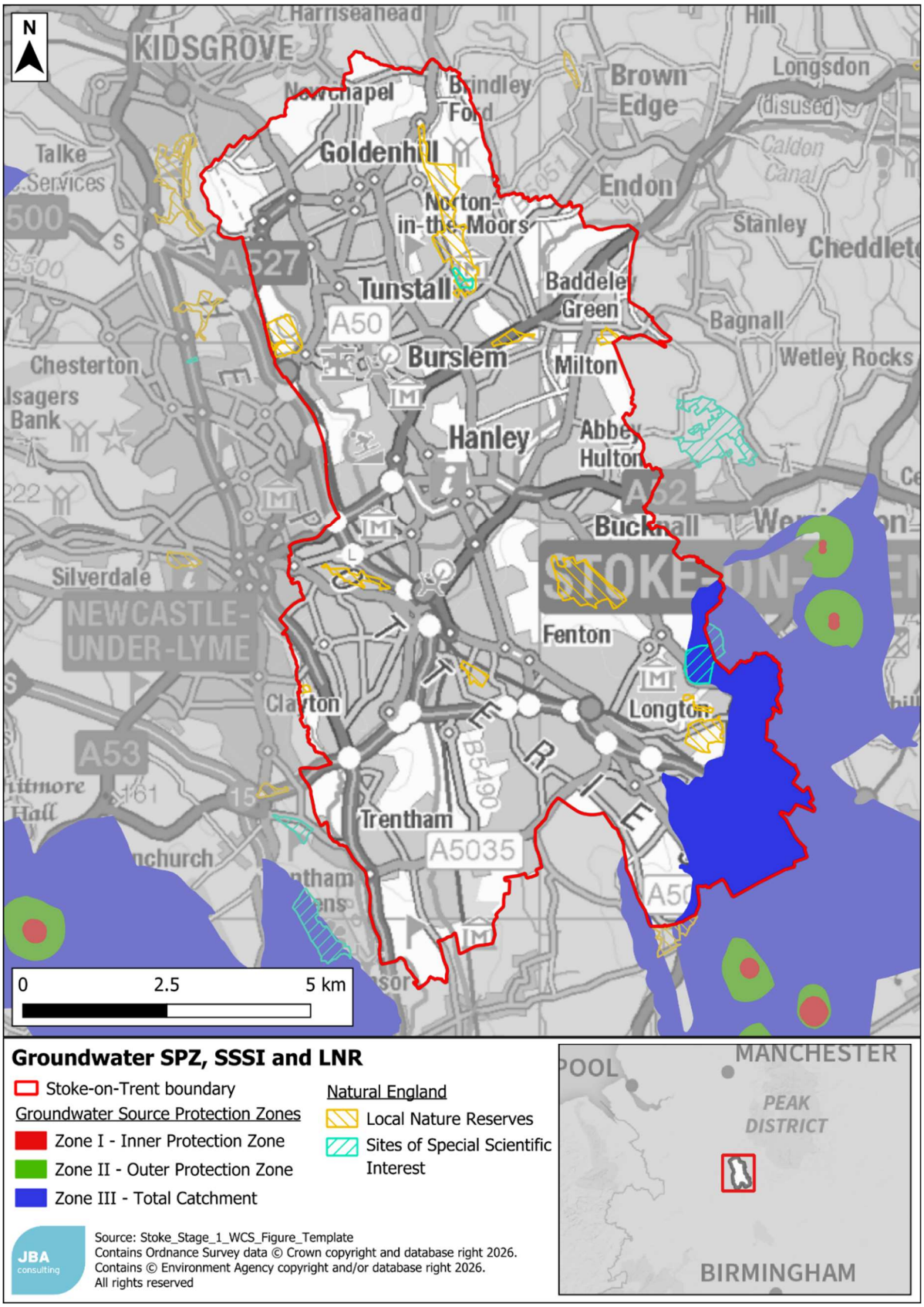


Figure 4-9: Ecological designations and Source Protection Zones

4.3 Availability of water resources

4.3.1 Abstraction Licensing Strategy

The EA working through the Catchment Abstraction Management Strategy process, prepare an Abstraction Licensing Strategy (ALS) for each sub-catchment in a river basin. The strategy sets out how water resources are managed within England and contributes to the implementation of the WFD. The ALS report provides information on the resources available and what conditions might apply to new licences. The licences require abstractions to stop or reduce when a flow or water level falls below a specific threshold, as a restriction to protect the environment and manage the balance between supply and demand for water users.

All new licences, and some existing licences are time limited, allowing for periodic review of the area as circumstances may have changed since the licence was first issued. The duration is generally twelve years, but shorter licences may be granted if they are based on resource assessment and environmental sustainability grounds. In some cases, future plans or changes may mean that the EA will grant a shorter time limited licence, so it can be re-assessed following the change. If a licence is only required for a short time, it can be granted either as a temporary licence or with a short time limit. If a licence is considered to pose a risk to the environment it may be granted with a short time limit while monitoring is carried out. The licences are then replaced with a changed licence, revoked or renewed near to the expiry date.

The ALS are important in terms of the WRMP as this helps to determine the current and future pressures on water resources and how the supply and demand will be managed by the relevant water companies. An abstraction license is needed from the EA if abstraction is above 20m^3/ day (4,400 gallons) a day from:

- rivers or streams;
- reservoirs, lake or pond;
- canal;
- spring; or
- an underground source.

The license is granted depending on the amount of water available. The majority of Stoke-on-Trent is covered by the Staffordshire Trent Valley ALS area (Figure 4-10).

4.3.2 Resource availability assessment

To abstract surface water, it is important to understand what water resources are available within a catchment and where abstraction for consumptive purposes will not pose a risk to resources or the environment. The EA has developed a classification system which shows:

- the relative balance between the environmental requirements for water and how much has been licensed for abstraction;
- whether there is more water available for abstraction in the area; and
- areas where abstraction may need to be reduced.

The availability of water for abstraction is determined by the relationship between the fully licensed (all abstraction licences being used to full capacity) and recent actual flows (amount of water abstracted in the last six years) in relation to the environmental flow indicator. Results are displayed using different water resource availability colours, further explained in Table 4-5. In some cases, water may be scarce at low flows, but available for abstraction at higher flows. Licences can be granted that protect low flows, this usually takes the form of a Hands-off Flow, or Hands-off Level, condition on a licence. The assessment is performed at Assessment Points (APs), which are usually significant points on a river such as a confluence or gauging station.

Groundwater availability as a water resource is assessed similarly, unless better information on principle aquifers is available or if there are local issues that need to be considered.

Table 4-5: Implications of surface water resource availability colours.

Water resource availability colour	Implications for licensing
	There is more water than required to meet the needs of the environment. Licences can be considered depending on local/downstream impacts.
RED- Water not available for licensing	Recent Actual flows are below the environmental flow indicator. This scenario highlights water bodies where flows are below the indicative flow requirement to help support Good Ecological Status. No further licences will be granted. Water may be available via licence trading.

Water resource availability is assessed under four different flow conditions.

- Q95 – very low flows which are exceeded 95% of the time
- Q70 – low flows which are exceeded 70% of the time
- Q50 – median flows which are exceeded 50% of the time
- Q30 – high flows which are exceeded 30% of the time

The resource availability for the Staffordshire Trent Valley ALS is summarised below, and for completeness the water resource availability in the Staffordshire Trent Valley ALS is presented graphically in Figure 4-10.

In some catchments this assessment may show that there is limited or no water available for abstraction at Q50 or Q70 but show that there is water available at lower flows. This is likely to be because most abstraction licences are limited using a 'Hands off Flow' or 'Hands off Level', therefore within the catchment less water is being abstracted at very low flows and there is theoretically water available.

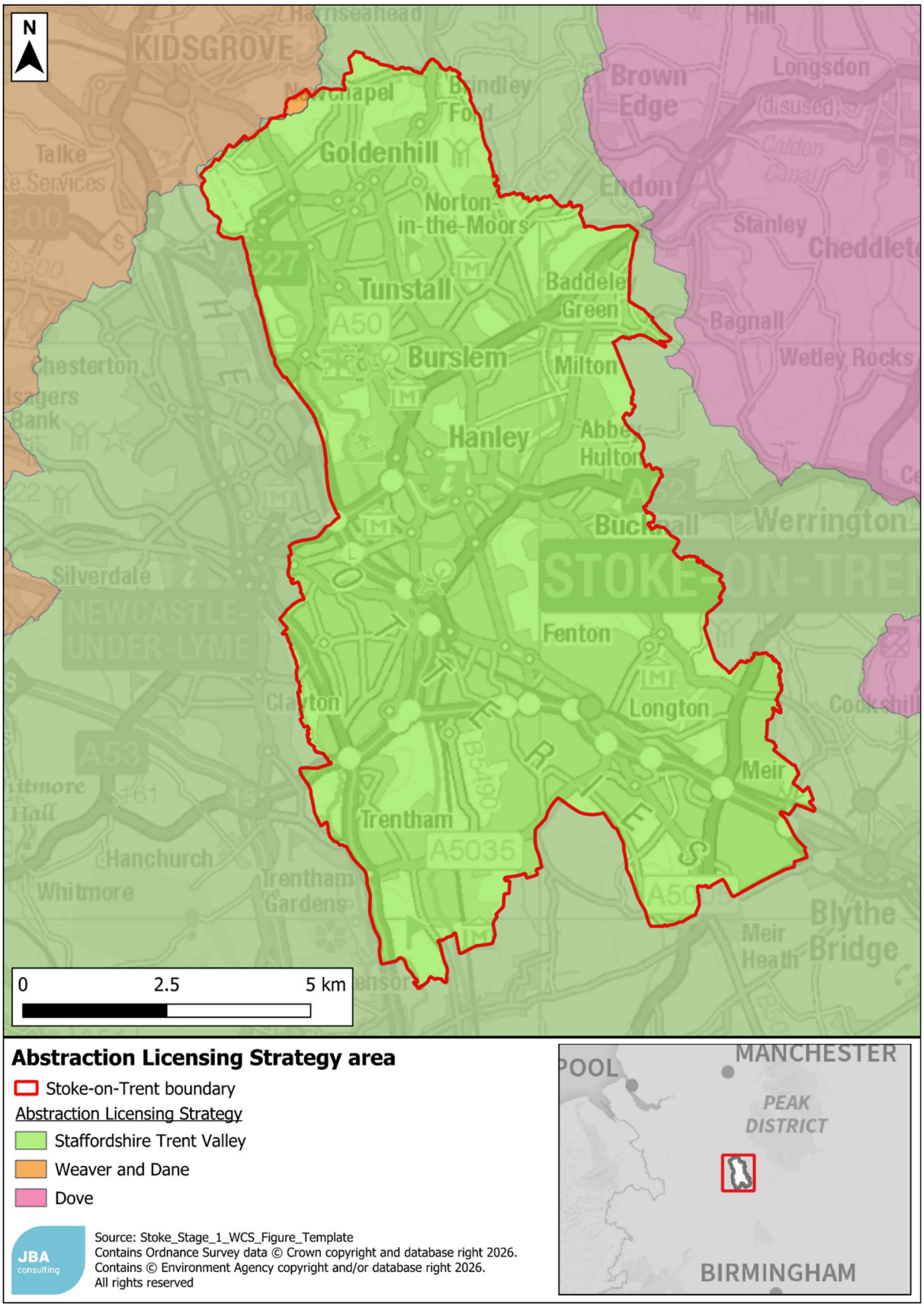


Figure 4-10: ALS area in and around Stoke-on-Trent

4.3.3 Staffordshire Trent Valley ALS

The Staffordshire Trent Valley Catchment covers an area of approximately 1,330km². The catchment covers the tributaries and catchment of the Staffordshire River Trent from its source on Biddulph Moor, north of Stoke-on-Trent, downstream to its confluence with the Tame near Alrewas (Environment Agency a, 2019).

At Q30, 65% of the ALS area has water available (green). There is a section of 'water not available' (red) upstream of the River Trent at Darlaston Assessment Point (AP), covering 1% of the ALS area, in the northeast of study area. To the southeast of the study area, there is another area where water is not available (red) covering 7% of the ALS area, and an area covering 2% of the ALS area with restricted water availability (yellow).

At Q50, 46% of the ALS area has water available (green). The upstream River Trent area is still red, the red 7% area in the southeast has remained the same. The yellow area covering 1% of the ALS at the southeast now has no water availability (red).

At Q70, 31% of the ALS area has water available (green). The upstream River Trent area is now yellow.

At Q95, water availability is either restricted (yellow) or not available (red) across the whole ALS area. The areas of the upstream River Trent covering the study area now have restricted water availability (yellow). The areas in the southeast of the study area remain red areas where water is not available.

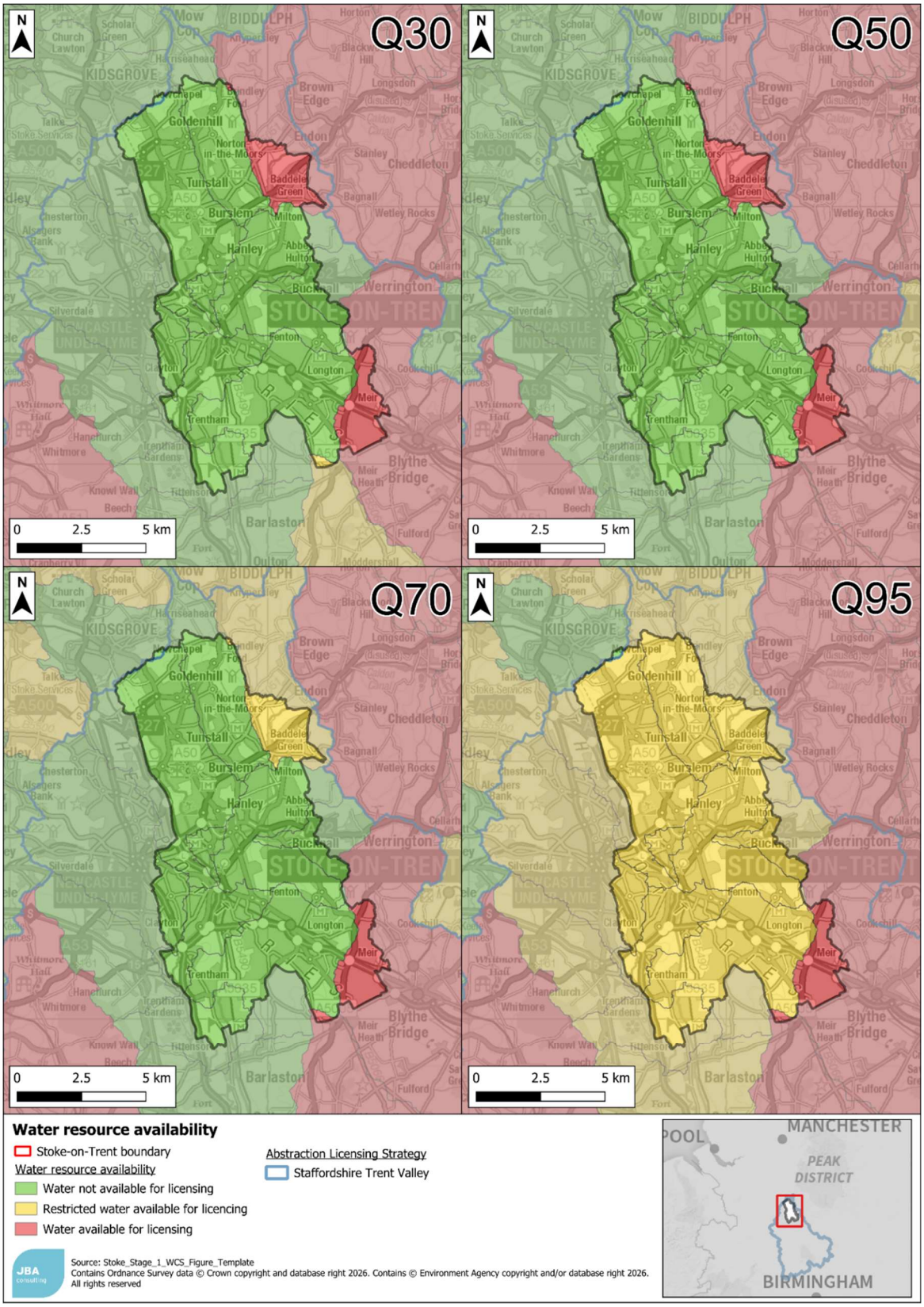


Figure 4-11: Water resource availability in Stoke-on-Trent

4.4 Water resource assessment: Water Resources Management Plans

4.4.1 Introduction

Water Resources Management Plans (WRMPs) are 50-year strategies that water companies are required to prepare, with full updates every five years. WRMPs are required to assess the following:

- Future demand (due to population and economic growth).
- Future water availability (including the impact of sustainability reductions).
- Demand management and supply-side measures (e.g., water efficiency and leakage reduction, water transfers and new resource development).
- How the company will address changes to abstraction licences.
- How the impacts of climate change will be mitigated.
- Where necessary, they set out the requirements for developing additional water resources to meet growing demand and describe how the balance between water supply and demand will be balanced over the next 50 years.
- Using cost-effective demand management, transfer, trading, and resource development schemes to meet growth in demand from new development and to restore abstraction to sustainable levels.
- In the medium to long term, ensuring that sufficient water continues to be available for growth and that the supply systems are flexible enough to adapt to climate change.

When new development within an LPA is being planned, it is important to ensure that there are sufficient water resources in the area to cover the increase in demand without risk of shortages in the future or during periods of high demand, and without causing a negative impact on the waterbodies from which water is abstracted.

The aim of this assessment was to compare the future additional demand as a result of development proposed within the emerging Local Plan, with the demand accounted for by Severn Trent Water's WRMP.

4.4.2 Water resources planning

WRZs are defined by the EA as areas in which the management of supply and demand is largely self-contained and where the supply infrastructure is linked such that customers within the zone experience the same risk of supply failure.

As seen in Figure 4-12 below, Severn Trent Water's North Staffs WRZ covers all of the study area.

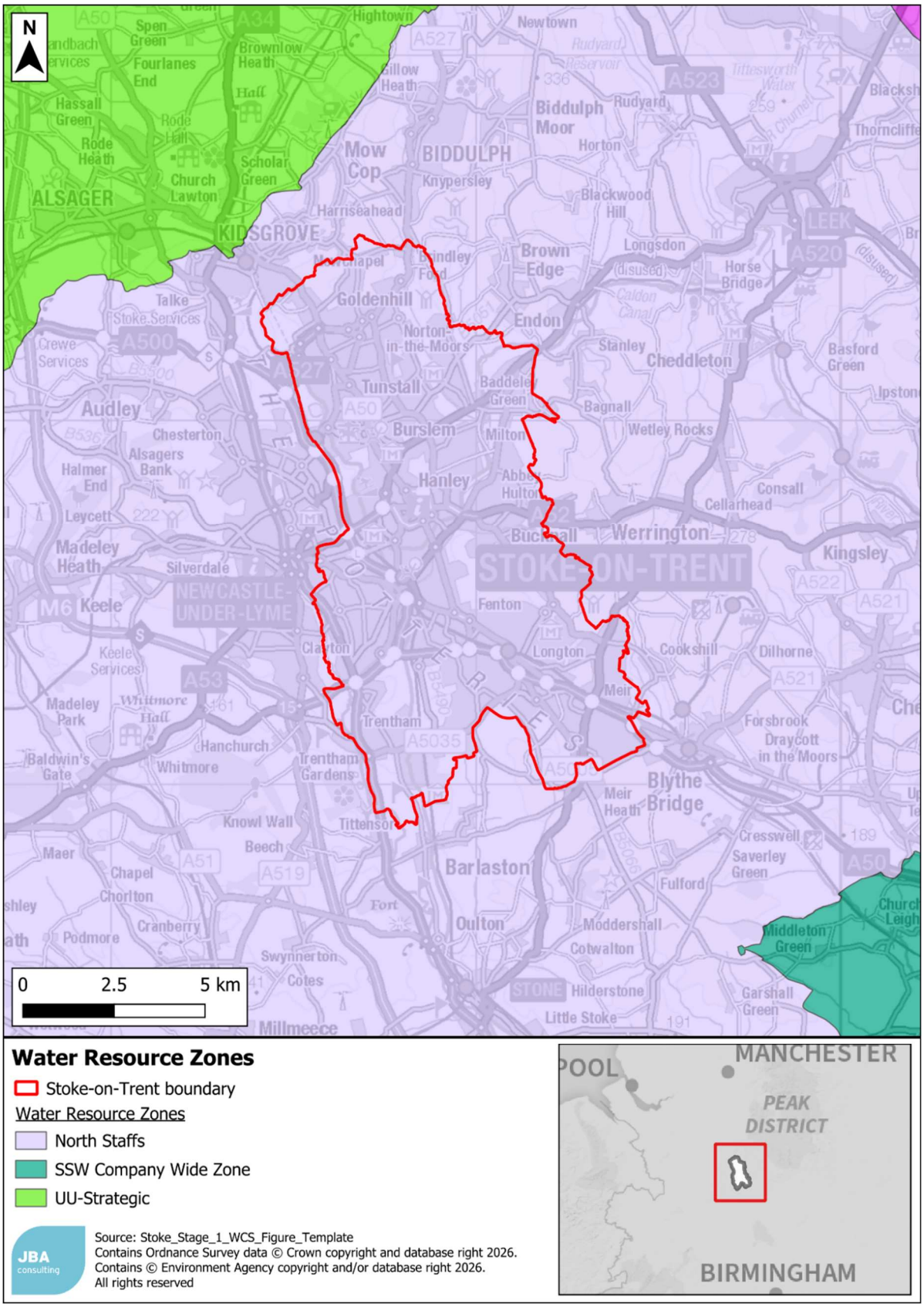


Figure 4-12 Water Resource Zones that Stoke-on-Trent

4.4.3 Methodology

Severn Trent Water's WRMP was reviewed. Attention was mainly focused upon:

- the available water resources and future pressures which may impact upon the supply element of the supply/demand balance; and
- the allowances within those plans for housing and population growth and its impact upon the demand side of the supply/demand balance.

For the WRMP base year, the numbers of unmeasured household, measured household and void household properties were taken from STW's billing system. Property records were allocated to Water Resources Zones using their postcodes.

For the initial period, projections of new households in the WRMP is based on five year land supply data, from LPA's annual published reports. The projection then reverts to the local authority housing need projections taken from their published local plans, which, at the time of publishing, run as far as 2036. After this point STW's WRMP estimates the housing need rate for the remaining period by continuing the last year of the local authority data annually to 2085. The growth forecast through this method was used to assess the supply demand balance throughout the WRMP period, as discussed below.

4.4.4 Severn Trent Water WRMP

Severn Trent Water's Final Water Resources Management Plan 2024 (WRMP24) was published in April 2025.

The Dry Year Annual Average (DYAA) Baseline Water Supply-Demand Balance can be seen in Table 4-6 and Figure 4-13. The WRMP data (as replicated from the WRMP24 Data Tables) indicates that there is a supply deficit across the whole planning period and beyond to the 2080s. The WRMP states that this is because of abstraction licence capping and the longer-term environmental destination pressures decreasing availability of groundwater sources and decreasing STW's deployable output in the baseline scenario (which includes the benefits of drought measures in a 1 in 500-year drought event). The predicted supply demand balance by the end of the Local Plan period (2039/40), with no intervention, shows that North Staffs WRZ will have a supply deficit of -65.48 Ml/d. As shown in Table 4-6 and Figure 4-14, North Staffs WRZ is expected to achieve a supply demand balance in the DYAA Final Plan scenario. Forecast supply surplus varies across the whole WRMP period.

STW's Final Plan is designed to address the full range of challenges across the WRMP plan period using a blend of options. The main demand-side options identified were:

- To roll out universal metering by 2035
- To reduce leakage by 50% by 2045
- To deliver the Severn Trent Efficiency Plan by 2050
- To support the Government's Water Labelling program

As discussed in Section 2.3.4, additional water demand from planned development is forecast to grow by 10.7 Ml/d across the five water industry Asset Management Plan (AMP) periods spanning the Local Plan period and beyond to 2045.

Table 4-6: North Staffs WRZ DYAA Baseline and Final Plan supply demand balance taken from WRMP

Year	End of AMP7 (2024/5)	End of AMP8 (2029/30)	End of AMP9 (2034/35)	End of AMP10 (2039/40)	End of AMP11 (2044/45)
Baseline Supply Demand Balance in Ml/d (Available Headroom - Target Headroom)	-29.15	-29.12	-58.16	-65.48	-65.40
Final Plan Supply Demand Balance in Ml/d (Available Headroom - Target Headroom)	9.49	16.63	0.15	6.42	6.01

* Information taken from Severn Trent Water's WRMP.

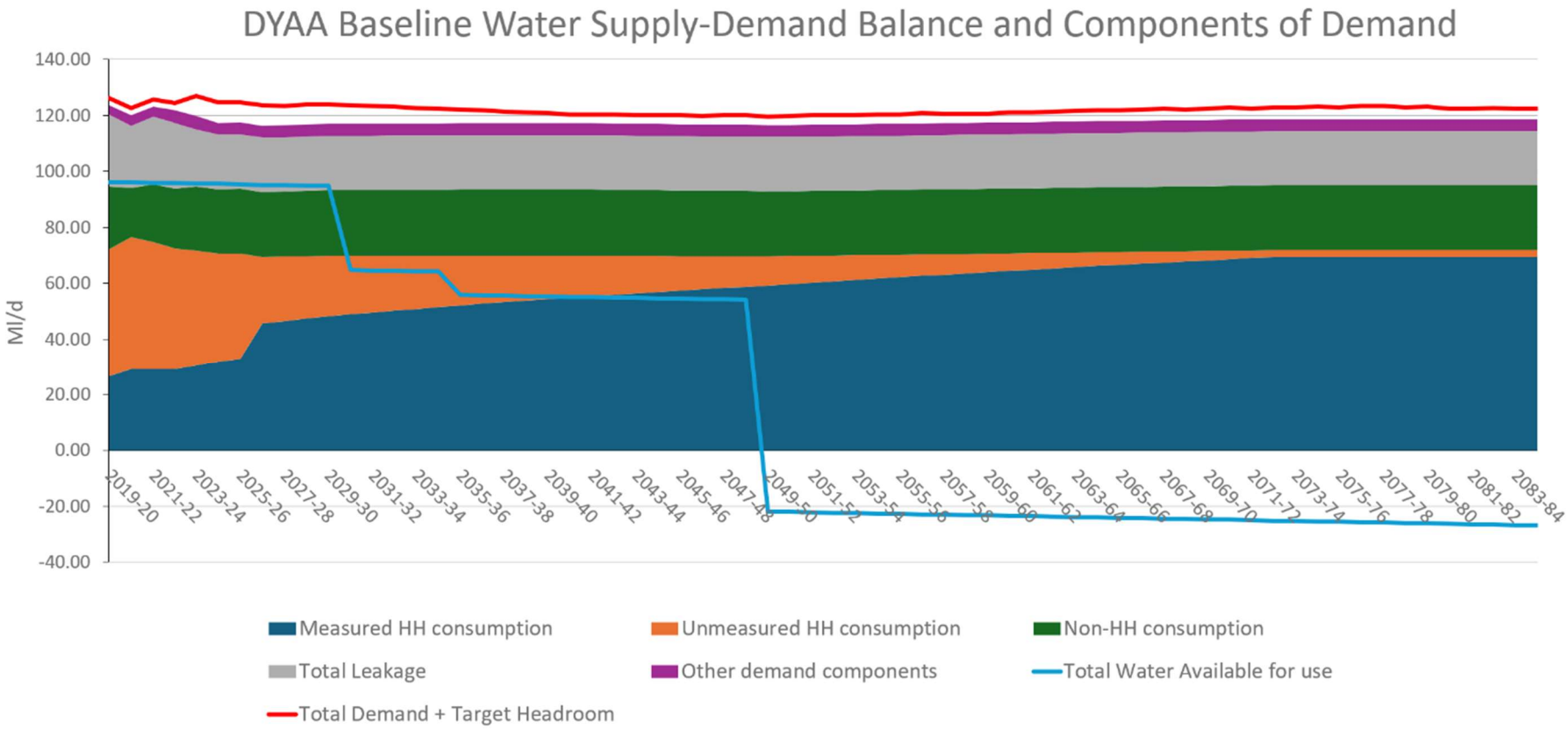


Figure 4-13: DYAA Baseline Supply Demand Balance for Staffs North WRZ (reproduced from STW WRMP24 Data Tables, published 2025)

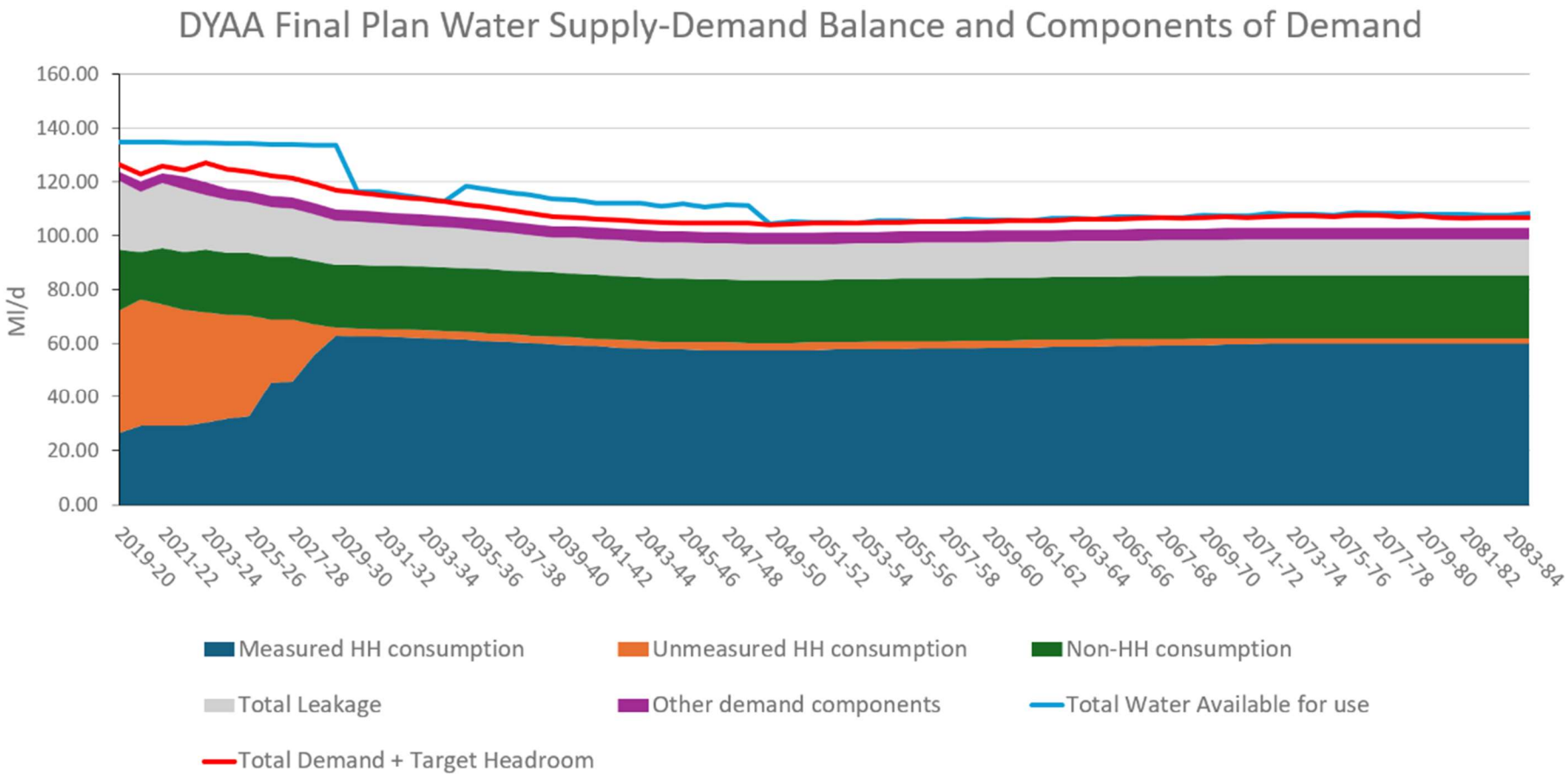


Figure 4-14: DYAA Final Plan Supply Demand Balance for Staffs North WRZ (reproduced from STW WRMP24 Data Tables, published 2025)

4.4.5 Growth forecast

The STW WRMP has accounted for an increase of properties of 31,310 during the period 2025 to 2050 (end of WRMP period) in the North Staffs WRZ. North Staffs WRZ serves the authority areas of Stoke-on-Trent City Council, Newcastle-under-Lyme Borough Council, Staffordshire Moorlands District Council, Stafford Borough Council and Shropshire Council.

The update to the NPPF in December 2024 introduced a new standard method for calculating Local Housing Need (LHN) figures for each local authority. The new method aims to increase the number of dwellings required to meet housing targets. Using the new standard LHN method, growth in Stoke-on-Trent, Newcastle-under-Lyme, Staffordshire Moorlands, Stafford and Shropshire between 2025 and 2040 is shown in Table 4-7. Local Plan periods may differ between Local Authorities, though, for ease of comparison, the annual LHN has been applied in the same way for all authorities. LHN figures are indicative, based on the standard method as referred to in paragraph 62 of the NPPF and calculated by the Land, Planning and Development Federation (May 2025).

It is worth noting that, based on the local plan growth scenario for Stoke-on-Trent, the total number of residential completions, commitments, under construction, potential allocations and windfall sites during the local plan period from 2025 onwards (though the local plan covers 2020 to 2040), indicates an increase in the number of properties in the authority area by 23,946, equating to 1,497 properties per year, though numbers may fluctuate. This amount of growth goes beyond the LHN figure for Stoke-on-Trent which is 948 residential properties per year.

The OS Open CodePoint dataset was used to provide an indication of the distribution of existing properties within Stoke-on-Trent, Newcastle-under-Lyme, Staffordshire Moorlands, Stafford and Shropshire (the local authority areas which make up the North Staffs WRZ). Table 4-7 shows an estimation of growth in the WRZ as based on the Local Housing Need of each local authority and the distribution of existing growth. If growth during the period up to 2050 (end of WRMP) follows the same distribution as existing properties, then there are estimated to be approximately 60,097 new properties in the North Staffs WRZ. STW's WRMP24 forecasts growth in the North Staffs WRZ (between 2025 and 2050) to be 31,310 dwellings. Therefore, the estimate calculated within this WCS exceeds STW's forecast by approximately 28,787 dwellings. This difference suggests that planned combined demand from growth is likely to be ahead of WRMP24 demand forecasts.

Regarding additional water demand resulting from growth, STW commented that all extra housing growth is already accounted for in the WRMP24. Any additional business demand identified as the WRMP29 is developed can be accounted for at that stage.

In line with WRMP guidelines, and based on the methodology followed by STW when producing the WRMP24 (see Section 4.4.3), local plan projections, including major strategic housing and growth locations, New Towns and Garden Communities, should be included when calculating the WRMP baseline and forecast future population growth.

Table 4-7: Expected growth in neighbouring authorities (based on indicative Local Housing Need) and distribution of existing properties within WRZ

Local authority	Annual Local Housing Need (new method)	Expected LPA growth during the period 2025 to 2050 (26 years)	% of existing properties (distribution) in WRZ	Adjusted growth in WRZ up to 2050
Stoke-on-Trent	948	24,648	100%	24,648
Newcastle-under-Lyme	545	14,170	99.6%	14,113
Staffordshire Moorlands	454	11,804	98.4%	11,615
Stafford	751	19,526	31.2%	6,092
Shropshire	1,994	51,844	7%	3,629
North Staffs WRZ -total	**N/A**	**121,992**	**N/A**	**60,097**

4.5 Water Environment National Environment Programme Measures - water resources

The Water Industry National Environment Programme (WINEP) is a set of actions that the EA have requested all water companies operating in England to complete in a particular AMP as part of their environmental commitments. Actions may include investigations or actual measures, examples could be reductions in abstraction in a particular river to maintain flow to support WFD objectives, or a reduction in phosphate pollution in a catchment through upgrades to a WwTW.

WINEP actions relating to water resources in surface water and groundwater bodies in Stoke-on-Trent are presented in Appendix A and show there is an early investigation into options appraisals or feasibility studies for measures identified within the WRMP to meet regional planning requirements that do not fit with WFD driver requirements across the STW Company Boundary. There are also actions to protect / ensure no deterioration in WFD status within the Staffordshire Trent Valley - PT Sandstone Staffordshire groundwater body.

Actions relating to water resources and water quality are presented in Appendix A, and are also discussed in Section 8.5.

Development and population growth can increase water demand and abstraction, and so Stoke-on-Trent City Council has an opportunity to contribute to these actions indirectly by pursuing policies that promote water efficiency in new development.

4.6 Water demand reduction

4.6.1 Water efficiency

It is widely recognised that the climate is changing. Climate change is predicted to increase pressure on water resources, increasing the potential for a supply-demand deficit in the future, and making environmental damage from over abstraction of water resources more likely. Furthermore, the delivery of water and wastewater services and the heating of water in the home require high energy inputs and therefore contribute directly to emissions of greenhouse gases. Water efficiency therefore reduces energy use and carbon emissions.

It is important therefore that new development does not result in an unsustainable increase in water abstraction. This can be done in a number of ways from reducing the water demand from new dwellings through to achieving 'water neutrality' in a region by offsetting a new development's water demand by improving efficiency in existing buildings.

It is for Local Authorities to establish a clear need to adopt the tighter water efficiency target through the building regulations. This should be based on existing sources of evidence such as:

- the EA classification of water stress;
- Water resource management plans produced by water companies;
- River basin management plans (RBMPs) which describe the river basin district and the pressure that the water environment faces. These include information on where water resources are contributing to a water body being classified as 'at risk' or 'probably at risk' of failing to achieve good ecological status, due to low flows or reduced water availability;
- Defra Plan for Water;
- consultations with the local water and sewerage company, the EA and catchment partnerships; and
- consideration of the impact on viability and housing supply of such a requirement.

This evidence is laid out below.

4.6.2 Water stress

Water stress is a measure of the level of demand for water (from domestic, business and agricultural users) compared to the available freshwater resources, whether surface or groundwater. Water stress causes deterioration of the water environment in both the quality and quantity of water and consequently restricts the ability of a waterbody to achieve a 'good' status under the WFD.

The EA has undertaken an assessment of water stress across the UK. This defines a water stressed area as where:

- the current household demand for water is a high proportion of the current effective rainfall which is available to meet that demand; or

- the future household demand for water is likely to be a high proportion of the effective rainfall available to meet that demand.

The EA's assessment (2021) concluded that the Severn Trent Water supply region is seriously water stressed.

4.6.3 Defra Plan for Water

Through their Plan for Water, Defra has signalled their intention to review the water efficiency standards for new homes. In 2025 they consulted on a revision of Part G of the Building Regulations to include a standard of 105 l/p/d, or 100 l/p/d where there is a clear local need.

4.6.4 National Water Resources Framework

A National Framework for Water Resources was published by the Government in June 2025. This outlines the water resources challenges facing England and sets out the strategic direction for the work being carried out by regional water resource groups.

The framework states that by 2055 England will need up to an additional five billion litres of water per day for public water supply, increased from the previous 2020 publication due to updated demand forecasts and additional reductions for the environment.

The new National Framework for Water Resources outlines next steps to improve water planning across all sectors. These include continuing the EA's strategic assessment of national water challenges; developing multi-sector plans through regional water resource groups; evaluating and identifying new solutions via regulators like RAPID; expanding engagement with other water-using sectors; and strengthening local planning efforts through groups like Water Abstractor Groups and Catchment Partnerships.

4.6.5 Impact on viability

As outlined in Section 4.7.1, the cost of installing water-efficient fittings to target a per capita consumption of 110l/d has been estimated as a one-off cost of £9 for a four-bedroom house. Engagement with developers and information from Defra that emerged as part of the Sussex North Water Neutrality Strategy (now withdrawn) indicated that a target of 100 l/p/d could be achieved with 'minimal additional cost'. Research undertaken for the devolved Scottish and Welsh governments indicated potential annual savings on water and energy bills for householders of £24 to £64 per year as a result of such water efficiency measures. Water efficiency is therefore not only viable but of positive economic benefit to both private homeowners and tenants. In addition, financial incentives are available from the water companies to developers to encourage water-efficient design.

Research published by BRE on the delivery of sustainable buildings reports that the cost of achieving lower BREEAM ratings incurs little or no additional cost and targeting higher BREEAM ratings incurs a typical cost of less than 2% above the baseline. The same study reports that the cost of achieving three credits in WAT01 (a 40% reduction in water

consumption from the baseline) would be £13,361 and payback could be achieved between one and two and a half years, depending on the price of water.

4.6.6 A water efficiency target beyond building regulations

Some LPAs are now going further than building regulations and adopting Local Plan policies or recommendations for tighter water efficiency standards where there is a clear local need.

Guidance to support developers to meet or exceed the Building Regulations long term target of 110l/p/d can also be found on within the Water efficiency and reuse in housing; design guide for a changing climate, on the Enabling Water Smart Communities (EWSC) website.

In 2025 Defra consulted on a revision of Part G of the Building Regulations to include a standard of 105 l/p/d, or 100 l/p/d where there is a clear local need.

4.7 Water neutrality concept

Water neutrality is a relatively new concept for managing water resources, but one that is receiving increased interest as deficits in future water supply/demand are identified. The definition adopted by the Government and the EA is:

"For every development, total water use in the wider area after the development must be equal to or less than total water use in the wider area before development."

It is useful to also refer to the refined definition developed by Ashton (Booth and Charlesworth, 2014):

"For every new significant development, the predicted increase in total water demand in the region due to the development should be offset by reducing demand in the existing community, where practical to do so, and these water savings must be sustained over time"

This definition states the need to sustain water saving measures over time, and the wording 'predicted increase in total water demand' reflects the need for water neutrality to be designed in at the planning stage.

Both definitions refer to water use in the region or 'wider area', and the extent of this area should be appropriate to local authority boundaries, water resource zones, or water abstraction boundaries depending on what is appropriate for that particular location. For instance, if a development site is in an area of water stress relating to a particular abstraction source, offsetting water use in a neighbouring town that is served by a different water source will not help to achieve water neutrality.

In essence water neutrality is about accommodating growth in a region without increasing overall water demand.

Water neutrality can be achieved in a number of ways, including through:

- reducing leakage from the water supply networks;

- making new developments more water-efficient;
- ‘offsetting’ new demand by retrofitting existing homes with water-efficient devices;
- encouraging existing commercial premises to use less water;
- implementing metering and tariffs to encourage the wise use of water; and
- education and awareness-raising amongst individuals.

4.7.1 Consumer water efficiency measures

Many interventions are designed to reduce water use if operated in a particular way and so rely on the user being aware and engaged with their water use. The educational aspect is therefore important to ensure that home occupiers are aware of their role in improving water efficiency. Table 4-8 shows water efficiency measures that can be made by consumers.

Table 4-8: Consumer water efficiency measures.

Type of measure	Examples
Education and promotional campaigns	Encourage community establishments (e.g., schools, hospitals) to carry out self-audits on their water use. Deliver water conservation message to schools and provide visual material for schools. Building awareness with homeowners/tenants.
Water-efficient measures for toilets	Cistern displacement devices to reduce volume of water in cistern. Retrofit or replacement dual flush devices. Retro-fit interruptible flush devices. Replacement low-flush toilets.
Water-efficient measures for taps	Tap inserts, such as aerators. Low flow restrictors. Push taps. Infrared taps.
Water-efficient measures for showers and baths	Low-flow shower heads. Aerated shower heads. Low-flow restrictors. Shower timers. Reduced volume baths (e.g. 60 litres). Bath measures.
Rainwater harvesting and water reuse	Large-scale rainwater harvesting. Small-scale rainwater harvesting for example with a water butt, or rainwater tank for toilet flushing. Grey water recycling.

Type of measure	Examples
Water-efficient measures addressing outdoor use	Hosepipe flow restrictors. Hosepipe siphons. Hose guns (trigger hoses). Drip irrigation systems. Mulches and composting.
Commercial properties	Commercial water audits. Rainwater recycling. Grey water recycling. Optimising processes. Provide water efficiency information to all newly metered businesses.
Metering	Promote water companies free meter option. Compulsory metering (in water stressed areas). Smart metering (to engage customer with their consumption). Provide interactive websites that allow customers to estimate the savings associated with metering (environmental and financial). Innovative tariffs (seasonal, peak, rising block). Customer supply pipe leakage - supply pope repair and replacement.
Other	Household water audits, including DIY or with help of plumber. Seek-and-fix internal leaks and/or dripping taps. Water efficient white goods included washing machines and dishwashers. Ask customers to spot and report leaks.

Source: Adapted from Booth and Charlesworth 2014.

4.7.2 Rainwater and greywater recycling

Rainwater harvesting

Rainwater recycling or rainwater harvesting is the capture of water falling on buildings, roads or pathways that would normally be drained via a surface water sewer, infiltrate into the ground or evaporate. In the UK this water cannot currently be used as a drinking water supply as there are strict guidelines on potable water, but it can be used in other systems within domestic or commercial premises.

Systems for collection of rainwater can be simple water butts attached to a drainpipe on a house, or it could be a complex underground storage system, with pumps to supply water for use in toilet flushing and washing machines. By utilising rainwater in this way there is a reduced dependence on mains water supply for a large proportion of the water use in a domestic property.

Benefits of rainwater harvesting

- Rainwater harvesting reduces the dependence on mains water supply – reducing bills for homeowners and businesses.
- Less water needs to be abstracted from river, lakes and groundwater.
- Stormwater is stored in a rainwater harvesting system reducing the peak surface water runoff leaving a site providing a flood risk benefit (for smaller storms).
- By reducing surface water flow, rainwater harvesting can reduce the first flush effect whereby polluted materials adhering to pavement surfaces during dry periods are removed by the first flush of water from a storm and can cause pollution in receiving watercourses.

Challenges of rainwater harvesting

- Dependency on rainfall can limit availability of harvested rainwater during drought and hot weather events.
- Increased capital (construction) costs to build rainwater harvesting infrastructure into new housing (£900 to £3,000 for a small-scale domestic system) (Waterwise, 2020).
- Payback periods are long as the cost of water is low so there is little incentive for homeowners to invest (DCLG, 2014).
- Despite being included as priority 1 in the hierarchy of runoff destinations (Standard 1) of the National Standards for SuDS, there is currently no statutory instrument to requirement the inclusion of RwH in new development.
- At present, legislation does not permit water and sewerage companies to adopt rainwater harvesting and associated infrastructure.

Greywater harvesting

Greywater refers to water that has been 'used' in the home in appliances such as washing machines, showers and hand basins. Greywater recycling or greywater harvesting is the treatment and re-use of this water in other systems such as for toilet flushing. By their nature, greywater harvesting systems require more treatment and are more complex than rainwater harvesting systems, and there are limited examples of their use in the UK.

Greywater re-use refers to systems where wastewater is taken from source and used without further treatment. An example of this would be water from a bath or shower being used on plants in the garden. This sort of system is easy to install and maintain, however as mentioned above the lack of treatment to remove organic matter means the water cannot be stored for extended periods.

Greywater recycling refers to systems where wastewater undergoes some treatment before it is used again. These systems are complex and require a much higher level of maintenance than rainwater harvesting or greywater re-use systems.

Domestic water demand can be significantly reduced by using greywater harvesting, and unlike with a rainwater harvesting system where the availability of water is dependent on the weather, the source of water is usually constant (for instance if it is from bathing and

showering). However, the payback period for a greywater harvesting system is usually long, as the initial outlay is large, and the cost of water relatively low.

Viability of greywater systems for domestic retrofit applications is therefore currently limited. However, communal systems may offer more opportunities where the cost can be shared between multiple households particularly on larger new build developments, or in new settlements.

4.7.3 Energy and water use

17% of the UK's domestic energy usage is for water heating (Energy consumption in the UK, Department for Energy Security & Net Zero). If less water was being used within the home, for instance through more water efficient showers, less water would need to be heated, and overall domestic energy usage would be reduced.

In 2020-2021 the government consulted on a Future Homes Standard that will involve changes to Part L (conservation of fuel and power) of the Building Regulations for new dwellings. Unfortunately, this fails to identify the role of water efficiency in the home in also reducing energy usage.

4.7.4 Funding for water neutrality

Water neutrality is unlikely to be achieved by just one type of measure, and likewise it is unlikely to be achieved by just one funding source. Funding mechanisms that may be available could be divided into the following categories:

- Infrastructure-related funding (generally from developer payments).
- Fiscal incentives at a national or local level to influence buying decisions of households and businesses.
- Water company activities, either directly funded by the five-year price review or as a consequence of competition and individual company strategies.
- Joint funding through energy efficiency schemes (and possibly to integrate with the heat and energy saving strategy).
- Currently in the UK, the main funding resource for the delivery of water efficiency measures is the water companies, with some discretionary spending by property owners or landlords. For water neutrality to be achieved, policy shifts may be required in order to increase investment in water efficiency. Possible measures could include:
- further incentivisation of water companies to reduce leakage and work with customers to reduce demand;
- the requirement of water efficient design in new development;
- developer funding to contribute towards encouraging water efficiency measures'
- the requirement of water efficient design in refurbishments when a planning application is made; and
- tighter standards on water using fittings and appliances.

4.8 Water efficiency incentives

4.8.1 Severn Trent Water

Severn Trent Water (STW) publish their charging arrangements annually on their website.

Environmental component charges are used to fund environmental incentives to encourage good design by developers, including water efficiency and flood prevention incentives for home builders.

Water efficiency incentives can be applied for where developers can demonstrate they have built a premises with a domestic water usage of 100l/p/d or less and specified criteria are met. The incentives offered are:

- Water usage of 100 litres per person per day or less: £250 per property,
- Water usage of 90 litres per person per day or less: £300 per property,
- Water usage of 85 litres per person per day or less: £350 per property.

STW will also allow non-household premises with domestic usage only to apply for the 100 l/p/d water efficiency incentive.

4.9 Conclusions and recommendations

4.9.1 Conclusions

Stoke-on-Trent receives its water resources from Severn Trent Water. The study area includes the upstream reach of the River Trent which flows from north-east to south-west through the centre of Stoke-on-Trent. Fowlea Brook and Lyme Brook, tributaries of the Trent within the study area, are both designated as main rivers by the Environment Agency. The study area is covered wholly by the North Staffs WRZ.

If growth during the period up to 2050 (end of WRMP) follows the same distribution as existing properties, then there are estimated to be approximately 60,097 new properties in the North Staffs WRZ. STW's WRMP24 forecasts growth in the North Staffs WRZ (between 2025 and 2050) to be 31,310 dwellings. Therefore, the estimate calculated within this WCS exceeds STW's forecast by approximately 28,787 dwellings. This difference suggests that planned combined demand from growth is likely to be ahead of WRMP24 demand forecasts. Regarding additional water demand resulting from growth, STW commented that all extra housing growth is already accounted for in the WRMP24. Any additional business demand identified as the WRMP29 is developed can be accounted for at that stage. In line with WRMP guidelines, and based on the methodology followed by STW when producing the WRMP24 (see Section 4.4.3), local plan projections, including major strategic housing and growth locations, New Towns and Garden Communities, should be included when calculating the WRMP baseline and forecast future population growth.

The WINEP is a set of actions that the EA have requested all water companies operating in England to complete in a particular AMP as part of their environmental commitments. WINEP actions relating to water resources in surface water and groundwater bodies in

Stoke-on-Trent are presented in Appendix A and show that there is an early investigation into options appraisals or feasibility studies for measures identified within the WRMP to meet regional planning requirements that do not fit with WFD driver requirements across the STW Company Boundary. There are also actions to protect / ensure no deterioration in WFD status within the Staffordshire Trent Valley - PT Sandstone Staffordshire groundwater body.

The Staffordshire Trent Valley Abstraction Licensing Strategy (ALS) indicate varying levels of water availability across these catchments under different flow conditions (Q30–Q90), with areas of restricted or unavailable water identified in specific locations.

Severn Trent Water has reviewed its infrastructure charges for 2026/27, increasing water infrastructure charges to £385 and sewerage infrastructure charges to £499. The company continues to offer incentives for water efficiency with £350 per property offered where homes are built to use 85 litres or less per person per day.

It is important that new development does not result in an unsustainable increase in water abstraction. This can be done in several ways from reducing the water demand from new dwellings through to achieving ‘water neutrality’ in a region by offsetting a new development's water demand by improving efficiency in existing buildings. In Stoke-on-Trent, there is a particular need for water efficiency as the North Staffs WRZ is classified by the EA as being "seriously water stressed". Additionally, water efficiency in the home also leads to costs and carbon savings where the volume of water heated is reduced. It is therefore recommended that the Council consider a household water efficiency policy aligned with the 100 l/p/d recently consulted on by Defra. Additionally, it is recommended that non-household development meet, as a minimum, three credits in the BREEAM WAT01 measure (a 40% reduction in water consumption from the baseline).

4.9.2 Recommendations

Table 4-9: Recommendations of Water Resources

Action	Responsibility	Timescale
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with LPAs.	Severn Trent Water	Ongoing
Provide yearly updates of projected housing growth to water companies to inform WRMP updates.	Stoke-on-Trent City Council	Ongoing
The concept of water neutrality has the potential to provide a benefit in improving resilience to climate change. Explore further with the water companies and the EA how the Council's planning and climate change policies can encourage this approach. This approach could have particular application in strategic sites and new settlements.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Larger residential developments (including new settlements), and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Severn Trent Water should advise the Council of any strategic water resource infrastructure developments within the study area, where these may require safeguarding of land to prevent other type of development occurring.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Consider a household water efficiency policy aligned with the 105l/p/d recently consulted on by Defra.	Stoke-on-Trent City Council	In Local Plan
Non-household developments meet, as a minimum, three credits in the BREEAM WAT01 measure (a 40% reduction in water consumption from the baseline).	Stoke-on-Trent City Council and developers	Ongoing

5 Water supply infrastructure

5.1 Introduction

An increase in water demand due to growth can exceed the hydraulic capacity of the existing supply infrastructure. This is likely to manifest itself as low pressure at times of high demand. An assessment is required to identify whether the existing infrastructure is adequate or whether upgrades will be required. The time required to plan, obtain funding and construct major pipeline works can be considerable and therefore water companies and planners need to work closely together to ensure that the infrastructure is able to meet growing demand.

Water supply companies make a distinction between supply infrastructure, the major pipelines, reservoirs and pumps that transfer water around a WRZ, and distribution systems, smaller scale assets which convey water around settlements to customers. This study is focused on the supply infrastructure. It is expected that developers should engage early with the Developer Services functions of the water and wastewater companies local to their site, and fund water company impact assessments and modelling of the distribution systems to determine requirements for local capacity upgrades to the distribution systems.

In addition to the work undertaken by water companies, there are opportunities for the local authority and other stakeholders to relieve pressure on the existing water supply system by increasing water efficiency in existing properties. This can contribute to reducing water consumption targets and help to deliver wider aims of achieving water neutrality.

A cost-effective solution can be for local authorities to co-ordinate with water supply companies and 'piggyback' on planned leakage or metering schemes, to survey and retrofit water efficient fittings into homes (Waterwise, 2009). This is particularly feasible within property owned or managed by the local authorities, such as social housing.

5.2 Severn Trent Water response to sites consultation

The potential allocation sites were submitted to Severn Trent Water, however they noted that they do not perform detailed network capacity assessments, at the local level, until a developer makes a formal enquiry.

5.3 Conclusions and recommendations

5.3.1 Conclusions

Severn Trent Water (STW) have a statutory duty to supply water for domestic purposes (as defined by Section 218 of the Water Industry Act 1991) to non-household development, but do not have to supply water for non-domestic purposes.

Early engagement with developers and STW is required. Modelling of the water supply network may be required at the planning application stage.

In addition to the work undertaken by water companies, there are opportunities for the local authority and other stakeholders to relieve pressure on the existing water supply system by increasing water efficiency in existing properties. This can contribute to reducing water consumption targets.

A full list of recommendations is provided in Table 5-1.

5.3.2 Recommendations

Table 5-1: Recommendations for water supply infrastructure.

Action	Responsibility	Timescale
Undertake network modelling to ensure adequate provision of water supply is feasible.	Severn Trent Water and Stoke-on-Trent City Council	Ahead of planning applications
Stoke-on-Trent City Council and developers should engage early with water companies to ensure supply infrastructure is in place prior to occupation.	Severn Trent Water, Stoke-on-Trent City Council, developers	Ongoing
Developers should engage early with water companies to ensure that the capacity of distribution systems is adequate prior to development coming forward.	Severn Trent Water, developers	Ongoing

6 Wastewater collection

6.1 Sewerage undertakers

Severn Trent Water are the sewerage undertakers for Stoke-on-Trent. The role of the sewerage undertaker includes the collection and treatment of wastewater from domestic and commercial premises, and in some areas, it also includes the drainage of surface water from building curtilages to combined or surface water sewers. It excludes, unless adopted by the sewerage undertaker, systems that do not connect directly to the wastewater network, e.g., SuDS or highway drainage.

Increased wastewater flows into collection systems due to growth in populations or per-capita consumption can lead to an overloading of the infrastructure, increasing the risk of sewer flooding and, where present, increasing the frequency of discharges from storm overflows. Seasonal and yearly variations in weather and infiltration can reduce headroom at WwTW.

Headroom at WwTW can be eroded by growth in population or per-capita consumption, requiring investment in additional treatment capacity. As the volumes of treated effluent rises, even if the effluent quality is maintained, the pollutant load discharged to the receiving watercourse will increase. In such circumstances the EA as the environmental regulator, may tighten effluent consents to achieve a 'load standstill', i.e., ensuring that as effluent volume increases, the pollutant discharged does not increase. Again, this would require investment by the water company to improve the quality of the treated effluent. Consents can also be tightened to prevent a deterioration in water quality due to growth, or to achieve environmental objectives.

In combined sewerage systems, or foul systems with surface water misconnections, there is potential to create headroom in the system, thus enabling additional growth, by the removal of surface water connections and reducing infiltration. This can most readily be achieved during the redevelopment of brownfield sites which have combined sewerage systems, where there is potential to discharge surface waters via SuDS to groundwater, watercourses or surface water sewers.

STW are supportive of the use of SuDS and SuDS principles to manage surface water runoff. STW have published a series of guidance documents on their website which largely reflect the key aspects of the CIRIA SuDS Manual

Severn Trent Services, a commercial arm of the Severn Trent Group, offers SuDS and nature-based solutions services through Oren Environmental.

Within their Wastewater Connection Pack guidance STW state:

"*It's really important that surface water is only sent to our sewage network as a last resort. Before we approve a connection to our sewers, you will need to demonstrate you've considered all alternative sustainable drainage methods, such as a soakaway, watercourse or ditch system*."

6.2 Sewerage system capacity assessment

New residential developments and new employment land add pressure to the existing sewerage systems. An assessment is required to identify the available capacity within the existing systems, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading works may vary significantly depending upon the location of the development in relation to the network itself and the receiving WwTW.

It may be the case that an existing sewerage system is already working at its full capacity, and further investigations have to be carried out to define which solution is necessary to implement an increase in its capacity. New infrastructure may be required if, for example, a site is not served by an existing system. Such new infrastructure will normally be secured through private third-party agreements between the developer and utility provider.

Sewerage undertakers must consider the growth in demand for wastewater services when preparing their five-yearly strategic business plans which set out investment for the next AMP period. Typically, investment is committed to provide new or upgraded sewerage capacity to support development only when planning permission has been granted, although growth allocated in Local Plans is used to forward plan investment. Additional sewerage capacity to service windfall sites, smaller infill development or to connect a site to the sewerage network across third party land is normally funded via developer contributions (see Section 3.5.5), as third-party arrangements between the developer and utility provider.

6.3 Severn Trent Water drainage and wastewater management plan

6.3.1 Severn Trent Water drainage and wastewater management plan (DWMP)

Severn Trent Water's DWMP23 was published in March 2023, setting out how their wastewater systems and drainage networks will be maintained and extended over the next 25 years addressing the pressures of population growth, climate change and responding to environmental requirements. At the time of publication, STW are working on their next DWMP, DWMP28 will be published in 2028 and will set out how money will be invested between 2030 and 2035 (AMP9).

Severn Trent Water's priorities set out in their DWMP23 Strategic Direction Statement include:

- Guarantee future water supplies
- Ensure water is used wisely
- Deliver a high quality, affordable service
- Lower the risk of flooding and pollution
- Protect and enhance our environment

The planning objectives within STW's DWMP23 outline their long-term ambitions:

- **CP01**: to reduce the number of internal sewer flooding incidents per year to zero by 2050 (company ambition).
- **CP02**: to reduce the number of category 1 to 3 pollution incidents per year to zero by 2050 (company ambition).
- **CP03**: to reduce the number of sewer collapses per year to zero by 2050 (company ambition).
- **CP04**: to reduce the percentage of properties at risk of sewer flooding in a 1 in 50-year storm per year to zero by 2050 (company ambition).
- **CP05**: to reduce the number of storm overflows with more than 10 activations per year to zero by 2050 (statutory target).
- **CP06**: 100% of wastewater treatment works to be permit compliant by 2050 (statutory target).

The main focus of the DWMP23 was on hydraulic capacity demand balance (objectives CP04, CP05 and CP06).

STW's 'base strategy' of proactive maintenance and asset optimisation approaches are highlighted as having a direct impact upon blockages, sewer related pollution incidents, internal and external sewer flooding and sewer collapses.

An assessment was carried out using a Baseline Risk and Vulnerability Assessment (BRAVA) for a one in 50-year storm with various climate change scenarios taken into consideration (no temperature change, 2°C increase and 4°C increase). The scenarios looked at how many properties would be at risk of internal sewer flooding. The assessment showed that there were 112,000 properties currently at risk of internal flooding which amounted to to 2.58% of connected properties in the Severn Trent region. If no upgrades of WwTW occur, by 2050 this percentage is expected to rise to 39% (155,998 properties), assuming a 2°C increase in temperature.

To address sewer flooding, investment options including alleviating flood risk by undertaking surface water separation scenarios, taking surface water out of combined sewers and maximising blue-green nature-based solutions (particularly SuDS), to reduce the inflow of surface water to the sewer network were focused on.

There are 2,647 storm overflows in the Severn Trent Water region. By 2050, 1,097 of the storm overflows are predicted to be classed as high priority activating higher than ten times per year, which is above the national annual allowance. By 2030, Severn Trent Water aim to align to the Storm Overflows Discharge Reduction Plan, by addressing 39% of high priority storm overflows causing harm, and 26% of all storm overflows activating more than 10 time as year. Upgrades to the sewer network and WwTW are planned to reduce storm overflow operation outside of intense rainfall events.

STW's PR24 Addendum indicates that additional investment will be made to reduce spill frequency at 198 storm overflows through nature-based solutions. STW have published a

Storm Overflows Action Plan in 2024 which indicated £640 million would be invested to improve storm overflows in Staffordshire over the next 25 years.

As detailed within the catchment overview for Strongford WwTW, STW carried out an assessment of priority drainage catchments using a Baseline Risk and Vulnerability Assessment (BRAVA). A variety of measures were assessed including risk of wastewater treatment works quality compliance failure and risk of internal flooding during a 1 in 50-year (2% annual exceedance probability) storm. At Strongford WwTW, quality compliance failure was assessed as a long-term priority. This indicates performance is not triggering specific risk thresholds and current baseline and project performance is not a significant issue or concern. Internal flood risk during a 1 in 50-year storm was assessed as a medium term priority for all AMP periods between 2020 and 2050.

6.4 Response from STW on sites consultation

The Stoke-on-Trent Local Plan potential allocations sites included in the growth scenario for this WCS assessment are all located within, or in close proximity of the catchment of Strongford Sewage Treatment Works (STW), also known as a wastewater treatment works (WwTW). Strongford WwTW is located within the south-western corner of the boundary of Stoke-on-Trent.

The potential allocation sites were submitted to STW, however they were not able to respond to this consultation request within the project programme.

6.5 Storm overflows

6.5.1 Background

Storm overflows are an essential component in the sewer network. However, when they operate, they can cause environmental damage. They occur on combined sewer systems where the sewer takes both foul flow (sewage from homes and offices) and rainwater runoff. In normal conditions (Figure 6-1) all of this flow passed through the sewer network and is treated at a WwTW.

In periods of exceptional rainfall (Figure 6-2), the capacity in a combined sewer may be used up by the additional flow from rooftops and storm drains. Once the capacity is exceeded, wastewater would back up into homes, businesses and on to roads. A storm overflow acts as a relief valve, preventing this from happening.

Storm overflows become problematic when they operate frequently in moderate or light rainfall, or for long periods as a result of groundwater infiltration in the sewerage system – possibly in breach of their permit.

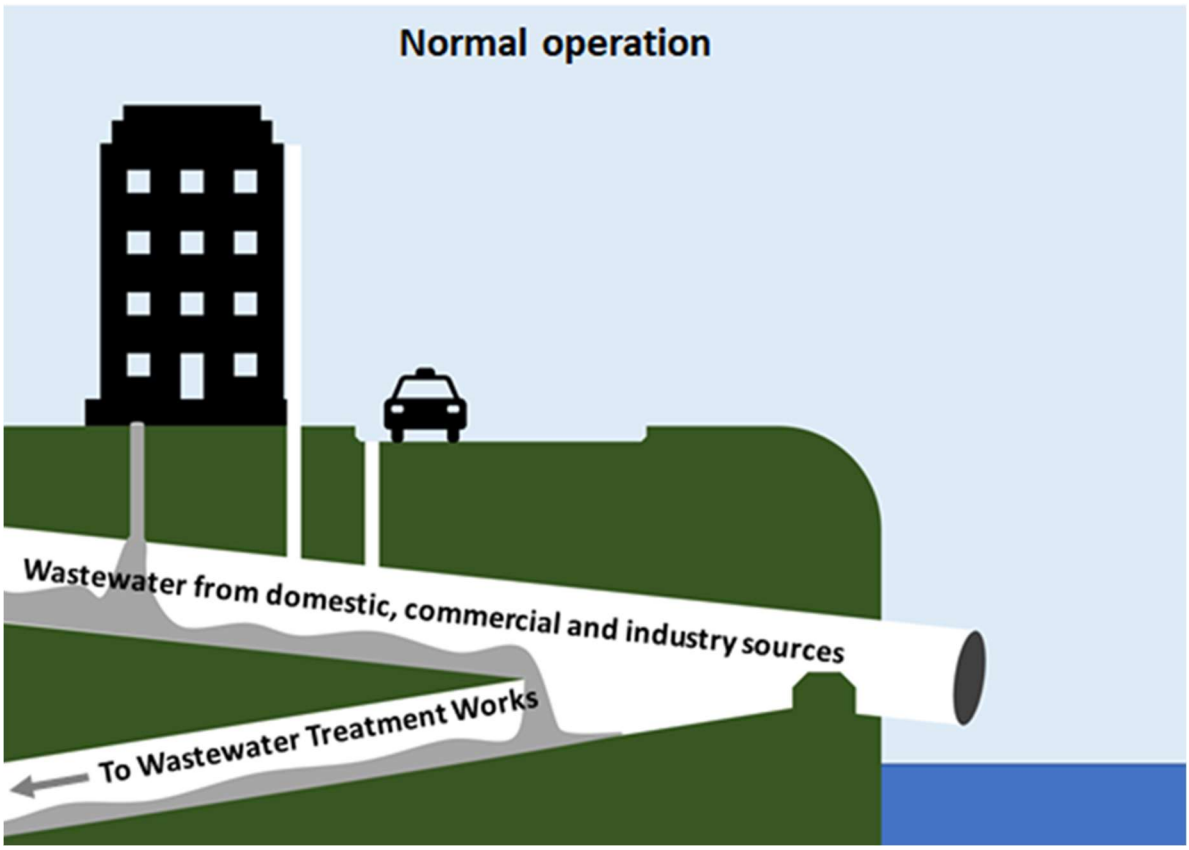


Figure 6-1: Storm overflow operation in normal conditions

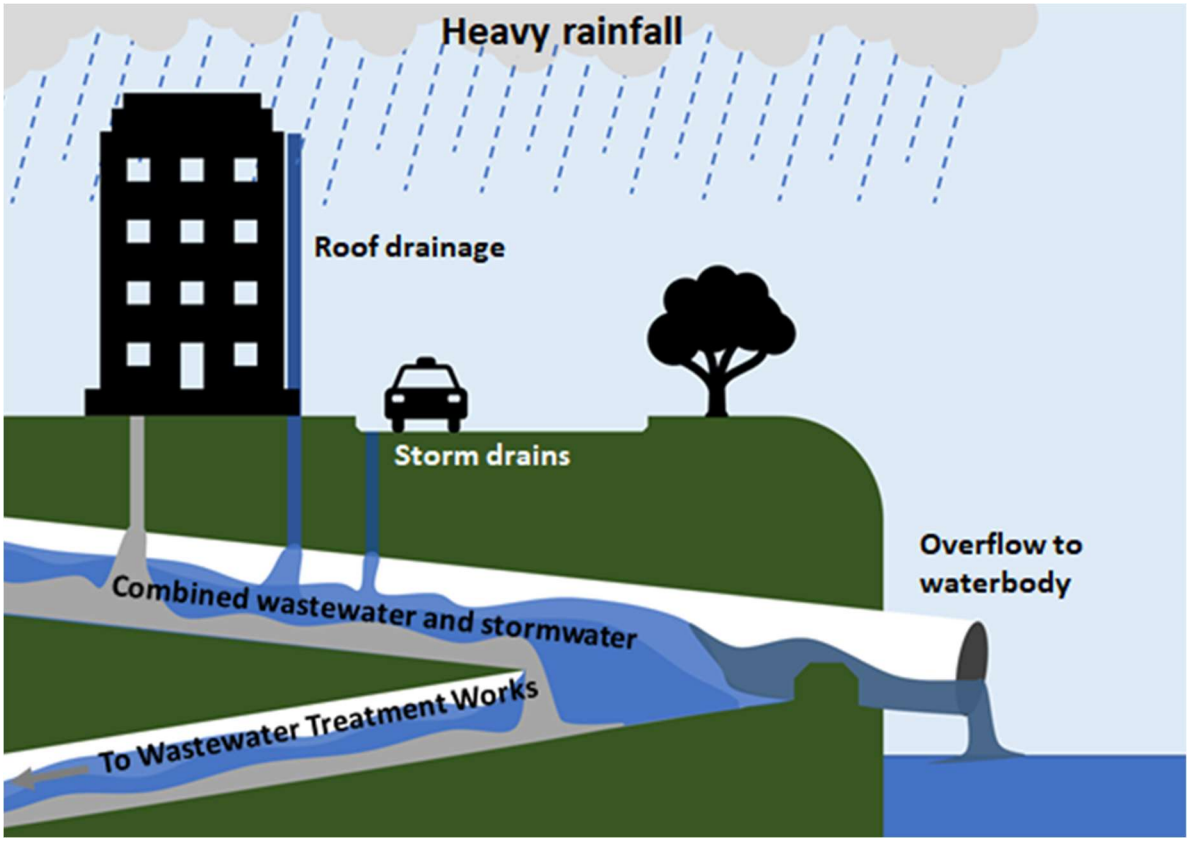


Figure 6-2: Storm overflow operation in exceptional rainfall.

6.5.2 Storm overflow assessment

The Environment Act now requires water companies to report and monitor storm overflows as well as reduce the harm caused to the rivers they discharge to. The Storm Overflow Taskforce has agreed a long-term goal to end the damaging pollution caused by the operation of storm overflows. An important component of this is the monitoring of overflows, and a target has been set to monitor the frequency and duration of operation at all storm overflows by 2023. This is called event duration monitoring. The event duration monitoring dataset (which contains performance data on the storm overflows monitored in 2023, 2024 and 2025) has been used to provide information on storm overflows in Stoke-on-Trent. Severn Trent Water have a long-term aim of reducing the number of spills at storm overflows to zero.

The SOAF 2025 set a threshold of 10 operations in a year (based on three year's data, 20 if based on two year's data, and 30 if based on one year), above which a storm overflow should be investigated. The EA state that a revised SOAF methodology will be realised to coincide with the Environment Act obligation on storm overflows, which will require all overflows to ensure that they are not causing adverse ecological harm. The Storm Overflow Reduction Plan which was published in August 2022 sets an objective that 'storm overflows will not be permitted to discharge above an average of ten rainfall events per year by 2050'.

The overflows identified in Stoke-on-Trent were also assessed on the average number of operations over three years. Table 6-1 outlines the criteria used for the Red/Amber/Green (RAG) assessment of network and WwTW storm overflows. The results of this RAG assessment are presented in Figure 6-3.

Table 6-1: Criteria used for RAG assessment of network and WwTW storm overflows

Sewer Overflows RAG Score	Number of operations per year (average of available data)	Commentary
	5-9	An investigation is not required at present, but improvements may be needed in the network and/or catchment to meet the long-term target.
Red		

6.5.3 Results

In Stoke-on-Trent, there are 88 sewer network storm overflows, two WwTW storm tank overflows and 4 storm overflows at pumping stations. The location of these is shown in Figure 6-3. Storm tank overflows at WwTWs are assessed in Section 7.3.

As shown in Appendix D, 37 storm overflows in Stoke-on-Trent exceeded the SOAF operations per year investigation threshold averaged over 2023 to 2025. They require an investigation under the SOAF 2025 and action to meet the long-term target.

All but six overflows, (Beddeley Green, Gayton Avenue, Little Heakley Farm, Meir - Meir Road, Peck Mill Lane and Stoke-On-Trent - Riverhead Close), are undergoing intervention (under driver code EnvAct_INV4) to reduce storm overflow spills. The aim is to protect the environment so that there will be no local adverse ecological impact. Reducing spill frequency will be through non-traditional solution types were feasible, and the completion date is 30th July 2027.

Unmitigated development within Stoke-on-Trent could cause the frequency or duration of operation of storm overflows to increase. There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, particularly within brownfield sites, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing developed areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

Figure 6-3 shows the RAG assessment based on the average number of operations over three years. Table 6-1 outlines the criteria used for the RAG assessment of network, WwTW and pumping station storm overflows. The results of this RAG assessment show 37 storm overflows with a red RAG score, 19 with an amber RAG score and 38 with a green RAG score.

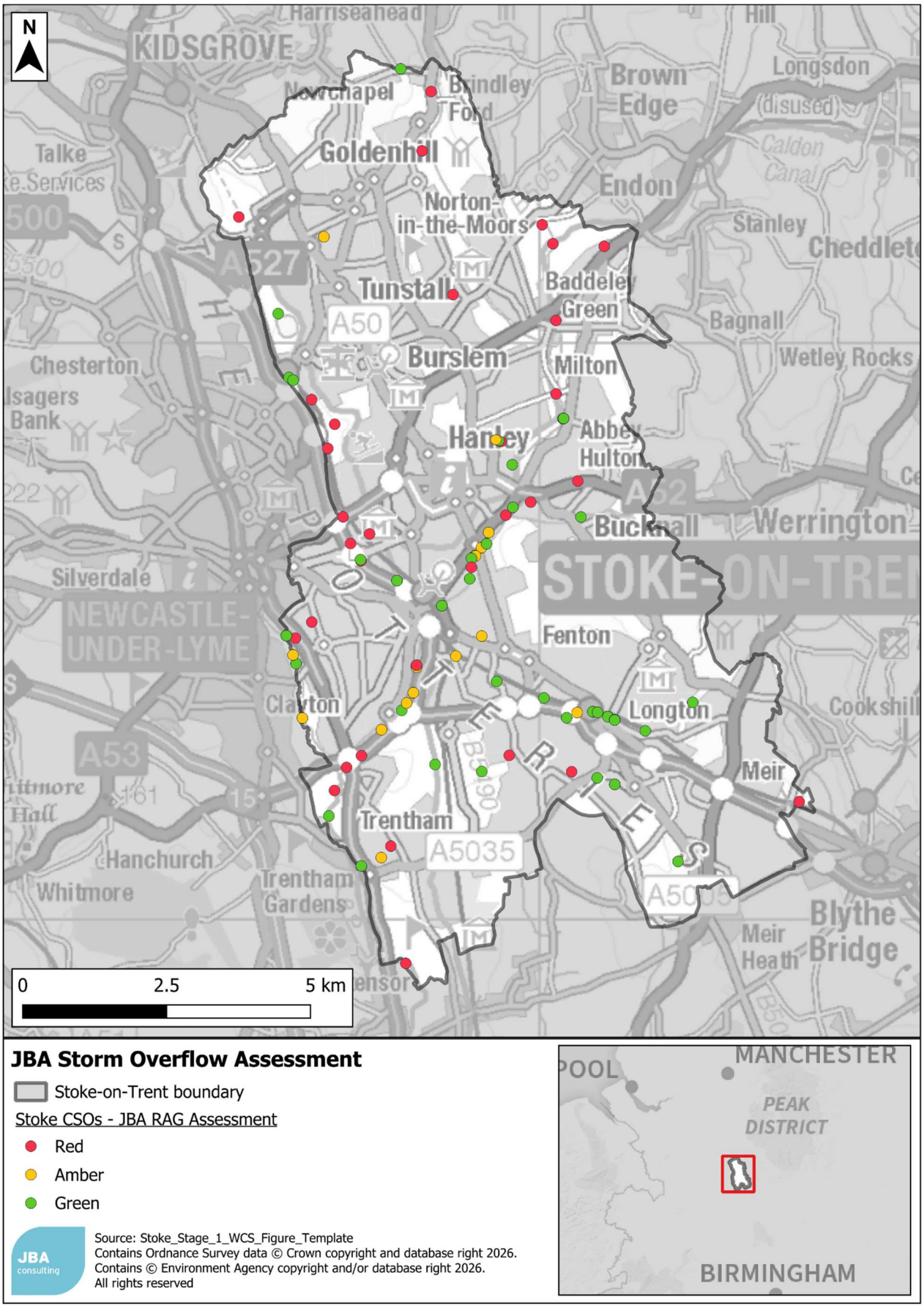


Figure 6-3: Storm overflow network RAG assessment

6.6 Conclusions and recommendations

6.6.1 Conclusions

As shown in Appendix D, 37 storm overflows in Stoke-on-Trent exceeded the SOAF operations per year investigation threshold averaged over 2023 to 2025. They require an investigation under the SOAF 2025 and action to meet the long-term target.

Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on customers, and increasing the likelihood of storm overflow operation. Early engagement with developers and STW is recommended to allow time for the strategic infrastructure required to serve development forecast in the Local Plan to be planned. Further modelling of the network may also be required by STW at the planning application stage.

Unmitigated development within Stoke-on-Trent could cause the frequency or duration of operation of storm overflows to increase. There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, particularly within brownfield sites, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing developed areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

Wastewater network recommendations are provided in Table 6-2. Early engagement between developers, SoTCC, and STW is recommended to allow time for the strategic infrastructure required to serve these developments to be planned.

6.6.2 Recommendations

Table 6-2: Recommendations from wastewater network assessment.

Action	Responsibility	Timescale
Early engagement between Stoke-on-Trent City Council and Severn Trent Water is required to ensure that where strategic infrastructure is required, it can be planned in by Severn Trent Water and will not lead to any increase in discharges from sewer overflows.	Stoke-on-Trent City Council, Severn Trent Water	Ongoing
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker.	Stoke-on-Trent City Council, Severn Trent Water	Ongoing
Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an Outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	Stoke-on-Trent City Council, Severn Trent Water and developers	Ongoing
Developers will be expected to demonstrate to the LLFA that surface water from a site will be disposed using a sustainable drainage system (SuDS) in line with the hierarchy set out in Standard 1 of DEFRA's 2025 National Standards for Sustainable Drainage Systems (SuDS) and as such proposals for new connections for surface water to foul sewers will not be accepted by the LLFA.	Stoke-on-Trent City Council as LLFA, developers	Ongoing

7 Wastewater treatment

7.1 Introduction

Severn Trent Water are the wastewater services provider covering Stoke-on-Trent. Severn Trent Water refer to their wastewater processing plants as WwTW. They may also be referred to a Sewage Treatment Works, STW, in some documents and data sources.

Sites which will potentially be allocated in the Local Plan (potential allocations), sites recently completed (completions), sites already allocated in the adopted Local Plan, or already in the planning system (commitments), an allowance for windfall, as well as neighbouring authority Local Plan allocations were assigned to a WwTW using the sewerage drainage area boundaries to set a baseline for WwTW capacity. Actual connection of a development site to a particular WwTW may be different and will depend on the capacity of the receiving works, and the local sewer network.

Very small developments in rural areas may be suitable for on-site treatment and discharge. However, the EA will not usually permit this where there is a public sewerage system within a distance calculated as 30m per dwelling. There is therefore a localised risk to water quality if all of these small developments were to be served by septic tanks, especially where there are clusters of small-scale new development. It needs to be noted that the EA have stated they 'would also object to a proposal which included septic tanks if they were within a 'sewered area'.

The location of the WwTW catchments that cover Stoke-on-Trent can be seen in Figure 7-1 below. Strongford WwTW covers the majority of the study area. The south-eastern areas of Stoke-on-Trent, including Meir, are covered by Checkley WwTW.

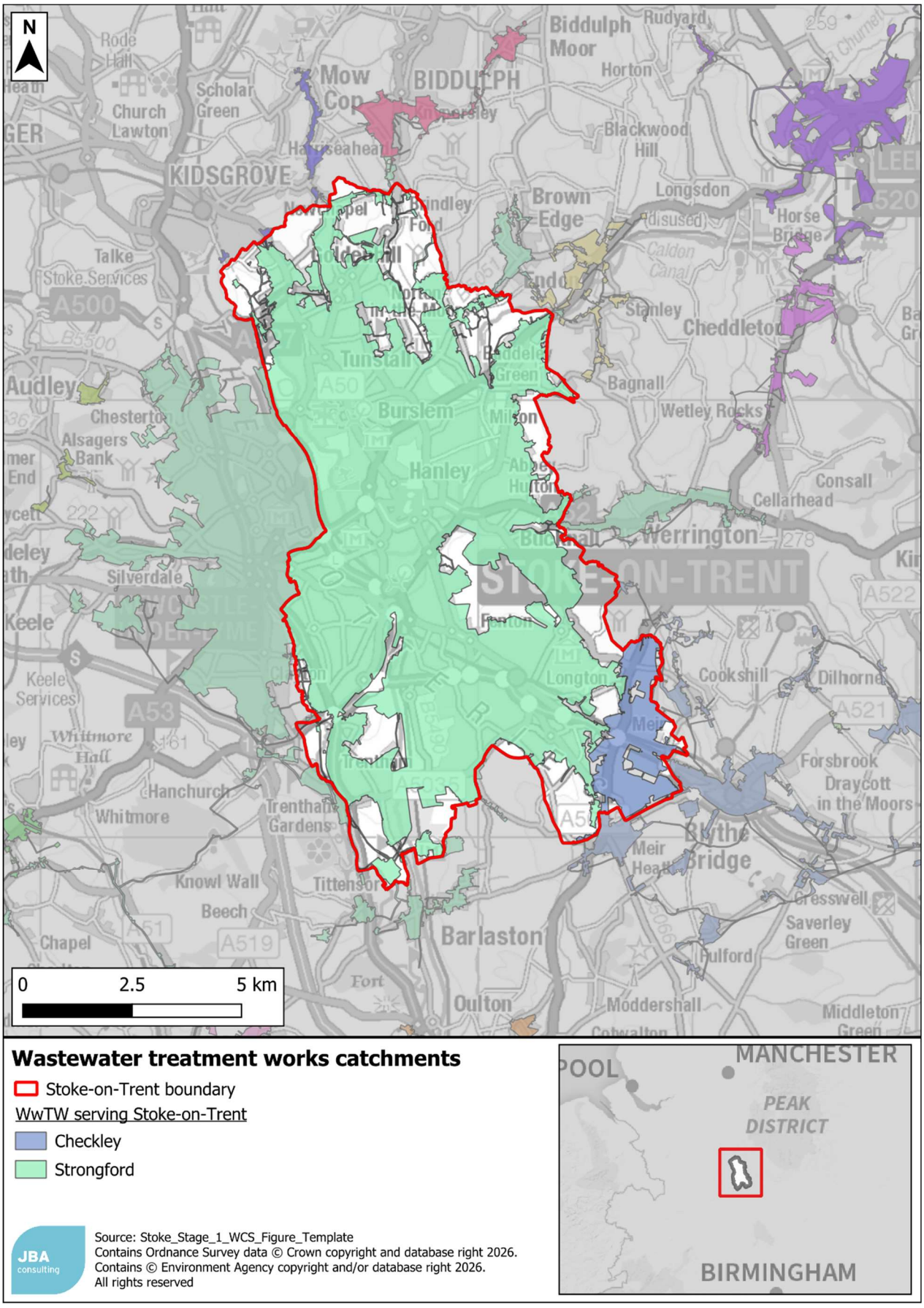

N
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Rudyard
Horton
Mow Cop
BIDDULPH
Scholar Green
Church Lawton
KIDSGROVE
Blackwood Hill
Brown Edge
Longsdon
Horse Bridge
Talke
Stoke Services
A500
Stanley
Cheddleton
Audley
Bagnall
Wetley Rocks
Chesterton
Alsagers Bank
Burslem
Hanley
Consall
Cellarhead
Werrington
STOKE-ON-TRENT
Silverdale
Keele
Keele Services
A53
Cookshill
Dilhorne
A521
Whitmore Hall
Hanchurch
Whitmore
Trentham Gardens
Forsbrook
Draycott in the Moors
Meir Heath
Blythe Bridge
Knowl Wall
Beech
Chapel
A519
Barlaston
Saverley Green
Fulford
Fort
Oulton
Moddershall
Middleton
0
2.5
5 km
Wastewater treatment works catchments
Stoke-on-Trent boundary
WwTW serving Stoke-on-Trent
Checkley
Strongford
MANCHESTER
PEAK DISTRICT
BIRMINGHAM
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Figure 7-1 WwTW catchments serving Stoke-on-Trent

7.2 Wastewater treatment works flow permit assessment

7.2.1 Introduction

New residential developments and new employment land add pressure to the existing treatment works. An assessment is required to identify the available capacity within the existing WwTW, and the potential to upgrade overloaded systems to accommodate future growth. The scale and cost of upgrading works may vary significantly depending upon the location of the development in relation to the network itself and the receiving WwTW.

The EA is responsible for regulating sewage discharge releases via a system of Environmental Permits (EPs). Monitoring for compliance with these permits is the responsibility of both the EA and the plant operators. Figure 7-2 summarises the different types of wastewater releases that might take place, although precise details vary from works to works depending on the design.

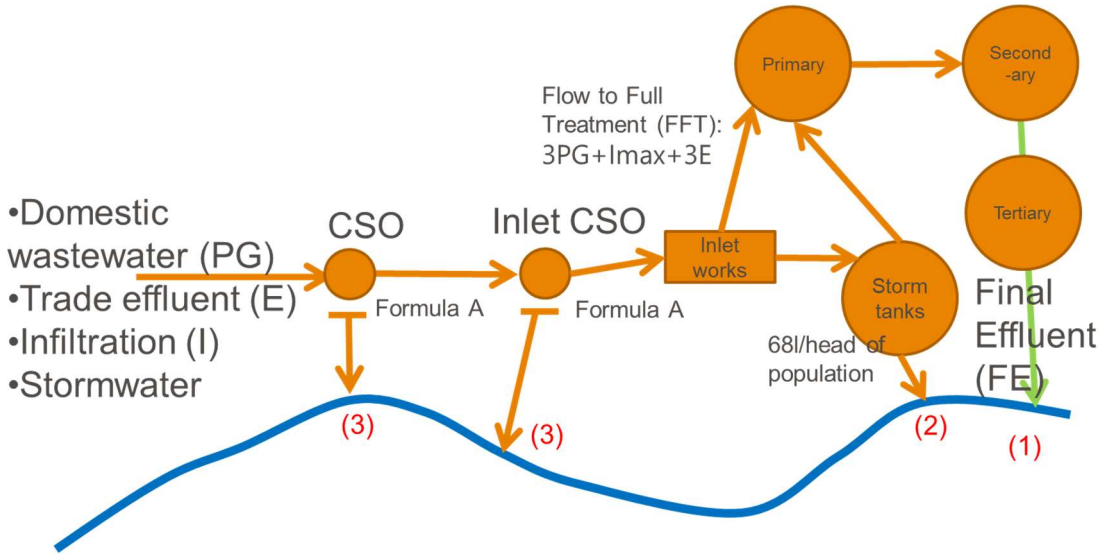


Figure 7-2: Overview of typical combined sewerage system and WwTW discharges

During dry weather, the final effluent from the WwTW should be the only discharge (1). With rainfall, the storm tanks fill and eventually start discharging to the watercourse (2) and Combined Sewer Overflows (CSOs) upstream of the storm tanks start to operate (3). The discharge of storm sewage from treatment works is allowed only under conditions of heavy rain or snow melt, and therefore the flow capacity of treatment systems is required to be sufficient to treat all flows arising in dry weather and the increased flow from smaller rainfall events. After rainfall, storm tanks should be emptied back to full treatment as soon as reasonably possible, freeing their capacity for the next rainfall event.

Environmental permits are used alongside water quality limits as a means of controlling the pollutant load discharged from a WwTW to a receiving watercourse. Sewage flow rates must be monitored for all WwTW where the permitted discharge rate is greater than 50 m3/day in dry weather.

Permitted discharges are based on a statistic known as the Dry Weather Flow (DWF). As well as being used in the setting and enforcement of effluent discharge permits, the DWF is used for WwTW design, as a means of estimating the 'base flow' in sewerage modelling and for determining the flow at which discharges to storm tanks will be permitted by the permit (Flow to Full Treatment).

WwTW Environmental Permits also consent for maximum concentrations of pollutants, in most cases Suspended Solids (SS), Biochemical Oxygen Demand (BOD) and Ammonia (NH_4). Some works (usually the larger works) also have permits for Phosphorous (P). These are determined by the EA with the objective of ensuring that the receiving watercourse is not prevented from meeting its environmental objectives, with specific regard to the Chemical Status element of the WFD classification.

Increased domestic population and/or employment activity can lead to increased wastewater flows arriving at a WwTW. Where there is insufficient headroom at the works to treat these flows, this could lead to failures in flow consents.

In the case of failures in flow consents, it needs to be considered that even if there is sufficient headroom there could also be separate issues related to the capacity of the receiving watercourse to cope from an environmental point.

7.2.2 Methodology

Severn Trent Water were provided with the list of Stoke-on-Trent Local Plan potential allocation sites and the potential number of dwellings for each site. Severn Trent Water were then invited to provide an assessment of the receiving WwTW which covers the local plan potential allocations (which is Strongford WwTW) and provide any additional comments about the impacts of the development. As discussed in Section **Error! Reference source not found.**, Severn Trent were not able to respond to this consultation request within the project programme.

An assessment of WwTW capacity was carried out by JBA using measured flow data supplied by Severn Trent Water. The process was as follows:

- Severn Trent Water provided 80th percentile (Q80), mean and standard deviation dry weather flow statistics for the WwTW covering Stoke-on-Trent (Strongford WwTW and Checkley WwTW).
- Development sites within the growth scenario including windfall and neighbouring authority growth were assigned to a WwTW using the sewerage drainage area boundaries.
- For each site, the future dry weather flow (DWF) was calculated using the occupancy rates and per-capita consumption values obtained from the WRMP (Table 7-1), and the assumption that 95% of water used is returned to sewer. Permitted headroom was used as a substitute for actual designed hydraulic capacity for each WwTW being assessed.

- For employment sites, wastewater demand was estimated based on the predicted number of new employees. Floor space, employment use types, and employment densities were used to estimate the number of employees.
- The current and estimated future flow was then compared to the permitted flow obtained from the EA's 'Consented Discharges to Controlled Waters with Conditions' database.
- Headroom (expressed as the number of homes that could be accommodated before the permit is exceeded) was estimated by calculating the difference between the current and permitted flow and using the occupancy and per capita consumption for the WRZ the sewer catchment is in to provide an estimate for the number of dwellings.
- A RAG score was then assigned to each WwTW based on whether it was likely to exceed its permitted flow.

Table 7-1: Per capita consumption values used in water demand calculations

Water company and WRZ	Occupancy rate (persons per dwelling)	Per capita residential consumption (m^3/person/day)	Per capita employment consumption (m^3/person/day)
Severn Trent Water North Staffs WRZ	2.3	0.1268	0.100

7.2.3 Results

The impact of committed growth on wastewater treatment capacity for the WwTWs serving Stoke-on-Trent is shown in below. It should be noted that this map represents the remaining capacity (number of dwellings) once all committed sites are built and does not take into account planned increases in treatment capacity, or growth from future allocations. The following definition was used by JBA to score each WwTW:

GREEN	AMBER	RED
Sufficient capacity to accommodate growth	Likely to be close to or exceed permit during plan period. Upgrades and / or a change to permit limit may be required. No significant constraints have been identified. (Based on less than 10% headroom remaining)	WwTW Capacity may be a constraint to growth (defined by Water Company)

As shown in Figure 7-3, Checkley and Strongford WwTWs are forecast to remain within their dry weather flow permit conditions. For planning purposes, headroom has been assessed based on the 80th exceedance percentile. Permit compliance is assessed by the Environment Agency using the 90th percentile statistic which in general results in a lower value than the 80th percentile. Compliance of WwTWs is not within the scope of the WCS and the assessment below should not be used to infer non-compliance.

Where a WwTW is likely to exceed its permit, the permit would be reviewed by the EA and if a higher flow consent was agreed, a tighter permit limit for substance concentrations is very likely to be required. In some cases, this may not be technically feasible if that means concentrations tighter than the Technically Accepted Limit (TAL) which is 0.25 mg/l for phosphate for example.

A summary of WwTW flow capacity assessment is shown in Table 7-2 below. Each WwTW has been given a GREEN assessment based on the approximate headroom at the end of the plan period, as also shown in Figure 7-3.

Table 7-2: Wastewater treatment works flow capacity assessment

WwTW name	Proposed housing growth over Local Plan period (no. dwellings)	Proposed employment growth over Local Plan period (m^2)	Estimated remaining capacity at end of Local Plan period (no. dwellings)	JBA Capacity Assessment
Checkley	1,770	141,141	5,129	GREEN - Sufficient capacity to accommodate growth
Strongford	28,572	1,310,738	49,539	GREEN - Sufficient capacity to accommodate growth

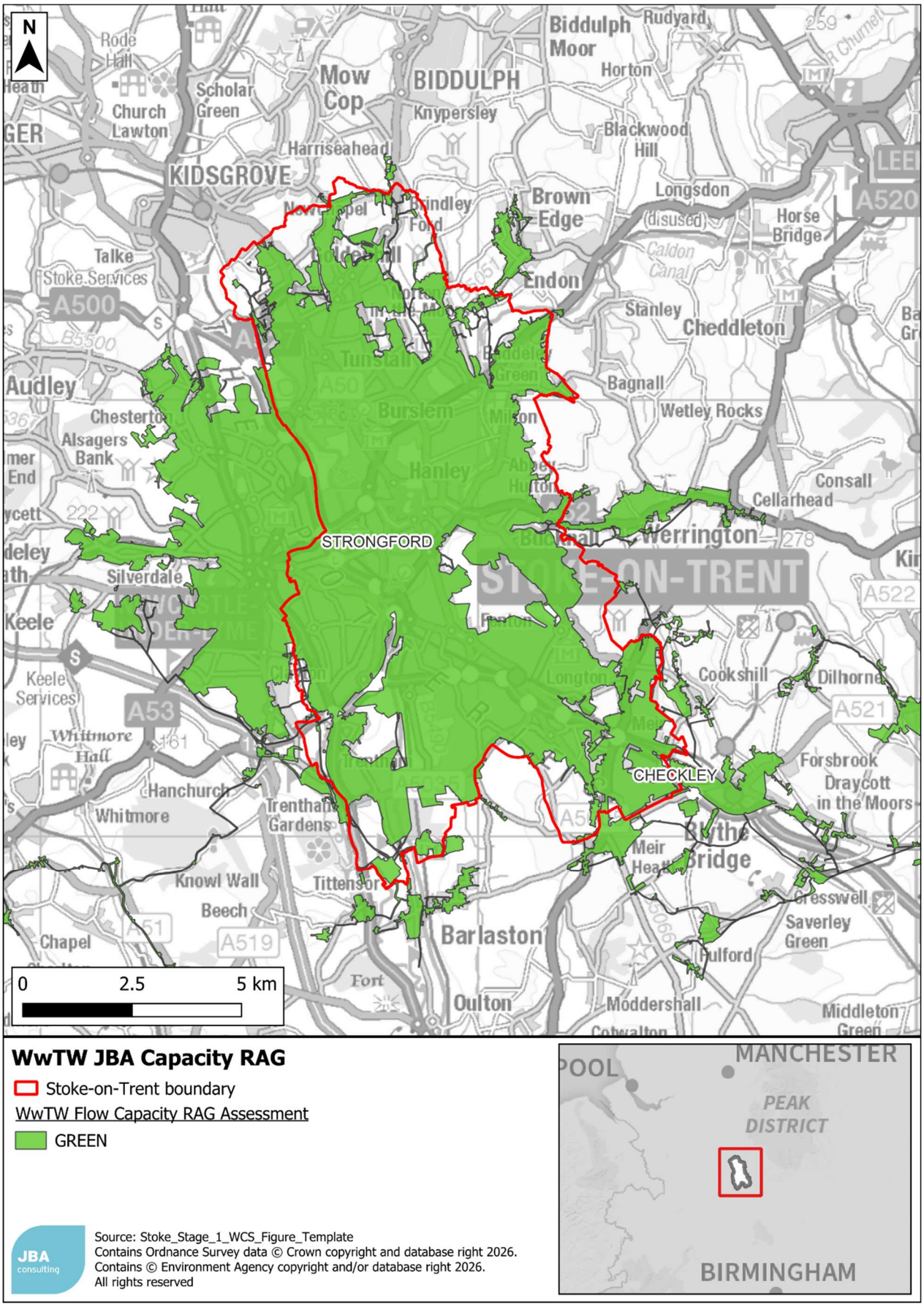

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STRONGFORD
CHECKLEY
KIDSGROVE
BIDDULPH
Biddulph Moor
Mow Cop
Knypersley
Harriseahead
Brown Edge
Endon
Stanley
Cheddleton
Bagnall
Wetley Rocks
Audley
Talke
Stoke Services
Alsagers Bank
Burslem
Hanley
Werrington
Consall
Cellarhead
Silverdale
Keele
Keele Services
Whitmore Hall
Whitmore
Hanchurch
Trentham Gardens
Knowl Wall
Beech
Chapel
Barlaston
Oulton
Fort
Cookshill
Dilhorne
Forsbrook
Draycott in the Moors
Meir Heath
Blythe Bridge
Saverley Green
Fulford
Moddershall
Middleton Green
Longsdon
Blackwood Hill
Horton
Rudyard
Horse Bridge
Church Lawton
Scholar Green
Rode Hall
A500
A53
A519
A521
A522
A520
0
2.5
5 km
WwTW JBA Capacity RAG
Stoke-on-Trent boundary
WwTW Flow Capacity RAG Assessment
GREEN
MANCHESTER
PEAK DISTRICT
BIRMINGHAM
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Figure 7-3: JBA WwTW flow capacity RAG assessment results

7.3 Storm tank overflows

In Stoke-on-Trent, the EA's storm overflow Event Duration Monitoring (EDM) dataset indicates there being two storm tank overflows within Stoke-on-Trent. One at Strongford WwTW and one at Campbell Road (NGR: SJ8759943629). Mapping and modelling data does not appear to indicate a WwTW at Campbell Road. The EA's EDM dataset shows zero spills at Campbell Road CSO for 2025, 2024 and 2023. Given this information, Campbell Road CSO is not discussed below.

Table 7-3 presents the performance of Strongford Sewage Treatment Works (WwTW) storm tank overflow. The storm tank overflow was operating above the SOAF threshold for investigations based on monitoring between 2023 and 2025. Figure 7-4 shows the SOAF RAG assessment based on the average of available data.

Where a storm tank overflow is operating in periods of moderate or light rainfall, or even in dry conditions it indicates either an infiltration problem within the network, the WwTW or its storm tanks are undersized for the population served, or that there are potential operational issues at the WwTW. Further development within a catchment that has a poorly performing storm tank overflow is likely to exacerbate the issue.

The Local Plan can contribute to this by encouraging the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW. This opportunity is greatest at brownfield sites connected to existing combined sewerage systems.

The receiving waterbody of Strongford STW (WwTW) storm tank overflow is the Trent from Fowlea Brook to Tettensor. The Water Industry National Environment Programme (WINEP) actions in place for PR24 at Strongford STW (WwTW) are as follows:

- U_MON3a: MCERTS certification of an AMP7 U_MON3 driver output overflow operation monitor
- U_MON4a: Move AMP7 U_MON4 driver output to 2 minute flow monitoring

Table 7-3: Storm tank overflow frequency of operation and duration

Overflow	Number of operations 2023	Number of operations in 2024	Number of operations in 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
STRONGFORD STW STORM TANK	79	84	84	82.3	Y

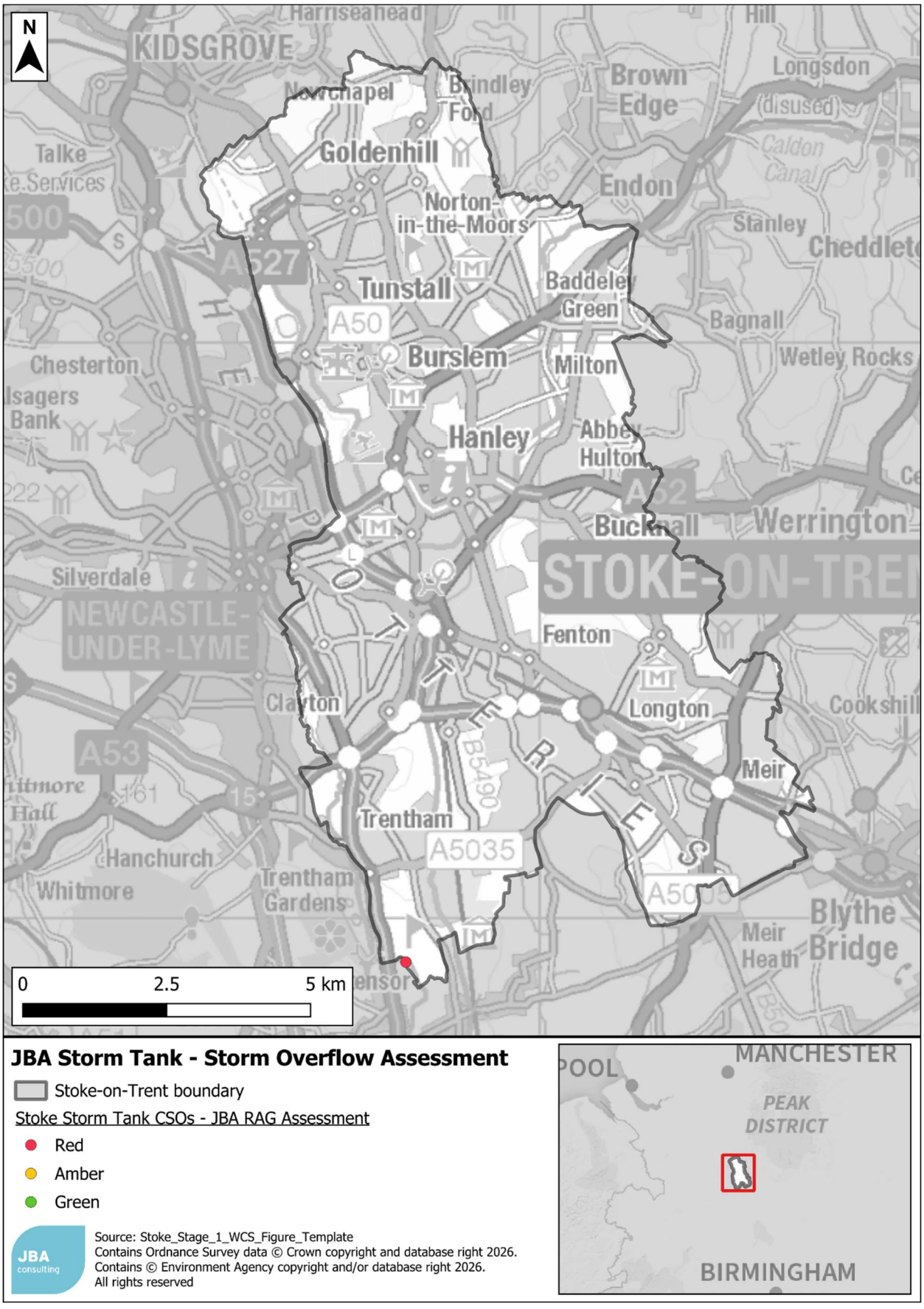


Figure 7-4: RAG assessment of WwTW storm tank overflow spills

7.4 Wastewater treatment works odour assessment

7.4.1 Introduction

WwTW have a typical range within which odour nuisance may be experienced. Where developments encroach upon this range, there may become a cause for nuisance and complaints from residents. Managing odour at WwTW can add considerable capital and operational costs, particularly when retrofitted to existing WwTW. National Planning Policy Guidance recommends that plan makers consider whether new development is appropriate near to sites used (or proposed) for water and wastewater infrastructure, due to the risk of odour nuisance.

7.4.2 Methodology

Sewerage undertakers recommend that an odour assessment may be required if the site of a proposed development is close to a WwTW and is encroaching closer to the WwTW than existing urban areas.

A Geographic Information System (GIS) assessment was carried out to identify areas that the sewerage undertaker considers may be at risk from odour nuisance due to encroachment on an existing WwTW. For Severn Trent Water, this is defined as development sites less than 800m from the WwTW and encroaching closer to the WwTW than existing urbanised areas. If there are no existing dwellings close to a WwTW it is more likely that an odour impact assessment is needed.

7.4.3 Results

The 800m buffer around Strongford WwTW is shown in Figure 7-5. There is one potential Local Plan allocation within 800m of Strongford WwTW; Site BL2 Trentham.

An odour assessment is recommended at this site as part of the planning process (to be funded by the developer). Consideration should also be given to the layout of the site where only part of the site boundary lies within the 800m buffer zone. In some cases, only part of a larger site may be at risk, in which case zoning of lower impact land uses (e.g., landscaping, amenity, parking) closer to sources of odour may be sufficient to address this risk.

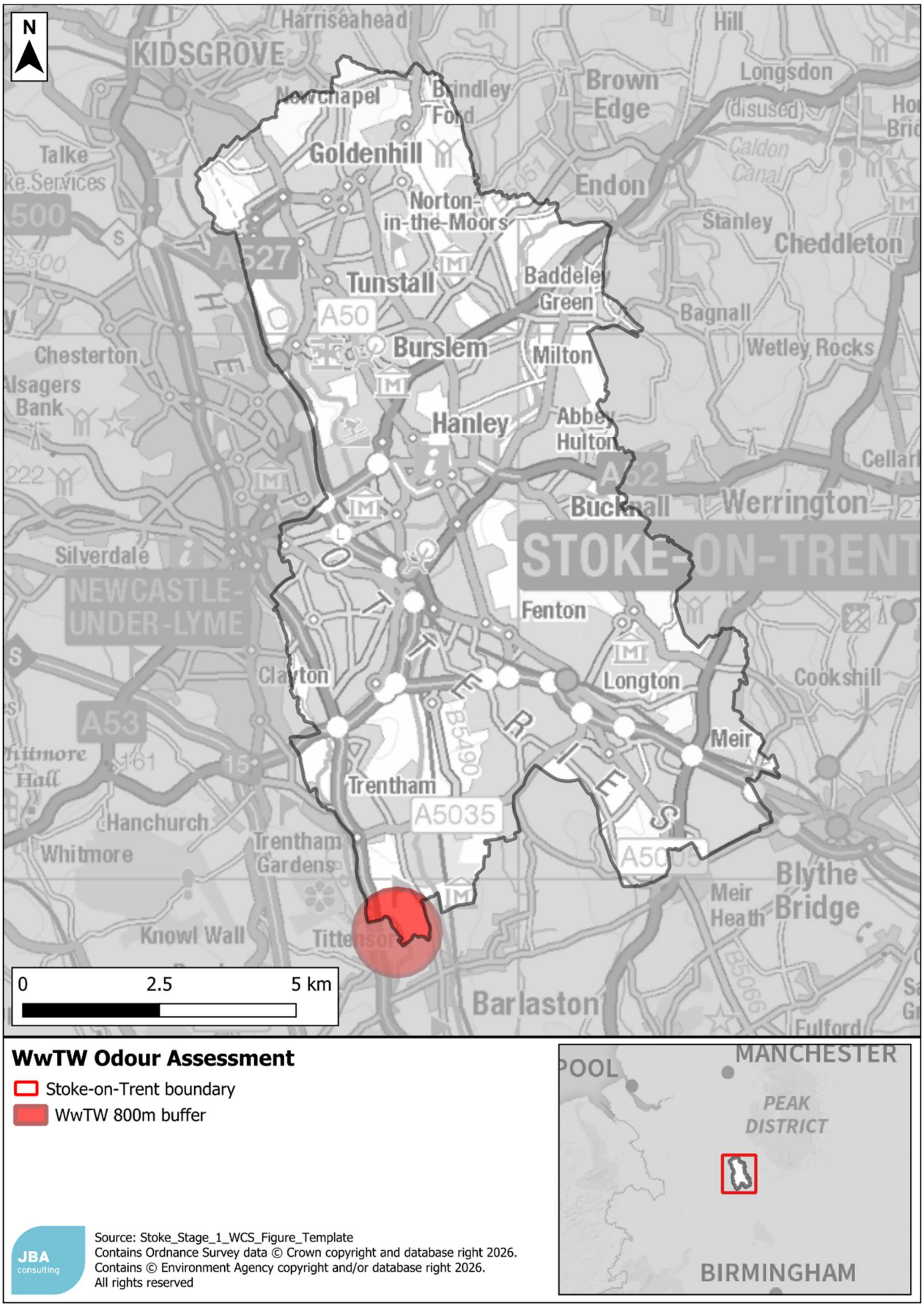

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KIDSGROVE
Harriseahead
Newchapel
Brindley Ford
Brown Edge
Hill
Longsdon
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Caldon Canal
Talke
Goldenhill
Norton-in-the-Moors
Endon
Stanley
Cheddleton
A527
Tunstall
Baddeley Green
A50
Bagnall
Chesterton
Burslem
Milton
Wetley Rocks
Alsagers Bank
Hanley
Abbey Hulton
Werrington
Silverdale
NEWCASTLE-UNDER-LYME
STOKE-ON-TRENT
Fenton
Clayton
Longton
Cookshill
A53
Meir
Whitmore Hall
Trentham
A5035
Hanchurch
Trentham Gardens
Whitmore
Meir Heath
Blythe Bridge
Knowl Wall
Barlaston
Fulford
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WwTW Odour Assessment
Stoke-on-Trent boundary
WwTW 800m buffer
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Figure 7-5: WwTW odour assessment buffer

7.5 Conclusions and recommendations

7.5.1 Conclusions

A headroom assessment was carried out comparing the current flow from each WwTW, making allowance for growth already planned, with the permit limit. This provides an estimate of the spare capacity in wastewater treatment infrastructure in Stoke-on-Trent.

Once growth from adopted plans and existing commitments, recently completed growth, windfall, potential allocations and future growth from neighbouring authority Local Plan allocations is taken into account, Checkley and Strongford WwTWs are forecast to remain within their dry weather flow permit conditions. For planning purposes, headroom has been assessed based on the 80th exceedance percentile. Permit compliance is assessed by the Environment Agency using the 90th percentile statistic which in general results in a lower value than the 80th percentile. Compliance of WwTWs is not within the scope of the WCS and the assessment should not be used to infer non-compliance.

Consideration should be given to using capacity in existing permits as this provides a lower carbon cost than upgrading capacity at existing WwTW or building new treatment works.

There is one storm tank overflow within Stoke-on-Trent, at Strongford WwTW. The storm tank overflow at Strongford WwTW is poorly performing and needs investigation based on the average of available data. Growth could also result in an increase in the operation of the overflow, contributing to a worsening of water quality in the area. Action should be taken by the Severn Trent Water to address the overflow prior to an increase in wastewater demand being generated by new development.

The WINEP actions in place for PR24 at Strongford include certifying the overflow operation monitor and moving to 2 minute flow monitoring.

New development proposed within Strongford WwTW odour buffer zone are recommended to prepare an odour impact assessment. Further recommendations for wastewater treatment and odour are provided in Table 7-4.

7.5.2 Recommendations

Table 7-4: Recommendations for wastewater treatment and odour.

Action	Responsibility	Timescale
Early engagement with Severn Trent Water is required to ensure that provision of WwTW capacity is aligned with delivery of development.	Stoke-on-Trent City Council	Ongoing
Provide Annual Monitoring Reports to Severn Trent Water detailing projected housing growth.	Stoke-on-Trent City Council	Ongoing
Severn Trent Water to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	Severn Trent Water	Ongoing
The Local Plan can encourage the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW. Policy should encourage developers to demonstrate to the LLFA that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Stoke-on-Trent City Council	In the Local Plan
Carry out an odour impact assessment for sites which fall within the buffer zone of WwTW.	Stoke-on-Trent City Council, developers	Ongoing
Consider the layout of the site BL2 where only part of the site boundary lies within the 800m odour buffer zone. In some cases, only part of the larger site may be at risk, in which case zoning of lower impact land uses (e.g. landscaping, amenity, parking) closer to sources of odour may be sufficient to address this risk.	Developers	Ongoing
Discussions between SoTCC and Severn Trent Water to determine how to progress within the Local Plan whilst considering the impact on the WwTWs. This includes around what solutions are programmed within the AMP, alternative solutions for short/medium/long-term growth, and short-term options to facilitate growth (e.g. SuDS retrofitting or removing surface water from sewer systems).	Stoke-on-Trent City Council and Severn Trent Water	Part of SoTCC's Local Plan process

8 Water quality

8.1 Introduction

An increase in the discharge of effluent from WwTW as a result of development and growth in the area in which they serve can lead to a negative impact on the quality of the receiving watercourse. Under the WFD, a watercourse is not allowed to deteriorate from its current WFD classification (either as an overall watercourse or for individual elements assessed).

It is EA policy to model the impact of increasing effluent volumes on the receiving watercourses. Where the scale of development is such that a deterioration is predicted, a variation to the environmental permit may be required for the WwTW to improve the quality of the final effluent, so that the increased pollution load will not result in a deterioration in the water quality of the watercourse. This is known as 'no deterioration' or 'load standstill'. The need to meet river quality targets is also taken into consideration when setting or varying a permit.

The EA operational instructions on water quality planning and no-deterioration are currently being reviewed. Previous operational instructions[1] (now withdrawn) set out a hierarchy for how the no-deterioration requirements of the WFD should be implemented on inland waters. The potential impact of development should be assessed in relation to the following objectives:

- **Could the development cause a greater than 10% deterioration in water quality?** This objective is to ensure that all the environmental capacity is not taken up by one stage of development and there is sufficient capacity for future growth.
- **Could the development cause a deterioration in WFD class of any element assessed?** This is a requirement of the WFD to prevent a deterioration in class of individual contaminants. The 'Weser Ruling' by the European Court of Justice in 2015 specified that individual projects should not be permitted where they may cause a deterioration of the status of a water body. If a water body is already at the lowest status ('bad'), any impairment of a quality element was considered to be a deterioration. Emerging practice is that a 3% limit of deterioration is applied.
- **Could the development alone prevent the receiving watercourse from reaching Good Ecological Status (GES) or Potential?** Is GES possible with current technology or is GES technically possible after development with any potential WwTW upgrades.

The overall WFD classification of a water body is based on a wide range of ecological and chemical classifications. This assessment focuses on three physio-chemical quality

1 Water Quality Planning: no deterioration and the Water Framework Directive, Environment Agency (2012)

elements; BOD, Ammonia, and Phosphate which are key to WFD compliance, as set out in EA guidance (2014).

BOD – Biochemical Oxygen Demand

BOD is a measure of how much organic material – sewage, sewage effluent or industrial effluent – is present in a river. It is defined as the amount of oxygen taken up by micro-organisms (principally bacteria) in decomposing the organic material in a water sample stored in darkness for five days at 20°C. Water with a high BOD has a low level of dissolved oxygen. A low oxygen content can have an adverse impact on aquatic life.

Ammonia

Nitrogen is an essential nutrient required by all plants and animals for the formation of amino acids. In its molecular form nitrogen cannot be used by most aquatic plants, and so it is converted into other forms. One such form is ammonia (NH_3). This may then be oxidized by bacteria into nitrate (NO_3) or nitrite (NO2). Ammonia may be present in water in either the unionized form NH_3 or the ionized form NH_4. Taken together these forms care called Total Ammonia Nitrogen.

Although ammonia is a nutrient, in high concentrations it can be toxic to aquatic life, in particular fish, affecting hatching and growth rates.

The main sources in rivers include agricultural sources, (fertilizer and livestock waste), residential sources (ammonia containing cleaning products and septic tank leakages), industrial processes and WwTW.

Phosphate

Phosphorus is a plant nutrient and elevated concentrations in rivers can lead to accelerated plant growth of algae and other plants. Its impact on the composition and abundance of plant species can have adverse implications for other aspects of water quality, such as oxygen levels. These changes can cause undesirable disturbances to other aquatic life such as invertebrates and fish.

Phosphorus (P) occurs in rivers mainly as Phosphate (PO_4), which are divided into Orthophosphates (reactive phosphates), and organic Phosphates.

Orthophosphates are the main constituent in fertilizers used in agriculture and domestic gardens and provide a good estimation of the amount of phosphorus available for algae and plant growth and is the form of phosphorus that is most readily utilized by plants.

Organic phosphates are formed primarily by biological processes and enter sewage via human waste and food residues. Organic phosphates can be formed from orthophosphates in biological treatment processes or by receiving water biota.

Although it is phosphorus in the form of phosphates that is measured as a pollutant, the term phosphorus is often used in water quality work to represent the total phosphorus containing pollutants.

8.2 Water quality modelling methodology

8.2.1 General approach

SIMCAT is used by the EA to model water bodies and identify where permit changes are needed to prevent deterioration or improve water quality as well as supporting decision making to guide development to locations where environmental deterioration will be reduced. SIMCAT is a 1D model which represents inputs from both point-source effluent discharges and diffuse sources, and the behaviour of solutes in the river.

SIMCAT can simulate inputs of discharge and water quality data and statistically distribute them from multiple effluent sources along the river reach. It uses the Monte Carlo method for distribution that randomly models up to 2,500 boundary conditions. The simulation calculates the resultant water quality as the calculations cascade further downstream.

Once the distribution results have been produced, an assessment can be undertaken on the predicted mean and ninetieth percentile concentrations or loads compared to the Environmental Quality Standards.

Within SIMCAT, the determinands modelled were Biochemical Oxygen Demand (BOD), ammonia) and phosphorus. In fresh waterbodies, phosphate is usually the limiting nutrient for algal growth. However, in marine environments, nitrogen is considered to be the limiting nutrient.

The methodology followed is summarised in Figure 8-1. In this flow chart, all of the questions in the top row must be answered.

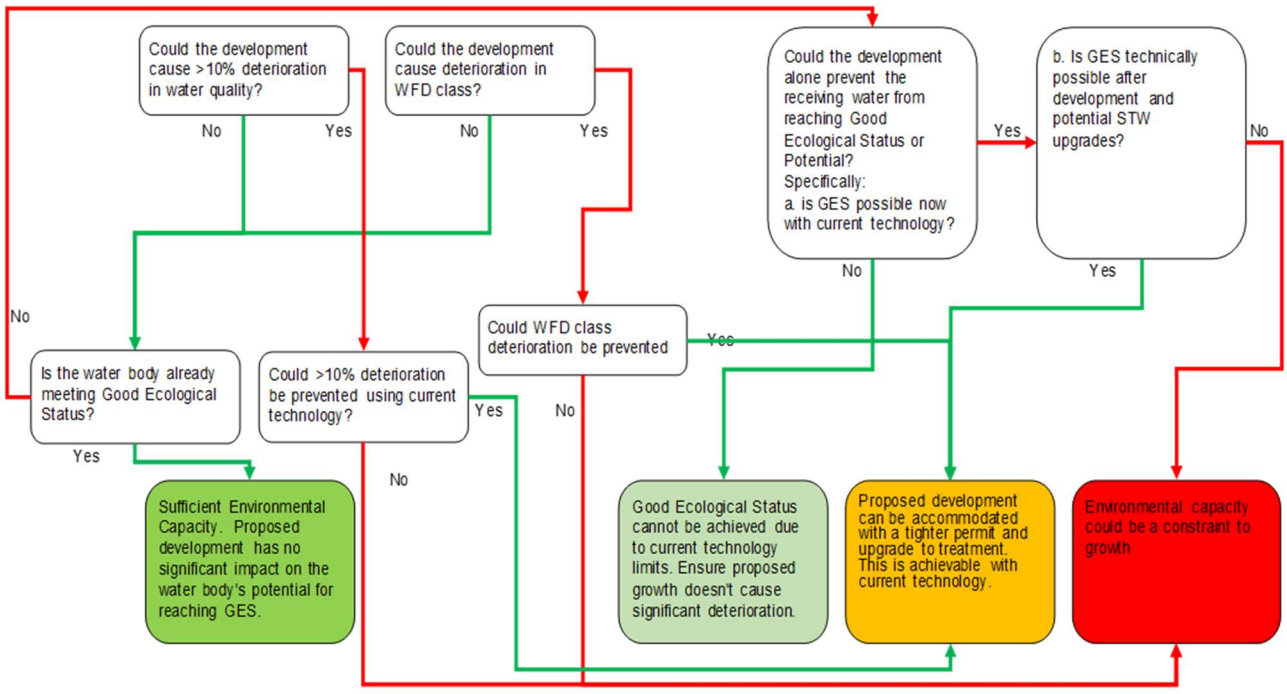


Figure 8-1: Water quality impact assessment following EA guidance

Where modelling indicated growth may lead to a deterioration in the watercourse, or where the watercourse is not currently meeting at least a 'Good' class for each determinant, the models were used to test whether this could be addressed by applying stricter discharge limits. In such cases, a Technically Achievable Limit (TAL) was considered. Technically Achievable Limit is a term used to describe the concentrations that effluent can be realistically treated to using the best available technology.

The EA advised that the following permit values are achievable using treatment at TAL, and that these values should be used for modelling all WwTW potential capacity irrespective of the existing treatment technology and size of the works:

- Ammonia (90%ile): 1 mg/l.
- BOD (90%ile): 5 mg/l.
- Phosphorus (mean): 0.25 mg/l.

This assessment did not take into consideration whether it is feasible to upgrade each existing WwTW to TAL due to constraints of costs, timing, space, carbon costs etc.

8.2.2 Water quality assessment

The study area is covered by the Trent SIMCAT model developed by the EA. The Trent model has been largely based on observed flow and quality data for the period 2014 - 2020. A widespread update of the model, and the resultant recalibration was not within the scope of this project. The methodology used in this WCS was to update just the effluent flow at WwTW receiving growth in the study area. Consequently, the modelling work presented should only be used to identify areas at risk of water quality deterioration, but not for permit setting.

Flow data statistics for each WwTW serving the study area was supplied by Severn Trent Water and used to update the model. The model was then run in its updated form to set a 2026 baseline.

Additional effluent flow from growth during the Local Plan period was added to current flow at WwTW receiving growth and the model re-run as a future scenario.

8.2.2.1 No deterioration test

The results from the baseline and future versions of the model were compared to assess the predicted percentage deterioration for each of the modelled determinands. WFD targets for each river reach were provided by the EA and used to determine if there was a risk of a class deterioration.

Where a deterioration of 10% or greater was predicted or a change in class (considered to be a significant deterioration under WFD) a further test was conducted to see if this deterioration could be prevented by upgrades to treatment processes. This used another version of the model with each WwTW set to operate at their TAL.

Good ecological status assessment

Where treatment at TAL and reductions in diffuse sources in the present day could improve water quality to achieve GES, it is important to understand whether this could be compromised as a result of future growth within the catchment.

Guidance from the EA suggests breaking this down into two questions:

a) Is GES possible now with current technology?

b) Is GES technically possible after development and any potential WwTW upgrades?

If the answer to questions a) and b) are both ‘Yes’ or both ‘No’ then the development can be assessed as having no significant impact on the water bodies potential for reaching GES, i.e., the development alone is not preventing GES from being achieved.

If the answer to a) is ‘Yes’ and the answer for b) is ‘No’ then development is having a significant impact, i.e., before development GES could be achieved with upstream improvements, and after growth the additional effluent from growth prevents GES being achieved.

The possible answers are summarised in Table 8-1.

Run type 9 within SIMCAT was used which assumes that upstream flow at each treatment works is at GES. This simulates improvements being made in upstream water quality. The water quality of the discharge from each WwTW in order to maintain GES is then calculated by the model.

Table 8-1: Possible GES assessment results.

Predicted to achieve GES after growth	Could achieve GES today with improvements in upstream water quality? (a)	Could achieve GES in the future with improvements in upstream water quality? (b)	Assessment Result
Yes	N/A	N/A	GREEN - Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES.
No	Yes	Yes	AMBER - Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology.
No	No	No	YELLOW - GES cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
No	Yes	No	RED - Environmental capacity could be a constraint to growth.

- If good ecological status is predicted to be achieved within the receiving waterbody following growth during the plan period, a green assessment is given. In this case, it can be said that there is environmental capacity to accommodate growth.
- Where GES is not currently being achieved but could be achieved if upstream water quality were improved, then an amber score is given – growth could be accommodated without preventing a waterbody achieving GES in the future.
- Where GES cannot be achieved either today or in the future, despite upgrades in treatment processes, and improvements in upstream water quality, then a yellow assessment is given – and it can be said that GES cannot be achieved due to the limits of current technology. Growth alone is not predicted to prevent GES being achieved in the future.
- Should GES be achievable today, but not in the future due to growth, a red assessment would be given, and it can be said that environmental capacity could be a constraint to growth, i.e., growth alone could prevent good ecological status being achieved in the future.

8.3 Water quality modelling results

8.3.1 Introduction

The first test applied compares the future scenario to the baseline and assesses whether a significant deterioration in water quality occurs – either a 10% deterioration in water quality or a deterioration in WFD class. Where, a significant deterioration is predicted, the TAL scenario then assesses whether this deterioration could be prevented by improvements in treatment processes.

Where a 'green' score is given, deterioration was less than 10% for each determinand, and no change in WFD class is predicted. Where an 'amber' assessment is given, a 10% deterioration or change in WFD class is predicted, but this could be prevented by improvements in treatment technology. In these cases, upgrades may therefore be required at that WwTW or at WwTW upstream.

A 'red' assessment would be given where a significant deterioration in water quality is predicted, and it cannot be prevented by improvements in treatment processes.

In this assessment, improvements in treatment processes have been modelled by assuming the WwTW is operating at TAL. It has not investigated the feasibility of upgrading individual WwTW. This should be performed by Severn Trent Water who have the detailed knowledge of their assets, and the EA who are responsible for setting permit limits at WwTWs.

8.3.2 Results

At both of the WwTWs serving growth during the plan period, no significant deteriorations are predicted for Ammonia, BOD or phosphate as a result of growth. Therefore modelling does not indicate any WFD class changes in the watercourses adjacent to the WwTWs.

A moderate water quality deterioration of 4%, associated with all determinands (ammonia, BOD and phosphate), is modelled in the watercourse adjacent to Checkley WwTW. A 3% deterioration in water quality associated with ammonia and a 2% deterioration in water quality associated with phosphate is modelled in the watercourse adjacent to Strongford WwTW. No deterioration in water quality associated with BOD is modelled in the watercourse adjacent to Strongford WwTW. Improvements in treatment to TAL reduce these deteriorations and result in improvements to water quality.

The water quality modelling results are displayed in Table 8-2.

The first set of maps in Appendix E show the modelled results if wastewater discharges increased by the volume predicted during the Local Plan period. They show a result at the point of mixing (i.e., where the WwTW discharges) and the results downstream in the river. These are colour coded based on whether deterioration is greater (red) or less than (amber) 10%. Areas where no deterioration is predicted are coloured green. The second set of maps in Appendix E show the modelled results in the TAL scenario, where each

WwTW has been upgraded to the technically achievable limit. This shows areas where deterioration could not be prevented. In each case this is less than 10%.

Table 8-2: Water quality modelling results

WwTW	Housing growth over plan period (dwellings)	Employment growth over plan period (m2)	Could the development cause a greater than 10% deterioration in water quality for one or more of BOD, Ammonia or Phosphate?	Could the development cause a deterioration in WFD class of any element?	Can a deterioration of >10% or in class be prevented by treatment at TAL?
Checkley	1,770	141,141	No	No	Yes
Strongford	28,572	1,310,738	No	No	Yes

Table 8-3 summarises the results of the GES assessment outlined in section 0.

Table 8-3: GES assessment results

WwTW	Ammonia assessment	Biochemical Oxygen Demand (BOD) assessment	Phosphate assessment
Checkley	AMBER - Proposed development can be accommodated with a tighter permit and upgrade to treatment. This is achievable with current technology.	GREEN- Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES.	YELLOW - GES cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.
Strongford	GREEN- Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES.	GREEN- Sufficient environmental capacity. Proposed development has no significant impact on the water body's potential for meeting GES.	YELLOW - GES cannot be achieved due to current technology limits. Ensure proposed growth doesn't cause significant deterioration.

Results of the GES assessment show that proposed development will not prevent good ecological status being achieved for ammonia and BOD. Within the watercourse adjacent to Checkley WwTW, there is sufficient environmental capacity for BOD. However, for ammonia, a tighter permit or upgrade would be required. This is achievable with current technology. Within the watercourse adjacent to Strongford WwTW, there is sufficient environmental capacity for ammonia and BOD. Within the watercourses adjacent to Checkley and Strongford WwTWs, GES for phosphate is not currently being achieved in the baseline scenario and could not be achieved even after upgrades to the technically achievable limit. Growth will not prevent GES being achieved in the future. Stoke-on-Trent City Council should ensure that proposed growth does not cause significant deterioration downstream of Checkley and Strongford WwTWs.

8.4 Water Framework Directive overview

The WFD aims to ensure 'no deterioration' in the environmental status of rivers and sets objectives to improve rivers to meet 'good' status. LPAs must have regard to the WFD and associated statutory objectives as implemented in the EA's RBMPs.

Figure 8-2 shows the overall WFD classification (2019) for river and surface water bodies in and downstream of Stoke-on-Trent. This is broken down in Table 8-4Table 8-4: into the determinands usually assessed in WCSs for each of the waterbodies that are predicted to receive additional effluent from growth during the plan period. The overall WFD status is not available for Cycle 3.

The overall Cycle 2 WFD status of waterbodies in Stoke-on-Trent and the surrounding area ranges from "Good" to "Bad". The overall WFD status of the River Trent from Source to Ford Green Brook is "Bad". The Trent flowing through Stoke-on-Trent has an overall "Moderate" status. Downstream of Strongford WwTW, the Trent (from Tittensor to River Sow) has a "Poor" overall WFD status.

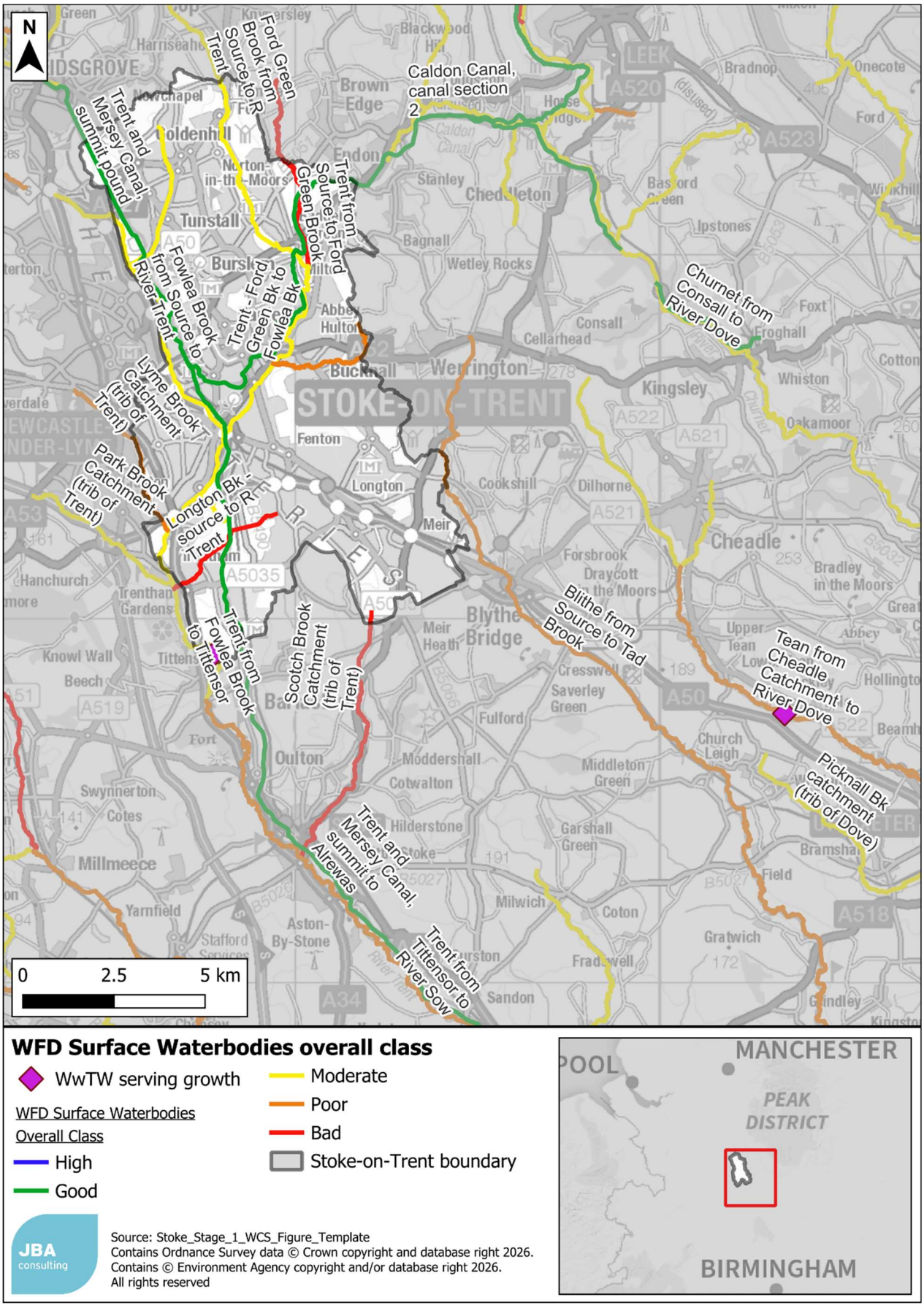
Overall WFD status is made of Ecological and Chemical status, which are further broken down into sub-elements, the measurement of which is prioritised for each waterbody based on its characteristics and risk, hence not all elements are reported for each waterbody.

A map showing the Cycle 3 WFD Ecological Status of the waterbodies in the Stoke-on-Trent study area is also shown below in Figure 8-3.

Table 8-4: 2022 WFD classifications for waterbodies acting as discharge point for WwTWs serving growth in the study area

WwTW	Receiving Waterbody	Ecological Status	Ammonia	BOD	Phosphate
Checkley	Tean from Cheadle Catchment to River Dove	Moderate	High	High	Moderate

WwTW	Receiving Waterbody	Ecological Status	Ammonia	BOD	Phosphate
Strongford	Trent from Fowlea Brook to Tittensor	Moderate	Good	N/A	Poor



Source: Stoke_Stage_1_WCS_Figure_Template
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Figure 8-2: WFD overall status for waterbodies in Stoke-on-Trent study area

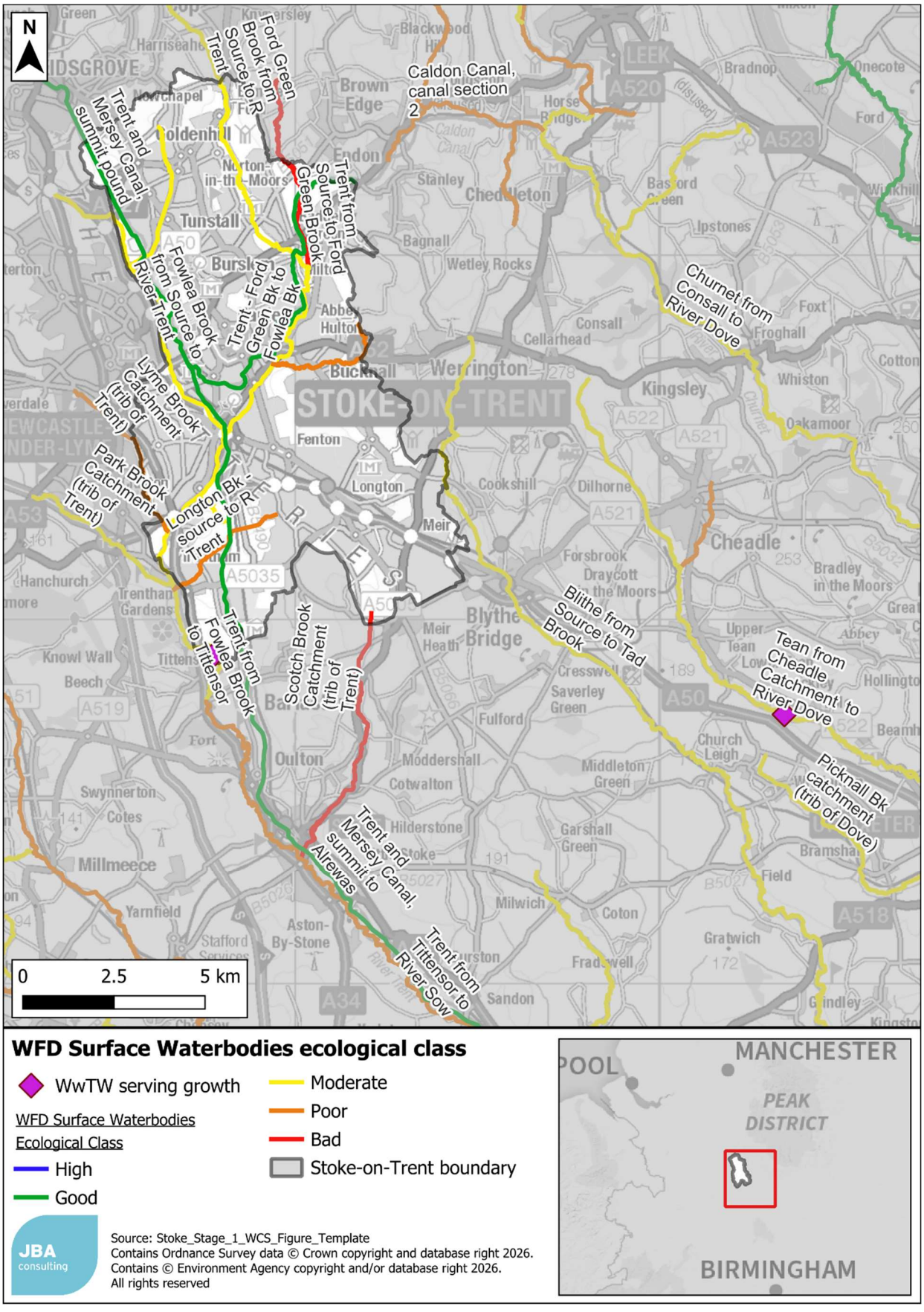


Figure 8-3: WFD ecological status for waterbodies in Stoke-on-Trent study area

8.4.1 Reasons for Not Achieving Good

The latest WFD assessment data shows that watercourses within the Stoke-on-Trent study area exhibit a range of overall statuses, including ‘high’, 'good', 'moderate', 'poor' and 'bad'.

The Reasons for Not Achieving Good (RNAG) dataset indicates that the main categories for watercourses not achieving good status in this area include urban and transport, water industry (sewerage discharge) and mining and quarrying (associated with abandoned mines). There are also several instances in the study area where no sector is responsible, or the sector is under investigation.

Causeley Brook from Source to River Trent and Ford Green Brook from Source to R Trent have a 'moderate' WFD invertebrate status due to pollution from abandoned mines. The Lyme Brook catchment has a 'moderate' WFD invertebrate status due to physical modifications associated with coal mining. Mine water issues are discussed further below.

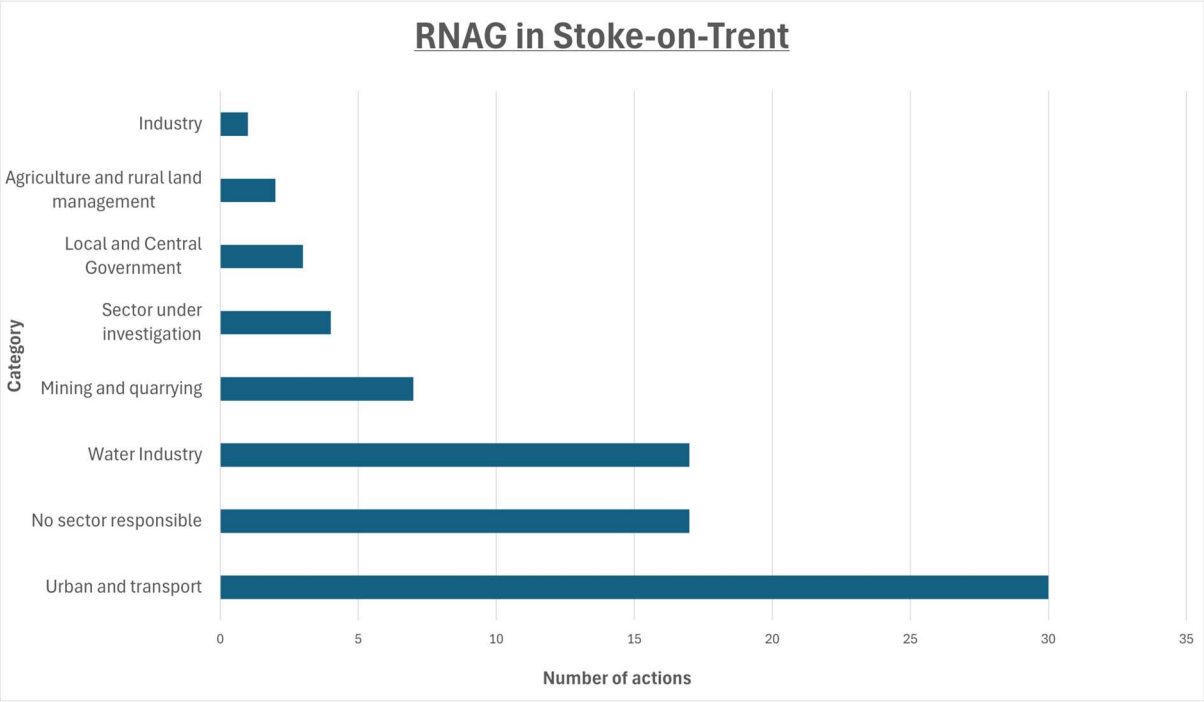


Figure 8-4: Reasons for Not Achieving Good WFD status in waterbodies within Stoke-on-Trent

8.4.2 Mine water issues

Mining activities have long-term implications for water quality and hydrological processes. Although most metal mines closed over a century ago, residual contamination persists, affecting more than 3% of rivers and influencing aquatic ecosystems, groundwater resources, and local economies. Coal mining also contributes to water quality concerns, with sediment from coalfields altering riverbed conditions and, in some areas, threatening groundwater supplies.

In October 2021, the EA published a report titled “Mine waters: challenges for the water environment”. This report outlines mine water pressures as well as current and future

challenges. Within this section of the report, mine water issues will be outlined, as well as future challenges, and how they could be dealt with.

Pollution from abandoned mines originates from several pathways:

- **Point sources**: Drainage tunnels and mine entries discharge metal-rich waters throughout the year. These are the most significant contributors to river pollution, particularly during periods of low river flow when dilution is limited.
- **Diffuse sources**: Mine wastes, metal-contaminated sediments, and groundwater release increasing amounts of metals as river flows rise, for example following heavy rainfall.
- **Groundwater and aquifer impacts**: Many mines were sunk through aquifers, allowing groundwater to flow into mine workings. After closure, pumps controlling groundwater were switched off, causing mine workings to flood. As groundwater levels recover, contaminated mine water can migrate upward into overlying aquifers, especially via connections such as mine shafts. This form of pollution is typically irreversible and can affect extensive areas.

Further details can be found in the EA's Mine Waters report.

8.4.2.1 Future challenges associated with mine water

Challenges of mining activities mainly revolve around water quality. When mines are abandoned without management, metal-rich water can flood workings and migrate into rivers, streams, and aquifers, causing long-term contamination. This pollution is often widespread and difficult to reverse, posing risks to ecosystems and drinking water supplies.

Climate change is expected to intensify these challenges. According to UK Climate Change Projections (UKCP18), the UK will experience more extreme weather events. These changes affect mine water pollution dynamics in two main ways:

- **Diffuse metal sources** become more significant during heavy rainfall and high river flows, as erosion of mine wastes and percolation of rainwater mobilise metals. Climate change is likely to increase these events, making diffuse sources a greater contributor to river pollution.
- **Lower river flows**, such as those observed during the hot summer of 2018, reduce dilution capacity. Since mine water discharges often occur year-round, their relative contribution to baseflow increases during dry periods, intensifying pollution severity.

The Coal Remediation Authority's (CRA), formally the Coal Authority, 2025-2028 Business Plan commits to expanding mine water management via over 80 treatment schemes using passive (reed beds, settlement ponds) and active (HDS) technologies, treating billions of litres annually to protect aquifers and rivers.

On an LPA level there are several options for mining water management such as:

- Minerals and development policy within local plan:

- Stoke-on-Trent Draft Local Plan Consultation Document (2020 to 2040): 'Policy CCER 5' mentions mineral extraction proposals will be supported where "detrimental impacts on water, ecology, landscape, vibration, pollution and land stability are mitigated on the surrounding environment".

- Dealing with abandoned coal mines- including mine water treatment schemes at abandoned coal mines.

8.4.3 Priority substances

As well as the physico-chemical water quality elements (BOD, Ammonia, Phosphate etc.) addressed above, a watercourse can fail to achieve Good Ecological Status due to exceeding permissible concentrations of hazardous substances. Currently 33 substances are defined as hazardous or priority hazardous substances, with others under review. Such substances may pose risks both to humans (when contained in drinking water) and to aquatic life and animals feeding in aquatic life. These substances are managed by a range of different approaches, including European Union and international bans on manufacturing and use, targeted bans, selection of safer alternatives and end-of-pipe treatment solutions. There is considerable concern within the UK water industry that regulation of these substances by setting permit values which require their removal at WwTW will place a huge cost burden upon the industry and its customers, and that this approach would be out of keeping with the 'polluter pays' principle.

We also consider how the planning system might be used to manage priority substances:

- **Industrial sources** – While this report covers potential employment sites, it does not consider the type of industry and therefore likely sources of priority substances are unknown. It is recommended that developers should discuss potential uses which may be sources of priority substances from planned industrial facilities at an early stage with the EA and, where they are seeking a trade effluent consent, with the sewerage undertaker.
- **Agricultural sources** - There is limited scope for the planning system to change or regulate agricultural practices. UK water companies are involved in a range of CaBA schemes aimed at reducing diffuse sources of pollutants, including agricultural pesticides.
- **Surface water runoff sources** - Some priority substances e.g., heavy metals, are present in urban surface water runoff. It is recommended that future developments would manage these sources by using SuDS that provide water quality treatment, designed following the CIRIA SuDS Manual. This is covered in more detail in Section 9.5.3. More information on SuDS can be found in Section 3.6.
- **Domestic wastewater sources** - Some priority substances are found in domestic wastewater as a result of domestic cleaning chemicals, detergents, pharmaceuticals, pesticides, or materials used within the home. While an increase in the population due to housing growth could increase the total volumes

of such substances being discharged to the environment, it would be more appropriate to manage these substances through regulation at source, rather than through restricting housing growth through the planning system.

No further analysis of priority substances will be undertaken as part of this study.

8.5 Water Industry National Environment Programme - water quality

The WINEP is a set of actions that the EA have requested all water companies operating in England to complete in a particular AMP as part of their environmental commitments. WINEP actions relating to water quality in surface water bodies in Stoke-on-Trent are presented in Appendix A. There are no WINEP actions relating to groundwater quality. The WINEP actions for surface water show that a significant number of CSOs in the study area have an action against them. In most cases these actions include investigating harm caused by storm overflows and improvements to reduce storm overflows spills.

Figure 8-5 shows the breakdown of all WINEP actions relating to water quality for the surface water bodies in Stoke-on-Trent by driver. The most common primary driver code for action is EnvAct_INV4 which is associated with investigations to reduce storm overflow spills to protect the environment so that they have no local adverse ecological impact.

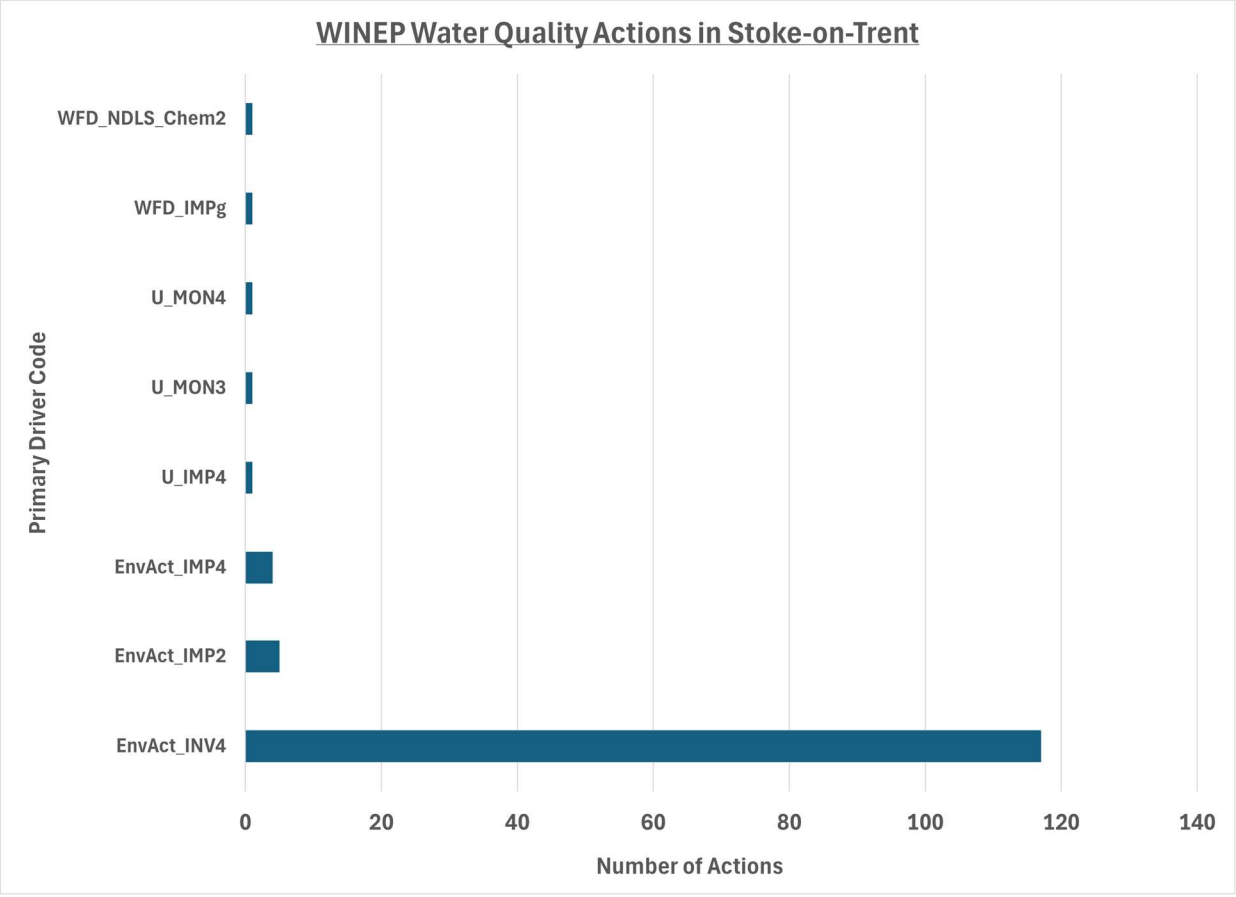


Figure 8-5: Summary of primary driver codes for water quality WINEP actions (driver codes are defined in Appendix A)

8.6 Conclusions and recommendations

8.6.1 Conclusions

The Reasons for Not Achieving Good (RNAG) dataset indicates that the main categories for watercourses not achieving good status in this area include: urban and transport, water industry (sewerage discharge) and mining and quarrying (associated with abandoned mines). There are also several instances in the study area where no sector is responsible, or the sector is under investigation.

Causeley Brook from Source to River Trent and Ford Green Brook from Source to R Trent have a 'moderate' WFD invertebrate status due to pollution from abandoned mines. The Lyme Brook catchment has a 'moderate' WFD invertebrate status due to physical modifications associated with coal mining. Mine water issues are discussed further below.

The water quality analysis suggests that waterbodies downstream of Checkley and Strongford WwTW may be moderately sensitive to increases in the discharge of treated wastewater (as a result of growth) for Ammonia, Biochemical Oxygen Demand (BOD) and Phosphate. Therefore modelling does not indicate any WFD class changes in watercourses adjacent to WwTWs. Improvements in treatment to TAL reduce these deteriorations and result in improvements to water quality.

Results of the GES assessment show that proposed development will not prevent good ecological status being achieved for ammonia and BOD. Within the watercourse adjacent to Checkley WwTW, there is sufficient environmental capacity for BOD. However, for ammonia, a tighter permit or upgrade would be required. This is achievable with current technology. Within the watercourse adjacent to Strongford WwTW, there is sufficient environmental capacity for ammonia and BOD. Within the watercourses adjacent to Checkley and Strongford WwTWs, GES for phosphate is not currently being achieved in the baseline scenario and could not be achieved even after upgrades to the technically achievable limit. It is therefore not growth that will prevent GES being achieved in the future. SoTCC should ensure that proposed growth does not cause significant deterioration downstream of Checkley and Strongford WwTWs.

Recommendations for water quality are provided in Table 8-5.

8.6.2 Recommendations

Table 8-5: Recommendations for water quality.

Action	Responsibility	Timescale
Provide Annual Monitoring Reports to Severn Trent Water detailing projected housing growth.	Stoke-on-Trent City Council	Ongoing
Severn Trent Water should take into account the full volume of growth (from SoTCC and neighbouring authorities within the catchment) when considering WINEP schemes for upgrades at WwTW.	Severn Trent Water	Ongoing
The Local Plan can encourage the use of SuDS to improve water quality. Policy should encourage developers to demonstrate to the LLFA that surface water from a site will be disposed using a sustainable drainage system in line with the National Standards for Sustainable Drainage.	Stoke-on-Trent City Council	In the Local Plan

9 Environmental opportunities and constraints

9.1 Introduction

Development has the potential to cause an adverse impact on the environment through a number of routes, such as worsening of air quality, pollution to the aquatic environment or disturbance to wildlife. In the context of a WCS, the impact of development on the aquatic environment is assessed. This chapter considers both water quantity (impact of abstraction) and water quality (impact of wastewater discharge and runoff) on protected sites.

A source-pathway-receptor approach can be taken to investigate the risk and identify where further assessment or action is required.

9.2 Impact of abstraction

9.2.1 Overview

Abstraction of water within a catchment, either from groundwater or surface water sources, is necessary to provide a public water supply, for industrial processes and for agriculture. When the volume of water being abstracted becomes too high, it can cause environmental damage by reducing river flow or lowering the water table.

Changes in river flow can impact sensitive ecosystems, for example Trout require a clean gravel bed to lay their eggs. A reduction in river flow can cause sediment to build up, blocking the spaces the fish require to lay their eggs impacting their reproductive cycle. Changes in groundwater levels can also affect the flow regime in rivers and can cause drying of wetland sites.

The precise location of abstraction points for public water supply in England is not available for reasons of national security. Furthermore, water demand within a WRZ can be met by anywhere within that WRZ, or from a neighbouring WRZ if the transfer between WRZs is used to provide some of the water available for use. It is therefore not possible to trace an impact of an individual development site back to a particular water abstraction and therefore to an environmental impact. The assessments in this report therefore rely on information in the public domain.

9.2.2 Methodology

Stoke-on-Trent City Council receive their water from Severn Trent Water. The study area is covered by North Staffs WRZ.

Abstraction either from surface water sources or from groundwater sources can occur anywhere within these zones. However, the impact of the abstraction could be felt outside of the WRZ within the same groundwater body, or downstream in surface waterbodies. In both cases this could be well outside the LPA boundary.

Groundwater Dependent Terrestrial Ecosystems (GWDTE)

Figure 9-1 shows a schematic of how Groundwater Dependent Terrestrial Ecosystems (GWDTEs) were identified. The LPA boundary is within a WRZ. Water abstracted anywhere within that WRZ could be used to serve growth within the LPA. In the diagram below, there are two abstraction points. Abstraction 1 could impact an area outside of the both the LPA boundary and the WRZ. However, there are no protected sites within that groundwater body. Abstraction 2 also impacts an area both within and outside of the LPA boundary. Protected site A is within the WRZ but may not be impacted directly by an abstraction. Protected site B is outside of the WRZ and outside of the groundwater body containing an abstraction and is therefore unlikely to be impacted by growth. Protected site 3 is within a groundwater body containing an abstraction. There is a risk that an increase in abstraction could impact the protected site.

The location of abstraction points within the study area is not known, and so the approach must be taken that GWDTE anywhere within the combined extent of the WRZ and groundwater bodies overlapping the WRZ could be impacted by an increase in abstraction.

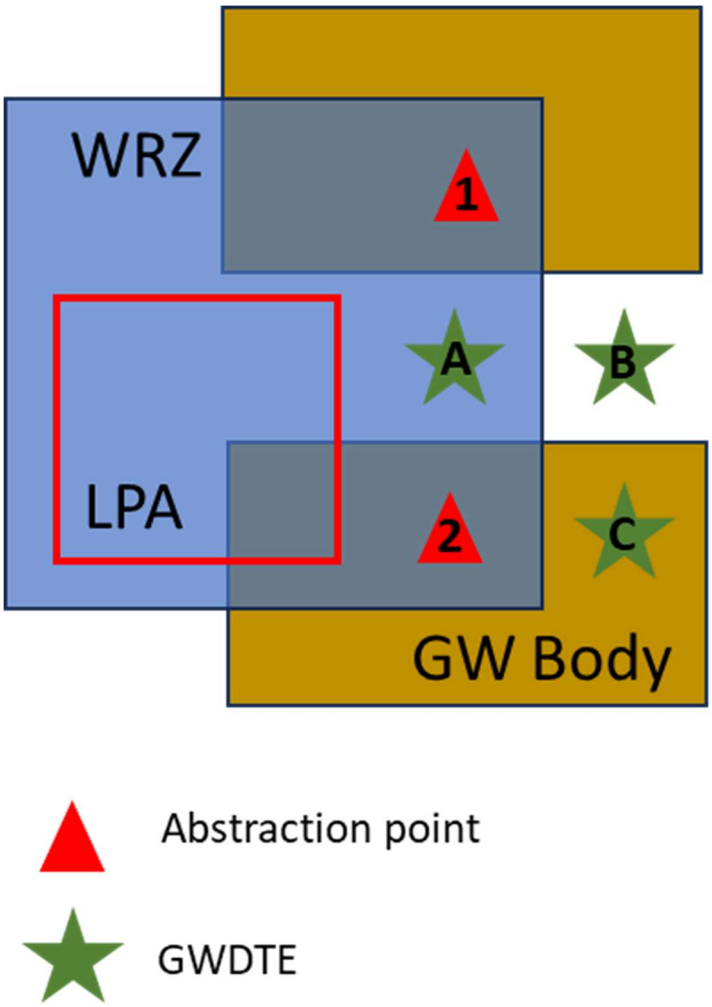


Figure 9-1: Definition of groundwater study area

The following procedure was followed:

- Define study area for Stoke-on-Trent based on extent of WRZ and WFD Groundwater bodies that overlap with the WRZs.
- Identify GWDTEs within the study area using the EA's GWDTE dataset.
- Identify GWDTEs that are within groundwater bodies with flow identified as a Significant Water Management Issue (SWMI).

Surface water-based ecosystems

Figure 9-2 shows a schematic of how protected sites on surface waterbodies were identified. As in the groundwater example, water could be abstracted from anywhere within the WRZ. Protected site A is downstream of an abstraction and so could be impacted by changes in river flow resulting from the abstraction. Protected site B while further downstream in the river basin, it is on a tributary not connected with the WRZ, abstraction is unlikely to have an impact. Protected site C is upstream of the abstraction so would not be impacted.

As with the groundwater abstractions, their location was not available as part of this study. The approach is therefore taken that any protected site directly on a waterbody that flows through or is downstream of the WRZ could be impacted by abstraction. Protected sites upstream or on tributaries that have not flowed through the WRZ are ignored.

In order to identify protected sites that may be at risk, Flood Zone 2 from the Risk of Flooding from Rivers and the Sea mapping was used to define an area that was either adjacent to a river or could be reasonably expected to receive surface water from a river.

The following procedure was followed:

- Define study area for Stoke-on-Trent - based on extent of WRZ and WFD surface water bodies that overlap with the WRZs.
- Identify protected sites within the study area.
- Filter these based on their proximity to waterbodies within the study area defined using Flood Zone 2 as a proxy.
- Identify the protected sites within a catchment where flow is recorded as a SWMI.

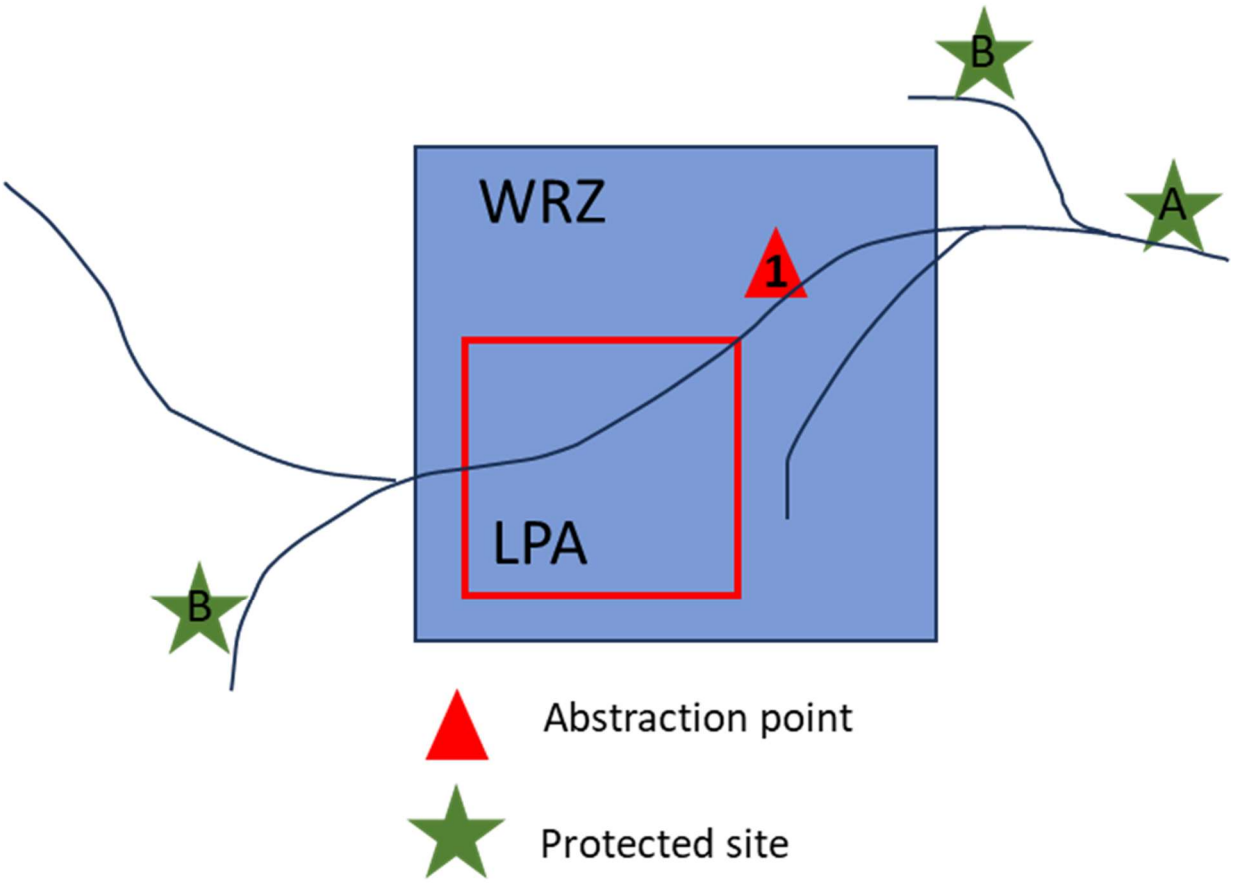


Figure 9-2: Definition of surface water study area.

9.2.3 Overview

Statutory designated sites have been identified within the study area. Sites assessed include:

- Special Protected Areas (SPA)
- Special Areas of Conservation (SAC)
- Sites of Special Scientific Interest (SSSI)
- Ramsar
- Local Nature Reserves
- National Nature Reserves

As shown in Figure 9-3, there are no SPA, SAC or Ramsar sites within Stoke-on-Trent.

There are two SSSIs, 10 LNRs and one NNR within, or bordering, Stoke-on-Trent. Details of these can be found within Appendix B. None of the protected sites within Stoke-on-Trent are located downstream of a WwTW however discharges from WwTWs could still negatively impact water dependent species.

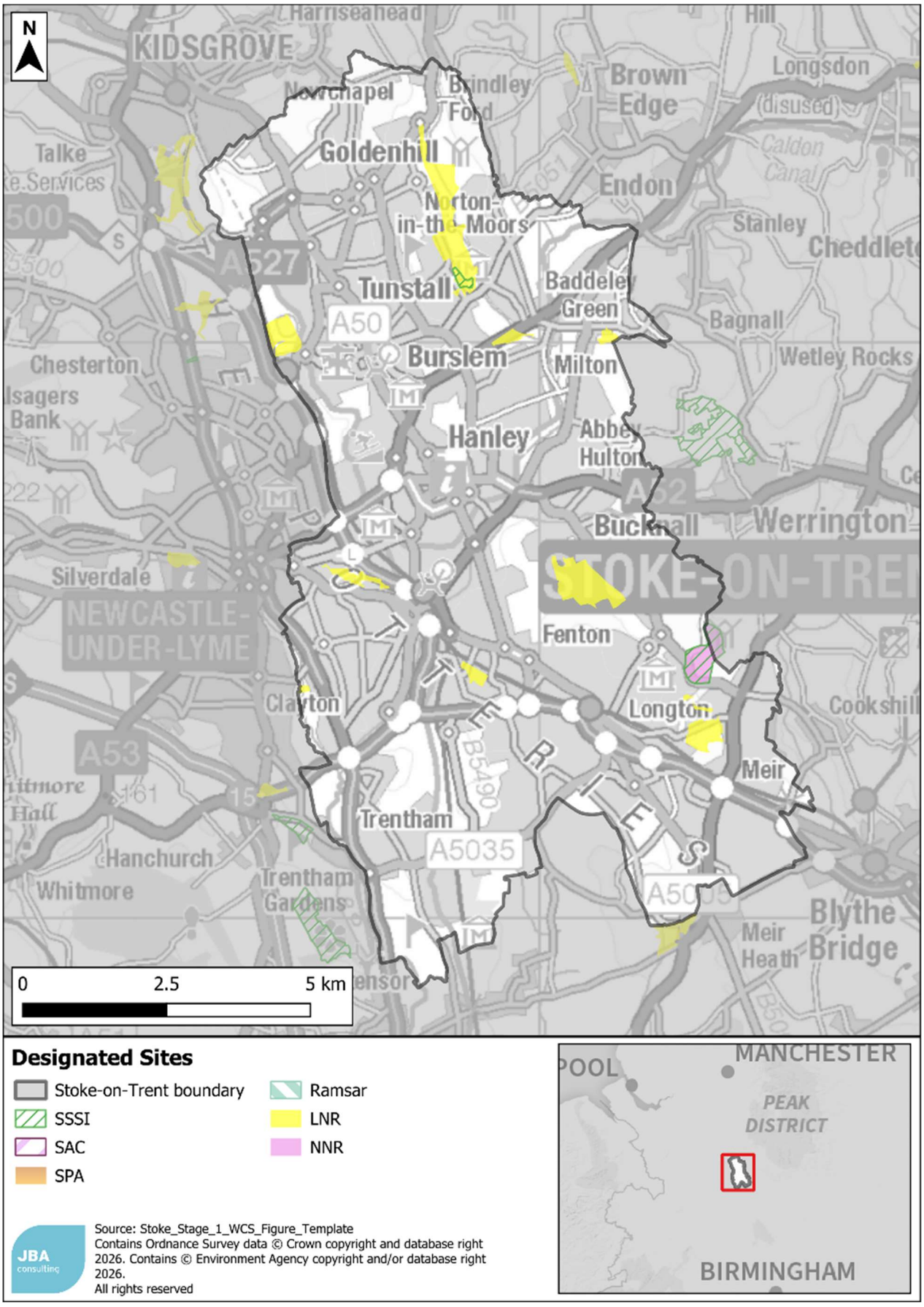

N
KIDSGROVE
Goldenhill
Tunstall
Burslem
Hanley
Milton
Baddeley Green
Brown Edge
Endon
Stanley
Bagnall
Wetley Rocks
Longsdon
Chesterton
Silverdale
NEWCASTLE-UNDER-LYME
Fenton
Longton
Meir
Trentham
Clayton
Werrington
Blythe Bridge
Meir Heath
Whitmore
Hanchurch
A527
A50
A53
A5035
B5490
0
2.5
5 km
Designated Sites
Stoke-on-Trent boundary
SSSI
SAC
SPA
Ramsar
LNR
NNR
MANCHESTER
PEAK DISTRICT
BIRMINGHAM
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Figure 9-3 Statutory designated sites in and around Stoke-on-Trent study area

9.2.4 Groundwater and surface water assessment results

There are 27 GWDTEs within the North Staffs WRZ that serves Stoke-on-Trent.

These are listed in Appendix C and shown in Figure 9-4. Of these, two GWDTEs, spread across two groundwater bodies, are in areas where flow is identified as a SWMI, due to groundwater abstraction.

Two SSSIs, one SAC and one Ramsar site are within groundwater bodies within the North Staffs WRZ and downstream of Stoke-on-Trent. These sites are presented in Appendix C.

All four of these sites have flow (from groundwater abstraction) noted as a significant water management issue. All the protected areas are shown in Figure 9-5.

This analysis demonstrates the potential for development within the study area to impact GWTDEs and waterbodies beyond the boundaries of the study area. The primary process for managing or mitigating these impacts is through the WRMPs and their associated habitats regulations assessments, however this analysis underlines that planning policies promoting water efficient development in Stoke-on-Trent can contribute to improved water management across a much wider region.

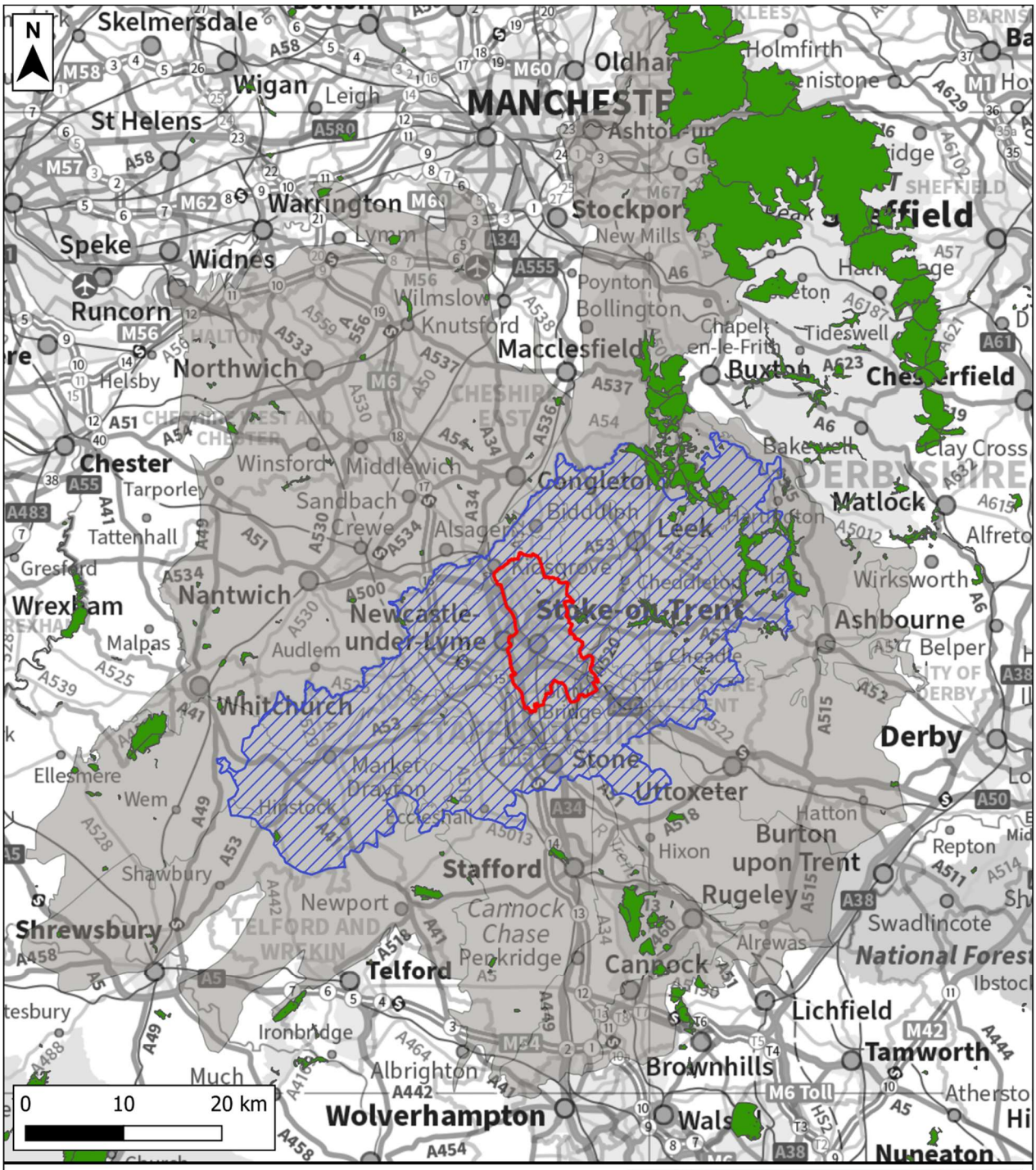

N
Skelmersdale
Wigan
Leigh
St Helens
Warrington
Speke
Widnes
Runcorn
Northwich
Chester
Nantwich
Wrexham
Malpas
Whitchurch
Ellesmere
Shawbury
Shrewsbury
Telford
Ironbridge
Much
Albrighton
Wolverhampton
Newcastle-under-Lyme
Stoke-on-Trent
Stafford
Cannock Chase
Penkridge
Rugeley
Burton upon Trent
Uttoxeter
Derby
Ashbourne
Matlock
Buxton
Macclesfield
Congleton
Leek
Crewe
Sandbach
Middlewich
Winsford
Tarporley
Tattenhall
Gresford
Audlem
Alsager
Biddulph
Knutsford
Wilmslow
Poynton
Bollington
New Mills
Stockport
Holmfirth
Tideswell
Bakewell
Wirksworth
Belper
Repton
Hixon
Stone
Hatton
Alrewas
Lichfield
Tamworth
Brownhills
Swadlincote
National Forest
Nuneaton
Atherstone
Ashton
Oldham
MANCHESTER
Leigh
Warrington
Lymm
Helsby
Frodsham
Runcorn
Chapel-en-le-Frith
Clay Cross
Alfreton
Ripley
Heanor
Ilkeston
Long Eaton
Derby
Swadlincote
Burton upon Trent
Rugeley
Cannock
Walsall
Wednesbury
Dudley
Kidderminster
Bridgnorth
Oswestry
Whitchurch
Nantwich
Crewe
Stoke-on-Trent
Newcastle-under-Lyme
Stafford
Telford
Shrewsbury
Wolverhampton
Walsall
Lichfield
Tamworth
Nuneaton
0
10
20 km
Groundwater Dependent Terrestrial Ecosystems (GWDTEs)
Stoke-on-Trent boundary
GWDTEs
WFD Groundwater Bodies
North Staffs WRZ
JBA consulting
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MANCHESTER
PEAK DISTRICT
BIRMINGHAM

Figure 9-4: GWDTE within groundwater bodies within North Staffs WRZ

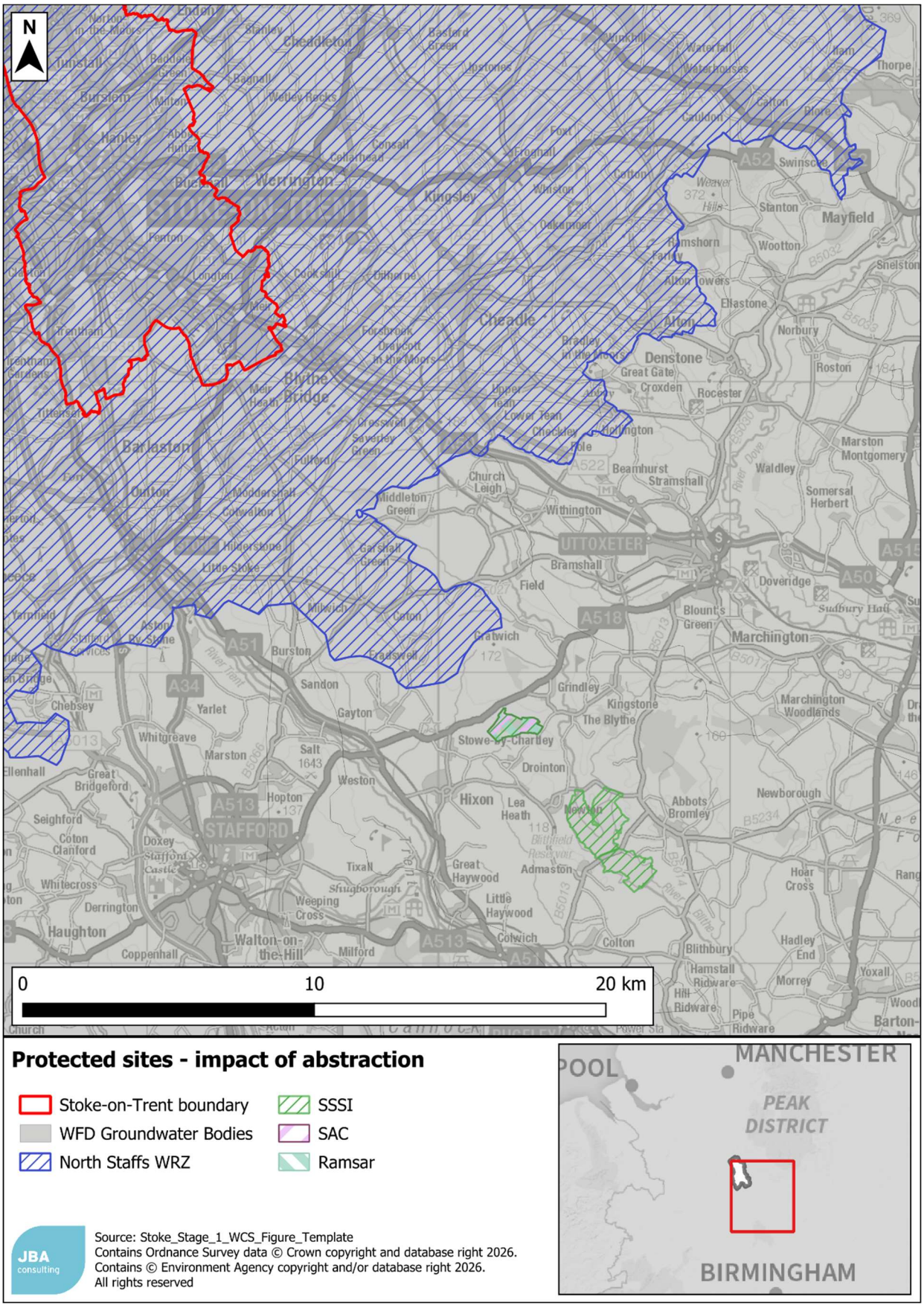


Figure 9-5: Protected areas downstream of Stoke-on-Trent

9.3 Water quality impact

9.3.1 Sources of pollution

Water pollution is usually categorised as either diffuse or point source. Point source sources come from a single well-defined point, an example being the discharge from a WwTW.

According to Defra (2012), diffuse pollution is defined as:

"unplanned and unlicensed pollution from farming, old mine workings, homes and roads. It includes urban and rural activity and arises from industry, commerce, agriculture and civil functions and the way we live our lives."

The most likely sources of diffuse pollution from new developments include drainage from housing estates, runoff from roads, and discharges from commercial and industrial premises. The pollution risk posed by a site will depend on the sensitivity of the receiving environment, the pathway between the source of the runoff and the receiving waters, and the level of dilution available. After or during heavy rainfall, the first flush of water carrying accumulated dust and dirt is often highly polluting.

Whilst the threat posed by an individual site may be low, a number of sites together may pose a cumulative impact within the catchment.

Runoff from development sites should be managed by a suitably designed SuDS scheme. More information on SuDS can be found in section 3.6.

Potential impacts on receiving surface waters include the blanketing of riverbeds with sediment, a reduction in light penetration from suspended solids, and a reduction in natural oxygen levels, all of which can lead to a loss in biodiversity.

9.3.2 Pathways

Pollutants can take a number of different pathways from their source to a 'receptor' – a habitat or species that can be impacted. This could be overland via surface water flow paths, via the river system, or via groundwater or a combination of all three. For the purpose of this study, it should be assumed at any protected site has the potential to be impacted by surface runoff from adjacent development sites. Linkages between development sites and protected sites will be explored further in Section 9.4.

9.3.3 Receptors

A receptor in this case is a habitat or species that is adversely impacted by a pollutant. Both the rivers and groundwater as well as being pathways, can also be considered to be receptors. Groundwater bodies are also given a status under the WFD which is reported in Section 4.2.2 for the groundwater bodies across Stoke-on-Trent.

Protected sites within Stoke-on-Trent can be seen in Section 9.2.3. All of these sites should be considered to be at risk from surface water runoff should development occur in the vicinity.

An assessment was undertaken to identify protected sites within and downstream of Stoke-on-Trent which may be at risk from an increase in the discharge of treated effluent due to growth. The relevant legislation that defines and protects these sites can be found in Section 3.7.

Priority Habitats are available to view on the DEFRA Magic Map website.

9.4 Impact of wastewater discharges

9.4.1 Methodology

This WCS has identified protected sites that may be at risk following a source-pathway-receptor approach. Sites within Stoke-on-Trent and downstream of the two WwTWs serving growth to the tidal limit were noted.

In order to identify which of the protected sites may be at risk, Flood Zone 2 from the Flood Map for Planning (FMfP) mapping was used to define an area that was either beside a river or could be reasonably expected to receive surface water from a river during times of flood. Where a WwTW serving growth in the plan period was present in the catchment upstream of the protected site, this site was taken forward for further assessment.

Where there were no WwTW serving growth upstream, these protected sites were discounted as no deterioration would be predicted in a water quality model, and the impact would be expected to be minimal. None of the protected sites within Stoke-on-Trent are downstream of a WwTW. However, in these cases the overall catchment water quality should be considered where for example they are designated for migratory fish species that may spend part of their lifecycle elsewhere in the catchment.

Whilst deterioration in water quality may not always lead to a significant impact at a protected site such as a SSSI, modelled deterioration can be used to highlight areas of risk for further analysis in the Habitats Regulations Assessment.

9.4.2 Results

The results of this assessment are presented in Appendix F. Results show there are no significant deteriorations adjacent to environmental sites. There is a 2% deterioration, associated with phosphate in two locations; upstream of Cannock Chase (SSSI and SAC) and upstream of the Old River Dove, Marston-on-Dove (SSSI). However, these deteriorations can be prevented by improvements in treatment to TAL.

9.5 Protection and mitigation

9.5.1 Groundwater protection

Groundwater is an important source of water in England and Wales. The EA is responsible for the protection of 'controlled waters' from pollution under the Water Resources Act 1991. These controlled waters include all watercourses and groundwater contained in underground strata.

The zones are based on an estimate of the time it would take for a pollutant which enters the saturated zone of an aquifer to reach the source of abstraction or discharge point (Zone 1 = 50 days, Zone 2 = 400 days, Zone 3 is the total catchment area). The EA will use SPZs alongside other datasets such as the Drinking Water Protected Areas (DrWPAs) and aquifer designations as a screening tool to show:

- Areas where the EA would object in principle to certain potentially polluting activities, or other activities that could damage groundwater,
- Areas where additional controls or restrictions on activities may be needed to protect water intended for human consumption,
- How it prioritises responses to incidents.

The EA have published a position paper (2018) outlining its approach to groundwater protection which includes direct discharges to groundwater, discharges of effluents to ground and surface water runoff. This is of relevance to this water cycle study where a development may manage surface water through SuDS.

Sewage and Trade Effluent

Discharges of treated sewage of $2m^3$ per day or less to ground are called small sewage discharges (SSDs). The majority of SSDs do not require an environmental permit if they comply with certain qualifying conditions. A permit will be required for all SSDs in Source Protection Zone 1 (SPZ1).

For treated sewage effluent discharges, the EA requires the use of shallow infiltration systems, which maximise the attenuation within the drainage blanket and the underlying unsaturated zone. While some sewage effluent discharges may not pose a risk to groundwater quality individually, the cumulative risk of pollution from aggregations of discharges can be significant. Improvement or pre-operational conditions may be imposed before granting an environmental permit. The EA will only agree to developments where the addition of new sewage effluent discharges to ground in an area of existing discharges is unlikely to lead to an unacceptable cumulative impact.

Generally, the EA will only agree to developments involving release of sewage effluent, trade effluent or other contaminated discharges to ground if it is satisfied that it is not reasonable to make a connection to the public foul sewer. The EA would normally expect to only permit new private discharges where the distance to connect to the nearest public sewer exceeds the number of dwellings multiplied by 30m. So, for example, a development of 100 dwellings would need to be more than 3km from a public sewer. The developer

would have to provide evidence of why the proposed development cannot connect to the foul sewer in the planning application. This position will not normally apply to surface water run-off via SuDS and discharges from WwTW operated by sewerage undertakers with appropriate treatment and discharge controls.

Deep infiltration systems (such as boreholes and shafts) are not generally accepted by the EA for discharge of sewage effluent as they bypass soil layers and reduce the opportunity for attenuation of pollutants.

Discharges of surface water run-off to ground at sites affected by land contamination, or from sites for the storage of potential pollutants are likely to require an environmental permit. This could include sites such as garage forecourts and coach and lorry parks. These sites would be subject to a risk assessment with acceptable effluent treatment provided.

Discharge of Clean Water

'Clean water' discharges such as runoff from roofs or from roads, may not require a permit. However, they are still a potential source of groundwater pollution if they are not appropriately designed and maintained.

Where infiltration SuDS schemes are proposed to manage surface runoff they should:

- be suitably designed;
- meet government non-statutory technical standards for sustainable drainage systems – these should be used in conjunction with the NPPF and PPG; and
- use a SuDS management treatment train.
- A hydrogeological risk assessment is required where infiltration SuDS is proposed for anything other than clean roof drainage in a SPZ1.

Source Protection Zones in Stoke-on-Trent

SPZs form a key part of the EA's approach to controlling the risk to groundwater supplies from potentially polluting activities and accidental releases of pollutants.

The EA's Manual for the production of groundwater SPZs details position statements which provide information about the EA's approach to managing and protecting groundwater.

Proposed development locations within or close to SPZs, should be assessed in relation to the relevant EA position statements.

As shown in Figure 9-6, There is one SPZs within the southeast of the study area, categorised SPZ3. Pollution in SPZ3 can eventually reach the groundwater source. The potential impact of development within Stoke-on-Trent on groundwater quality should be carefully considered.

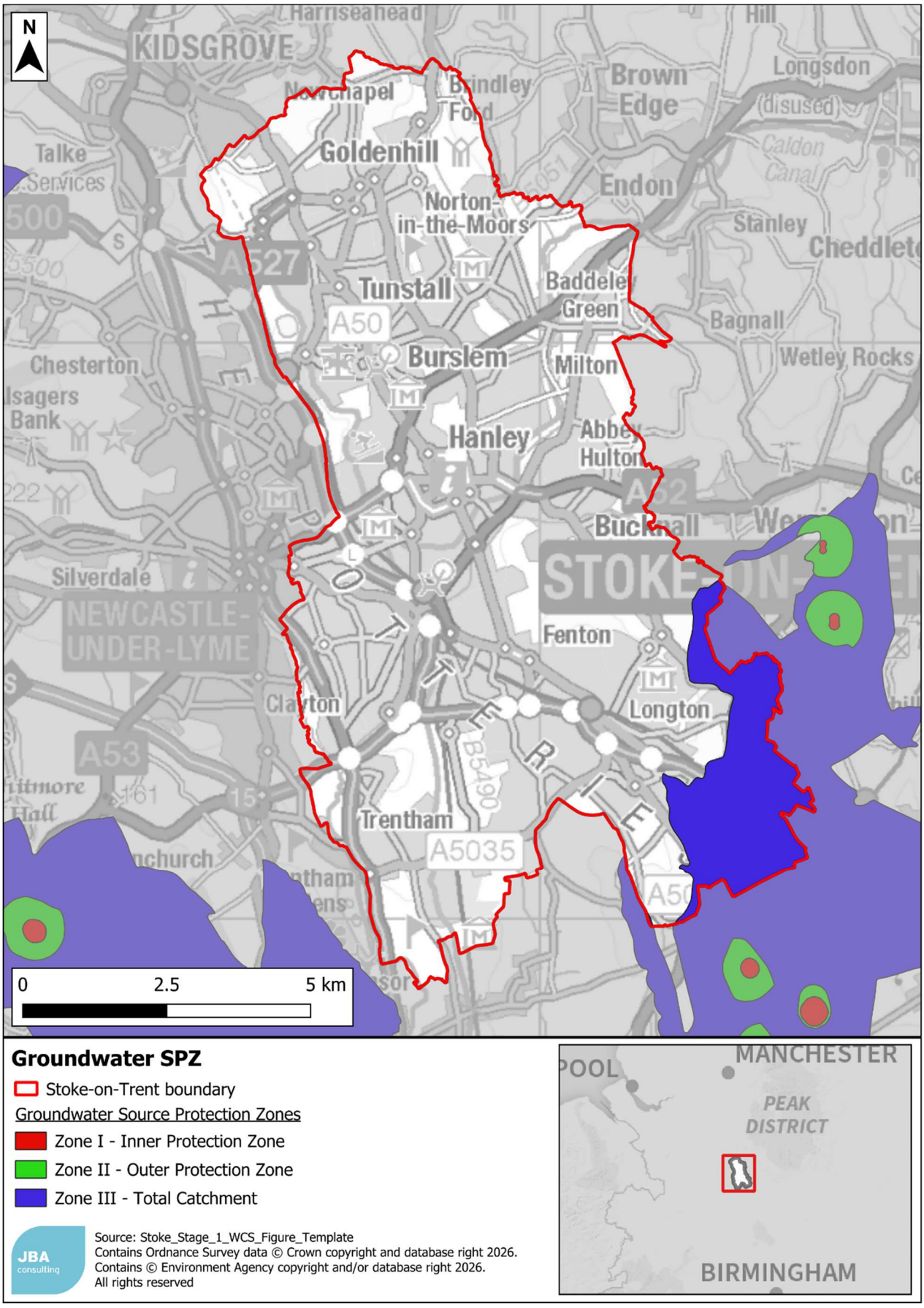

N
KIDSGROVE
Goldenhill
Norton-in-the-Moors
Tunstall
Burslem
Hanley
Milton
Baddeley Green
Bagnall
Wetley Rocks
Brown Edge
Endon
Stanley
Longsdon
Talke
Chesterton
Silverdale
NEWCASTLE-UNDER-LYME
STOKE-ON-TRENT
Fenton
Longton
Trentham
A50
A527
A53
A5035
0
2.5
5 km
Groundwater SPZ
Stoke-on-Trent boundary
Groundwater Source Protection Zones
Zone I - Inner Protection Zone
Zone II - Outer Protection Zone
Zone III - Total Catchment
MANCHESTER
PEAK DISTRICT
BIRMINGHAM
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Figure 9-6: SPZs in Stoke-on-Trent

9.5.2 Surface water drainage

As of July 2025, the Defra National standards for sustainable drainage systems (SuDS) were brought in to comply with the principles of surface water drainage design.

The national standards contain two sets of standards. The first type (Standard 1) is known as the hierarchy standard and sets the criteria for the prioritisation of final surface water runoff destinations. The other standards (Standards 2-7) detail the minimum design criteria that SuDS should satisfy alongside how they are to be appropriately built, maintained, and operated. For more information, see Section 3.6.

Standard 4 specifically relates to water quality and details that a 'SuDS approach' should be applied by managing the quality of surface water runoff to adequately address water quality risks from a development. Standard 4 also references that SuDS management approaches should reflect industry recognised guidance (such as Chapter 4, Chapter 26 and Chapter 27 of the CIRIA SuDS Manual) or other quantitative assessment as agreed with the approving body and permitting requirements (An Environmental Permit may be required under Paragraph 3 (1) (c) of Schedule 22 of the Environmental Permitting (England and Wales) Regulations 2016 if there is a risk of mobilising existing contamination).

9.5.3 Use of SuDS in water quality management

SuDS allow the management of diffuse pollution generated by urban areas through the sequential treatment of surface water reducing the pollutants entering lakes and rivers, resulting in lower levels of water supply and wastewater treatment being required. This treatment of diffuse pollution at source can contribute to meeting WFD water quality targets, as well as national objectives for sustainable development.

This is usually facilitated via a SuDS Management Train of a number of components in series that provide a range of treatment processes delivering gradual improvement in water quality and providing an environmental buffer for accidental spills or unexpected high pollutant loadings from the site. Considerations for SuDS design for water quality are summarised in Table 9-1.

Table 9-1: Considerations for SuDS design for water quality.

Action	Considerations
Manage surface water close to source	Where practicable, treatment systems should be designed to be close to source of runoff. It is easier to design effective treatment when the flow rate and pollutant loadings are relatively low. Treatment provided can be proportionate to pollutant loadings and sensitivity receptor. Accidental spills or other pollution events can be isolated more easily without affecting the downstream drainage system. Encourages ownership of pollution. Poor treatment performance or component damage/ failure can be dealt with more effectively without impacting on the whole site.

Action	Considerations
Treat surface water runoff on the surface	Where practicable, treatment systems should be designed to be on the surface. Where sediments are exposed to UV light, photolysis and volatilisation processes can act to break down contaminants. If sediment is trapped in accessible parts of the SuDS, it can be removed more easily as part of maintenance. It enables use of evapotranspiration and some infiltration to the ground to reduce runoff volumes and associated total contamination loads (provided risk to groundwater is managed appropriately). It allows treatment to be delivered by vegetation. Sources of pollution can be easily identified. Accidental spills or misconnections are visible immediately and can be dealt with rapidly. Poor treatment performance can be easily identified during routine inspections, and remedial works can be planned efficiently.
Treat surface water runoff to remove a range of contaminants	SuDS design should consider the likely presence and significance of any contaminant that may pose a risk to the receiving environment. The SuDS component or combination of components selected should include treatment processes that, in combination, are likely to reduce this risk to acceptably low levels.
Minimise risk of sediment remobilisation	The SuDS design should consider and mitigate the risks of sediments (and other contaminants) being remobilised and washed into receiving surface waters during events greater than those which the component has been specifically designed for.
Minimise impacts from accidental spills	By using several components in series, SuDS can help ensure that accidental spills are trapped in/on upstream component surfaces, facilitating contamination management and removal. The selected SuDS components should deliver a robust treatment design that manages risks appropriately - considering the uncertainty and variability of pollution loadings, sensitivity of receptors and treatment processes.

Managing pollution close to its source can help keep pollutant levels and accumulation rates low, allowing natural processes to be more effective. Treatment can often be delivered within the same components that are delivering water quantity design criteria, requiring no additional cost or land-take.

SuDS designs should control the ‘first flush’ of pollutants (usually mobilised by the first 5mm of rainfall) at source, to ensure contaminants are not released from the site. Best practise is that no runoff should be discharged from the site to receiving watercourses or sewers for the majority of small (e.g., less than 5mm) rainfall events.

Infiltration techniques are likely to require consultation with the EA. Early consideration of SuDS within master planning will typically allow a more effective scheme to be designed.

Further guidance on designing SuDS to reduce phosphorus and nitrogen in surface water runoff can be found in the relevant CIRIA guidance documents.

9.5.4 Benefits of sustainable drainage systems

Flood risk

SuDS can be effective at reducing flood risk for relatively high intensity, short and medium duration events. They are particularly important in mitigating potential increases in surface water flooding, sewer flooding and flooding from small and medium sized watercourses resulting from development.

Water resources

A central principle of SuDS is the use of surface water as a resource. Traditionally, surface water drainage involved the rapid disposal of rainwater, by conveying it directly into a sewer or WwTW.

SuDS techniques such as rainwater harvesting, allow rainwater to be collected and re-used as non-potable water supply within homes and gardens, reducing the demand on water resources and supply infrastructure.

Climate resilience

Climate projections for the UK suggest that winters may become milder and wetter. Summers may become warmer, but with more frequent higher intensity rainfall events, particularly in the south east. This is expected to increase diffuse pollution, reduce water availability, and increase the volume of runoff, thereby increasing the risk of surface water flooding.

SuDS offer a more adaptable way of draining surfaces. They control the rate and volume of runoff leaving urban areas during high intensity rainfall, also reducing flood risk to downstream communities through storage and controlled release of rainwater from development sites.

Through allowing rainwater to soak into the ground, SuDS are effective at retaining soil moisture and groundwater levels. This allows for the recharge of the watercourses and underlying aquifers, which is particularly important in areas where water resource availability is limited and likely to become increasingly scarce under future drier climates.

Biodiversity

The water within a SuDS component is an essential resource for the growth and development of plants and animals. Biodiversity benefits can be delivered even by very small, isolated schemes. The greatest value can be achieved where SuDS are planned as part of a wider green landscape, providing important habitat, and wildlife connectivity. With careful design, SuDS can provide shelter, food, foraging, and breeding opportunities for a

variety of species including plants, amphibians, invertebrates, birds, bats, and other animals.

Amenity

Designs using surface water management systems to help structure the urban landscape can enrich its aesthetic and recreational value, promoting health and well-being and supporting green infrastructure. Water managed on the surface rather than underground can help reduce summer temperatures and provide habitat for flora and fauna. It can also act a resource for local environmental education programmes and working groups, directly influencing the sense of community in an area. Although there are few comparative studies, the sites compared in available studies indicate that SuDS are more cost-effective than traditional drainage systems.

9.5.5 Suitable SuDS techniques

The hydraulic and geological characteristics of each property development site across Stoke-on-Trent should be assessed to identify the most appropriate forms of surface water management and any constraining factors to the utilisation of SuDS. These assessments are designed to inform the early-stage site planning process and should be followed up by the site-specific detailed drainage assessments.

Appropriate SuDS techniques have been categorised into five main groups, as shown in Table 9-2. Further site-specific investigation should be conducted to determine what SuDS techniques could be used on a particular development, informed by detailed hydrogeological assessments and ground investigations. The Mining Remediation Authority also provide advice regarding mining and groundwater constraints for development within coalfield areas where additional consideration to the proposed drainage and infiltration may be required.

Table 9-2: Summary of SuDS categories

SuDS Type	Technique
Source Control	Green roof, rainwater harvesting, pervious pavements, rain gardens
Infiltration	Infiltration trench, infiltration basin, soakaway
Detention	Pond, wetland, sub-surface storage, shallow wetland, extended detention wetland, pocket wetland, submerged gravel wetland, wetland channel, detention basin
Filtration	Surface sand filter, sub-surface sand filter, perimeter sand filter, bioretention, filter strip, filter trench
Conveyance	Dry swale, under-drained swale, wet swale

9.5.6 Natural Flood Management

Natural Flood Management (NFM) is used to protect, restore, and re-naturalise the function of catchments and rivers to reduce flood risk. A wide range of techniques can be used that aim to reduce flooding by working with natural features and processes in order to store or slow down flood waters before they can damage flood risk receptors (e.g., people, property, infrastructure, etc.).

Techniques and measures, which could be applied in Stoke-on-Trent include:

- peatland and moorland restoration in upland catchments;
- offline storage areas;
- re-meandering streams;
- targeted woodland planting;
- reconnection and restoration of functional floodplains;
- restoration of rivers and removal of redundant structures;
- installation or retainment of large woody material in river channels;
- improvements in management of soil and land use; and
- creation of rural and urban SuDS.

In 2017, the EA published an online evidence base to support the implementation of NFM and with JBA produced maps showing locations with the potential for NFM measures. These maps are intended to be used alongside the evidence directory to help practitioners think about the types of measure that may work in a catchment and the best places in which to locate them. There are limitations with the maps; however, it is a useful tool to help start dialogue with key partners.

9.5.7 Multiple benefits of natural flood management

In addition to flood risk benefits, there are also significant benefits in other areas such as habitat provision, air quality, climate regulation and water quality.

Many NFM measures have the ability to reduce nutrient and sediment sources by reducing surface runoff flows from higher ground, reducing soil erosion, trapping sediment at the edge of agricultural land, or encouraging deposition of sediments behind natural dams upstream in watercourses.

Suitable techniques may include:

- leaky dams;
- woodland planting;
- buffer strips;
- runoff retention ponds; and
- Land management techniques (soil aeration, cover crops etc.).

Case Study - Black Brook Slow the Flow

Four engineered log dams, see Figure 9-7, were installed on Black Brook at an estimated cost of £2,000, funded by Natural England and the EA to restore Stanley Bank SSSI. The

scheme aimed to improve habitat and reduce the risk of flooding. However, the scheme also resulted in reduced levels of phosphate and nitrate in Black Brook, with phosphate concentrations falling by 3.6 mg/l. By 2035, it is predicted that 792m^3 of sediment will be stored in three ponds retained by the dams.



Figure 9-7: Photographs of leaky dams and Black Brook.

Reproduced from Case Study 17. Black Brook Slow the Flow, St Helens, Norbury, Rogers and Brown, EA WwNP Evidence Base 2017. Photograph taken on 8 May 2015; courtesy of Matthew Catherall

9.5.8 Integrated constructed wetlands

An integrated constructed wetland (ICW) is an artificial wetland created for the purpose of treating polluted water, whether this is municipal wastewater, grey water from residential properties, or agricultural runoff.

They are usually unlined, free surface flow wetlands, designed to contain and treat influents within emergent vegetated areas.

Defra carried out a systematic review of the effectiveness of various wetland types, including ICWs for mitigating agricultural pollution such as phosphate and nitrate. The overall conclusion was that all wetland types are very effective at reducing major nutrients and suspended sediments, with the exception of nitrite in ICWs. Nitrate is only reduced when passing through overland buffer strips and through constructed wetlands with vegetation, where the systematic review showed a mean reduction of 29% across the evidence included in the study. The mean reduction in Total Phosphorus across the evidence base was 78%. More information on this review can be accessed here.

It needs to be noted that in some cases where phosphorus is especially high the effectiveness of removal may be less certain. Although the reduction in total phosphorus is beneficial, stakeholders need to ensure the excess nutrients are dealt with at source, such as storm overflows and at a policy level.

Other techniques to manage nutrients are possible such as catchment nutrient balancing, where excess nutrients are managed at a catchment level, as well as catchment permitting. These techniques are recommended where environmental capacity is restrictive to growth.

Case Study - Frogshall ICW

The Upper River Mun in Norfolk was experiencing chronic pollution, and a loss in biodiversity in the river. Investigation found that nutrients from a WwTWs upstream were contributing to this issue.

A pilot ICW was created consisting of three shallow ponds, filled with 18,000 emergent aquatic plants, and the outfall from the treatment works was diverted to pass through the wetland.

Early monitoring has shown that 90% of the phosphate is being removed by the wetland, and a large increase in biodiversity downstream observed.

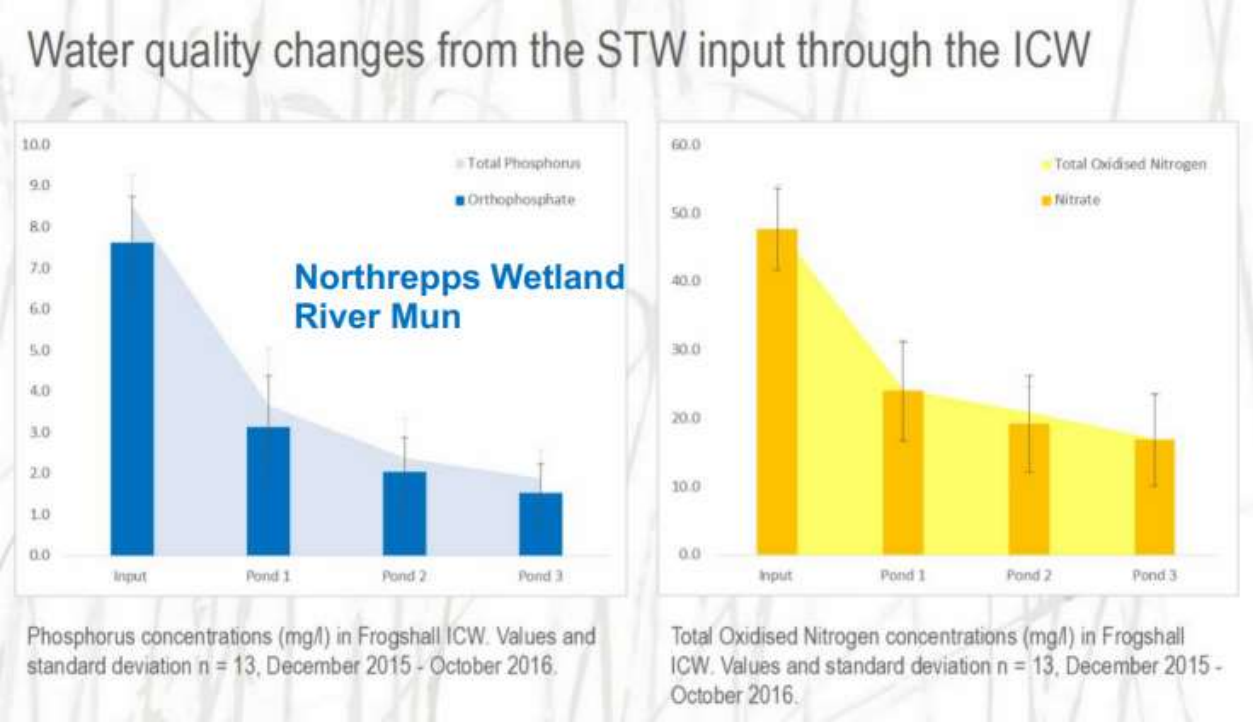


Figure 9-8: Graph of water quality changes, reproduced from 'Stripping the Phosphate', a presentation by the Norfolk Rivers Trust (2018)

The Constructed Wetland Association website contains the Constructed Wetland Hub which shows the location of constructed wetlands across the UK. The map shows a horizontal flow wetland at Birtley Wastewater Treatment Works which treats trickling filter effluent. The record shows that this wetland was established in 1999.

9.5.9 Agricultural management

The EA's RNAG database indicates that one of the reasons for some of the watercourses in the area are not meeting 'Good' WFD standards can be related to agriculture and rural land use. The cause of this includes pollution from fertilisers, manures, pesticides and soils washing into streams when it rains or percolating into the groundwater. Other pressures from agriculture include deepening, widening or re-routing of streams for land drainage, gravel removal and bankside erosion.

There is a big potential to improve water quality by interventions aimed at agricultural sources, especially considering the measures already taken by the water companies to reduce their contribution to phosphate load.

Potential schemes could include:

- buffer strips;
- cross slope tree planting;
- runoff retention basins;
- contour ploughing; and
- cover crops.

There is considerable overlap with NFM measures, and the challenges are also very similar. Exact impacts are difficult to measure, although modelling tools such as Farmscoper (adas.co.uk) exist to help with this. Once a scheme is implemented it relies on the landowner to continue to maintain it in order to maintain the mitigation benefit.

Funding for agricultural interventions could come from Catchment Sensitive Farming or a Payment for Ecosystem Services approach.

Case Study - Wessex Water - EnTrade

Wessex Water catchment team used EnTrade to invite farmers to bid to grow cover crops over winter to reduce the nitrogen leaching into the watercourse.

This avoided the need to upgrade Dorchester WwTW to provide the same nitrogen removal capacity.

A trial auction was held in 2015, and two further auctions have since taken place attracting 557 bids from 63 farmers to save 153 tonnes of nitrogen.

Ruth Barden, Director of Environmental Strategy, Wessex Water, stated that:

"using EnTrade to create a market in measures to deliver reductions in nitrogen has delivered a 30% saving for Wessex Water compared to traditional catchment approaches."

9.5.10 Barriers

While there are many benefits to implementing NFM and constructed wetlands, or modifying agricultural practises, the impact of these techniques is hard to quantify. It also relies on ongoing maintenance to maintain that benefit. Where a potential scheme is not on

a development site it will also require permission and support of the landowner. It may not be possible to influence this through planning policy.

9.6 Conclusions and recommendations

9.6.1 Conclusions

There is one source protection zone within Stoke-on-Trent which is classified as Zone 3 Pollution in Zone 3 can eventually reach the groundwater source. The potential impact of development on groundwater quality and at protected sites such as SAC and SSSIs within, or downstream of the study area should be carefully considered in future plan making. Development sites within the study area could be sources of diffuse pollution from surface runoff.

SuDS are required on all development sites. Their design should consider both water quantity and water quality and site level investigations should be undertaken to define the most appropriate SuDS types for each specific development. Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.

Stoke-on-Trent City Council should be consulted at an early stage of development to ensure that SuDS are implemented and designed in response to site characteristics and policy factors. In the wider area, opportunities exist to implement NFM techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

The impact of increased wastewater discharges, as a result of the growth shown in the local plan, on protected sites downstream of Stoke-on-Trent has been assessed. Results indicate a 2% deterioration, associated with phosphate in two locations; upstream of Cannock Chase (SSSI and SAC) and upstream of the Old River Dove, Marston-on-Dove (SSSI). However, these deteriorations can be prevented by improvements in treatment to TAL.

Recommendations for environmental constraints and opportunities are provided in Table 9-3.

9.6.2 Recommendations

Table 9-3: Recommendations for environmental constraints and opportunities.

Action	Responsibility	Timescale
In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	SoTCC, Severn Trent Water, EA	Ongoing
Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme.	Developers	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	SoTCC, developers	Ongoing
Opportunities for NFM that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution within Stoke-on-Trent.	SoTCC, EA, Natural England	Ongoing

10 Summary and overall conclusions and recommendations

10.1 Conclusions

10.1.1 Water resources

Stoke-on-Trent receives its water resources from Severn Trent Water. The study area includes the upstream reach of the River Trent which flows from north-east to south-west through the centre of Stoke-on-Trent. Fowlea Brook and Lyme Brook, tributaries of the Trent within the study area, are both designated as main rivers by the Environment Agency. The study area is covered wholly by the North Staffs WRZ.

If growth during the period up to 2050 (end of WRMP) follows the same distribution as existing properties, then there are estimated to be approximately 60,097 new properties in the North Staffs WRZ. STW's WRMP24 forecasts growth in the North Staffs WRZ (between 2025 and 2050) to be 31,310 dwellings. Therefore, the estimate calculated within this WCS exceeds STW's forecast by approximately 28,787 dwellings. This difference suggests that planned combined demand from growth is likely to be ahead of WRMP24 demand forecasts. Regarding additional water demand resulting from growth, STW commented that all extra housing growth is already accounted for in the WRMP24. Any additional business demand identified as the WRMP29 is developed can be accounted for at that stage. In line with WRMP guidelines, and based on the methodology followed by STW when producing the WRMP24 (see Section 4.4.3), local plan projections, including major strategic housing and growth locations, New Towns and Garden Communities, should be included when calculating the WRMP baseline and forecast future population growth.

The WINEP is a set of actions that the EA have requested all water companies operating in England to complete in a particular AMP as part of their environmental commitments. WINEP actions relating to water resources in surface water and groundwater bodies in Stoke-on-Trent are presented in Appendix A and show that there is an early investigation into options appraisals or feasibility studies for measures identified within the WRMP to meet regional planning requirements that do not fit with WFD driver requirements across the STW Company Boundary. There are also actions to protect / ensure no deterioration in WFD status within the Staffordshire Trent Valley - PT Sandstone Staffordshire groundwater body.

The Staffordshire Trent Valley Abstraction Licensing Strategy (ALS) indicate varying levels of water availability across these catchments under different flow conditions (Q30–Q90), with areas of restricted or unavailable water identified in specific locations.

Severn Trent Water has reviewed its infrastructure charges for 2026/27, increasing water infrastructure charges to £385 and sewerage infrastructure charges to £499. The company continues to offer incentives for water efficiency with £350 per property offered where homes are built to use 85 litres or less per person per day.

It is important that new development does not result in an unsustainable increase in water abstraction. This can be done in several ways from reducing the water demand from new dwellings through to achieving 'water neutrality' in a region by offsetting a new development's water demand by improving efficiency in existing buildings. In Stoke-on-Trent, there is a particular need for water efficiency as the North Staffs WRZ is classified by the EA as being "seriously water stressed". Additionally, water efficiency in the home also leads to costs and carbon savings where the volume of water heated is reduced. It is therefore recommended that the Council consider a household water efficiency policy aligned with the 100 l/p/d recently consulted on by Defra. Additionally, it is recommended that non-household development meet, as a minimum, three credits in the BREEAM WAT01 measure (a 40% reduction in water consumption from the baseline).

10.1.2 Wastewater collection

As shown in Appendix D, 37 storm overflows in Stoke-on-Trent exceeded the SOAF operations per year investigation threshold averaged over 2023 to 2025. They require an investigation under the SOAF 2025 and action to meet the long-term target.

Development in areas where there is limited wastewater network capacity will increase pressure on the network, increasing the risk of a detrimental impact on customers, and increasing the likelihood of storm overflow operation. Early engagement with developers and STW is recommended to allow time for the strategic infrastructure required to serve development forecast in the Local Plan to be planned. Further modelling of the network may also be required by STW at the planning application stage.

Unmitigated development within Stoke-on-Trent could cause the frequency or duration of operation of storm overflows to increase. There are opportunities through the planning system to ease pressure on the wastewater network by separating foul and storm flow in existing combined systems, particularly within brownfield sites, and not allowing new surface water connections. Surface water can also be better managed by retrofitting SuDS in existing developed areas, and in new development, ensuring SuDS are incorporated into designs at the master planning stage to maximise the potential benefits.

10.1.3 Wastewater treatment

A headroom assessment was carried out comparing the current flow from each WwTW, making allowance for growth already planned, with the permit limit. This provides an estimate of the spare capacity in wastewater treatment infrastructure in Stoke-on-Trent.

Once growth from adopted plans and existing commitments, recently completed growth, windfall, potential allocations and future growth from neighbouring authority Local Plan allocations is taken into account, Checkley and Strongford WwTWs are forecast to remain within their dry weather flow permit conditions. For planning purposes, headroom has been assessed based on the 80th exceedance percentile. Permit compliance is assessed by the Environment Agency using the 90th percentile statistic which in general results in a lower

value than the 80th percentile. Compliance of WwTWs is not within the scope of the WCS and the assessment should not be used to infer non-compliance.

Consideration should be given to using capacity in existing permits as this provides a lower carbon cost than upgrading capacity at existing WwTW or building new treatment works.

There is one storm tank overflow within Stoke-on-Trent, at Strongford WwTW. The storm tank overflow at Strongford WwTW is poorly performing and needs investigation based on the average of available data. Growth could also result in an increase in the operation of the overflow, contributing to a worsening of water quality in the area. Action should be taken by the Severn Trent Water to address the overflow prior to an increase in wastewater demand being generated by new development.

The WINEP actions in place for PR24 at Strongford include certifying the overflow operation monitor and moving to 2 minute flow monitoring.

10.1.4 Water quality

The Reasons for Not Achieving Good (RNAG) dataset indicates that the main categories for watercourses not achieving good status in this area include: urban and transport, water industry (sewerage discharge) and mining and quarrying (associated with abandoned mines). There are also several instances in the study area where no sector is responsible, or the sector is under investigation.

Causeley Brook from Source to River Trent and Ford Green Brook from Source to R Trent have a 'moderate' WFD invertebrate status due to pollution from abandoned mines. The Lyme Brook catchment has a 'moderate' WFD invertebrate status due to physical modifications associated with coal mining. Mine water issues are discussed further below.

The water quality analysis suggests that waterbodies downstream of Checkley and Strongford WwTW may be moderately sensitive to increases in the discharge of treated wastewater (as a result of growth) for Ammonia, Biochemical Oxygen Demand (BOD) and Phosphate. Therefore modelling does not indicate any WFD class changes in watercourses adjacent to WwTWs. Improvements in treatment to TAL reduce these deteriorations and result in improvements to water quality.

Results of the GES assessment show that proposed development will not prevent good ecological status being achieved for ammonia and BOD. Within the watercourse adjacent to Checkley WwTW, there is sufficient environmental capacity for BOD. However, for ammonia, a tighter permit or upgrade would be required. This is achievable with current technology. Within the watercourse adjacent to Strongford WwTW, there is sufficient environmental capacity for ammonia and BOD. Within the watercourses adjacent to Checkley and Strongford WwTWs, GES for phosphate is not currently being achieved in the baseline scenario and could not be achieved even after upgrades to the technically achievable limit. It is therefore not growth that will prevent GES being achieved in the future. SoTCC should ensure that proposed growth does not cause significant deterioration downstream of Checkley and Strongford WwTWs.

10.1.5 Environmental constraints and opportunities

There is one source protection zone within Stoke-on-Trent which is classified as Zone 3 Pollution in Zone 3 can eventually reach the groundwater source. The potential impact of development on groundwater quality and at protected sites such as SAC and SSSIs within, or downstream of the study area should be carefully considered in future plan making. Development sites within the study area could be sources of diffuse pollution from surface runoff.

SuDS are required on all development sites. Their design should consider both water quantity and water quality and site level investigations should be undertaken to define the most appropriate SuDS types for each specific development. Opportunities exist for these SuDS schemes to offer multiple benefits of flood risk reduction, amenity value and biodiversity.

Stoke-on-Trent City Council should be consulted at an early stage of development to ensure that SuDS are implemented and designed in response to site characteristics and policy factors. In the wider area, opportunities exist to implement NFM techniques to achieve multiple benefits of flood risk, water quality and habitat creation.

The impact of increased wastewater discharges, as a result of the growth shown in the local plan, on protected sites downstream of Stoke-on-Trent has been assessed. Results indicate a 2% deterioration, associated with phosphate in two locations; upstream of Cannock Chase (SSSI and SAC) and upstream of the Old River Dove, Marston-on-Dove (SSSI). However, these deteriorations can be prevented by improvements in treatment to TAL.

10.2 Recommendations

10.2.1 Water resources

Action	Responsibility	Timescale
Continue to regularly review forecast and actual household growth across the supply region through WRMP Annual Update reports, and where significant change is predicted, engage with LPAs.	Severn Trent Water	Ongoing
Provide yearly updates of projected housing growth to water companies to inform WRMP updates.	Stoke-on-Trent City Council	Ongoing
The concept of water neutrality has the potential to provide a benefit in improving resilience to climate change. Explore further with the water companies and the EA how the Council's planning and climate change policies can encourage this approach. This approach could have particular application in strategic sites and new settlements.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Larger residential developments (including new settlements), and commercial developments should consider incorporating greywater recycling and/or rainwater harvesting into development at the master planning stage in order to reduce water demand.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Severn Trent Water should advise the Council of any strategic water resource infrastructure developments within the study area, where these may require safeguarding of land to prevent other type of development occurring.	Stoke-on-Trent City Council and Severn Trent Water	In Local Plan
Consider a household water efficiency policy aligned with the 105l/p/d recently consulted on by Defra.	Stoke-on-Trent City Council	In Local Plan
Non-household developments meet, as a minimum, three credits in the BREEAM WAT01 measure (a 40% reduction in water consumption from the baseline).	Stoke-on-Trent City Council and developers	Ongoing

10.2.2 Wastewater collection

Action	Responsibility	Timescale
Early engagement between Stoke-on-Trent City Council and Severn Trent Water is required to ensure that where strategic infrastructure is required, it can be planned in by Severn Trent Water and will not lead to any increase in discharges from sewer overflows.	Stoke-on-Trent City Council, Severn Trent Water	Ongoing
Take into account wastewater infrastructure constraints in phasing development in partnership with the sewerage undertaker.	Stoke-on-Trent City Council, Severn Trent Water	Ongoing
Developers will be expected to work with the sewerage undertaker closely and early in the planning promotion process to develop an Outline Drainage Strategy for sites. The Outline Drainage strategy should set out the following: What – What is required to serve the site Where – Where are the assets / upgrades to be located When – When are the assets to be delivered (phasing) Which – Which delivery route is the developer going to use s104 s98 s106 etc. The Outline Drainage Strategy should be submitted as part of the planning application submission, and where required, used as a basis for a drainage planning condition to be set.	Stoke-on-Trent City Council, Severn Trent Water and developers	Ongoing
Developers will be expected to demonstrate to the LLFA that surface water from a site will be disposed using a sustainable drainage system (SuDS) in line with the hierarchy set out in Standard 1 of DEFRA's 2025 National Standards for Sustainable Drainage Systems (SuDS) and as such proposals for new connections for surface water to foul sewers will not be accepted by the LLFA.	Stoke-on-Trent City Council as LLFA, developers	Ongoing

10.2.3 Wastewater treatment

Action	Responsibility	Timescale
Early engagement with Severn Trent Water is required to ensure that provision of WwTW capacity is aligned with delivery of development.	Stoke-on-Trent City Council	Ongoing
Provide Annual Monitoring Reports to Severn Trent Water detailing projected housing growth.	Stoke-on-Trent City Council	Ongoing
Severn Trent Water to assess growth demands as part of their wastewater asset planning activities and feedback to the Councils if concerns arise.	Severn Trent Water	Ongoing
The Local Plan can encourage the use of SuDS to divert storm water away from the sewer network, reducing the volume that reaches the WwTW. Policy should encourage developers to demonstrate to the LLFA that surface water from a site will be disposed using a sustainable drainage system (SuDS) with connection to surface water sewers seen as the last option. New connections for surface water to foul sewers will be resisted by the LLFA.	Stoke-on-Trent City Council	In the Local Plan
Carry out an odour impact assessment for sites which fall within the buffer zone of WwTW.	Stoke-on-Trent City Council, developers	Ongoing
Consider the layout of the site BL2 where only part of the site boundary lies within the 800m odour buffer zone. In some cases, only part of the larger site may be at risk, in which case zoning of lower impact land uses (e.g. landscaping, amenity, parking) closer to sources of odour may be sufficient to address this risk.	Developers	Ongoing
Discussions between SoTCC and Severn Trent Water to determine how to progress within the Local Plan whilst considering the impact on the WwTWs. This includes around what solutions are programmed within the AMP, alternative solutions for short/medium/long-term growth, and short-term options to facilitate growth (e.g. SuDS retrofitting or removing surface water from sewer systems).	Stoke-on-Trent City Council and Severn Trent Water	Part of SoTCC's Local Plan process

10.2.4 Water quality

Severn Trent Water should take into account the full volume of growth (from SoTCC and neighbouring authorities within the catchment) when considering WINEP schemes for upgrades at WwTW.	Severn Trent Water	Ongoing

10.2.5 Environmental constraints and opportunities

Action	Responsibility	Timescale
In partnership, identify opportunities for incorporating SuDS into open spaces and green infrastructure, to deliver strategic flood risk management and meet WFD water quality targets.	SoTCC, Severn Trent Water, EA	Ongoing
Developers should include the design of SuDS at an early stage to maximise the benefits of the scheme.	Developers	Ongoing
Work with developers to discourage connection of new developments into existing surface water and combined sewer networks. Prevent connections into the foul network, as this is a significant cause of sewer flooding.	SoTCC, developers	Ongoing
Opportunities for NFM that include schemes aimed at reducing / managing runoff should be considered to reduce nutrient and sediment pollution within Stoke-on-Trent.	SoTCC, EA, Natural England	Ongoing

11 Appendix

A Water Industry National Environment Programme (WINEP)

A.1 Driver codes

- **U_MON3** - Urban Waste Water treatment Regulations - Monitoring Emissions to Air, Land and Water (MCERTS) certified Flow Pass Forward (FPF) overflow operation monitoring at WwTW or last in line Sewage Pumping Station (SPS) overflows.
  - **U_MON3a** - MCERTS certification of an AMP7 U_MON3 driver output overflow operation monitor.
  - **U_MON 3b** - MCERTS certified overflow operation monitor.
- **U_MON4** - Urban Waste Water treatment Regulations - MCERTS certified FPF flow monitoring at WwTW or last in line SPS overflows.
  - **U_MON4a** - Move AMP7 U_MON4 driver output to 2-minute flow monitoring.
  - **U_MON4b** - Move AMP7 U_INV2 driver output to 2-minute flow monitoring.
  - **U_MON4c** - PR24 U_MON4 from U_INV2 investigation.
  - **U_MON4d** - MCERTS certified Flow passed forward flow monitor
  - **U_MON4e** - MCERTS certified Flow passed forward flow monitor including civils.
- **EnvAct_IMP4** - Improvements to reduce storm overflows spills so that they do not discharge above an average of ten rainfall events per year by 2050.
- **EnvAct_INV4** - Investigations to reduce storm overflow spills to protect the environment so that they have no local adverse ecological impact.
- **WFD_IMP** - Implementation of actions to improve water quality in terms of relevant WFDR status objectives.
  - The driver WFD_IMP should have a suffix letter applied to indicate what target the measure is aimed at achieving: the status objective standard. The following are to be used:
  - h – measure to meet High status for the element
  - g – measure to meet Good status for the element
  - m – measure to meet Moderate status for the element
  - p – measure to meet Poor status for the element.
  - Potential changes to current water body objectives, as a result of PR24 planning, may be included in the 2027 river basin management plans.
  - Where a water company is willing to do more for WFDR than is required then the work should be represented on the WINEP with two driver codes; one

WFD_IMP driver code to reflect the statutory work and one 25 Year Environment Plan driver code (25YEP_IMP) to reflect the discretionary work. Please see the separate driver guidance on the 25 Year Environment Plan driver.

- If we know that a water company is going to implement an action, irrespective of our economic appraisal, then we should include that action in the programme of measures and build the expected outcome into the water body objective.

- **WFD_NDLS_Chem1 -** Measures related to load standstill requirements for chemicals (where Environmental Quality Standards (EQS) exceedance is predicted, but measures fail economic assessments associated with EQS).
- **WFD_NDLS_Chem2** - Measures related to load standstill requirements for chemicals (below EQS). These are set where a WwTW is discharging significant concentrations of a chemical, but the EQS is not threatened immediately downstream. Targets are set to ensure that current effluent quality does not deteriorate and to contribute to broader aims to cease and phase out emissions, discharges and losses of priority hazardous substances and prevent pollution swapping. This driver would be used where there is no risk that growth between 2015 and 2021 would cause an actual failure of the EQS.
- **WFD_IMP_CHEM** - To meet either good ecological status or good chemical status. Needed where an EQS is exceeded downstream of a WwTW discharge. Measures that fail economic tests will receive standstill limits under WFD_NDLS_CHEM1.
- **WFD_ND_WRFlow** - Action to protect/ensure no deterioration in status (surface water).
- **WFDGW_INV** - Groundwater good status improvement action relating to water resource or water quality.
- **EDWRMP_INV** - Investigations, options appraisals or feasibility studies for measures identified within the WRMP to meet regional planning requirements that do not fit with WFD driver requirements.

A.2 WINEP actions relating to water resources

Table 11-1: Surface water WINEP actions relating to water resources

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Within Water Company Boundary	08ST100405a	Staffordshire Trent Valley early investigation phase	EDWRMP_INV Early investigation to inform WRMP/PR29	31/12/2028
Within Water Company Boundary	08ST100406a	Staffordshire Trent Valley later investigation phase	EDWRMP_INV Later investigation to build on WRMP/PR29 and prepare for PR34	30/03/2030

Table 11-2: Groundwater WINEP actions relating to water resources

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Staffordshire Trent Valley - PT Sandstone Staffordshire	08ST100086d	***Holding line awaiting outcome of AMP7 INV -Cresswell (STAFFORDSHIRE)***	WFD_ND_WRFlow Action to protect/ensure no deterioration in status (surface water).	31/03/2035
Staffordshire Trent Valley - PT Sandstone Staffordshire	08ST100086g	***Holding line awaiting outcome of Priority B AMP7 Investigation and options appraisal - Fulford (STAFFORDSHIRE)***	WFD_ND_WRFlow Action to protect/ensure no deterioration in status (surface water).	31/03/2035
Staffordshire Trent Valley - PT Sandstone Staffordshire	08ST100086k	***Holding line awaiting outcome of Priority B AMP7 Investigation and options appraisal - Mossgate (STAFFORDSHIRE)***	WFD_ND_WRFlow Action to protect/ensure no deterioration in status (surface water).	31/03/2035

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Staffordshire Trent Valley - PT Sandstone Staffordshire	08ST100086l	***Holding line awaiting outcome of Priority B AMP7 Investigation and options appraisal - Sheepwash (STAFFORDSHIRE)***	WFD_ND_WRFlow Action to protect/ensure no deterioration in status (surface water).	31/03/2035
Staffordshire Trent Valley - PT Sandstone Staffordshire	08ST100086o	***Holding line awaiting outcome of Priority B AMP7 Investigation and options appraisal - Wallmyres (STAFFORDSHIRE)***	WFD_ND_WRFlow Action to protect/ensure no deterioration in status (surface water).	31/03/2035

A.3 WINEP actions relating to water quality

There are no groundwater actions relating to water quality in the PR24 WINEP dataset.

Table 11-3: Surface water WINEP actions relating to water quality

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Causeley Brook from Source to River Trent	08ST100258a	Address harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_IMP2 WERRINGTON - CLOUGH LANE CSO	31/03/2030
Causeley Brook from Source to River Trent	08ST100258b	Address harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_IMP2 WOOLISCROFT ROAD CSO	31/03/2030
Causeley Brook from Source to River Trent	08ST100258g	Investigation to inform scheme to eliminate harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_INV4 WERRINGTON - CLOUGH LANE CSO	30/04/2027
Causeley Brook from Source to River Trent	08ST100258h	Investigation to inform scheme to eliminate harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_INV4 WOOLISCROFT ROAD CSO	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100258d	Address harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_IMP2 DIVIDY ROAD / JOINERS SQUARE CSO	31/03/2030
Trent - Ford Green Bk to Fowlea Bk	08ST100258e	Address harm caused by sewer overflows discharging into the upper Trent (within Stoke on Trent)	EnvAct_IMP2 PECK MILL LANE CSO	31/03/2030
Trent - Ford Green Bk	08ST100258f	Address harm caused by sewer overflows discharging into the	EnvAct_IMP2 Surface water	31/03/2030

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
to Fowlea Bk		upper Trent (within Stoke on trent)	separation	
Trent - Ford Green Bk to Fowlea Bk	08ST100258j	Investigation to inform scheme to eliminate harm caused by sewer overflows discharging into the upper Trent (within Stoke on trent)	EnvAct_INV4 DIVIDY ROAD / JOINERS SQUARE CSO	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100258k	Investigation to inform scheme to eliminate harm caused by sewer overflows discharging into the upper Trent (within Stoke on trent)	EnvAct_INV4 PECK MILL LANE CSO	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100882x	ABBEY HULTON – O/S GREASLEY ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100882y	ABBEY HULTON-GREASLEY/LEEK ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100882z	HANLEY - AUSTIN ST/JOINERS SQ PS (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883a	BERRY HILL - VICTORIA STREET (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent - Ford Green Bk to Fowlea Bk	08ST100883b	ABBEY HULTON - BIRCHES HEAD ROAD (SSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883c	HANLEY - BOUGHEY ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883d	HANLEY - CAULDON ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883e	STOKE-ON-TRENT - CROMER ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883f	ABBEY HULTON - GREASLEY/HOLE-HRD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883g	ABBEY HULTON - GREASLEY/CROXDENRD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883h	ABBEY HULTON - GREASLEY ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent -	08ST100883i	HANLEY - LICHFIELD	EnvAct_INV4	30/04/20

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Ford Green Bk to Fowlea Bk		ST/LEEK ROAD (CSO)	undertake harm investigation.	27
Trent - Ford Green Bk to Fowlea Bk	08ST100883j	HANLEY - LEEK ROAD/SIMPSON STREET (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883k	HANLEY - LEEK RD/BOTTESLOW STREET (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883l	HANLEY - LEEK ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883m	HANLEY - LICHFIELD ST/LEEK ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883n	NORTHWOOD - PRIME ST/CARDWELL ST (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883o	NORTHWOOD - PRIME ST/LOCKLEY ST (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent - Ford Green Bk to Fowlea Bk	08ST100883p	NORTHWOOD - ROSE STREET (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883q	HANLEY - STUART ROAD (JOINERS SQ) (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883r	HANLEY - VICTORIA ROAD PS (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent - Ford Green Bk to Fowlea Bk	08ST100883s	BUCKNALL - WERRINGTON ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100756a	Spill Reduction at HARTSHILL - RISELEY ROAD (CSO)	EnvAct_IMP4 Reduce spill frequency at HARTSHILL - RISELEY ROAD (CSO) utilising non-traditional solution types where feasible	31/03/2030
Lyme Brook Catchment (trib of Trent)	08ST100756b	Spill Reduction at NEWCASTLE - KING STREET (CSO)	EnvAct_IMP4 Reduce spill frequency at NEWCASTLE - KING STREET (CSO) utilising non-traditional solution types where feasible	31/03/2030

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100863e	Investigation of intermittent discharges from SILVERDALE - CHURCH STREET (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863f	Investigation of intermittent discharges from SILVERDALE - NEWCASTLE ST/MILL ST (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863g	Investigation of intermittent discharges from SILVERDALE - SILVERDALE ROAD (SSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863h	Investigation of intermittent discharges from SILVERDALE - ELLAMS PLACE (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100863i	Investigation of intermittent discharges from KNUTTON - COTSWOLD AVENUE PS (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863j	Investigation of intermittent discharges from CHESTERTON - LOOMER ROAD PS (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863k	Investigation of intermittent discharges from CHESTERTON - APEDALE ROAD PS (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100863l	Investigation of intermittent discharges from WESTLANDS - PRIORY RD/PILKINGTON AV (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100864a	Investigation of intermittent discharges from NEWCASTLE - THE HIGHERLAND (NORTH) (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864b	Investigation of intermittent discharges from NEWCASTLE - THE HIGHERLAND (SOUTH) (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864c	Investigation of intermittent discharges from NEWCASTLE - CLAYTON RD (HOMEBASE) (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864d	Investigation of intermittent discharges from NEWCASTLE U LYME - MILEHOUSE LN (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100864e	Investigation of intermittent discharges from CROSS HEATH - BRYMBO ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864f	Investigation of intermittent discharges from LYME VALLEY-OPP REMPLOY WORKS-CRIT (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864g	Investigation of intermittent discharges from NEWCASTLE - GEORGE ST/HASSELL ST (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100864h	Investigation of intermittent discharges from CROSS HEATH - HEMSTALLS LN (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100865d	Investigation of intermittent discharges from SPRINGFIELDS - NEWCASTLE ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100865j	Investigation of intermittent discharges from TRENT VALE - HARPFIELD ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100868d	Investigation of intermittent discharges from HARTSHILL - HILTON ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100868h	Investigation of intermittent discharges from HARTSHILL - RISELEY ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100868i	Investigation of intermittent discharges from HARPFIELDS - THE AVENUE (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100868k	Investigation of intermittent discharges from CROSS HEATH - LAXLEY ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100868m	Investigation of intermittent discharges from NEWCASTLE UNDER LYME - STAFFORD AV (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100869b	Investigation of intermittent discharges from CLAYTON - LILLESHALL ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Lyme Brook Catchment (trib of Trent)	08ST100869c	Investigation of intermittent discharges from CROSS HEATH - ST MICHAELS ROAD (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100869d	Investigation of intermittent discharges from NEWCASTLE - KING STREET (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100869e	Investigation of intermittent discharges from WESTLANDS - DARTMOUTH AVENUE (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Lyme Brook Catchment (trib of Trent)	08ST100869i	Investigation of intermittent discharges from SILVERDALE - NEWCASTLE STREET (CSO) into RNAG Waterbody (Lyme Brook Catchment (trib of Trent) catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Fowlea Brook from Source to River Trent	08ST100864i	Investigation of intermittent discharges from PORTHILL - WATLANDS VIEW (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100864j	Investigation of intermittent discharges from ETRURIA - ETRURIA/LOWER OXFORD RD (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100865a	Investigation of intermittent discharges from ETRURIA - ETRURIA ROAD (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100865b	Investigation of intermittent discharges from ETRURIA - GARNER STREET (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100865c	Investigation of intermittent discharges from ETRURIA - QUEENSWAY () (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook	08ST100865e	Investigation of intermittent discharges	EnvAct_INV4	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
from Source to River Trent		from LONGPORT - STATION STREET (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)		
Fowlea Brook from Source to River Trent	08ST100865f	Investigation of intermittent discharges from TUNSTALL - CANAL LN (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100866a	Investigation of intermittent discharges from STOKE-ON-TRENT - BEECHS GARAGE (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100866b	Investigation of intermittent discharges from BURSLEM STW OVERFLOW (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100867d	Investigation of intermittent discharges from HANLEY - SHELTON NEW ROAD (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Fowlea Brook from Source to River Trent	08ST100867e	Investigation of intermittent discharges from ETRURIA VALE (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100867z	Investigation of intermittent discharges from TUNSTALL - GREENWAY (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100868e	Investigation of intermittent discharges from STOKE-ON-TRENT - QUEEN ANNE STREET (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100868g	Investigation of intermittent discharges from TUNSTALL - BOATHORSE ROAD (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from Source to River Trent	08ST100868j	Investigation of intermittent discharges from PORTHILL - ORFORD STREET (CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Fowlea Brook from	08ST100868n	Investigation of intermittent discharges from ETRURIA VALE	EnvAct_INV4	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Source to River Trent		(CSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)		
Fowlea Brook from Source to River Trent	08ST100869f	Investigation of intermittent discharges from STOKE-ON-TRENT - QUEENSWAY (SSO) into RNAG Waterbody (Fowlea Brook from Source to River Trent catchment)	EnvAct_INV4	30/04/2027
Ford Green Brook from Source to R Trent	08ST100258c	Address harm caused by sewer overflows discharging into the upper Trent (within Stoke on trent)	U_IMP4 IVY HOUSE ROAD CSO	31/03/2028
Ford Green Brook from Source to R Trent	08ST100258i	Investigation to inform scheme to eliminate harm caused by sewer overflows discharging into the upper Trent (within Stoke on trent)	EnvAct_INV4 IVY HOUSE ROAD CSO	30/04/2027
Ford Green Brook from Source to R Trent	08ST100873k	BIDDULPH - BROWN LEES ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Ford Green Brook from Source to R Trent	08ST100873l	BRADELEY - CHELL HEATH ROAD (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Ford Green Brook	08ST100873m	GREAT CHELL - CUMBERBATCH AVENUE (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
from Source to R Trent				
Ford Green Brook from Source to R Trent	08ST100873n	PACKMOOR - BULL LANE/MELLOR ST (CSO)	EnvAct_INV4 undertake harm investigation.	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100061a	ammonia load removal river Trent	WFD_IMPg ammonia load removal at Strongford STW	31/03/2030
Trent from Fowlea Brook to Tittensor	08ST100619a	Dissolved metal load standstill permitting (no investment proposed)	WFD_NDLS_Chem2 Strongford STW (cadmium)	31/03/2027
Trent from Fowlea Brook to Tittensor	08ST100451dj	STRONGFORD (STW)	U_MON4 Move AMP7 U_MON4 driver output to 2-minute flow monitoring (U_MON4a)	31/12/2025
Trent from Fowlea Brook to Tittensor	08ST100450nl	STRONGFORD (STW)	U_MON3 MCERTS certification of an AMP7 U_MON3 driver output overflow operation monitor (U_MON3a)	31/12/2025
Trent from Fowlea Brook to Tittensor	08ST100754a	Spill Reduction at BOOTHEN - CHAMBERLAIN AVENUE (CSO)	EnvAct_IMP4 Reduce spill frequency at BOOTHEN - CHAMBERLAIN AVENUE (CSO) utilising non-traditional solution	31/03/2030

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
			types where feasible	
Trent from Fowlea Brook to Tittensor	08ST100865h	Investigation of intermittent discharges from TRENT VALE PS (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100865i	Investigation of intermittent discharges from MICHELIN A34-CRITICAL (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100865k	Investigation of intermittent discharges from OAK HILL - WOLSELEY ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867a	Investigation of intermittent discharges from BOOTHEN - SIDEWAY ONE (MICHELIN) (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent from Fowlea Brook to Tittensor	08ST100867aa	Investigation of intermittent discharges from BOOTHEN - CHAMBERLAIN AVENUE (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867ab	Investigation of intermittent discharges from PENKHULL - PENKHULL NEW ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867b	Investigation of intermittent discharges from BOOTHEN - BOOTHEN OLD RD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867c	Investigation of intermittent discharges from BOOTHEN - BOOTHEN OLD ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent from Fowlea Brook to Tittensor	08ST100867f	Investigation of intermittent discharges from FENTON - SMITHPOOL ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867g	Investigation of intermittent discharges from FENTON - WILLIAM STREET (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867w	Investigation of intermittent discharges from TITTENSOR - STONE ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100867x	Investigation of intermittent discharges from BARLASTON - OLD ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent from Fowlea Brook to Tittensor	08ST100868a	Investigation of intermittent discharges from TRENTHAM - STONE RD/BANKHOUSE RD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100868f	Investigation of intermittent discharges from HANFORD - STONE ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100868q	Investigation of intermittent discharges from STRONGFORD STW (SSTO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100869a	Investigation of intermittent discharges from STOKE ON TRENT - CAMPBELL ROAD (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Trent from Fowlea Brook to Tittensor	08ST100869g	Investigation of intermittent discharges from TRENTHAM - WHITMORE RD/PARK DRIVE (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100869h	Investigation of intermittent discharges from SIDEWAY - POPLAR LANE (CANAL) (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Trent from Fowlea Brook to Tittensor	08ST100869j	Investigation of intermittent discharges from FENTON - HERON STREET (CSO) into RNAG Waterbody (Trent from Fowlea Brook to Tittensor catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100755a	Spill Reduction at STOKE-ON-TRENT - ASH GREEN CLOSE (CSO)	EnvAct_IMP4 Reduce spill frequency at STOKE-ON-TRENT - ASH GREEN CLOSE (CSO) utilising non-traditional solution types where feasible	31/03/2030

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100865g	Investigation of intermittent discharges from TRENTHAM - WERBURGH DRIVE (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867h	Investigation of intermittent discharges from BLURTON - BALLINSON ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867i	Investigation of intermittent discharges from LONGTON - BLURTON ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867j	Investigation of intermittent discharges from DRESDEN - KIMBERLEY ST (GOMS MILL) (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100867k	Investigation of intermittent discharges from DRESDEN - CARLISLE ST/RUSSELL ST (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867l	Investigation of intermittent discharges from LONGTON - FOLEY ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867m	Investigation of intermittent discharges from LONGTON - BATHS ROAD (WEST) (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867n	Investigation of intermittent discharges from LONGTON - BATHS/MOULTON RD (EAST) (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100867o	Investigation of intermittent discharges from DRESDEN - BELGRAVE RD/CHAPLIN RD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867p	Investigation of intermittent discharges from LONGTON - CAROLINE/LOWER CROSS ST (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867q	Investigation of intermittent discharges from LONGTON - UTTOXETER RD/CHADWICK ST (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867r	Investigation of intermittent discharges from LONGTON - ANCHOR ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100867s	Investigation of intermittent discharges from LONGTON - AMISON STREET (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867t	Investigation of intermittent discharges from LONGTON - KENDRICK STREET (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867u	Investigation of intermittent discharges from LIGHTWOOD - LIGHTWOOD ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100867v	Investigation of intermittent discharges from WESTON COYNEY - PARK AVE/HORTON DRIVE (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100867y	Investigation of intermittent discharges from LONGTON - BROCKSFORD/HOLLINGS ST (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100868b	Investigation of intermittent discharges from DRESDEN - CHAPLIN RD/SAINT CLAIR ST (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100868c	Investigation of intermittent discharges from TRENTHAM - GOODWOOD PLACE (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100868l	Investigation of intermittent discharges from LONGTON - SUTHERLAND RD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

Waterbody name	Action unique ID	Scheme name(s)	Primary driver code and action description	Completion date
Longton Bk - source to R Trent	08ST100868o	Investigation of intermittent discharges from TRENTHAM - STONE ROAD (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027
Longton Bk - source to R Trent	08ST100868p	Investigation of intermittent discharges from STOKE-ON-TRENT - ASH GREEN CLOSE (CSO) into RNAG Waterbody (Longton Bk - source to R Trent catchment)	EnvAct_INV4 Catchment-wide Investigation to assess potential impact of intermittent discharges on the water quality in waterbodies with RNAGS	30/04/2027

B Statutory designated sites within Stoke-on-Trent study area

B.1 Sites of Special Scientific Interest

Name	Code
Ford Green Reedbed SSSI	1002074
Hulme Quarry SSSI	1002470

B.2 Local Nature Reserve

Name	Code
BAGNALL ROAD WOOD	1082928
BARLASTON AND ROUGH CLOSE COMMON	1009409
BERRYHILL FIELDS	1009901
BRIGETT'S POOL	1421544
COYNEY WOODS	1421551
HOLDEN LANE POOLS	1009728
HARTSHILL PARK	1009787
SMITH'S POOL	1421583
WESTPORT LAKE	1009721
WHITFIELD VALLEY	1009241

B.3 National Nature Reserves

Name	Code
Hulme Quarry	1008720

C Groundwater and surface water assessment

C.1 GWDTEs present in the study area

GWDTE name	ID	RBD name
Churnet Valley (SSSI)	380	Humber
Maer Pool (SSSI)	726	Humber

C.2 Surface water assessment

C.2.1 Surface water assessment Ramsar

Ramsar code	Name	Waterbody	SWMI Y/N
UK11043	Midland Meres & Mosses - Phase 1	Blithe from Source to Tad Brook	Y

C.2.2 Surface water assessment SAC

SAC Code	Name	Waterbody	SWMI Y/N
UK0013595	West Midland Mosses	Blithe from Source to Tad Brook	Y

C.2.3 Surface water assessment SSSI

SSSI Code	Name	Waterbody	SWMI Y/N
1002216	Blithfield Reservoir	Blithe from Source to Tad Brook	Y
1002230	Chartley Moss	Blithe from Source to Tad Brook	Y

D Storm overflows assessment

Table 11-4: Storm overflow frequency of operation and duration

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
ABBEY HULTON ? O/S 70 GREASLEY ROAD (CSO)	16	37	37	30.0	Y
ABBEY HULTON-GREASLEY/LEEK ROAD (CSO)	0	0	0	0.0	N
ANCHOR ROAD CSO	1	3	3	2.3	N
ASDA - OXFORD STREET CSO	7	18	18	14.3	Y
AUSTIN STREET SPS	6	5	5	5.3	N
BALLINSON ROAD CSO	0	0	0	0.0	N
BATH ROAD 2 CSO	7	7	7	7.0	N
BATHS ROAD COMBINED SEWER OVERFLOW	0	0	0	0.0	N

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
BEDDELEY GREEN CSO	22	30	30	27.3	Y
BEECHS GARAGE CSO	6	16	16	12.7	Y
BERRY HILL	0	0	0	0.0	N
BIRCHES HEAD ROAD CSO	47	51	51	49.7	Y
BOATHORSE ROAD CSO	9	13	13	11.7	Y
BOOTHEN OLD ROAD 1 CSO	2	13	13	9.3	N
BOOTHEN OLD ROAD 2 CSO	4	10	10	8.0	N
BOUGHEY ROAD CSO	10	9	9	9.3	N
BROCKSFORD STREET CSO	0	0	0	0.0	N
BURSLEM STW CSO	9	16	16	13.7	Y
CANAL LANE CSO	1	3	3	2.3	N
CARLISLE STREET CSO	0	1	1	0.7	N
CAULDON ROAD CSO	0	3	3	2.0	N

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
CHAMBERLAIN AVENUE CSO	2	6	6	4.7	N
CHAPLIN ROAD NO.1 CSO	1	2	2	1.7	N
CHAPLIN ROAD NO.2 CSO	0	0	0	0.0	N
CHELL HEATH ROAD CSO	22	24	24	23.3	Y
CUMBERBATCH AVENUE CSO	35	47	47	43.0	Y
DIVIDY ROAD / JOINERS SQUARE CSO	53	61	61	58.3	Y
ETRURIA VALE 1 CSO	26	16	16	19.3	Y
ETRURIA VALE 2 (CSO)	2	1	1	1.3	N
FENTON - HERON STREET (CSO)	1	5	5	3.7	N
FOLEY ROAD CSO	0	1	1	0.7	N
FURLONG ROAD CSO	9	10	10	9.7	N

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
GARNER STREET CSO	46	0	0	15.3	Y
GAYTON AVENUE CSO	34	41	41	38.7	Y
GOMS MILL CSO	10	11	11	10.7	Y
GOODWOOD PLACE CSO	7	13	13	11.0	Y
GRAFTON ROAD CSO	0	0	0	0.0	N
GREASLEY ROAD 1 CSO	0	1	1	0.7	N
GREASLEY ROAD 2 CSO	9	15	15	13.0	Y
GREASLEY ROAD 3 CSO	0	4	4	2.7	N
HANFORD A34 PUMPING STATION	34	27	27	29.3	Y
HARPFIELD ROAD CSO	4	13	13	10.0	N
HARTSHILL - RISELEY ROAD CSO	45	42	42	43.0	Y

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
HILTON ROAD COMBINED SEWER OVERFLOW	39	44	44	42.3	Y
IVY HOUSE ROAD CSO	20	8	8	12.0	Y
JOINERS SQUARE CSO	14	8	8	10.0	N
KENDRICK STREET CSO	3	2	2	2.3	N
LEEK ROAD / BOTTESLOW STREET CSO	15	4	4	7.7	N
LEEK ROAD CSO	0	4	4	2.7	N
LICHFIELD STREET/LEEK ROAD	4	0	0	1.3	N
LICHFIELD STREET/LEEK ROAD	4	0	0	1.3	N
LIGHTWOOD ROAD	0	0	0	0.0	N
LILLESHALL ROAD PLAYING FIELDS CSO	1	3	3	2.3	N

Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
LITTLE HEAKLEY FARM CSO	12	17	17	15.3	Y
LONGPORT STATION ROAD CSO	0	0	0	0.0	N
LONGTON - AMISON STREET CSO	14	21	21	18.7	Y
LOWER OXFORD ROAD CSO	29	33	33	31.7	Y
LYME VALLEY (OPPO REMPLOY WKS) CSO	24	27	27	26.0	Y
MEIR - MEIR ROAD (CSO)	11	12	12	11.7	Y
MELLOR STREET CSO	0	2	2	1.3	N
MICHELIN A34 CSO	15	24	24	21.0	Y
NEWCASTLE ROAD - A34 CSO	3	5	5	4.3	N

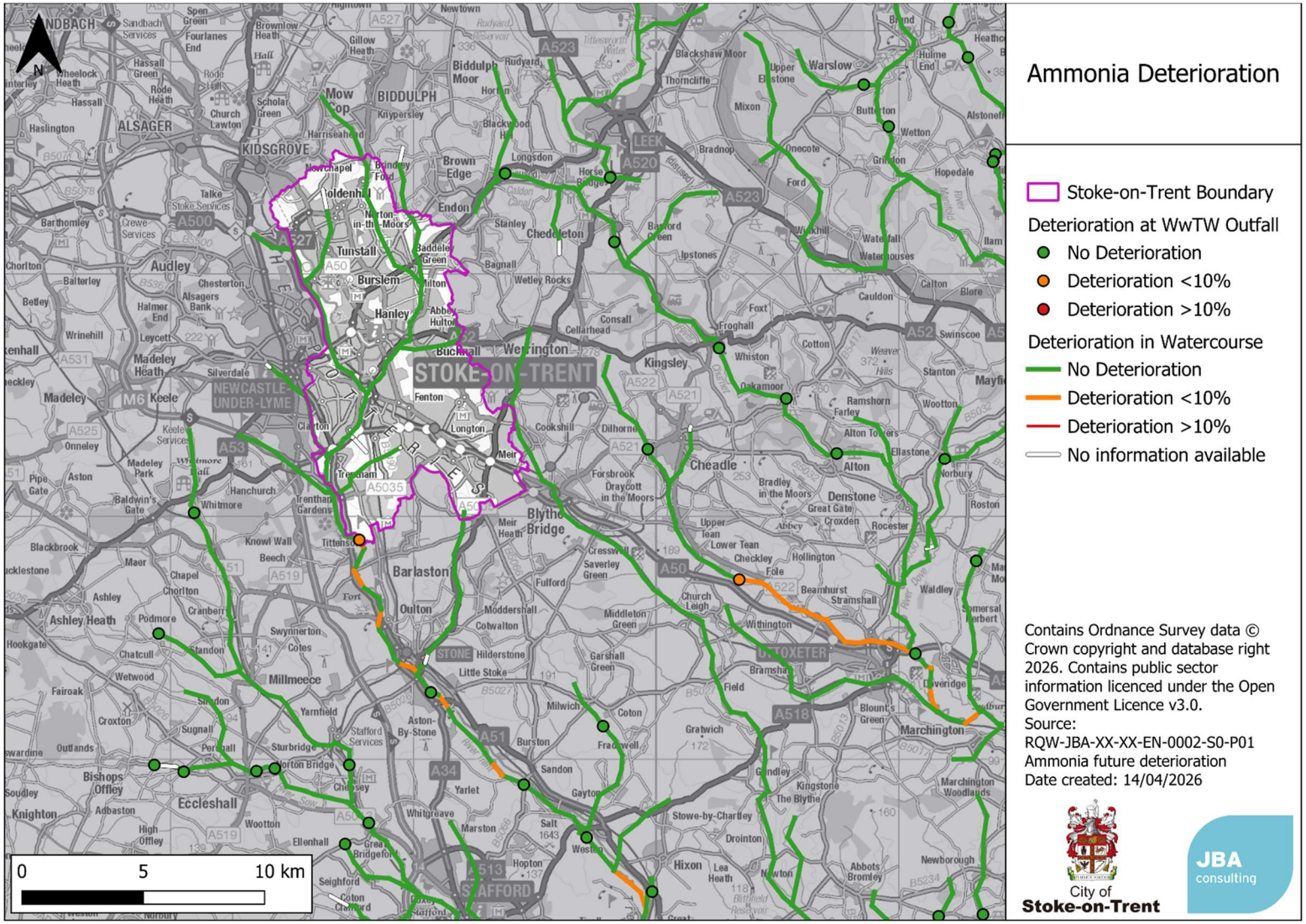
Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
NO. 159 THE AVENUE CSO	0	0	0	0.0	N
NORTHWOOD PRIME ST-CARDWELL ST CSO	0	29	29	19.3	Y
OFF BLURTON ROAD CSO	7	13	13	11.0	Y
ORFORD STREET CSO	52	62	62	58.7	Y
PECK MILL LANE CSO	40	42	42	41.3	Y
PENKHULL NEW ROAD CSO	71	81	81	77.7	Y
POPLAR DRIVE CSO	4	3	3	3.3	N
PRIME STREET (NO.1)/LOCKLEY ST CSO	0	0	0	0.0	N
QUEENSWAY/VERNON ROAD SPS	0	0	0	0.0	N
ROSE STREET CSO	1	6	6	4.3	N

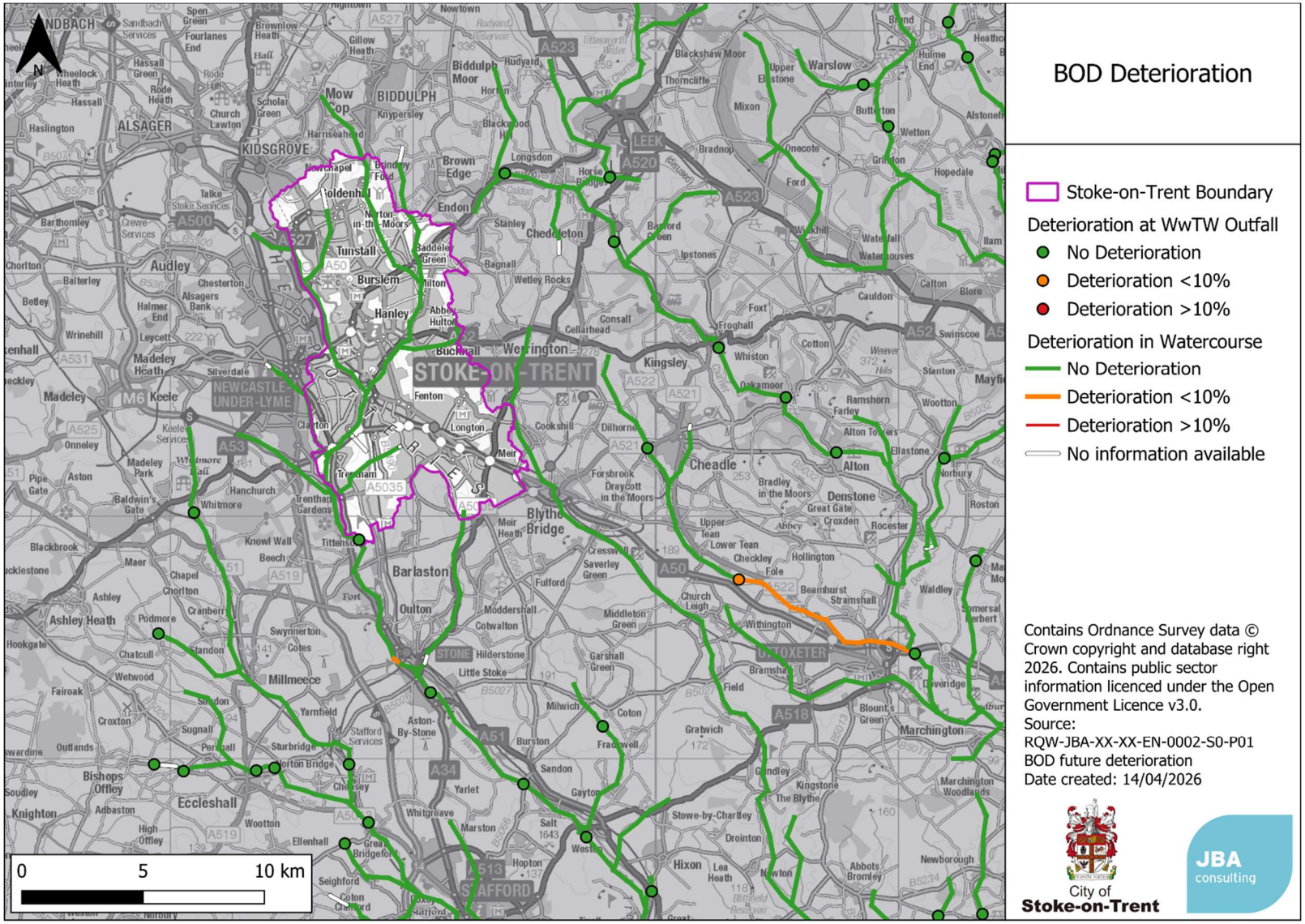
Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
SHELTON NEW ROAD CSO	3	4	4	3.7	N
SIDEWAY ROAD CSO	4	9	9	7.3	N
SMITHPOOL ROAD CSO	4	7	7	6.0	N
STOKE ON TRENT - CAMPBELL ROAD (CSO)	0	0	0	0.0	N
STOKE-ON-TRENT - ASH GREEN CLOSE (CSO)	19	4	4	9.0	N
STOKE-ON-TRENT - CROMER ROAD (CSO)	0	1	1	0.7	N
STOKE-ON-TRENT - QUEEN ANNE STREET (CSO)	9	2	2	4.3	N

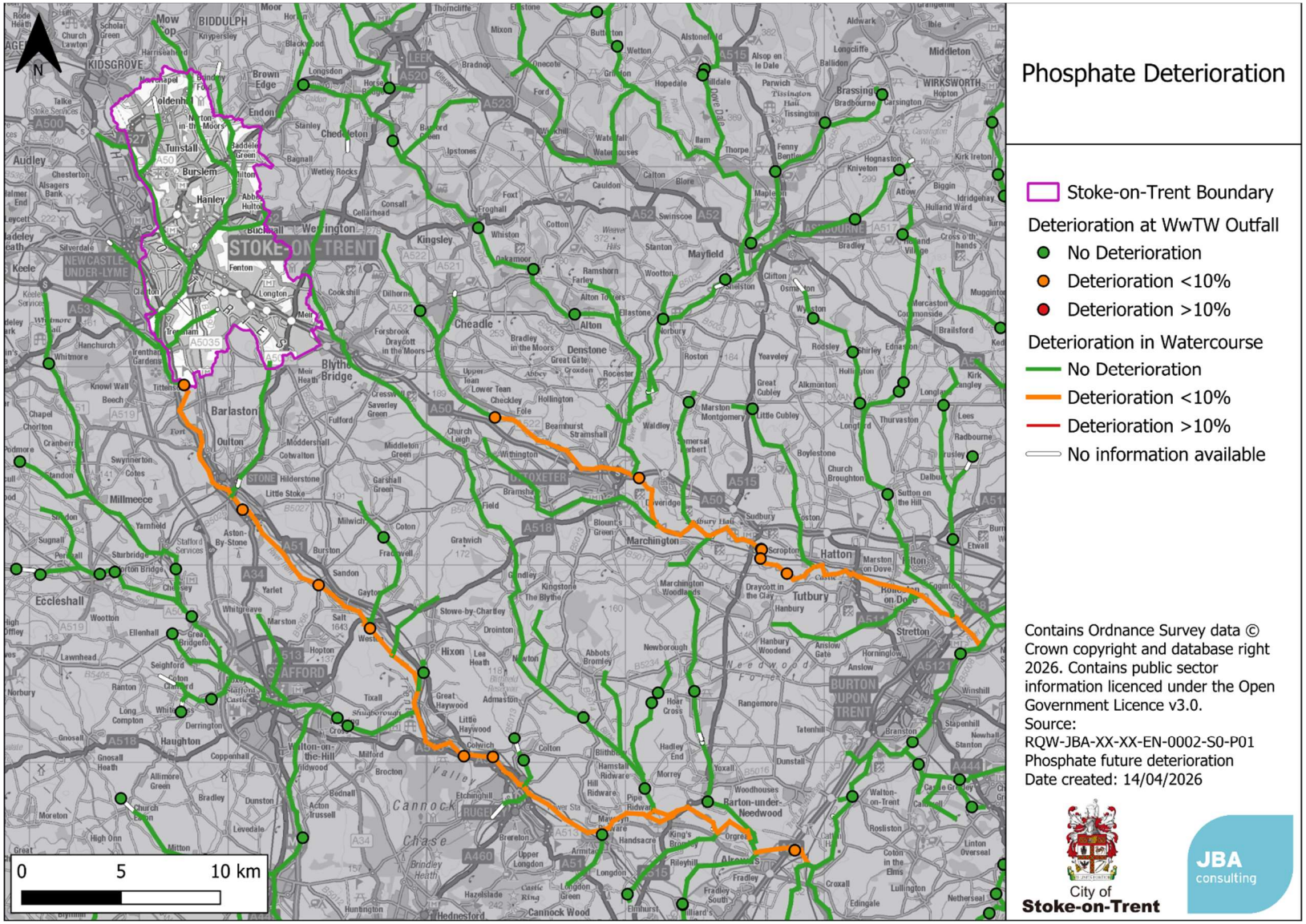
Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
STOKE-ON-TRENT - RIVERHEAD CLOSE (CSO)	30	33	33	32.0	Y
STONE ROAD/BANKHOUSE ROAD JNCT CSO	1	2	2	1.7	N
STRONGFORD SEWAGE TREATMENT WORKS	79	84	84	82.3	Y
STUART ROAD COMBINED SEWER OVERFLOW	0	0	0	0.0	N
SUTHERLAND ROAD CSO	12	8	8	9.3	N
TRENT VALE SPS	46	53	53	50.7	Y
TRENTHAM - STONE ROAD 1 CSO	12	17	17	15.3	Y
UTTOXETER ROAD CSO	0	0	0	0.0	N

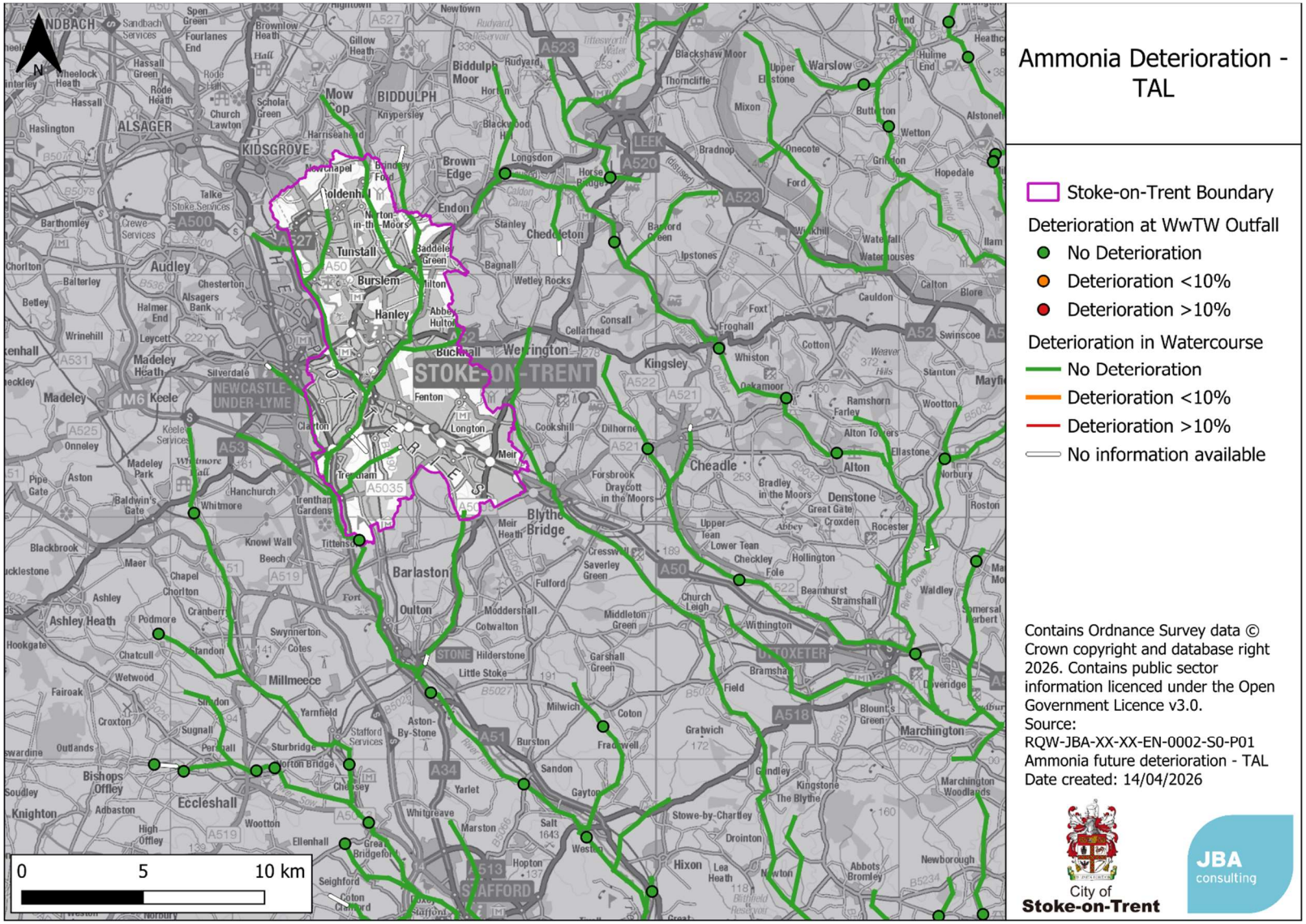
Overflow	Number of operations 2023	Number of operations 2024	Number of operations 2025	Average number of operations 2023 2025	Above threshold for investigation? (Y/N)
VICTORIA ROAD SEWAGE PUMPING STA	45	4	4	17.7	Y
WATLANDS VIEW CSO	4	2	2	2.7	N
WERBURGH DRIVE CSO	0	3	3	2.0	N
WERRINGTON ROAD CSO	39	49	49	45.7	Y
WESTON COYNEY - PARK AVE/HORTON DRIVE (CSO)	0	1	1	0.7	N
WILLIAM STREET CSO	3	6	6	5.0	N
WOLSELEY ROAD CSO	3	5	5	4.3	N
WOOLISCROFT ROAD CSO	1	1	1	1.0	N

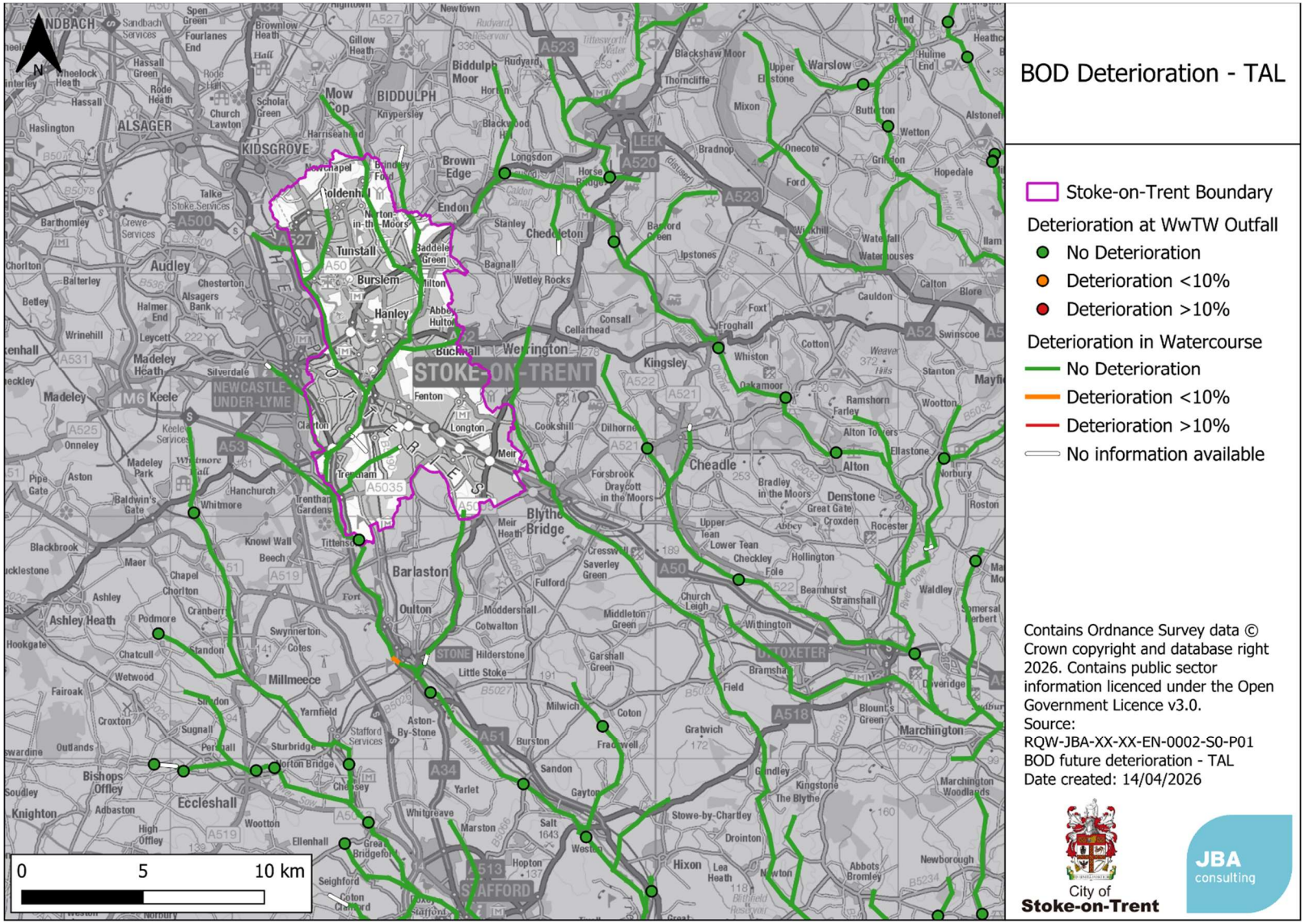
E Water quality assessment mapping

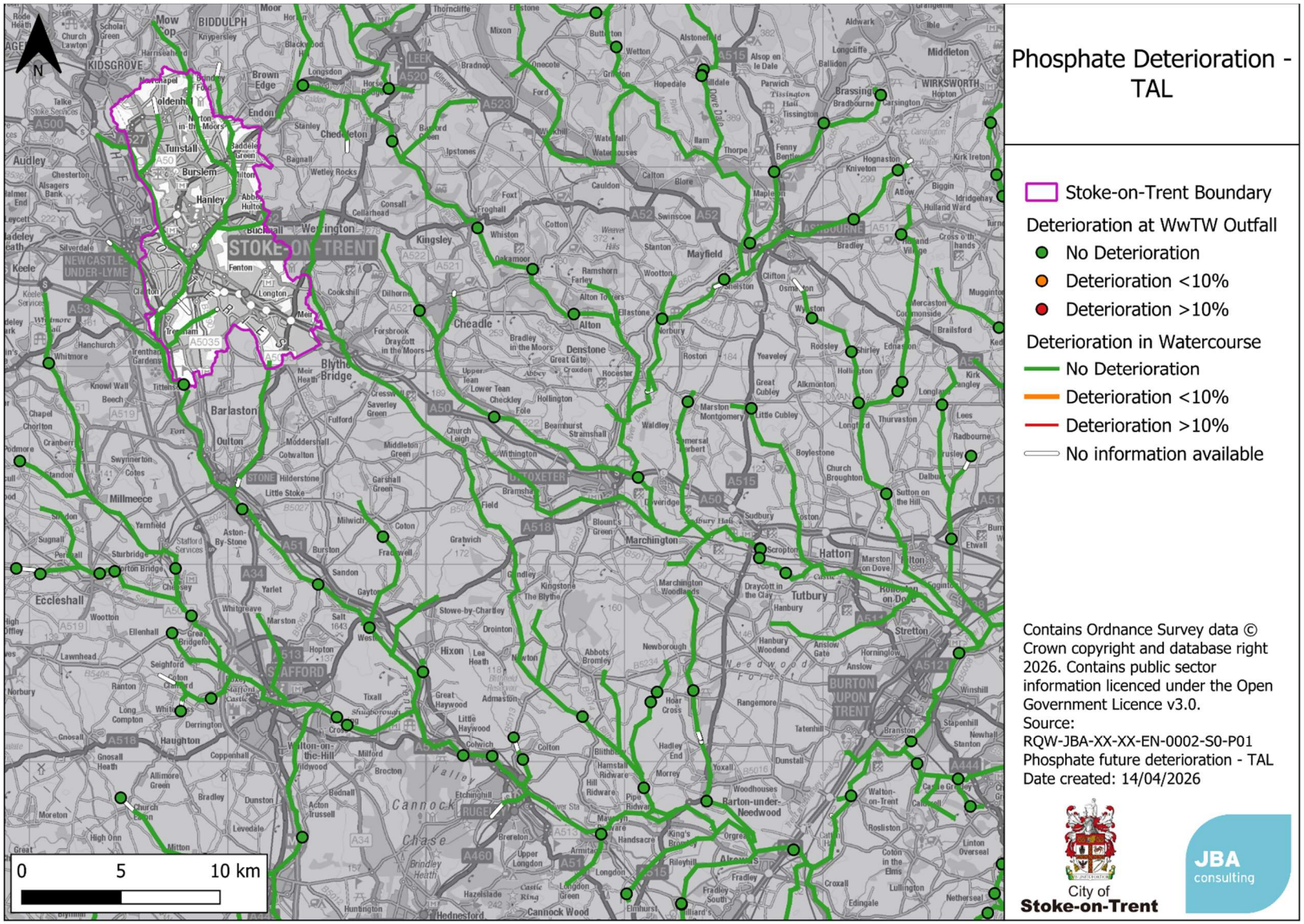



BOD Deterioration
Stoke-on-Trent Boundary
Deterioration at WwTW Outfall
No Deterioration
Deterioration <10%
Deterioration >10%
Deterioration in Watercourse
No Deterioration
Deterioration <10%
Deterioration >10%
No information available
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Source:
RQW-JBA-XX-XX-EN-0002-S0-P01
BOD future deterioration
Date created: 14/04/2026
City of Stoke-on-Trent
JBA consulting
0
5
10 km
STOKE-ON-TRENT
NEWCASTLE-UNDER-LYME
Burslem
Hanley
Tunstall
Longton
Fenton
Stoke
Meir
Blythe Bridge
Barlaston
Oulton
Millmeece
Eccleshall
Audley
Madeley
Kidsgrove
Biddulph
Leek
Cheadle
Alton
Uttoxeter
Marchington
Warslow
Kingsley
Checkley
Denstone
Ashley Heath
Bishops Offley
Knighton
Adbaston
Whitgreave
Stowe-by-Chartley
Drointon
Hixon
Stafford
Newborough
Abbots Bromley


Phosphate Deterioration
Stoke-on-Trent Boundary
Deterioration at WwTW Outfall
No Deterioration
Deterioration <10%
Deterioration >10%
Deterioration in Watercourse
No Deterioration
Deterioration <10%
Deterioration >10%
No information available
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Source:
RQW-JBA-XX-XX-EN-0002-S0-P01
Phosphate future deterioration
Date created: 14/04/2026
City of Stoke-on-Trent
JBA consulting
0
5
10 km
N
STOKE-ON-TRENT
NEWCASTLE-UNDER-LYME
STAFFORD
BURTON UPON TRENT
Cannock Chase


Ammonia Deterioration - TAL
Stoke-on-Trent Boundary
Deterioration at WwTW Outfall
No Deterioration
Deterioration <10%
Deterioration >10%
Deterioration in Watercourse
No Deterioration
Deterioration <10%
Deterioration >10%
No information available
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Source:
RQW-JBA-XX-XX-EN-0002-S0-P01
Ammonia future deterioration - TAL
Date created: 14/04/2026
City of Stoke-on-Trent
JBA consulting
0
5
10 km
STOKE-ON-TRENT
NEWCASTLE-UNDER-LYME
STAFFORD
LEEK
UTTOXETER
Audley
Madeley
Barlaston
Eccleshall
Bishops Offley
Ashley Heath
Millmeece
Alton
Cheadle
Kingsley
Werrington
Burslem
Hanley
Tunstall
Biddulph
Biddulph Moor
Kidsgrove
Alsager
Warslow
Blackshaw Moor
Brown Edge
Endon
Longton
Fenton
Meir
Blythe Bridge
Denstone
Marchington
Yarlet
Sandon
Gayton
Burston
Milwich
Coton
Fradswell
Aston-By-Stone
Stowe-by-Chartley
Hixon
Marston
Whitgreave
Knighton
Adbaston
Woodseaves
Seighford
Coton
Crakemarsh
Ellenhall
Wootton
Croxton
Sugnall
Millmeece
Yarnfield
Swynnerton
Podmore
Whitmore
Madeley Heath
Keele
Newchapel
Goldenhill
Chesterton
Halmer End
Wrinehill
Betley
Balterley
Barthomley
Crewe
Talke
Mow Cop
Harriseahead
Scholar Green
Church Lawton
Rode Heath
Hassall Green
Wheelock Heath
Haslington
Sandbach
Brownlow Heath
Gillow Heath
Knypersley
Newtown
Rudyard
Rudyard Reservoir
Thorncliffe
Upper Elkstone
Mixon
Butterton
Wetton
Onecote
Bradnop
Grindon
Hopedale
Ford
Waterfall
Waterhouses
Ipstones
Cheddleton
Stanley
Wetley Rocks
Bagnall
Consall
Cellarhead
Froghall
Foxt
Cauldon
Calton
Blore
Ilam
Swinscoe
Stanton
Whiston
Oakamoor
Cotton
Ramshorn
Farley
Alton Towers
Ellastone
Norbury
Roston
Wootton
Mayfield
Bradley in the Moors
Great Gate
Croxden
Rocester
Draycott in the Moors
Forsbrook
Dilhorne
Cookshill
Longdon
Horse Bridge
Brindley Ford
Norton-in-the-Moors
Baddeley Green
Abbey Hulton
Talke
Stoke Services
Keele Services
Madeley Park
Whitmore Hall
Hanchurch
Trentham Gardens
Trentham
Tittensor
Knowl Wall
Beech
Maer
Chapel Chorlton
Ashley
Cranberry
Standon
Chatcull
Wetwood
Fairoak
Outlands
Swardine
Hookgate
Blackbrook
Pipe Gate
Aston
Baldwin's Gate
Onneley
Silverdale
Newcastle Services
Meir Heath
Fulford
Saverley Green
Cresswell
Middleton Green
Moddershall
Cotwalton
Oulton
Hilderstone
Little Stoke
Garshall Green
Stone
Stafford Services
Sturbridge
Norton Bridge
Chebsey
Great Bridgeford
Hopton
Milford
Weston
Salt
Drointon
Lea Heath
Newton
Abbots Bromley
Newborough
Blount's Green
Gratwich
Field
Bramshall
Doveridge
Marchington Woodlands
Kingstone
The Blythe
Gandley
Withington
Church Leigh
Checkley
Fole
Upper Tean
Lower Tean
Hollington
Beamhurst
Stramshall
Waldley
Somersal Herbert
Cotton
Whiston
Oakamoor
Ramshorn
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Blount's Green
Gratwich
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Bramshall
Doveridge
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Kingstone
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Gandley
Withington
Church Leigh
Checkley
Fole
Upper Tean
Lower Tean
Hollington
Beamhurst
Stramshall
Waldley
Somersal Herbert


BOD Deterioration - TAL
Stoke-on-Trent Boundary
Deterioration at WwTW Outfall
No Deterioration
Deterioration <10%
Deterioration >10%
Deterioration in Watercourse
No Deterioration
Deterioration <10%
Deterioration >10%
No information available
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Source:
RQW-JBA-XX-XX-EN-0002-S0-P01
BOD future deterioration - TAL
Date created: 14/04/2026
City of Stoke-on-Trent
JBA consulting
0
5
10 km
STOKE-ON-TRENT
NEWCASTLE-UNDER-LYME
BIDDULPH
KIDSGROVE
ALSAGER
Audley
Burslem
Hanley
Tunstall
Wolstanton
Wolstanton
Madeley
Keele
Barlaston
Oulton
Millmeece
Eccleshall
Bishops Offley
Knighton
Adbaston
Ashley
Ashley Heath
Chapel Chorlton
Maer
Blackbrook
Whitmore
Baldwin's Gate
Aston
Onneley
Madeley Heath
Madeley Park
Pipe Gate
Alsagers Bank
Chesterton
Halmer End
Wrinehill
Betley
Balterley
Barthomley
Crewe Services
Talke
Stoke Services
Haslington
Hassall
Hassall Green
Rode Heath
Wheelock Heath
Sandbach
Sandbach Services
Fourlanes End
Spen Green
Church Lawton
Scholar Green
Brownlow Heath
Gillow Heath
Mow Cop
Harriseahead
Biddulph Moor
Rudyard
Knypersley
Brindley Ford
Newchapel
Goldenhill
Norton-in-the-Moors
Baddeley Green
Endon
Brown Edge
Longsdon
Stanley
Chedleton
Bagnall
Wetley Rocks
Caldon
Horse Bridge
Leek
Bradnop
Onecote
Grindon
Hopedale
Thorncliffe
Blackshaw Moor
Upper Elkstone
Warslow
Butterton
Wetton
Alstonefield
Mixon
Ford
Ipstones
Cheddleton
Basford Green
Wetley Rocks
Consall
Cellarhead
Foxt
Froghall
Whiston
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Calton
Blore
Waterfall
Waterhouses
Wetley Rocks
Swinscoe
Ramshorn
Farley
Alton Towers
Ellastone
Alton
Cheadle
Bradley in the Moors
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Great Gate
Croxden
Rocester
Norbury
Roston
Wootton
Mayfield
Stanton
Weaver Hills
Cotton
Whiston
Foxt
Froghall
Consall
Cellarhead
Kingsley
Fenton
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Meir
Cookshill
Dilhorne
Forsbrook
Draycott in the Moors
Blythe Bridge
Meir Heath
Cresswell
Saverley Green
Fulford
Tittensor
Trentham
Trentham Gardens
Hanchurch
Whitmore
Knowl Wall
Beech
Swynnerton
Cotes
Standon
Chatcull
Wetwood
Fairoak
Croxton
Sugnall
Outlands
Yarnfield
Stafford Services
Aston-By-Stone
Sturbridge
Norton Bridge
Cheswardine
Swardine
Soudley
Ellenhall
Great Bridgeford
Seighford
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Yarlet
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Garshall Green
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Draycott in the Moors
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Sandbach Services
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Chedleton
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Caldon
Horse Bridge
Leek
Bradnop
Onecote
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Hopedale
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Warslow
Butterton
Wetton
Alstonefield
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Ford
Ipstones
Cheddleton
Basford Green
Wetley Rocks
Consall
Cellarhead
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Froghall
Whiston
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Calton
Blore
Waterfall
Waterhouses
Wetley Rocks
Swinscoe
Ramshorn
Farley
Alton Towers
Ellastone
Alton
Cheadle
Bradley in the Moors
Denstone
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Norbury
Roston
Wootton
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Stanton
Weaver Hills
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Hanchurch
Whitmore
Knowl Wall
Beech
Swynnerton
Cotes
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Wetwood
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Croxton
Sugnall
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Yarnfield
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Bramshall
Uttoxeter
Withington
Beamhurst
Stramshall
Waldley
Somersal Herbert
Church Leigh
Checkley
Fole
Hollington
Lower Tean
Upper Tean
Blount's Green
Marchington
Marchington Woodlands
Kingstone
The Blythe


Phosphate Deterioration - TAL
Stoke-on-Trent Boundary
Deterioration at WwTW Outfall
No Deterioration
Deterioration <10%
Deterioration >10%
Deterioration in Watercourse
No Deterioration
Deterioration <10%
Deterioration >10%
No information available
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Source:
RQW-JBA-XX-XX-EN-0002-S0-P01
Phosphate future deterioration - TAL
Date created: 14/04/2026
City of Stoke-on-Trent
JBA consulting
0
5
10 km
N
STOKE-ON-TRENT
NEWCASTLE-UNDER-LYME
STAFFORD
BURTON UPON TRENT
Cannock Chase

F Environmental Sites Water Quality Impact Assessment

F.1 SSSIs downstream of WwTWs serving growth in Stoke-on-Trent

SSSI name	ID	SIMCAT Model Point	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration	Ammonia Deterioration TAL	BOD Deterioration TAL	Phosphate Deterioration TAL
Attenborough Gravel Pits SSSI	1002867	Extra Plot Point - Reach 699 No 3	0%	0%	0%	-21%	-3%	-46%
Besthorpe Meadows SSSI	1007109	Extra Plot Point - Reach 807 No 1	0%	0%	0%	-40%	-5%	-46%
Besthorpe Warren SSSI	1009935	Extra Plot Point - Reach 809 No 1	0%	0%	0%	-39%	-5%	-46%
Cannock Chase SSSI	1002228	Extra Plot Point - Reach 247 No 1	0%	0%	2%	-12%	-5%	-46%
Holme Pit SSSI	1002892	Extra Plot Point -	0%	0%	0%	-22%	-3%	-46%

SSSI name	ID	SIMCAT Model Point	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration	Ammonia Deterioration TAL	BOD Deterioration TAL	Phosphate Deterioration TAL
		Reach 720 No 1						
Lea Marsh SSSI	1007160	CSO 1593	0%	0%	0%	-35%	-4%	-45%
Lockington Marshes SSSI	1003043	Reach 537	0%	0%	0%	-22%	-3%	-46%
Mother Drain, Misterton SSSI	1002709	East Stockwith STW	0%	0%	0%	-39%	-4%	-45%
Old River Dove, Marston On Dove SSSI	1002254	FS Dove Marston on D	0%	0%	2%	-23%	-1%	-65%
River Mease SSSI	1007357	Start of Reach 273	0%	0%	0%	-21%	-3%	-47%
Spalford Warren SSSI	1003095	Extra Plot Point - Reach 815 No 1	0%	0%	0%	-38%	-4%	-46%

F.2 SACs downstream of WwTWs serving growth in Stoke-on-Trent

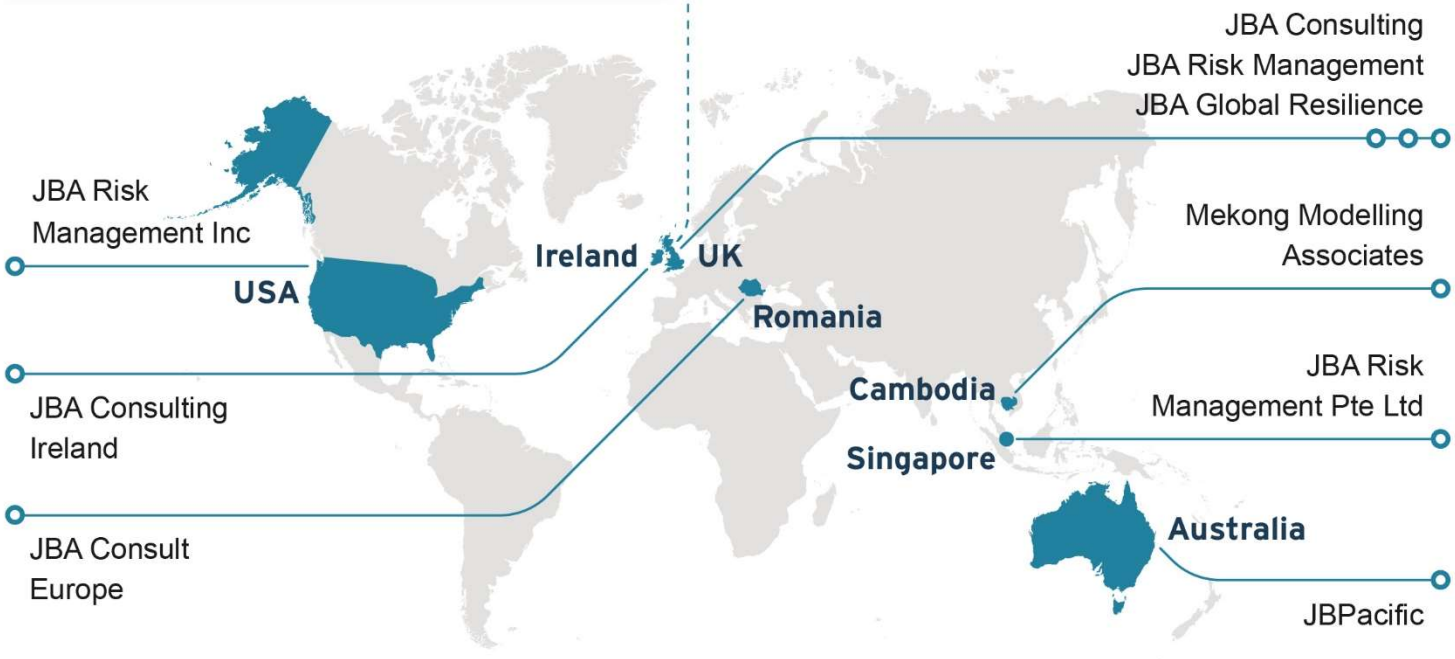
SAC name	ID	SIMCAT Model Point	Ammonia Deterioration	BOD Deterioration	Phosphate Deterioration	Ammonia Deterioration TAL	BOD Deterioration TAL	Phosphate Deterioration TAL
Cannock Chase	UK0030107	Extra Plot Point - Reach 247 No 1	0%	0%	2%	-12%	-5%	-46%
River Mease	UK0030258	Start of Reach 273	0%	0%	0%	-21%	-3%	-47%

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United Kingdom

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