ANNEX B5

Water Quality Monitoring

Minworth SRO

Severn Trent Water & Affinity Water

Water Quality - Baseline Monitoring and Modelling

Minworth Strategic Resource Option

Affinity Water, Severn Trent Water Ltd

Project number: 60663957

October 2022

Produced for Affinity Water in association with Severn Trent Water

Delivering a better world

Quality information

Prepared by	Checked by	Verified by	Approved by
[redacted] Consultant Water Scientist [redacted] Senior Hydrologist	[redacted] Project Manager	[redacted] Technical Director, Water Environment	[redacted] Water Sector Lead (Environment)

Revision History

Revision	Revision date	Details	Authorized	Name	Position
D2	17/06/22	First-line assurance comments addressed	17/06/22	[redacted]	Technical Director
V3	12/08/22	Second-line assurance comments addressed. Report updated with latest monitoring data	12/08/22	[redacted]	Technical Director
V4	20/10/22	Further second-line assurance comments addressed. Added data from additional baseline monitoring	21/10/22	[redacted]	Technical Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name
0	Y	Affinity Water, Severn Trent Water

Prepared for:

Affinity Water, Severn Trent Water Ltd

Prepared by:

AECOM Limited
1st floor, Victoria Square House
Victoria Square
Birmingham B2 4AJ
United Kingdom

T: +44 (121) 212 3035
aecom.com

Table of Contents

Figures

Tables

1. Introduction

1.1 Background

1.1.1 AECOM previously completed the Hydrology, Environment and Ecological (HEE) gap analysis of the River Tame, River Trent and Humber (TTH) system for Gate 1, carried out jointly for Minworth and the South Lincolnshire Reservoir (SLR). Subsequent investigations completed for Gate 2 include baseline Aquatic Ecological Monitoring (May 2022), water quality monitoring in the River Tame (June 2022), and Hydrological, Aquator and Hydraulic Modelling of the rivers Tame and Trent (June 2022). The latter is running parallel with these assessments and provides modelling outputs to inform the assessment of potential environmental impacts. This report also informs the Minworth Environmental Assessment Report and associated Water Framework Directive (WFD) Assessment (AECOM June 2022).

1.1.2 The HEE baseline study for the TTH in support of Minworth and SLR for Gate 1 encompassed 19 in-depth topic reports and an overall summary report to inform further environmental assessment for the Minworth and SLR Strategic Resource Options (SROs).

1.1.3 The Gate 1 work involved considering Water Framework Directive (WFD) related impacts and benefits, baseline ecological data, and in particular the potential impacts of changes in flow to ecological receptors such as designated sites and their qualifying features, protected and notable species, and particular constraints from the presence or future spread of Invasive Non-Native Species (INNS). Other topics assessed were Navigation, Sedimentation, Assets along the Trent, Abstraction and Discharge Licences, Saline Intrusion, Fish Habitats and Migration, Biodiversity Net Gain, Natural and Social Capital, and Soil and Humidity. Some of these topics have been carried forward for further detailed assessment at Gate 2, as presented in the overall Environmental Assessment report[1] and the accompanying technical appendices. A separate WFD compliance assessment[2] has also been undertaken for Gate 2.

1.1.4 This report presents the results of the baseline water quality monitoring and water quality modelling of the River Tame and Trent, in support of the Minworth SRO only. Water quality monitoring in support of the SLR SRO has been undertaken and reported separately.

1.2 Objectives

1.2.1 The key objectives of the Gate 2 Environmental Assessments in respect of the Minworth SRO are as follows:

- Build on the work completed in Gate 1 to provide a robust impact assessment of the discharge reduction from Minworth in to the TTH system and surrounding environment and assess the impact the proposed transfer could have on aquatic ecology.
- Define what mitigation measures need to be implemented to satisfy regulators that the SROs are viable. Any mitigation measures that require engineering solutions such as modification to fish passes or weirs, should be fed back into the Engineering workstream.
- Support engagement with key stakeholders including the Environment Agency, Natural England, Canal and River Trust, Water Resources East, and the River Trent Working Group. This has taken the form of monthly workshops to present findings and/or discuss key themes, risks, or mitigations, and site visits to inform the assessment of specific features.
- Produce an environmental scoping checklist (provided in the Environmental Assessment report) to ensure identification of the likely significant environmental effects of the proposed projects and ensure all assessments and data collection are completed to support further environmental assessments during Gate 3.

1.2.2 This report sets out the findings of the baseline water quality monitoring, and the results of the water quality modelling.

[1] AECOM (April 2022). Environmental Assessment for the Trent Strategic Resource Options (SRO): Minworth SRO and South Lincolnshire Reservoir (SLR) SRO. Results and Recommendations.
[2] AECOM (June 2022). Water Framework Directive Assessment for Minworth SRO

1.3 Scope and Programme

Locations

1.3.1 The project brief stipulated that water quality sampling is required at the following locations:

- Upstream of Minworth WwTW discharges
- Downstream of both Minworth and Coleshill WwTW discharges
- Downstream of the River Blythe confluence with the River Tame
- Downstream of the River Anker confluence with the River Tame
- Downstream of the River Trent confluence with the River Tame

1.3.2 Further details on sampling locations are provided in Section 3.1.

Parameters

1.3.3 The parameters monitored consider the Water Supply (Water Quality) Regulations 2018 that apply to all treated water for human consumption to meet the wholesomeness criteria but also and in particular the specified requirements for new sources. Parameters have been classified into several groups, with each parameter to be analysed during each round of monitoring. Table 1-1 shows the full list of parameters for the Minworth SRO monitoring.

Table 1-1. List of Parameters

Parameter type	**Phys-Chem**			
Parameters	Hardness Turbidity	pH	Alkalinity	Salinity
Parameter type	**Pesticides**			
Parameters	2,4-D Aldrin Atrazine Bentazone Carbendazim Carbetamide Chlormequat Chlorotoluron Chlorothalonil	Clopyralid Dieldrin Diuron Flufenacet Fluroxypyr Glyphosate Heptachlor Heptachlor epoxide Isoproturon	Linuron MCPA MCPB Mecoprop Metaldehyde Metazachlor Monuron Propazine Propyzamide	Prosulfocarb Quinmerac Simazine Terbutryn Triallate Clothianidin* Imidacloprid* Omethoate Permethrin
Parameter type	**Fuels**			
Parameters	Benzene	Benzo(a)pyrene	Polycyclic Aromatic Hydrocarbons (total)	
Parameter type	**Solvents**			
Parameters	1-2-dichloroethane Epichlorohydrin	Tetrachloroethene Trichloroethene	Tetrachloromethane	Trihalomethanes (total)
Parameter type	**Metals (dissolved)**			
Parameters	Aluminium Antimony Arsenic Boron	Cadmium Chromium Copper Iron	Lead Manganese Mercury Nickel	Selenium Sodium
Parameter type	**Microbiology**			
Parameters	Clostridium perfringens Colony counts	Coliform bacteria Cryptosporidium	Enterococci	E. coli
Parameter type	**Nutrients**			
Parameters	Ammonium Nitrate	Nitrite Phosphorus (total)	Orthophosphate (as P)	Orthophosphate (as PO_4)
Parameter type	**Algal indicators**			
Parameters	Chlorophyll-a	Cyanobacteria		

Parameter type	**Other – high impact**			
Parameters	Gross alpha activity Gross beta activity	Acrylamide Cyanide (total)	Indicative dose Radon	Tritium
Parameter type	**Other – low impact**			
Parameters	Bromate Bromide Chloride	True colour Conductivity Fluoride	Sulphate Total organic carbon	Dissolved organic carbon Vinyl chloride

* - clothianidin and imidacloprid were not originally included in the list of key parameters but were added following discussion with the Environment Agency.

1.3.4 The following parameters were added to the monitoring scope for the final monitoring round only. Analytical results for these parameters are not yet available but will be included in an updated version of this report. These parameters are:

- Dissolved cobalt
- Cypermethrin
- EDTA
- Hexabromocyclododecane (HBCDD)
- Mancozeb
- Nonylphenols
- Perfluorooctane sulfonic acid and its derivatives
- Zinc (see Table 4-7 and associated footnote)

Programme

1.3.5 The initial scope required 12 baseline monitoring rounds to be completed. Following initial discussions with Affinity Water and Severn Trent Water, the first monitoring visit was completed in early August 2021. The end date of the sampling programme was retained as May 2022 in accordance with the timeline for Gate 2; consequently some months have included two visits as detailed in Table 1-2. During the winter months (November to February), visits were completed across two consecutive days due to lack of daylight hours.

1.3.6 During Summer 2022, following discussions between Affinity Water, Severn Trent Water, the Environment Agency, and AECOM, it was decided that an additional baseline monitoring round be undertaken during a period of very low river flows. This round was completed on 1 August 2022.

Table 1-2. Sampling Programme

Visit Number	Date(s)
1	4 August 2021
2	25 August 2021
3	23 September 2021
4	20 October 2021
5	25-26 November 2021
6	7-8 December 2021
7	12-13 January 2022
8	7-8 February 2022
9	1 March 2022
10	22 March 2022
11	11 April 2022
12	5 May 2022
13	1 August 2022

Water Quality Modelling

The water quality monitoring data collected under the above scope of works has been used to inform modelling of the impacts of reducing discharges from Minworth WwTW on downstream flow and water quality. Changes in flow and concentrations of orthophosphate, ammonia, and BOD downstream of Minworth WwTW have been assessed using SIMCAT catchment modelling and the results are presented in terms of absolute change in concentrations and compliance with WFD status limits. Impacts for other parameters have been assessed based on mass balance mixing calculations and review of percent changes in downstream concentration.

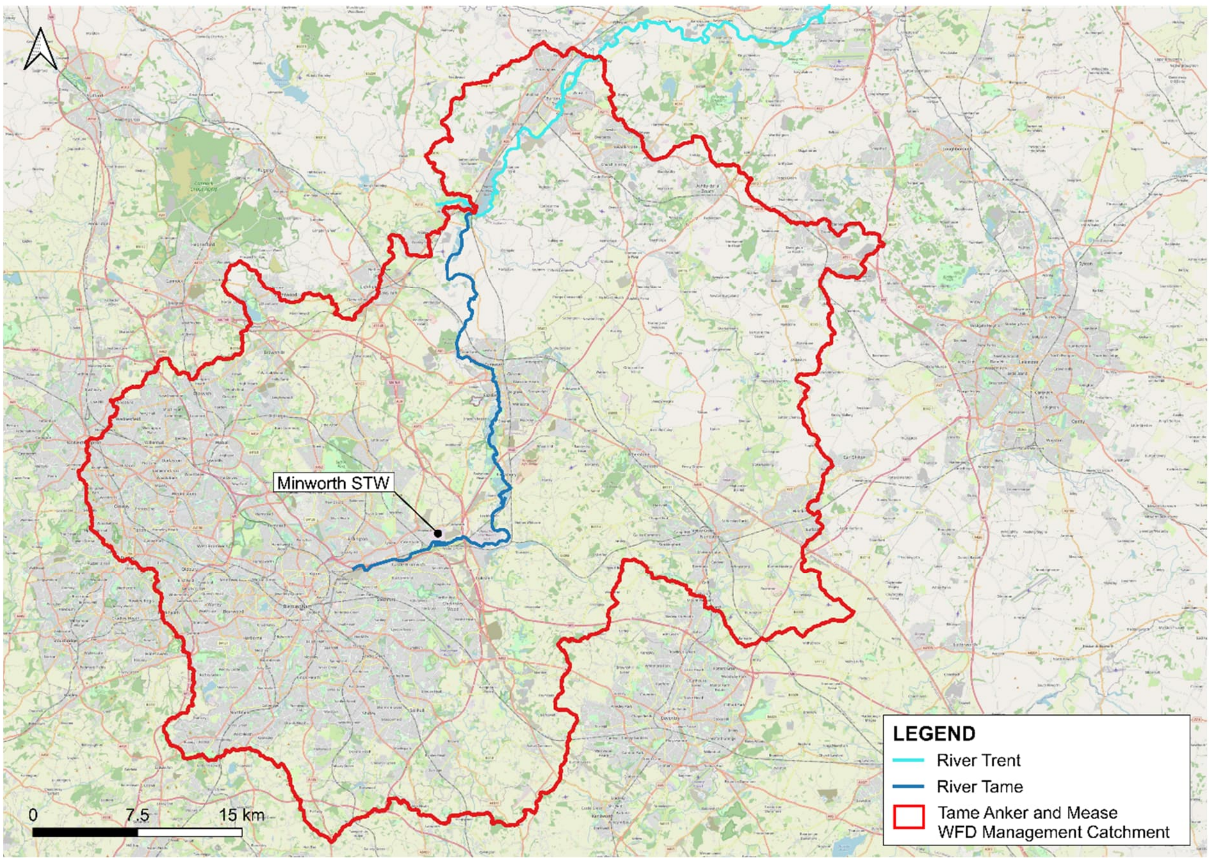
2. Baseline Environment and Data

2.1 Catchment Overview & Hydrology

River System

2.1.1 The study area lies within the ‘Tame Anker and Mease’ Water Framework Directive (WFD) Management Catchment (Figure 2-1), the most southerly unit of the Humber River Basin. The Humber River Basin itself extends south to north from the West Midlands to North Yorkshire and from Staffordshire in the west to part of Lincolnshire and the Humber Estuary in the east.

Figure 2-1. Tame Anker and Mease WFD Management Catchment



2.1.2 The ‘Tame Anker and Mease’ Management Catchment includes the major urban centre of Birmingham and as such a large proportion of land use within this catchment is dedicated to industrial activities and residential areas, although agricultural land makes up swathes of the management unit in its’ northern and eastern extents. The major watercourse within this management unit is the River Trent, located within the north of the unit as it flows north to Burton upon Trent from its confluence with the River Tame, situated east of Alrewas, Staffordshire. The River Tame is the other major watercourse within this unit and the primary tributary of the River Trent.

2.1.3 The River Tame has two main sources generally known as the Willenhall Arm and the Oldbury Arm, both of which flow through the Black Country to the north-west of Birmingham, to their confluence at Bescot, Walsall. From the confluence, the River Tame flows into the north of Birmingham via Sandwell Valley where it flows through Hamstead and Perry Hall Park to Perry Barr, before continuing through Witton, then Gravelly Hill where the River Rea merges with the River Tame. The watercourse then passes north of Castle Bromwich and leaves Birmingham to the north-east at Park Hall Nature Reserve. Most of the River Tame's channel has been realigned through this extent to accommodate for industry, residential areas, and infrastructure, most notably the M6 and the Birmingham Canals.

2.1.4 As the River Tame leaves Birmingham, it begins to recover some of its' natural meanders. After Minworth Sewage Treatment Works, the River Tame flows through Water Orton and is joined by the River Blythe SSSI, having itself just been joined by the River Cole. The River Cole runs from Birmingham through Coleshill, whilst the River Blythe runs through the more rural landscape of Arden from the other side of Packington Park. The floodplain opens out where the three rivers meet near Hams Hall, with a large number of pools, mostly the result of former sand and gravel extraction that now act as settlement ponds to help remove heavy metals and other pollutants.

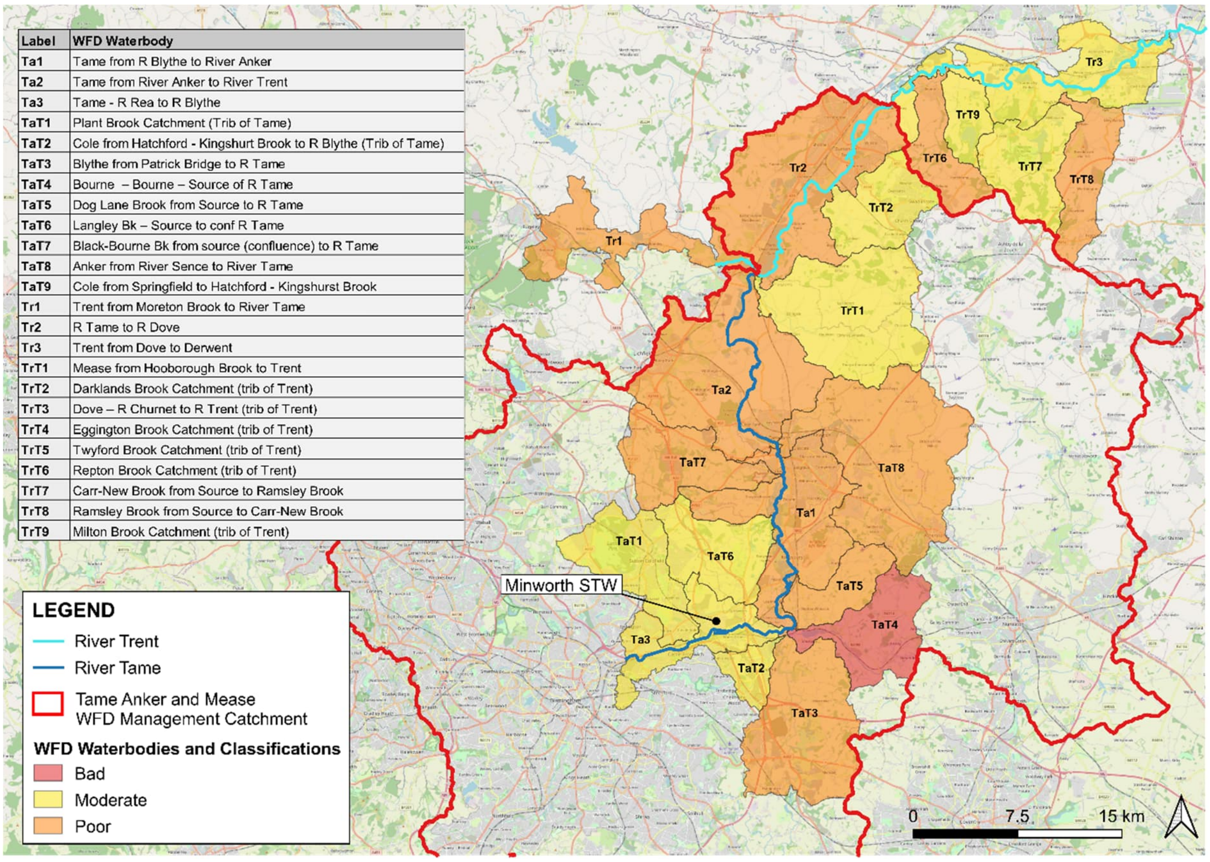
2.1.5 The River Tame continues to flow north beyond the Lea Marston Pools at Hams Hall, through Kingsbury and on to Tamworth, where it is joined by the River Anker from the east. After its confluence with the Anker, the River Tame continues its journey north-west out of the scheme area and further north towards the River Trent via Burton upon Trent, the northern extent of the management unit and this study.

Water Framework Directive

2.1.6 Under the WFD it is a legislative requirement to maintain and improve ecological and chemical status of the water environment, which includes rivers, lakes, wetlands, groundwater, estuaries, and coastal waters. The Environment Agency bears overall responsibility for implementation of the WFD in England, including setting and measuring progress against various objectives. The section of the River Tame within this study falls within the 'Tame Anker and Mease' Management Unit Operational Catchment whilst the River Trent falls within the 'Trent – Tame to Dove Rivers' Operational Catchment.

2.1.7 There are four WFD surface water waterbodies within the study area (Figure 2-2), three along the River Tame (Table 2-1, Table 2-2, Table 2-3) and one along the River Trent (Table 2-4).

Figure 2-2. WFD Water Bodies within the study area



2.1.8 The 'Tame – R Rea to R Blythe' WFD Water Body is classified as Moderate overall Status. In the most recent River Basin Management Cycle 2 (2015), the water body was classified as having Moderate Ecological Status and a Fail Chemical Status. Recent monitoring undertaken in 2019 shows no change in classification. The objective of the water body is to achieve Moderate status by 2015, rather than Good, since an unfavourable balance of costs and benefits make any objective beyond this target infeasible. Reasons for not achieving good are attributed to diffuse and point source pollution sources including sewage discharges, urbanisation, and contaminated land.

Table 2-1. Tame – R Rea to R Blythe WFD Water Body Classifications (2019)[3]

RBMP Parameter	Tame – R Rea to R Blythe
RBMP	Humber RBMP
Waterbody ID	GB104028046841
Water Body Type	Heavily Modified
Catchment Area (km^2)	32.48
Length (km)	14.36
Overall Ecological Potential / Status	Moderate
Chemical Status	Fail
Biological Quality Elements	Poor
Fish	Poor
Invertebrates	Moderate
Physico-Chemical Parameters	Moderate
Acid Neutralising Capacity	High
Ammonia (phys-chem)	Moderate
Biochemical Oxygen Demand	High
Dissolved Oxygen	Good
pH	High
Phosphate	Poor
Temperature	High
Hydromorphological Parameters	Supports Good
Hydrological regime	Supports Good
Supporting Elements (Surface Water)	Moderate
Specific pollutants	Moderate
Copper	High
Iron	High
Manganese	High
Permethrin	High
Triclosan	High
Zinc	Moderate
Chemical	Fail
Priority hazardous substances	Fail
Benzo(a)pyrene	Good
Benzo(b)fluoranthene	Good
Benzo(g-h-i)perylene	Good
Benzo(k)fluoranthene	Good
Cadmium and Its Compounds	Good
Dioxins and dioxin-like compounds	Good
Heptachlor and cis-Heptachlor epoxide	Good
Hexabromocyclododecane (HBCDD)	Good
Hexachlorobenzene	Good
Hexachlorobutadiene	Good
Mercury and Its Compounds	Fail
Perfluorooctane sulphonate (PFOS)	Fail

[3] Catchment Data Explorer (online). Accessed 19 April 2022. Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028046841

RBMP Parameter	Tame – R Rea to R Blythe
Polybrominated diphenyl ethers (PBDE)	Fail
Tributyltin Compounds	Good
Priority substances	Fail
Cypermethrin (Priority hazardous)	Fail
Fluoranthene	Good
Lead and Its Compounds	Good
Nickel and Its Compounds	Fail
Trichloromethane	Good
Other Pollutants	Good
Trichloroethylene	Good
pH	High

2.1.9 The 'Tame from R Blythe to River Anker' WFD Water Body is classified as Poor Overall Status under the most recent River Basin Management Cycle 2 (2015), due to being classified as having Poor Ecological status and a Fail Chemical Status. Monitoring completed in 2019 shows no change in status and different assessment elements, although Phosphorus was found to improve from Bad to Poor, between 2015 and 2019. The objective for the water body is Poor by 2015, since there are a number of issues preventing the water body from achieving Good Status as reported on the Catchment Data Explorer, specifically diffuse and point source pollution sources associated with sewage discharges, urbanisation, and contaminated land.

Table 2-2. Tame from R Blythe to River Anker WFD Water Body Classifications (2019)[4]

RBMP Parameter	Tame from R Blythe to River Anker
RBMP	Humber RBMP
Waterbody ID	GB104028046440
Water Body Type	Heavily Modified
Catchment Area (km²)	61.66
Length (km)	18.10
Overall Ecological Potential / Status	Poor
Chemical Status	Fail
Biological Quality Elements	Poor
Fish	Poor
Invertebrates	Moderate
Macrophytes and Phytobenthos Combined	Poor
Physico-Chemical Parameters	Moderate
Ammonia (Phys-Chem)	Good
Dissolved oxygen	Moderate
Phosphate	Poor
Temperature	Good
pH	High
Hydromorphological Supporting Elements	Supports good
Hydrological Regime	Supports good
Morphology	Supports good
Specific pollutants	High
Chromium (VI)	High
Copper	High
Iron	High
Manganese	High
Triclosan	High
Zinc	High

[4] Catchment Data Explorer (online). Accessed 19 April 2022. Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028046440

RBMP Parameter	Tame from R Blythe to River Anker
Chemical	Fail
Priority hazardous substances	Fail
Benzo(a)pyrene	Good
Benzo(b)fluoranthene	Good
Benzo(g-h-i)perylene	Good
Benzo(k)fluoranthene	Good
Cadmium and Its Compounds	Good
Dioxins and dioxin-like compounds	Good
Heptachlor and cis-Heptachlor epoxide	Good
Hexabromocyclododecane (HBCDD)	Good
Hexachlorobenzene	Good
Hexachlorobutadiene	Good
Mercury and Its Compounds	Fail
Perfluorooctane sulphonate (PFOS)	Fail
Polybrominated diphenyl ethers (PBDE)	Fail
Tributyltin Compounds	Fail
Priority substances	Good
Cypermethrin (Priority hazardous)	Good
Fluoranthene	Good
Lead and Its Compounds	Good
Nickel and Its Compounds	Good
Other Pollutants	Does not require assessment

2.1.10 The 'Tame from River Anker to River Trent' WFD Waterbody is classified as Poor Overall Status under the River Basin Management Cycle 2 (2015). The status is derived from the water body's Poor Ecological status and its' Fail Chemical status. Monitoring of the water body in 2019 shows a degradation in the water body's Ecological status from Moderate to Poor between 2015 and 2019, as a result of Macrophytes and Phytobenthos Combined being classified as Poor in 2019. The objective for the water body is Good by 2027. Reasons for the water body not currently achieving Good status as reported on the Catchment Data Explorer are deemed to be a result of point source and diffuse source pollution associated with the water industry.

Table 2-3. Tame from River Anker to River Trent WFD Water Body Classifications (2019)[5]

RBMP Parameter	Tame from River Anker to River Trent
RBMP	Humber RBMP
Waterbody ID	GB104028047050
Water Body Type	Heavily Modified
Catchment Area (km^2)	90.58
Length (km)	19.76
Overall Ecological Potential / Status	Poor
Chemical Status	Fail
Biological Quality Elements	Poor
Fish	Good
Invertebrates	Moderate
Macrophytes and Phytobenthos Combined	Poor
Physico-Chemical Parameters	Moderate
Acid neutralising	High
Ammonia (Phys-Chem)	Good
Dissolved oxygen	Good
Phosphate	Poor

[5] Catchment Data Explorer (online). Accessed 19th April 2022. Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028047050

RBMP Parameter	Tame from River Anker to River Trent
Temperature	High
pH	High
Hydromorphological Supporting Elements	Supports good
Hydrological Regime	Supports good
Morphology	Supports good
Specific pollutants	High
Arsenic	High
Chlorothalonil	High
Chromium (VI)	High
Copper	High
Iron	High
Manganese	High
Pendimethalin	High
Triclosan	High
Zinc	High
Chemical	Fail
Priority hazardous substances	Fail
Benzo(a)pyrene	Good
Benzo(b)fluoranthene	Good
Benzo(g-h-i)perylene	Good
Benzo(k)fluoranthene	Good
Cadmium and Its Compounds	Good
Dioxins and dioxin-like compounds	Good
Heptachlor and cis-Heptachlor epoxide	Good
Hexabromocyclododecane (HBCDD)	Good
Hexachlorobenzene	Good
Hexachlorobutadiene	Good
Hexachlorocyclohexane	Good
Priority substances	Good
,2-dichloroethane	Good
Aclonifen	Good
Alachlor	Good
Benzene	Good
Bifenox	Good
Cybutryne	Good
Cypermethrin (Priority hazardous)	Good
Dichloromethane	Good
Dichlorvos (Priority)	Good
Fluoranthene	Good
Lead and Its Compounds	Good
Nickel and Its Compounds	Good
Pentachlorophenol	Good
Terbutryn	Good
Trichlorobenzenes	Good
Trichloromethane	Good
Other Pollutants	Does not require assessment
Aldrin, Dieldrin, Endrin & Isodrin	Good
Carbon Tetrachloride	Good
DDT Total	Good
Tetrachloroethylene	Good
Trichloroethylene	Good
para - para DDT	Good

2.1.11 The 'Trent – R Tame to R Dove' WFD Waterbody is classified as Poor Overall Status under the River Basin Management Cycle 2 (2015). The Ecological status of the waterbody was classified as Poor in 2015, with no improvement reported across monitoring between 2016 and 2019. The Chemical status is classified as Fail due to the presence of Priority hazardous substances such as Mercury, Perfluorooctane sulphonate (PFOS) and Polybrominated diphenyl ethers (PBDE). The objective of the water body is to achieve Good status by 2027 with reasons for not achieving good status as reported on the Catchment Data Explorer including diffuse and point source pollution associated with poor livestock management and intermittent and continuous sewage discharge.

Table 2-4. Trent – R Tame to R Dove WFD Water body (2019)[6]

RBMP Parameter	Trent – R Tame to R Dove
RBMP	Humber RBMP
Waterbody ID	GB104028047180
Water Body Type	Heavily Modified
Catchment Area (km^2)	88.47
Length (km)	21.43
Overall Ecological Potential / Status	Poor
Chemical Status	Fail
Biological Quality Elements	Poor
Fish	Poor
Invertebrates	Moderate
Macrophytes and Phytobenthos Combined	Moderate
Physico-Chemical Parameters	Moderate
Acid-Neutralising Capacity	High
Ammonia (Phys-Chem)	High
Dissolved oxygen	High
Phosphate	Poor
Temperature	High
pH	High
Hydromorphological Supporting Elements	Supports good
Hydrological Regime	Supports good
Morphology	Supports good
Specific pollutants	High
Chromium (VI)	High
Copper	High
Iron	High
Manganese	High
Triclosan	High
Zinc	High
Chemical	Fail
Priority hazardous substances	Fail
Benzo(a)pyrene	Good
Cadmium and Its Compounds	Good
Dioxins and dioxin-like compounds	Good
Heptachlor and cis-Heptachlor epoxide	Good
Hexabromocyclododecane (HBCDD)	Good
Hexachlorobenzene	Good
Hexachlorobutadiene	Good
Mercury and Its Compounds	Fail
Perfluorooctane sulphonate (PFOS)	Fail

[6] Catchment Data Explorer (online). Accessed 14th April 2022. Available at: https://environment.data.gov.uk/catchment-planning/WaterBody/GB104028047180

RBMP Parameter	Trent – R Tame to R Dove
Polybrominated diphenyl ethers (PBDE)	Fail
Tributyltin Compounds	Good
Priority substances	Good
Cypermethrin (Priority hazardous)	Good
Fluoranthene	Good
Lead and Its Compounds	Good
Nickel and Its Compounds	Good
Other Pollutants	Does not require assessment
Cypermethrin	Good
Fluoranthene	Good
Lead and its Compounds	Good
Nickel and its Compounds	Good

Geology

2.1.12 The underlying bedrock beneath the River Tame and River Trent within the study area (Table 2-5) is predominantly Triassic Rocks (undifferentiated). In addition, there are also areas of Millstone Grit Group, Merevale Shale Formation, Pennine Lower Coal Measures Formation and Alveley Member Formation underlying the River Tame, south, and southeast of Tamworth.

Table 2-5. Summary of Bedrock formations within the study area[7]

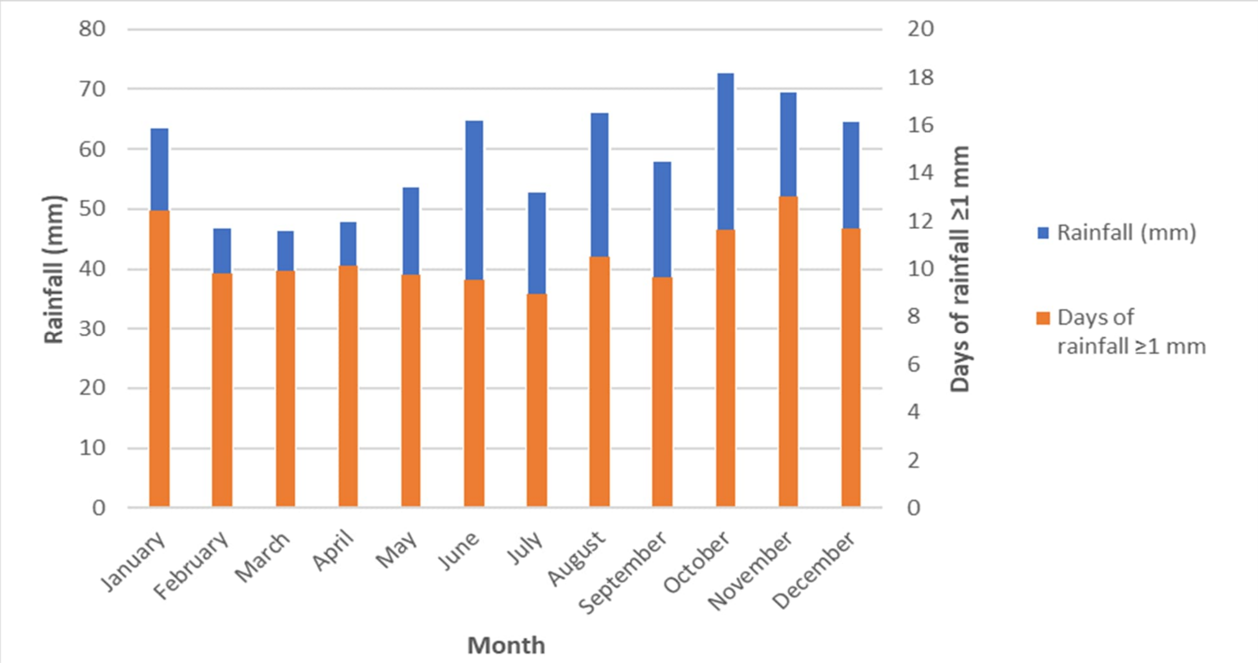
Bedrock Group/Formation name	Description
Triassic Rocks (Undifferentiated)	Mudstone, Siltstone and sandstone
Millstone Grit Group	Sandstone
Merevale Shale Formation	Mudstone
Pennine Lower Coal Measures Formation	Mudstone, Siltstone and sandstone
Alveley Member	Mudstone and sandstone

2.1.13 Alluvium superficial deposits are present along the lengths of the River Tame and River Trent within the study area, bordered by River Terrace Deposits (undifferentiated) – Sand and Gravel and Till – Diamicton.

[7] British Geological Survey Map Viewer. Accessed 14 April 2022. Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html

Rainfall

Figure 2-3. Coleshill Weather Station, average monthly rainfall and days of rainfall ≥ 1 mm.



2.1.14 The average annual rainfall at the site is approximately 708 mm based on the nearest Met Office climate station at Coleshill (located in the south-east of the study area, approximately 5 km of sample location 2A, 2B and 2C), measured between 1991 and 2020[8]. October to January is on average the wettest period with a range of 73 – 64 mm of rainfall (Figure 2-3). The driest period is February to April, with an average of 47 mm per month across this period.

2.2 Hydrological Monitoring

River Flow

2.2.1 Flow monitoring data from the National River Flow Archive[9] is presented for three stations within the study area: Tame at Water Orton (station number [redacted], Tame at Lea Marston Lakes (station number [redacted], and Trent at Drakelow Park (station number [redacted]), as shown on Figure 2-4. Data have been obtained for the period 1 July 2021 to 23 May 2022 for each of the flow gauging stations. Figures 2-5 to 2-7 show the flow data and are annotated in red to show the timings of the monitoring visits.

2.2.2 The River Tame at Water Orton flow monitoring station (Figure 2-4) is located approximately 8.5 km upstream of The River Tame at Lea Marston Lakes monitoring station. The greatest flows occurred in the autumn, with flows of 28.9 m^3/s and 29.3 m^3/s recorded on the 4 October 2021 and 31 October 2021 respectively. The approximate baseflow during the study period was 2 m^3/s, and Q95 was 1.89 m^3/s. Flows generally remain around baseflow levels between July and November, with peaks in flows characterised by steep rising and recessional limbs. Baseflow was generally higher across winter and declined into the spring months.

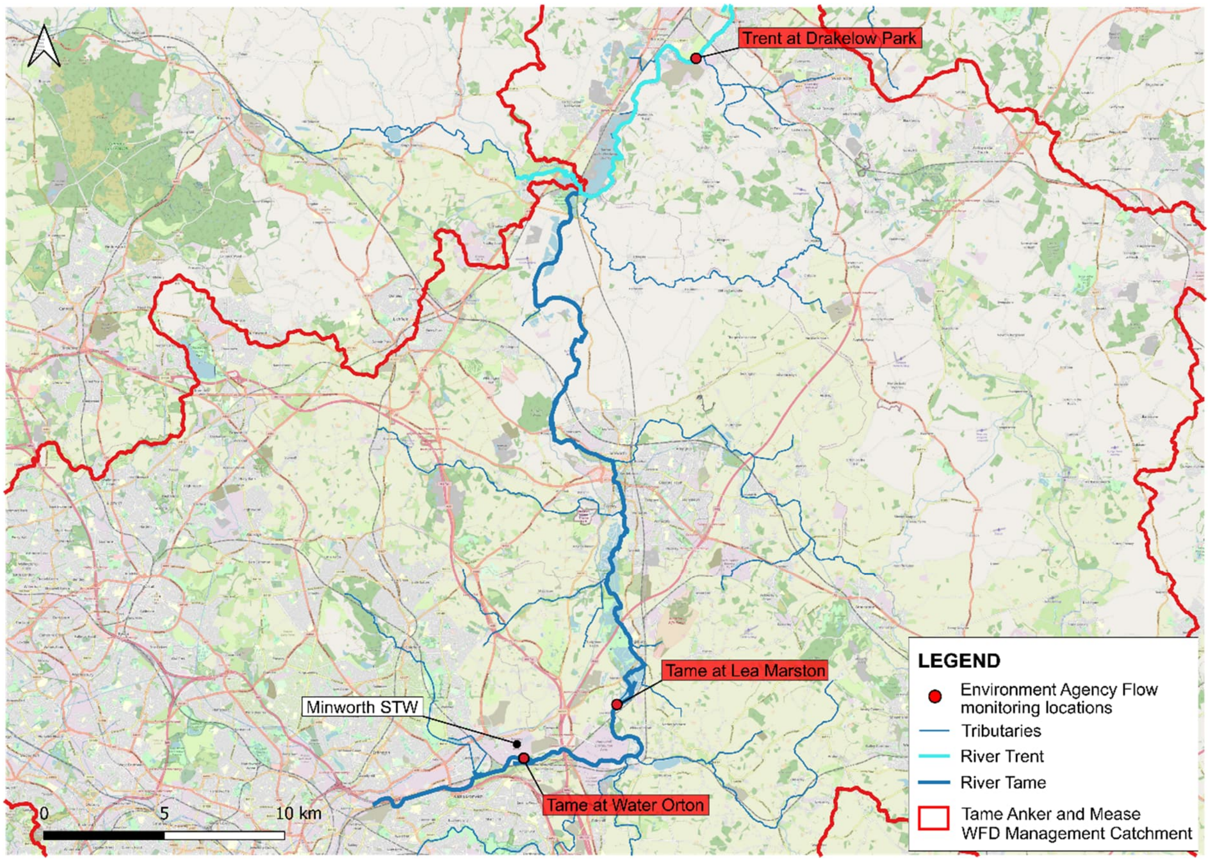
2.2.3 The River Tame at Lea Marston Lakes flow monitoring station (Figure 2-6), is located at the outfall to the Lea Marston Lakes from the River Tame, approximately 23km upstream of the confluence between the River Tame and the River Trent. Baseflow during the monitoring period was approximately 8 m^3/s whilst peak flow was noted as 53.9 m^3/s on 30 October 2021, 49% less than the peak flow recorded downstream at the Trent at Drakeflow Park Station. Peaks in flows are characterised by steep rising and recessional limbs with the largest peaks occurring between 29 October – 1 November 2021 (peak flow 53.9 m^3/s) and 24 – 27 December 2021 (peak flow 42.1 m^3/s). Q95 value across the monitoring study was 9.37 m^3/s.

[8] Met Office Coleshill Airport Climate Station (online). Available at: https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcqf99dn5
[9] National River Flow Archive (online). Accessed 14 April 2022. Available at: https://nrfa.ceh.ac.uk/

2.2.4 The flow record for the River Trent at Drakelow Park monitoring station (Figure 2-7), is located at the northern extent of the study area, approximately 7 km downstream of the confluence between the River Tame and the River Trent. Flow data for the study period shows baseflow in the region of 11 m³/s whilst peak flow for this period was observed at 135 m³/s on 22 February 2022. Peak flows are characterised on the hydrograph by steep rising and falling limbs, suggesting a responsive catchment to rainfall. Flows were lower through the summer, with flows steadily increasing as the autumn and winter progressed. Across the monitoring period, the Q95 value at this station was 12.2 m³/s.

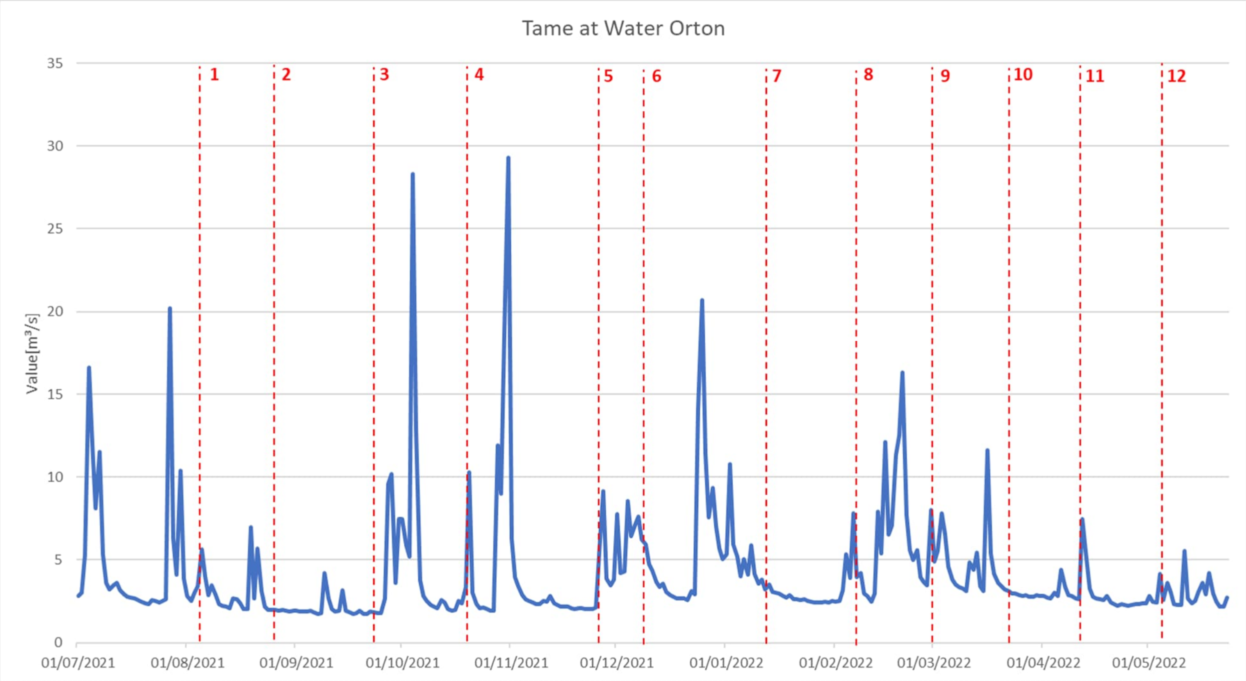
2.2.5 Monitoring visits 1, 2 and 3 took place at times of relatively low flow across the study area. Visit 4 on 20 October 2021 took place immediately a small peak in flow shown at all three flow monitoring stations. Visit 5 took place after a reasonably long period of low flow across the study area. Visits 6, 7, 8 and 9 (7-8 December 2021, 12-13 January 2022, 7-8 February 2022 and 1 March 2022) took place when flow was relatively high as would generally be expected during winter months. Visits 10, 11 and 12 during Spring 2022 took place during periods of low to moderate flow. The additional visit undertaken on 1 August 2022 was at a time of very low flow (not shown on Figures 2-5 to 2-7). The UK Water Resources Portal[10] indicates that flows were 1.75 m³/s (classified as 'exceptionally low' on the UK Water Resources Portal) in the Tame at Water Orton, 7.08 m³/s ('notably low') in the Tame at Lea Marston Lakes, and 13.4 m³/s ('notably low') in the Trent at Drakelow Park.

Figure 2-4. Flow monitoring locations



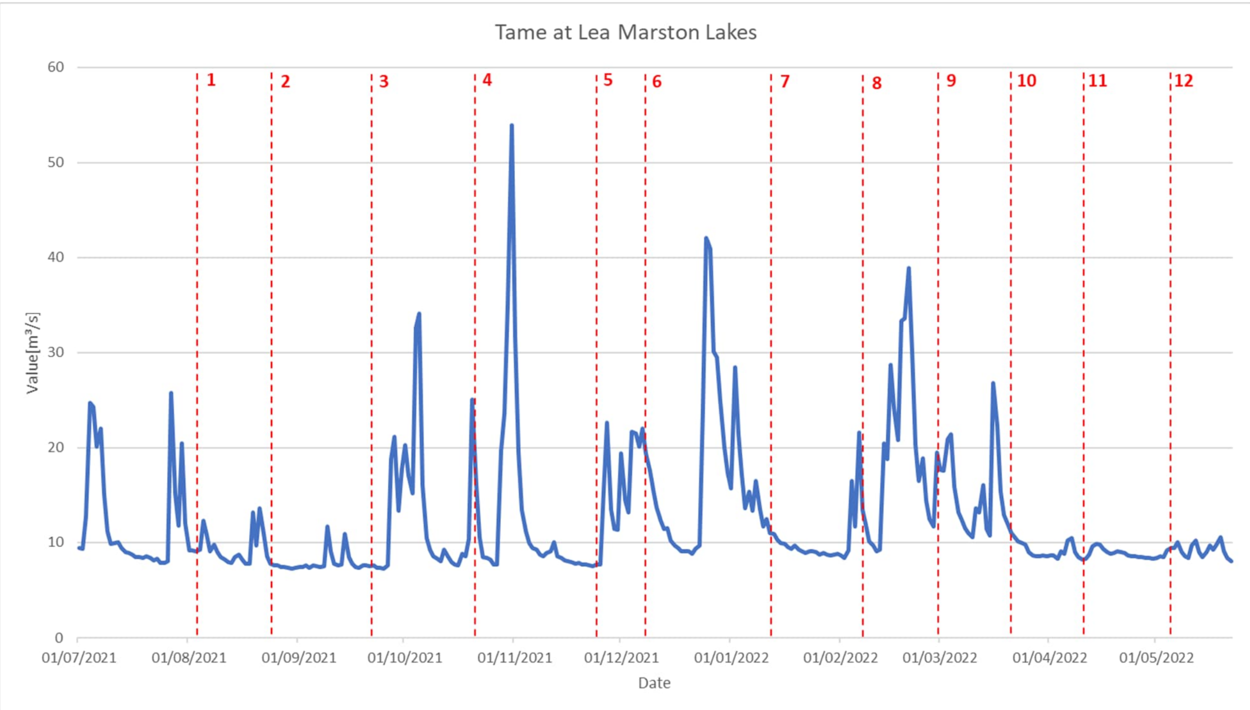
[10] UK Water Resources Portal. Available at https://eip.ceh.ac.uk/hydrology/water-resources/. Accessed 19 October 2022.

Figure 2-5. Tame at Water Orton Flow Data (1 July 2021 to 23 May 2022)



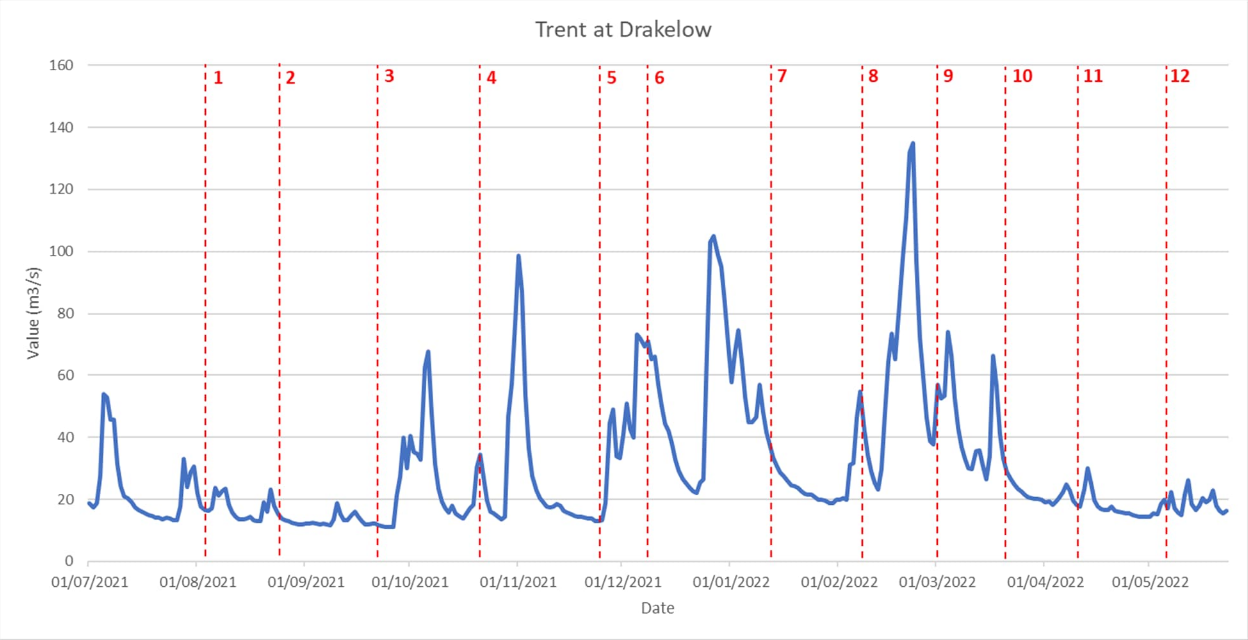
Note: red annotations indicate timings of monitoring visits

Figure 2-6. Lea Marston Lakes Flow Data (1 July 2021 to 23 May 2022)



Note: red annotations indicate timings of monitoring visits

Figure 2-7. Trent at Drakelow Park (1 July 2021 to 23 May 2022)



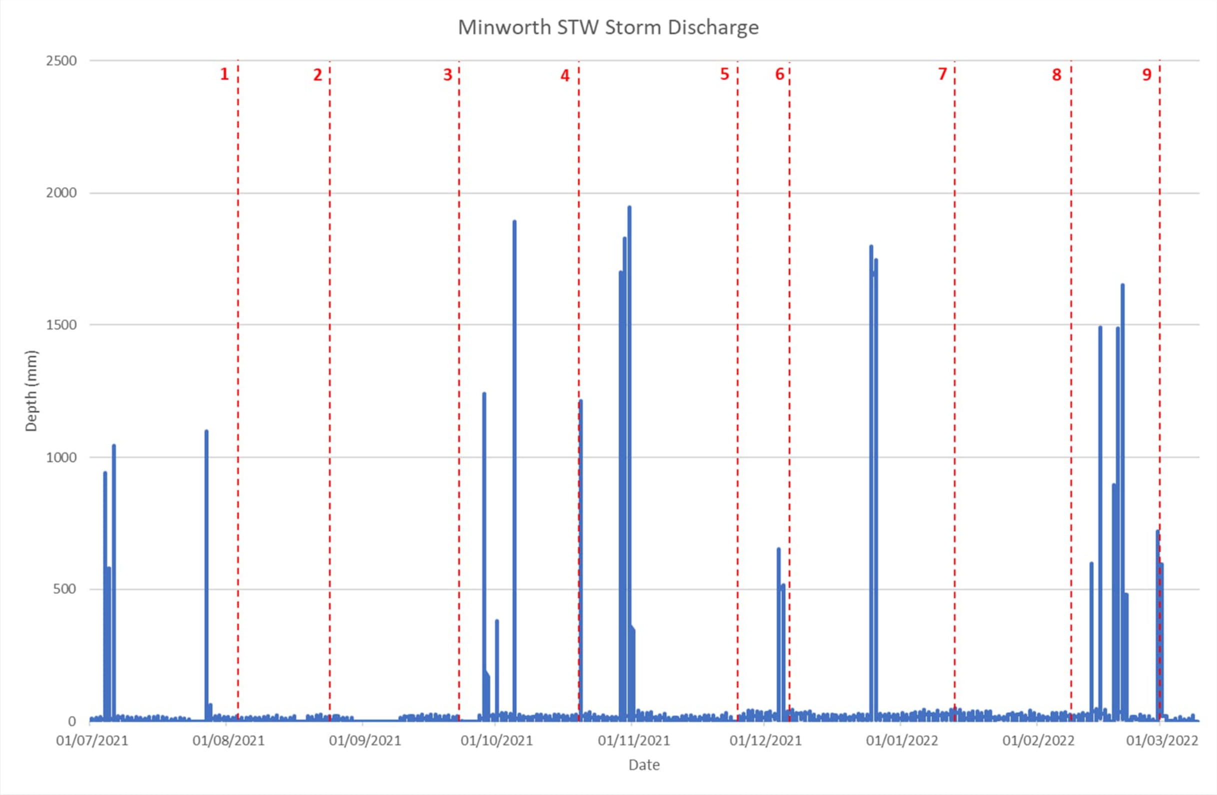
Note: red annotations indicate timings of monitoring visits

Sewage Treatment Works Storm Discharges

2.2.6 Storm discharge data for Minworth and Coleshill WwTW sites were provided by Severn Trent for the period 1 July 2021 to 8 March 2022, and are presented in Figure 2-8 and Figure 2-9 respectively, which are annotated to show the timings of the monitoring visits. Further data will be obtained and presented with the final version of this report.

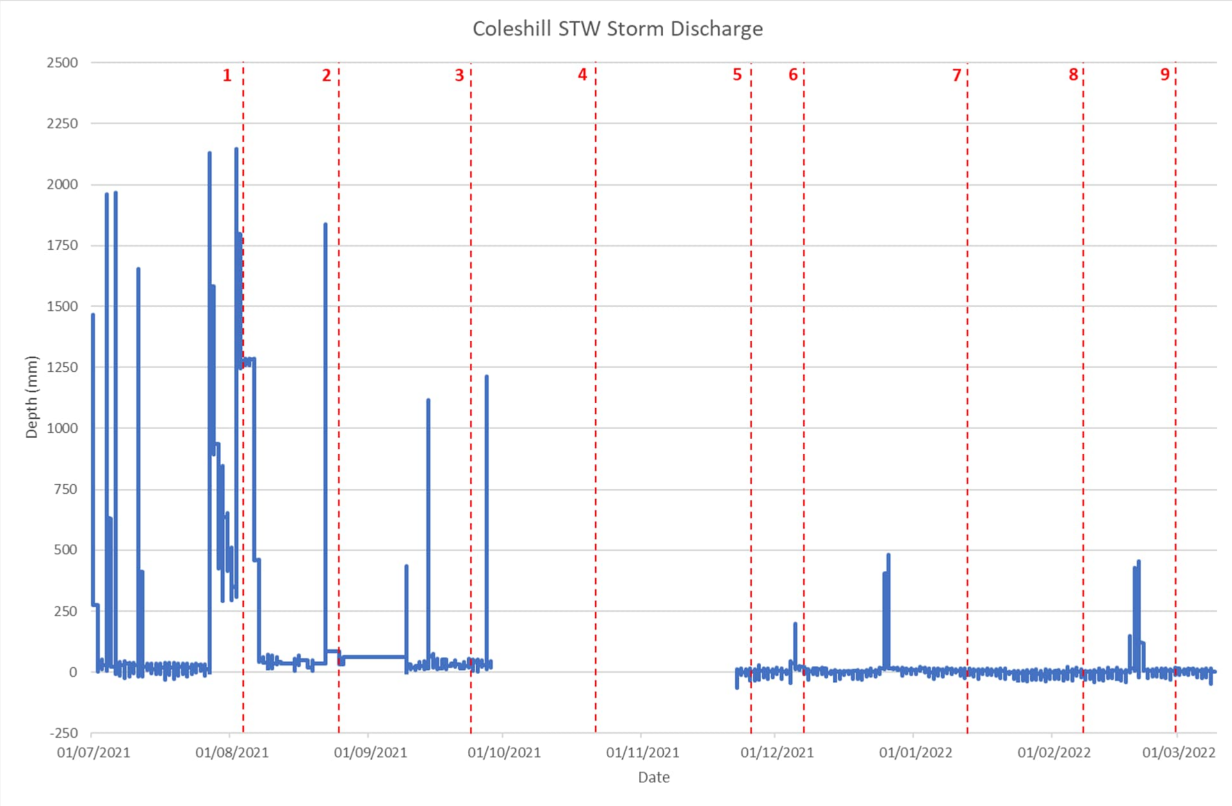
2.2.7 The data provided are depths in mm which are taken to qualitatively indicate the extent of flow within the storm discharge channels, rather than being recorded discharge volumes. The data for Coleshill between 28 September and 22 November 2021 have been excluded as these were reported as being inaccurate by Severn Trent due to equipment issues. Some values included in the figure are slightly below zero, indicating a potential calibration issue. Nevertheless, there are many similarities in peak flow between the two sites.

Figure 2-8. Minworth WwTW Storm Discharge Data



Note: red annotations indicate timings of monitoring visits

Figure 2-9. Coleshill WwTW Storm Discharge Data



Note: red annotations indicate timings of monitoring visits

2.2.8 The Minworth storm discharge enters the River Tame slightly upstream of the most upstream sampling location (see Section 3). For the dates where sampling took place, significant storm discharge from Minworth WwTW was recorded on just two of the visits: round 4 on 20 October 2021, and round 9 on 1 March 2022.

3. Water Quality Sampling

3.1 Sample Locations

3.1.1 To ensure any potential influence on water quality from the Minworth WwTW discharge is captured and to provide a baseline, five locations were originally proposed, as detailed in Table 3-1.

Table 3-1. Sampling Locations - Original

Sample location ID	Description	Comment
MIN-01	R Tame Timet Uk Ltd 100M DS Brookvale Rd	Upstream of Minworth WwTW Discharges
MIN-02	R Tame at Edison Road - Hams Hall distribution park	Downstream of both Minworth and Coleshill WwTW discharges
MIN-03	R Tame Kingsbury Rd, Kingsbury Village	Downstream of River Blythe confluence with the River Tame
MIN-04	R Tame at Hopwas	Downstream of the River Anker confluence with the River Tame
MIN-05	Non-Tidal R. Trent Burton on Trent	Downstream of the River Trent confluence with the River Tame

3.1.2 Following initial discussions with Affinity Water and Severn Trent Water it was decided that as sample location MIN-01 was significantly upstream of the Minworth WwTW discharge, other inputs to the Tame would impact water quality, particularly from the heavily industrialised areas to the north and east of Birmingham. Therefore, samples from the originally proposed location would not be entirely representative of water quality in the Tame immediately upstream of Minworth. For the first monitoring round a location was trialled at the A452 (adjacent to M6 Junction 5), however this was found to be difficult to obtain samples due to a high bridge parapet and proximity to a busy main road. From the second monitoring round onwards, the location for the MIN-01 sample has been adjacent to Water Orton Lane, approximately 50 metres upstream of the Minworth discharge.

3.1.3 Additionally, prior to the first monitoring round, it was decided that samples should be collected immediately up- and downstream of the Coleshill WwTW discharge, plus from the Coleshill discharge directly. Therefore, location MIN-02 was replaced by MIN-02A (upstream of Coleshill discharge), MIN-02B (Coleshill discharge), and MIN-02C (downstream of Coleshill discharge).

3.1.4 The revised sampling locations are shown in Table 3-2 and on Figure 3-1.

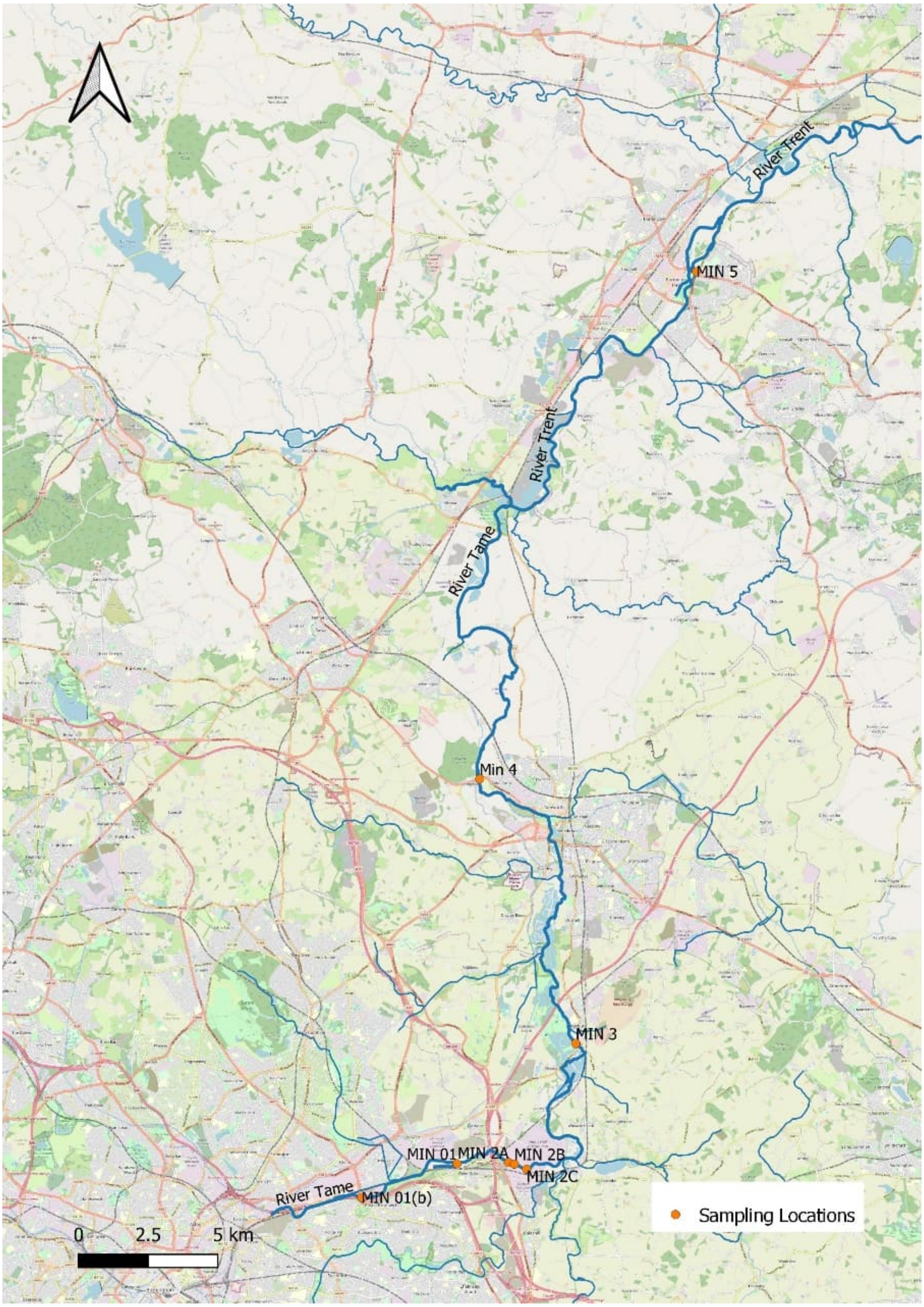
Table 3-2. Sampling Locations - Revised

Sample Location ID	Description	Approximate NGR	Comment
MIN-01	R Tame A452 Chester Rd (first sampling visit only)	[redacted]	Upstream of Minworth WwTW discharge
	R Tame upstream of Water Orton Lane (second sampling visit onwards)	[redacted]	
MIN-02A	R Tame Coleshill WwTW, u/s of discharge	[redacted]	Downstream of Minworth WwTW discharge, upstream of Coleshill WwTW discharge
MIN-02B	Coleshill WwTW discharge	[redacted]	
MIN-02C	R Tame Coleshill WwTW, d/s of discharge	[redacted]	Downstream of Coleshill WwTW discharge
MIN-03	R Tame Kingsbury Rd, Kingsbury Village	[redacted]	Downstream of River Blythe confluence with the River Tame
MIN-04	R Tame at Hopwas	[redacted]	Downstream of the River Anker confluence with the River Tame

Grid references for continued monitoring locations redacted

Sample Location ID	Description	Approximate NGR	Comment
MIN-05	Non-Tidal R. Trent Burton on Trent	[redacted]	Downstream of the River Trent confluence with the River Tame

Figure 3-1. Sampling Locations



3.2 Methodology

3.2.1 For collection of each sample, AECOM has used the following procedure and methodology:

- Retrieve water from the watercourse using a clean stainless-steel bucket
- Measurement of field parameters (pH, electrical conductivity, temperature, dissolved oxygen, redox potential, turbidity) using a calibrated portable multiparameter probe
- Decanting of water into laboratory-supplied containers, which are then stored and transported in cool boxes to maintain the required sample temperature

3.2.2 This methodology is in accordance with the following British Standards:

- BS EN ISO 5667-14:2016 (Guidance on quality assurance and quality control of environmental water sampling and handling)
- BS EN ISO 5667-6:2016+A11:2020 - Water Quality – Sampling: Part 6: Guidance on sampling of rivers and streams,
- BS EN ISO 5667-3:2018 - Water Quality – Sampling: Part 3: Preservation and handling of water samples.

3.2.3 AECOM procured the services of ALS Global for laboratory analysis of the samples. ALS are an AECOM-approved supplier and were able to complete all analysis in house by subcontracting internally to take advantage of their own specialist facilities.

4. Monitoring Results

4.1 Introduction

4.1.1 The following sections present summaries of the baseline monitoring data collected to date. Detailed tabulated results are included in Appendix A, and laboratory certificates are included in Appendix B.

4.2 In-situ Physicochemical Parameters

4.2.1 Results of in-situ physicochemical parameters measured in the field at the time of sample collection are summarised in Table 4-1 below. Full results are presented in Appendix A.

Table 4-1. Field Parameter Results Summary

Location	Parameter	pH	Electrical Conductivity	Temperature	Dissolved Oxygen	Redox Potential	Turbidity
	Units	pH units	µS/cm	°C	mg/L	mV	NTU
MIN-01	Minimum	6.86	328	5.58	7.16	-10.6	0.60
	(date)	*04-Aug-21*	*20-Oct-21*	*13-Jan-22*	*20-Oct-21*	*13-Jan-22*	*11-Apr-22*
	Mean	**7.87**	**630**	**12.61**	**10.65**	**94.9**	**16.68**
	Maximum	8.85	864	20.54	16.75	165.8	81.19
	(date)	*23-Sep-21*	*23-Sep-21*	*01-Aug-22*	*11-Apr-22*	*04-Aug-21*	*20-Oct-21*
MIN-02A	Minimum	7.24	453	7.65	7.25	6.4	0.83
	(date)	*08-Dec-21*	*20-Oct-21*	*08-Dec-21*	*20-Oct-21*	*13-Jan-22*	*25-Aug-21*
	Mean	**7.58**	**672**	**14.15**	**9.50**	**97.1**	**8.50**
	Maximum	8.24	864	21.69	13.06	185.0	47.76
	(date)	*23-Sep-21*	*04-Aug-21*	*01-Aug-22*	*11-Apr-22*	*08-Dec-21*	*20-Oct-21*
MIN-02B	Minimum	6.50	446	11.72	1.34	39.7	0.02
	(date)	*22-Mar-22*	*01-Mar-22*	*01-Mar-22*	*20-Oct-21*	*12-Jan-22*	*01-Mar-22*
	Mean	**6.90**	**575**	**15.77**	**3.48**	**116.1**	**1.06**
	Maximum	7.48	704	21.61	4.85	164.1	3.03
	(date)	*23-Sep-21*	*01-Aug-22*	*01-Aug-22*	*05-May-22*	*07-Dec-21*	*08-Feb-22*
MIN-02C	Minimum	7.27	414	9.10	6.54	13.8	0.27
	(date)	*04-Aug-21*	*20-Oct-21*	*07-Dec-21*	*25-Aug-21*	*08-Feb-22*	*11-Apr-22*
	Mean	**7.51**	**652**	**14.40**	**9.01**	**105.1**	**5.79**
	Maximum	8.25	842	21.60	11.61	164.0	22.15
	(date)	*23-Sep-21*	*04-Aug-21*	*01-Aug-22*	*11-Apr-22*	*07-Dec-21*	*20-Oct-21*
MIN-03	Minimum	7.31	458	7.22	6.56	-4.0	0.63
	(date)	*25-Aug-21*	*07-Dec-21*	*07-Dec-21*	*25-Aug-21*	*12-Jan-22*	*04-Aug-21*
	Mean	**7.58**	**642**	**13.79**	**8.83**	**103.4**	**5.90**
	Maximum	8.36	767	21.63	10.71	187.6	24.32
	(date)	*23-Sep-21*	*04-Aug-21*	*01-Aug-22*	*12-Jan-22*	*01-Mar-22*	*07-Dec-21*
MIN-04	Minimum	7.37	459	6.52	0.50	-5.4	0.41
	(date)	*05-May-22*	*12-Jan-22*	*07-Dec-21*	*08-Feb-22*	*08-Feb-22*	*04-Aug-21*
	Mean	**7.73**	**629**	**13.02**	**8.75**	**104.5**	**7.59**
	Maximum	8.45	752	20.62	11.45	187.0	32.47
	(date)	*23-Sep-21*	*23-Sep-21*	*04-Aug-21*	*11-Apr-22*	*01-Mar-22*	*08-Feb-22*

Location	Parameter	pH	Electrical Conductivity	Temperature	Dissolved Oxygen	Redox Potential	Turbidity
	Units	pH units	µS/cm	°C	mg/L	mV	NTU
MIN-05	Minimum	7.34	165	5.73	0.53	-7.6	0.52
	(date)	*08-Feb-22*	*25-Nov-21*	*07-Dec-21*	*08-Feb-22*	*12-Jan-22*	*04-Aug-21*
	Mean	**7.68**	**664**	**12.14**	**8.29**	**93.4**	**8.94**
	Maximum	8.28	1,024	19.56	11.14	174.9	41.34
	(date)	*23-Sep-21*	*01-Aug-22*	*01-Aug-22*	*07-Dec-21*	*23-Sep-21*	*08-Feb-22*

4.3 Laboratory Physicochemical Parameters

pH

4.3.1 A summary of the laboratory pH results is presented in Table 4-2. None of the results lie outside the EQS range of pH 6 to pH 9 for Good to High WFD status. The data indicate that pH in the Tame generally reduces between Water Orton (MIN-01) and Coleshill WwTW (MIN-02A) – this was the case in 11 of the 12 monitoring rounds. The Coleshill WwTW discharge (MIN-02B) has a lower pH than the Tame (MIN-02A) at the point of discharge, which has the effect of reducing the pH in the Tame immediately downstream of Coleshill WwTW (MIN-02C). pH then steadily rises in the river after the Blythe and Anker confluences (MIN-03 and MIN-04 respectively) and is higher again in the Trent downstream of the Tame-Trent confluence (MIN-05).

4.3.2 Figure 4-1 shows the pH results for each monitoring location over time. This shows that there has been no significant overall change in pH during the baseline monitoring period, and that generally the pattern described above can be seen for each monitoring round, with some exceptions, e.g., pH at MIN-02C is occasionally higher than at MIN-03.

Table 4-2. Laboratory Results Summary - pH

pH (pH units)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Minimum	7.46	7.35	6.81	7.16	7.37	7.56	7.84
Maximum	8.48	7.97	7.33	7.87	8.01	7.97	8.15
Mean	**7.97**	**7.69**	**7.05**	**7.57**	**7.66**	**7.80**	**8.01**

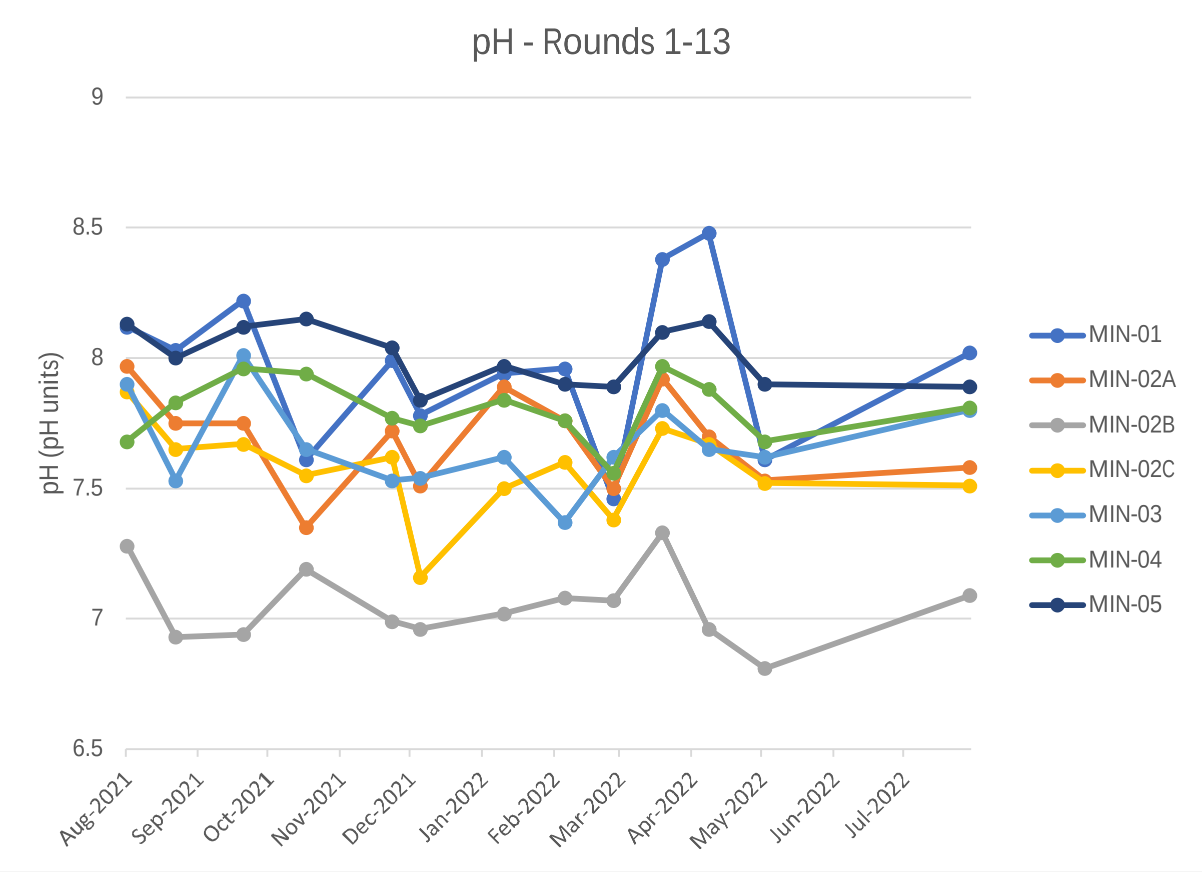


Figure 4-1. pH Results - Aug 2021 to Aug 2022

Hardness

4.3.3 Laboratory results for hardness are summarised in Table 4-3. The highest hardness values are generally at the most upstream (MIN-01) and most downstream (MIN-05) locations. Hardness at the Coleshill WwTW discharge (MIN-02B) is generally slightly lower than in the Tame and consequently hardness reduces from MIN-02A to MIN-02C. Figure 4-2 shows there has been no discernible variation over time during the baseline monitoring period.

Table 4-3. Laboratory Results Summary - Hardness

Hardness (mg/L)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Minimum	158	165	146	153	185	210	211
Maximum	336	263	194	260	250	283	344
Mean	**265**	**229**	**172**	**220**	**222**	**249**	**301**

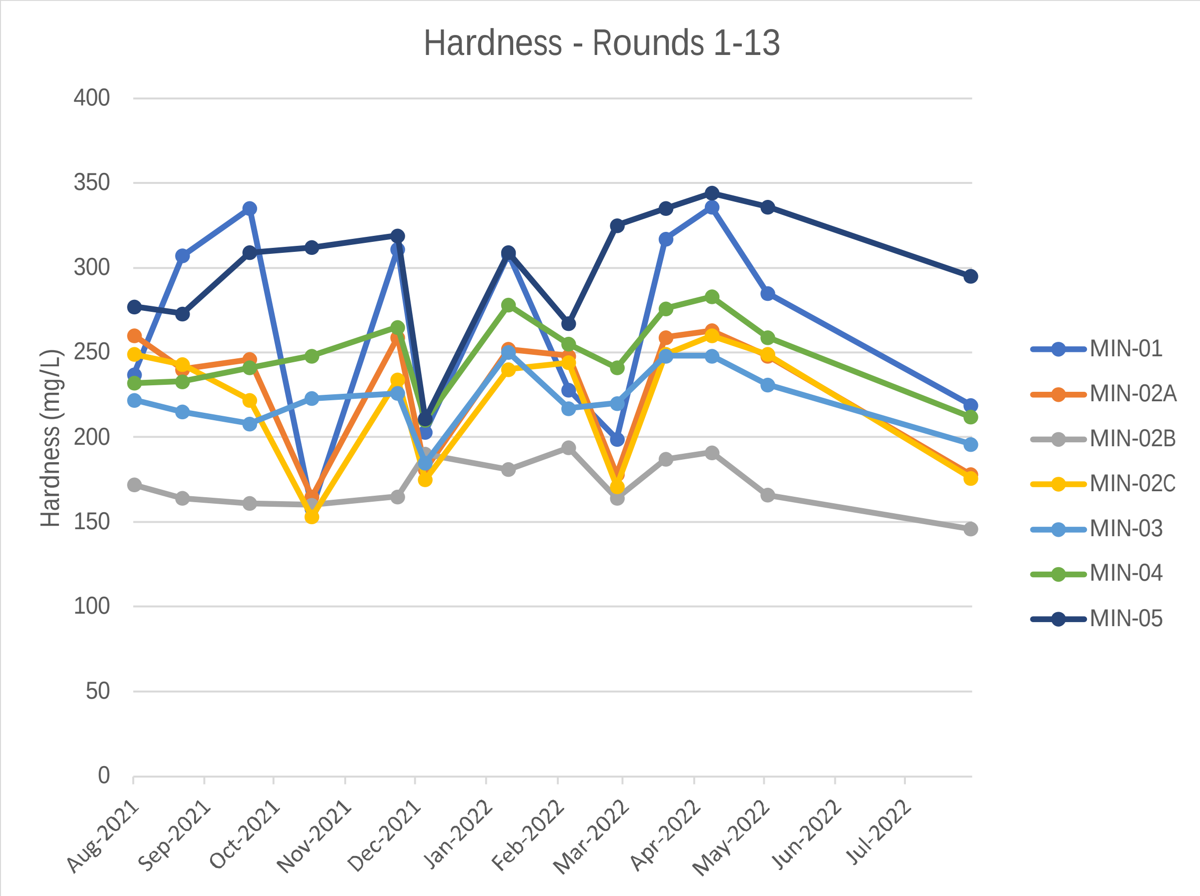


Figure 4-2. Hardness Results Aug 2021 to Aug 2022

Alkalinity

4.3.4 Similar to hardness, the highest alkalinity is generally at the most upstream (MIN-01) and most downstream (MIN-05) locations. Table 4-4 shows a summary of alkalinity laboratory results to date. Figure 4-3 shows that there has been no apparent variation over time during the baseline monitoring period.

Table 4-4. Laboratory Results Summary - Alkalinity

Alkalinity (mg/L)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Minimum	109	46	44.7	84	97.7	107	128
Maximum	200	162	110	145	142	152	170
Mean	**160**	**121**	**75**	**116**	**119**	**128**	**153**

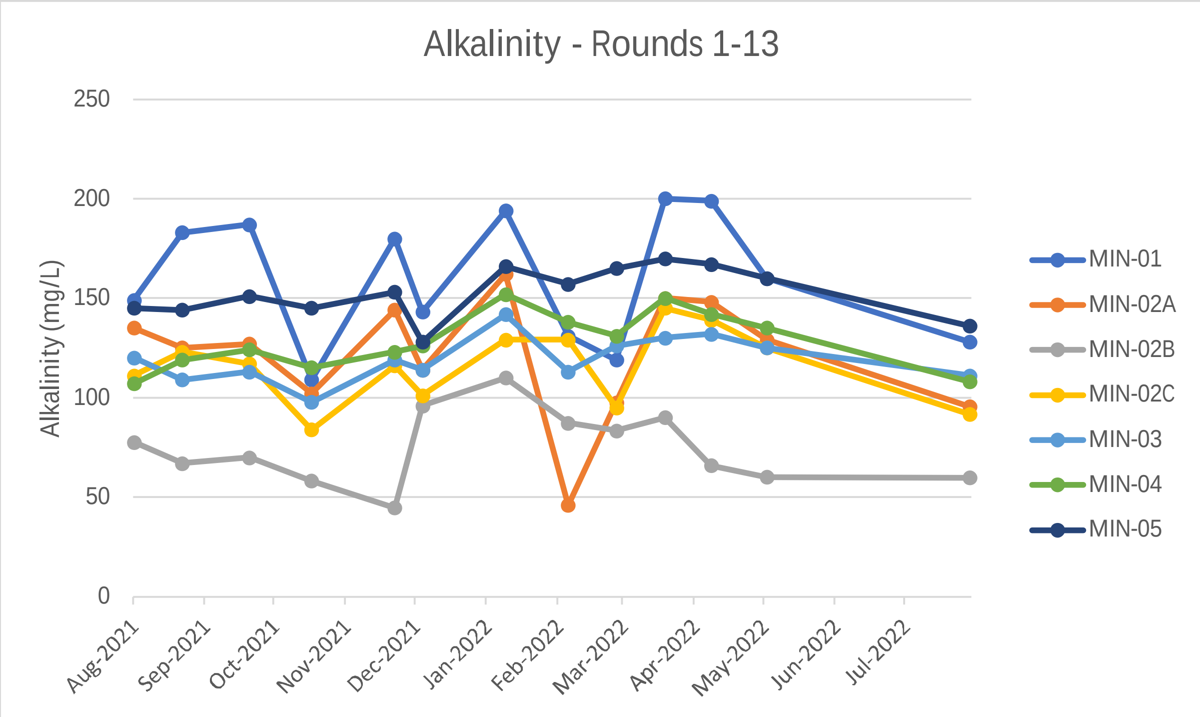


Figure 4-3. Alkalinity Results - Aug 2021 to Aug 2022

Turbidity

4.3.5 Maximum turbidity results, as shown in Table 4-5 in the Tame for the locations upstream of the Blythe confluence (MIN-01, MIN-02A and MIN-02C) occurred on 20 October 2021, while for downstream locations turbidity values were much lower on this date. Maximum turbidity for MIN-03 occurred on 7 December 2021, and for MIN-04 and MIN-05 on 8 February 2022. The mean values are somewhat distorted by occasional peaks of high turbidity. As shown on Figure 4-4, most turbidity results have been below 10 NTU.

Table 4-5. Laboratory Results Summary - Turbidity

Turbidity (NTU)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Minimum	1.57	1.87	1.25	1.38	1.33	1.71	1.02
Maximum	55.4	34.6	3.38	17.7	21.4	22.7	25.8
Mean	**11.38**	**7.72**	**2.08**	**5.19**	**5.90**	**7.00**	**7.25**

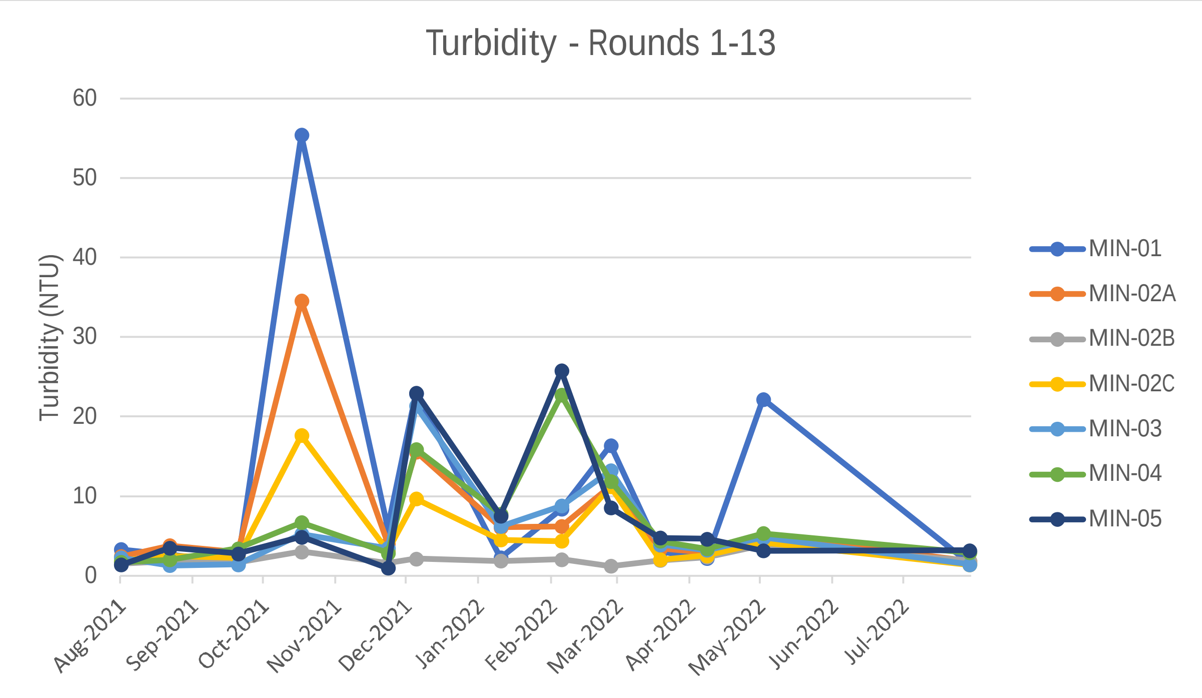


Figure 4-4. Turbidity Results - Aug 2021 to Aug 2022

Salinity

4.3.6 All results for salinity were below the laboratory limit of detection of 2 (no units).

4.4 Pesticides

4.4.1 Table 4-6 shows the occurrence of detections of the specified pesticides to date during baseline monitoring. Where the number of detections is greater than zero, the maximum concentration is shown in parentheses. EQS values are shown where these are available.

Table 4-6. Laboratory Results Summary - Pesticides

Parameter	EQS (µg/L)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
2,4-D	0.3	2 (0.066)	1 (0.028)	1 (0.116)	2 (0.028)	2 (0.025)	0	2 (0.284)
Aldrin	0.01	0	0	0	0	0	0	0
Atrazine	0.6	4 (0.0436)	6 (0.0463)	0	5 (0.0256)	3 (0.0232)	4 (0.0188)	2 (0.0168)
Bentazone	500	0	0	0	0	0	0	0
Carbendazim	0.15	1 (0.022)	1 (0.019)	0	1 (0.016)	1 (0.011)	0	0
Carbetamide	-	0	0	0	0	0	2 (0.042)	2 (0.034)
Chlormequat	-	0	0	0	0	0	0	0
Chlorothalonil	0.035	0	0	0	0	0	0	0
Chlorotoluron	2	0	0	0	0	0	0	0
Clopyralid	-	1 (0.019)	0	0	0	0	0	0
Dieldrin	0.01	0	0	0	0	0	0	0
Diuron	0.2	0	0	0	0	0	0	0
Flufenacet	-	0	0	0	0	3 (0.113)	4 (0.406)	4 (0.317)
Fluroxypyr	-	0	0	0	0	0	0	0
Glyphosate	196	9 (3.63)	12 (1.81)	10 (0.395)	12 (1.19)	13 (0.69)	12 (0.876)	9 (0.373)
Heptachlor	0.0003	0	0	0	0	0	0	0
Heptachlor epoxide	0.0003	0	0	0	0	0	0	0

Parameter	EQS (µg/L)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Isoproturon	0.3	1 (0.011)	0	0	0	0	0	0
Linuron	0.5	0	0	2 (0.027)	0	0	0	0
MCPA	80	1 (0.01)	3 (0.046)	3 (0.139)	3 (0.026)	4 (0.038)	3 (0.038)	3 (0.044)
MCPB	-	0	0	0	0	0	0	0
Mecoprop	18	5 (0.047)	8 (0.271)	4 (0.04)	9 (0.207)	9 (0.139)	9 (0.17)	6 (0.05)
Metaldehyde	-	3 (39.8)	4 (59.2)	1 (29)	3 (37.1)	3 (37.9)	3 (37)	4 (56.6)
Metazachlor	-	0	0	0	0	0	0	0
Monuron	-	0	0	0	0	0	0	0
Propazine	-	0	0	0	0	0	0	0
Propyzamide	100	2 (0.0524)	1 (0.0693)	0	1 (0.012)	3 (0.138)	2 (0.122)	3 (0.232)
Prosulfocarb	-	2 (0.087)	1 (0.075)	1 (0.022)	2 (0.068)	1 (0.029)	2 (0.087)	3 (0.047)
Simazine	1	2 (0.284)	4 (0.0732)	3 (0.132)	4 (0.0992)	5 (0.0589)	4 (0.0577)	4 (0.0512)
Terbutryn	-	1 (0.0177)	1 (0.0131)	0	1 (0.0141)	1 (0.0123)	0	1 (0.019)
Triallate	0.25	3 (0.0379)	1 (0.0271)	1 (0.0135)	1 (0.0218)	1 (0.0328)	5 (0.0596)	3 (0.032)
Quinmerac	-	0	0	0	0	0	0	0
Clothianidin	-	0	0	0	0	0	0	0
Imidacloprid	-	10 (0.049)	11 (0.082)	10 (0.162)	11 (0.092)	11 (0.086)	11 (0.071)	11 (0.064)
Omethoate	0.01	0	0	0	0	0	0	0
Permethrin	-	0	0	0	0	0	0	0

4.4.2 Of the 36 pesticides specified, 18 were not detected above their respective detection limits at any location on any occasion. A further six (2,4-D, carbendazim, carbetamide, clopyralid, isoproturon and terbutryn) were only detected at trace levels on one or two occasions at one or more locations. Observations on the concentrations and occurrence of the remaining 12 pesticides are as follows:

- Atrazine – detected at trace concentrations only during rounds 2, 3, 8, 10, 12 and 13
- Flufenacet – detected downstream of the Blythe confluence only during rounds 6 to 9
- Glyphosate – detected in most locations during most of the monitoring rounds. Highest concentration recorded at MIN-01 (most upstream location) during round 4. Concentration generally decreases downstream, however frequently shows a slight increase downstream of the Blythe confluence
- Linuron – detected only in the Coleshill discharge (MIN-02B) at trace concentrations on 2 occasions
- MCPA – detected at trace levels at all locations except MIN-01 during rounds 10 and 11, and at all locations including MIN-01 during round 13
- Mecoprop – greater occurrence of detections and higher concentrations at locations MIN-02C, MIN-03 and MIN-04. Highest concentrations generally occurred during the May 2022 monitoring round.
- Metaldehyde – most detections occurred during rounds 2 and 3. Concentrations remain similar at both up- and downstream locations
- Propyzamide – detections occurred during round 6, 7 and 8 only. Higher concentrations occur in more downstream locations (MIN-03, MIN-04 and MIN-05)
- Prosulfocarb – detections occurred during rounds 4, 5 and 6 only. No clear trends or differences between upstream and downstream locations
- Simazine – detections generally during rounds 6, 7, 8, 10 and 12 only at downstream locations, with concentrations generally decreasing downstream, but detections and concentrations occur more sporadically upstream.
- Triallate – only occasional trace detections at most locations. Most frequently detected, and highest concentrations at location MIN-04, downstream of the Anker confluence.

– Imidacloprid – detected at most locations during most monitoring rounds, however concentrations generally of the same order of magnitude as detection limit.

– None of the specified pesticides exceed their respective EQS, where these are present.

4.5 Fuels

4.5.1 Benzene was not detected above the detection limit of 1 µg/L at any location.

4.5.2 Benzo(a)pyrene and total PAH were routinely detected at locations upstream of the Blythe confluence (including MIN-01 upstream of the Minworth discharge), and less often at downstream locations, where concentrations were also lower when detections did occur. The maximum detected concentration of 0.261 µg/L occurred during round 2 on 25 August 2021 at location MIN-02A, downstream of the Minworth WwTW discharge and immediately upstream of the Coleshill WwTW discharge. The concentration on the same day was 0.172 µg/L at location MIN-02C and below the detection limit (0.002 µg/L) at locations further downstream. The result for the upstream location MIN-01 was below the detection limit. Total PAH concentrations for this monitoring round followed a similar pattern (<LOD at MIN-01, 5.05 µg/L at MIN-02A, 4.12 µg/L at MIN-02C, <LOD at MIN-03, MIN-04 and MIN-05).

4.5.3 There are numerous potential sources of PAH compounds from the heavily industrialised areas close to the Tame upstream of Minworth, and between locations MIN-01 and MIN-02A (notably a vehicle repair site, scrap yard and the M42 motorway).

4.5.4 The maximum detected concentration of benzo(a)pyrene is marginally below the maximum allowable concentration EQS value of 0.27 µg/L.

4.6 Metals

4.6.1 Table 4-7 shows the occurrence of detections of the specified dissolved metals to date during baseline monitoring. EQS annual average values are shown where these are available. Where the number of detections is greater than zero, the maximum concentration is shown in parentheses. The location of the maximum concentration for each parameter is shown with bold underlined text.

Table 4-7. Laboratory Results Summary - Dissolved Metals

Parameter	EQS (units)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Aluminium	- µg/L	5 (21.1)	8 (32.5)	2 (23.6)	5 (25.2)	**3 (39.2)**	3 (27.8)	5 (14.3)
Antimony	- µg/L	**7 (2.26)**	8 (1.54)	2 (1.09)	7 (1.49)	5 (1.76)	4 (1.33)	1 (1.02)
Arsenic	50 µg/L	13 (2.24)	13 (1.57)	13 (1.24)	13 (1.47)	13 (2.09)	**13 (2.35)**	13 (2.07)
Boron	2,000 µg/L	**13 (357)**	13 (337)	13 (231)	13 (300)	13 (273)	13 (264)	13 (249)
Cadmium	0.25 µg/L	0	0	0	0	0	0	0
Chromium	4.7 µg/L	13 (12.8)	**11 (16.6)**	3 (1.25)	11 (9.51)	12 (2.06)	10 (1.87)	1 (1.63)
Copper	1 µg/L (bioavailable)	13 (4.97)	**13 (5.04)**	10 (2.16)	13 (3.83)	13 (3.95)	13 (4.82)	13 (3.93)
Iron	1 mg/L	13 (0.129)	13 (0.151)	**13 (0.197)**	13 (0.173)	13 (0.125)	13 (0.130)	11 (0.0497)
Lead	1.2 µg/L (bioavailable)	9 (0.701)	11 (2.39)	7 (0.582)	13 (0.988)	**9 (7.39)**	10 (1.49)	6 (0.678)
Manganese	123 µg/L (bioavailable)	13 (78.5)	13 (85.3)	13 (114)	13 (81.6)	**13 (122)**	13 (105)	13 (52.7)
Mercury	0.07 µg/L	0	0	0	0	0	0	0
Nickel	4 µg/L (bioavailable)	13 (13.2)	**13 (24.2)**	13 (20.6)	13 (22.5)	13 (22.9)	13 (18.3)	13 (12.1)
Selenium	- µg/L	0	0	0	0	0	0	0
Sodium	- mg/L	13 (73.0)	13 (84.7)	13 (62.1)	13 (77.6)	**13 (85.6)**	13 (67.6)	13 (85.7)
Zinc (Note 1)	10.9 µg/L (bioavailable)	3 (60.9)	3 (160)	3 (114)	3 (90.2)	**3 (237.7)**	3 (90.2)	3 (114.7)

Note 1: zinc was not included in the original list of parameters; results are available for the final three monitoring rounds only.

4.6.2 Several metals (antimony, arsenic, boron, chromium, copper, nickel) show a trend where the greatest concentrations are generally at upstream locations MIN-01 and MIN-02A, and concentrations generally reduce further downstream. The highest chromium concentrations were detected at locations MIN-01, MIN-02A and MIN-02C during the 11th monitoring round on 11 April 2022.

4.6.3 Aluminium, lead, manganese, sodium and zinc each have their highest concentrations at MIN-03 downstream of the Blythe confluence, although concentrations upstream are generally only slightly lower. There is an anomalous peak concentration for lead of 7.39 µg/L at MIN-03 during the first monitoring round; the next highest at this location was 0.961 µg/L.

4.6.4 Cadmium, mercury, and selenium were not detected above their respective detection limits during any monitoring round.

4.6.5 The annual average EQS for chromium was exceeded at locations MIN-01, MIN-02A and MIN-02C during the 11th monitoring round, however concentrations remained below the maximum allowable concentration EQS of 32 µg/L. All other results for chromium were below the annual average EQS of 4.7 µg/L. The EQS values for copper, lead, manganese, nickel, and zinc are contingent on bioavailability. A bioavailability assessment has not been undertaken during this exercise. These metals are generally present in road run-off and concentrations such as those recorded are not uncommon for urban and semi-urban rivers, and upstream concentrations are generally similar to those downstream of Minworth WwTW.

4.7 Solvents

4.7.1 The solvents 1,2 dichloroethane, epichlorohydrin, tetrachloroethene, trichloroethene and tetrachloromethane were not detected above their respective detection limits at any location during baseline monitoring to date, and therefore EQS values (where present) were not exceeded. The trihalomethane chloroform was detected at trace levels on two occasions at locations MIN-02A and once at MIN-02C.

4.8 Microbiology

4.8.1 Microbiological parameters clostridium perfringens, coliform bacteria, enterococci, E. coli and total colony counts are each reported as colony forming units (CFU) per 100 ml. Results are typically shown as >100 CFU/100ml, which is the limitation of the laboratory method. The only exceptions to this were during the second monitoring round when enterococci was reported at between 0 (zero) and 37 CFU/100ml at each monitoring location, and E. coli between 12 and 35 CFU/100ml at locations MIN-01, MIN-03, MIN-04 and MIN-05, during the tenth monitoring round when enterococci was reported at 87 CFU/100ml at MIN-01 only, during the eleventh monitoring round, when enterococci was reported at between 57 and 62 CFU/100ml at locations MIN-04 and MIN-05 only, and during the twelfth monitoring round when enterococci was reported at 79 CFU/100ml at MIN-04 only.

4.8.2 Cryptosporidium (reported as Oocysts/10L) was not detected during any monitoring round at any location.

4.8.3 Microbiological analysis could not be completed for the first monitoring round due to provision of incorrect sample containers by the laboratory.

4.9 Nutrients

4.9.1 Table 4-8 shows the occurrence of detections of the specified nutrients to date during baseline monitoring. The maximum concentration is shown in parentheses and the location of the maximum concentration for each parameter is shown with bold underlined text. EQS could not be determined for these parameters, except for phosphate (orthophosphate as P), which is discussed below. Further consultation with the Environment Agency would be required to establish whether EQS for the remaining parameters are available.

Table 4-8. Laboratory Results Summary - Nutrients

Parameter	LOD (units)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Ammonium	0.2 mg/L	6 (0.740)	**<u>6 (3.389)</u>**	7 (2.234)	5 (0.595)	10 (1.419)	2 (1.015)	1 (0.356)
Nitrate	0.3 mg/L	13 (37.2)	13 (64.9)	13 (66.5)	13 (67.9)	**<u>13 (68.4)</u>**	13 (65.9)	13 (57.3)

Parameter	LOD (units)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Nitrite	0.05 mg/L	12 (0.477)	13 (0.969)	**13 (2.16)**	13 (0.997)	13 (1.77)	13 (1.24)	13 (0.378)
Phosphorous (total)	20 µg/L	12 (725)	13 (915)	**13 (1,240)**	13 (510)	13 (706)	13 (953)	13 (668)
Orthophosphate as P	0.02 mg/L	12 (0.149)	13 (0.409)	**13 (0.956)**	13 (0.342)	13 (0.609)	13 (0.851)	13 (0.569)
Orthophosphate as PO_4	0.05 mg/L	13 (0.458)	13 (1.25)	**13 (2.93)**	13 (1.05)	13 (1.87)	13 (2.61)	13 (1.74)

4.9.2 The WFD EQS values for phosphate are derived at a site-specific level based on the altitude and alkalinity within a given reach. Site-specific classification ranges have been obtained from the 'WFD_site_specific_standards' produced by the Environment Agency which provides locations of the specific sampling sites used to provide the data from which the WFD classification ranges are derived. Table 4-9 shows the baseline monitoring locations and which WFD sampling locations they correspond to, along with the WFD classification banding. Classification is based on the annual average concentrations.

Table 4-9 Phosphate WFD Classification Ranges

Location	Reach	WFD Site	Phosphate Classification Range (maximum value; mg/l)				
			High	Good	Moderate	Poor	Bad
MIN-01			0.035	0.066	0.168	0.992	>0.992
MIN-02A	Tame – R Rea to R Blythe	River Tame – u/s Coleshill STW	0.035	0.066	0.168	0.992	>0.992
MIN-02B			0.035	0.066	0.168	0.992	>0.992
MIN-02C		R Tame – d/s Minworth STW Bacteria Beds	0.034	0.065	0.165	0.985	>0.985
MIN-03	Tame from R Blythe to River Anker	R Tame Kingsbury Rd Kingsbury Village	0.035	0.067	0.170	0.996	>0.996
MIN-04	Tame from River Anker to River Trent	River Tame – Elford	0.037	0.070	0.176	1.010	>1.010
MIN-05	Trent – R Tame to R Dove	Non-tidal R Trent Burton on Trent	0.040	0.074	0.184	1.029	>1.029

4.9.3 Table 4-10 shows the average concentration from the baseline monitoring for each location and the resulting WFD classification. Each location is classified as 'Moderate' or 'Poor' status which broadly aligns with the overall WFD status of each reach. The WFD classification for phosphate as shown in Section 2.1 are 'Poor' for each of the reaches of the Rivers Tame and Trent within which the sampling locations are situated.

Table 4-10 Phosphate WFD Results

Location	Average Concentration of Orthophosphate as P (mg/l)	WFD Classification
MIN-01	0.076	**Moderate**
MIN-02A	0.127	**Moderate**
MIN-02B	0.518	**Poor**
MIN-02C	0.162	**Moderate**
MIN-03	0.243	**Poor**
MIN-04	0.291	**Poor**
MIN-05	0.275	**Poor**

4.10 Algal Indicators

4.10.1 Detections of Chlorophyll-a have been variable during the baseline monitoring. Each site, with the exception of MIN-02B (Coleshill WwTW discharge) has each had between four and seven positive detections reported for the twelve baseline monitoring rounds, although these did not occur during the same monitoring round across these locations. The maximum concentration reported was 120 µg/L at MIN-01 on 5 May 2022.

4.10.2 Cyanobacteria results have generally been reported as 0 (zero) cells/ml, with positive detections occurring at most locations during rounds 1, 3 and 4. Positive detections also occurred at the most downstream locations MIN-04 and MIN-05 during round 9, and at MIN-04 only during round 13. The maximum detection in the River Tame has been 2,910 cells/ml at the most upstream location MIN-01 during the first monitoring round.

4.11 Other – High Impact

4.11.1 Of the high impact parameters, only gross beta activity has had positive detections reported. All results are between 0.22 and 0.69 Bq/l. No positive detections were reported for the other parameters on this list (gross alpha activity, acrylamide, cyanide, radon, tritium). Based on the results for gross alpha and gross beta activity, total indicative dose can be reported[11] as <0.1 mSv/y.

4.12 Other – Low Impact

4.12.1 Table 4-11 shows the occurrence of detections of the low impact parameters to date during baseline monitoring. Where the number of detections is greater than zero, the maximum concentration is shown in parentheses. The location of the maximum concentration for each parameter is shown with bold underlined text.

Table 4-11. Laboratory Results Summary - Low Impact Parameters

Parameter	EQS	LOD (units)	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Bromate	-	5 µg/L	0	0	0	0	0	0	0
Bromide	-	0.06 mg/L	12 (0.354)	**13 (0.467)**	13 (0.384)	13 (0.440)	13 (0.336)	13 (0.351)	13 (0.649)
Chloride	250 mg/L	2 mg/L	13 (118)	13 (122)	13 (99.2)	13 (118)	13 (112)	13 (106)	**13 (138)**
Colour	-	mg/L Pt/Co	13 (12.5)	13 (28.1)	13 (21.3)	13 (26.2)	**13 (29.5)**	13 (25.0)	13 (22.0)
Electrical conductivity	-	mS/cm	**13 (0.938)**	13 (0.850)	13 (0.662)	13 (0.820)	13 (0.796)	13 (0.791)	13 (0.935)
Fluoride	5 mg/L	0.5 mg/L	3 (0.814)	7 (0.912)	**11 (1.65)**	7 (0.919)	7 (1.01)	6 (0.931)	1 (0.524)
Sulphate	400 mg/L	2 mg/L	13 (133)	13 (111)	13 (93.2)	13 (106)	13 (108)	13 (114)	**13 (151)**
Total organic carbon	-	3 mg/L	12 (9.01)	13 (12.0)	13 (10.9)	13 (11.2)	13 (11.7)	**13 (13.6)**	13 (8.91)
Dissolved organic carbon	-	3 mg/L	13 (7.23)	13 (11.4)	13 (9.91)	13 (12.3)	**13 (13.0)**	13 (11.4)	13 (10.5)
Vinyl chloride	-	1 µg/L	0	0	0	0	0	0	0

4.12.2 Where EQS values exist, these have not been exceeded during baseline monitoring at any location. Many of the low impact parameters do not show a clear trend between locations or over time. Organic carbon (both total and dissolved) tends to increase between MIN-02C and MIN-03 downstream of the Blythe confluence.

4.12.3 There have been no detections of either bromate or vinyl chloride at any locations during baseline monitoring to date.

4.13 Additional Parameters

4.13.1 Various parameters were added to the monitoring scope based on the identified treatment requirements for the Minworth effluent. These were included in the final monitoring round, and results are presented in Table 4-12. These parameters are discussed further in the context of their concentrations in Minworth WwTW effluent in Section 6.3.

[11] Wilkins, BT; Brown, J; Hammond, DJ; Youngman, MJ, (2008). Requirements for the radiological monitoring of drinking water: Guidance provided to the Drinking Water Inspectorate. Health Protection Agency, June 2008.

Table 4-12 Additional Parameters Results

Parameter	Limit of Detection (units) *(see note)*	MIN-01	MIN-02A	MIN-02B	MIN-02C	MIN-03	MIN-04	MIN-05
Dissolved cobalt	<0.1 µg/L	0.2	0.7	0.4	0.5	1.0	0.7	0.6
Cypermethrin	0.00008 µg/L	0.0002	0.0002	0.0003	0.0002	0.0003	<0.0001	0.0002
EDTA	0.1 mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexabromocyclododecane (HBCDD)	0.00014 µg/L	0.00023	0.00050	0.00070	0.00047	0.00033	0.00022	0.00024
Mancozeb	1 µg/L	<1	<1	<1	<1	<1	<1	<1
Nonylphenols	0.02 µg/L	0.05	0.30	0.61	0.30	0.23	0.17	0.10
Perfluorooctane sulfonic acid (PFOS) and its derivatives	0.00065 µg/L	0.0083	0.0132	0.0093	0.0134	0.0193	0.0169	0.0093
Triclosan	0.01 µg/L	<0.01	<0.01	0.01	<0.01	<0.01	<0.01	<0.01
Dissolved zinc				see Table 4-7				

Note: standard limit of detection shown, in some cases dilution may result in an increased reporting limit for a sample

5. Discussion

5.1 Seasonal Variations

5.1.1 Most parameters have not shown any notable seasonal trends during the period of baseline monitoring. However, there are several observations as follows:

- As would be anticipated, water temperature measured in the field varies seasonally, with the minimum recorded temperature during December or January at each location, and the maximum during August 2021 and August 2022.
- At the most upstream location MIN-01, pH was notably lower during the late autumn and winter months (October to March) than at other times (Figure 4-1).
- Total phosphorus concentrations tended to peak at all locations in October 2021 and again in March 2022.
- The pesticide MCPA was generally undetected until March and April 2022 at all locations.

5.2 Impact of Minworth WwTW Discharge

5.2.1 Table 5-1 shows the average percentage change for each parameter between locations MIN-01 (upstream of the Minworth WwTW discharge) and MIN-02A (downstream of the Minworth WwTW discharge) where positive detections at both locations routinely occur. This is to indicate the presumed impact of the Minworth WwTW discharge on water quality in the Tame immediately downstream, based on the raw water quality data only, however other land uses and inputs to the Tame between these two sampling locations may also impact water quality.

Table 5-1. Water Quality Changes MIN-01 to MIN-02A

Parameter Group	Parameter	Average % change	Parameter	Average % change	Parameter	Average % change
Phys-Chem	Hardness	-11.8%	pH	-3.5%	Alkalinity	-24.2%
	Turbidity	+7.3%				
Pesticides	Glyphosate	+18.1%	Imidacloprid	+107%		
Fuels	Benzo(a)pyrene	+200%	Total PAH	+406%		
Metals	Arsenic	-16.5%	Boron	+2.6%	Chromium	+12.0%
	Copper	-1.5%	Iron	+14.4%	Lead	+129.2%
	Manganese	+19.5%	Nickel	+47.4%	Sodium	+23.9%
Nutrients	Nitrate	+101.3%	Nitrite	+33.0%	Total phosphorus	+51.1%
	Orthophosphate (P)	+67.1%	Orthophosphate (PO_4)	+66.3%		
High Impact	Gross beta activity	+32.7%				
Low Impact	Bromide	+46.5%	Chloride	+19.8%	Conductivity	+5.7%
	Sulphate	-2.8%	Total organic carbon	+43.8%	Dissolved organic carbon	+47.9%

5.2.2 The following observations are made in respect of the water quality changes between MIN-01 and MIN-02A sampling locations. Many of these parameters have been assessed in detail within the water quality modelling (Section 6) which considers the impact of the Minworth SRO scenarios on overall water quality in the Tame.

5.2.3 The laboratory physicochemical parameters do not show significant change between the two locations. The mean pH value at MIN-01 is 7.97 and at MIN-02A is 7.70. Further downstream, pH reduces again at MIN-02C (mean pH 7.58) downstream of the Coleshill discharge, before rising again to a mean pH of 8.02 in the Trent at Burton (MIN-05).

5.2.4 The average increase in imidacloprid concentrations is 109%, however it is noted that concentrations at MIN-02A are of the same order of magnitude as the detection limit.

5.2.5 Fuels parameters benzo(a)pyrene and total PAH show significant increases of 200% and 406% respectively between MIN-01 and MIN-02A. However, situated between these monitoring locations are a vehicle repair site, a scrap yard and the M42 motorway, and the potential for significant inputs of PAH compounds to the River Tame from these locations cannot be discounted.

5.2.6 Similarly, several metals (chromium, iron, lead, manganese, nickel) show percentage increases which may be attributable to the other land uses between the two sampling locations. Other metals such as arsenic, boron and copper do not fit this pattern and concentrations are generally similar between the two locations.

5.2.7 Of the nutrient parameters, nitrate, total phosphorus, orthophosphate as P, and orthophosphate as PO_4 show significant increases which may be attributable to the discharge from Minworth WwTW. With the exception of nitrate, these parameters tend to show higher concentrations in the samples from the Coleshill WwTW discharge (MIN-02B), and further downstream particularly at MIN-03 and MIN-04 downstream of the Blythe and Anker confluences respectively, possibly due to the higher proportions of agricultural land use in those catchments. However, this does not appear to be impacting upon the overall WFD classification for the downstream water bodies.

5.2.8 For the high impact parameter gross beta activity, an increase is apparent between MIN-01 and MIN-02A, however this is not considered significant as values further downstream show similar average values.

5.2.9 For the low impact parameters bromide, total organic carbon and dissolved organic carbon, increases are evident between MIN-01 and MIN-02A. For bromide, concentrations gradually reduce moving further downstream. Both total and dissolved organic carbon concentrations increase further downstream of the Blythe confluence.

6. Water Quality Modelling

6.1 Overview

6.1.1 The water quality monitoring data set out above has been combined with Environment Agency water quality monitoring data to model the impacts of the proposed future reductions in effluent discharges from Minworth WwTW to the River Tame. Catchment scale modelling (SIMCAT) has been used to inform an assessment of the impacts of the proposals on orthophosphate, ammonia and BOD concentrations. A simplified percentage change approach has been undertaken in order to assess impacts for other pollutants where data is more limited.

6.2 SIMCAT Water Quality Modelling Results

6.2.1 Catchment scale water quality modelling has been carried out to determine the impacts of reducing flows from Minworth WwTW to the River Tame on downstream concentrations of orthophosphate, ammonia and BOD. This allows an assessment of whether reduced pollutant loading due to lower flows from Minworth WwTW results in improved river water quality, or whether reduced downstream river flow results in reduced water quality if there is less water available to dilute more polluted downstream inputs. The Environment Agency's SIMCAT models of the Tame and Trent catchments have been used to assess the cumulative downstream impacts of reducing flows from Minworth WwTW under different future discharge scenarios. The resulting downstream mean concentrations of orthophosphate and 90%ile BOD and ammonia concentrations have been compared with the relevant water quality status limits to assess the impacts of changing WwTW flows on compliance with Water Framework Directive (WFD) requirements. It is acknowledged that these sub-elements only make up part of the overall WFD status classification for river waterbodies, and that there are other sub-elements (e.g., Fish, Dissolved Oxygen, etc.) which are the main cause for waterbody target status' as set by the Environment Agency.

6.2.2 The Tame and Trent catchment SIMCAT models cover an extremely large geographic area (Figure 6-1) and include major additional watercourses and their tributaries, including the River Soar, River Dove and River Derwent catchments. Changes to outputs from Minworth WwTW will not have any effect on water quality within these catchments and therefore the results presented below are limited to the River Tame and River Trent downstream of the Tame-Trent confluence. Note that cumulative impacts are considered within the separate WFD assessment. The SIMCAT models extend into the tidal section of the River Trent near East Ferry and include several WwTW discharges direct to the Tame and Trent. A full discussion of the input data and model update and calibration process is provided in Appendix C.

6.2.3 The Environment Agency provided two separate SIMCAT models for the River Trent catchment, one allowing for modelling of orthophosphate concentrations and one allowing for modelling of ammonia and BOD concentrations. The catchment models take into account the changes in flows from Minworth WwTW as well as diffuse pollution from surrounding land (including urban runoff, agricultural run-off, etc.) as well as Combined Sewer Overflows (CSOs) and storm tank discharges.

6.2.4 The modelling scenarios undertaken are detailed in Table 6-1 below and Figure 6-1 shows the watercourses included in the Trent catchment SIMCAT models and the section of the model for which results are reported.

Table 6-1: SIMCAT Modelling Scenarios

Scenario	Description
Baseline Scenario	SIMCAT model showing existing water quality in the Rivers Tame and Trent, based on Environment Agency water quality datasets[12], Severn Trent Water WwTW flow data and National River Flow Archive (NFRA) river flow gauge data[13]. This model provides a baseline showing the current impact of existing effluent flows from Minworth WwTW on water quality in the Rivers Tame and Trent, against which possible future impacts can be assessed.
TREAT57	Model run to show the impacts of reducing flows from Minworth WwTW by 57Ml/d
TREAT115	Model run to show the impacts of reducing flows from Minworth WwTW by 115Ml/d
TREAT172	Model run to show the impacts of reducing flows from Minworth WwTW by 172Ml/d
TREAT230	Model run to show the impacts of reducing flows from Minworth WwTW by 230Ml/d

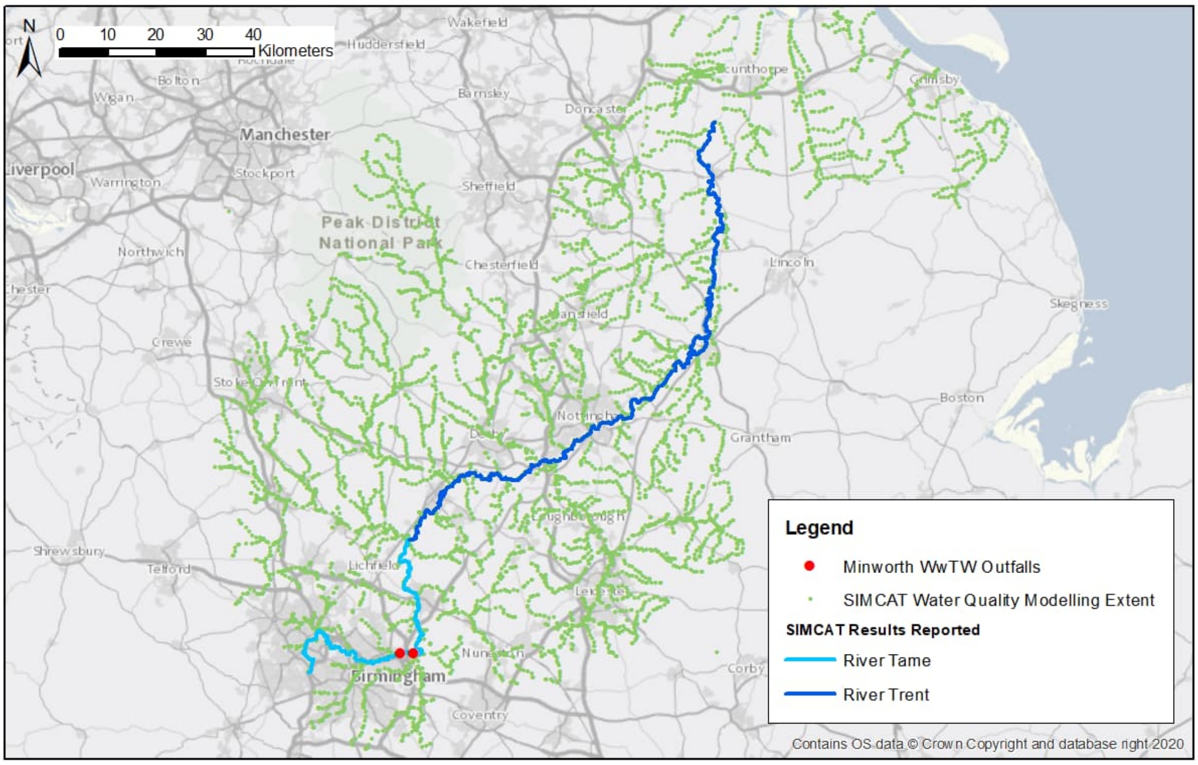


Figure 6-1: Watercourse and Key Location Schematic for SIMCAT Modelling

Baseline Scenario

6.2.5 Figure 6-2 shows the modelled mean and Q_{95} flow along the Rivers Tame and Trent for the for the baseline (current condition) scenario with the locations of key WwTW and tributary inflows identified. Figure 6-3 shows the same output for the River Tame only – the results have been extracted from the orthophosphate SIMCAT model, calibrated using observed flows at gauges. The model is unable to carry out a full back calculation process because the extremely large geographic area included in the model results in well over 1,000 individual discharge points. This results in some irregularities in the model outputs for flow, with the model showing a reduction in flow to fit the observed flow at four gauges which would not actually be observed. However, these reductions are a small proportion of the modelled flow and are localised such that this problem is not expected to undermine the overall confidence in the results.

[12] https://environment.data.gov.uk/water-quality/view/landing, data from 2014-2022 were used where available, otherwise the entire record from each data point was applied.
[13] https://nrfa.ceh.ac.uk/data/search, daily mean flow data were used to calculate the mean and Q_{95} flows

6.2.6 Figures 6-2 and Figure 6-3 show that the combined effluent discharges from Minworth and Coleshill WwTW increase flow in the River Tame. The current total mean flow from Minworth WwTW is 513.5Ml/d and the current mean flow from Coleshill WwTW is 71Ml/d. The modelled mean River Tame flow is increased from 458.8Ml/d upstream of Minworth Outlet 1 to 715.7Ml/d downstream (note that the mean downstream flow is not a simple sum of the mean upstream flow and mean effluent flow rate as these conditions do not necessarily coincide). Flows are further increased downstream of Minworth Outlet 2 from 790.5Ml/d to 1,047.6Ml/d. The inputs from the two WwTW, plus small contributions from the surrounding catchments, result in an increase in mean flow of 228% over a distance of 3.2km.

6.2.7 Prolonged periods of dry weather which result in low Q_{95} river flows often also results in reduced WwTW discharges, so the absolute additional flow provided under these conditions is smaller. The modelled Q_{95} flow upstream of Minworth Outlet 1 is 182Ml/d, increasing to 352.0Ml/d downstream and the Q_{95} flow is further increased from 402.1Ml/d to 573Ml/d downstream of Minworth Outlet 2. Overall, the Q_{95} flow is increased by 314% by the addition of flows from Minworth and Coleshill WwTWs; this is a larger proportional increase than under mean flow conditions because the upstream river flows are smaller.

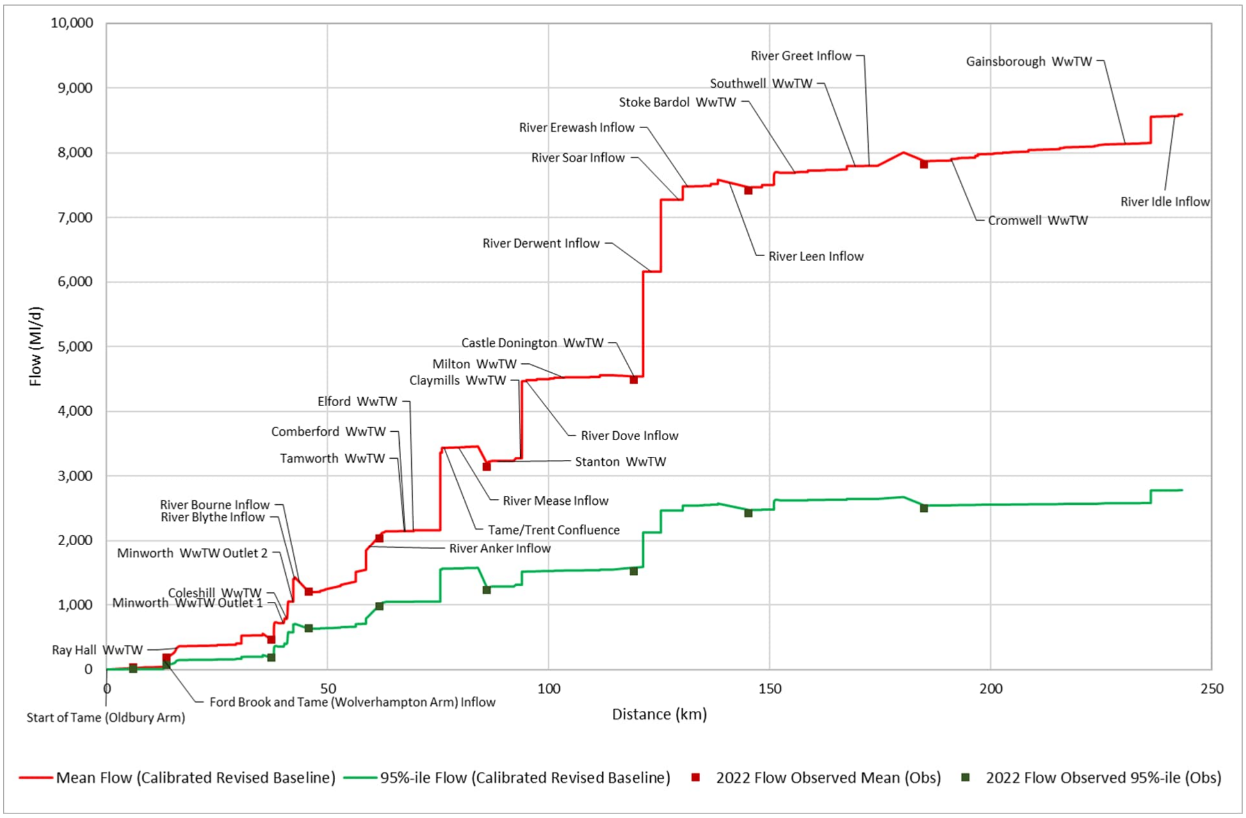


Figure 6-2: Modelled Mean and Q_{95} River Flow in the Rivers Tame and Trent (from orthophosphate SIMCAT model)/ Baseline Scenario

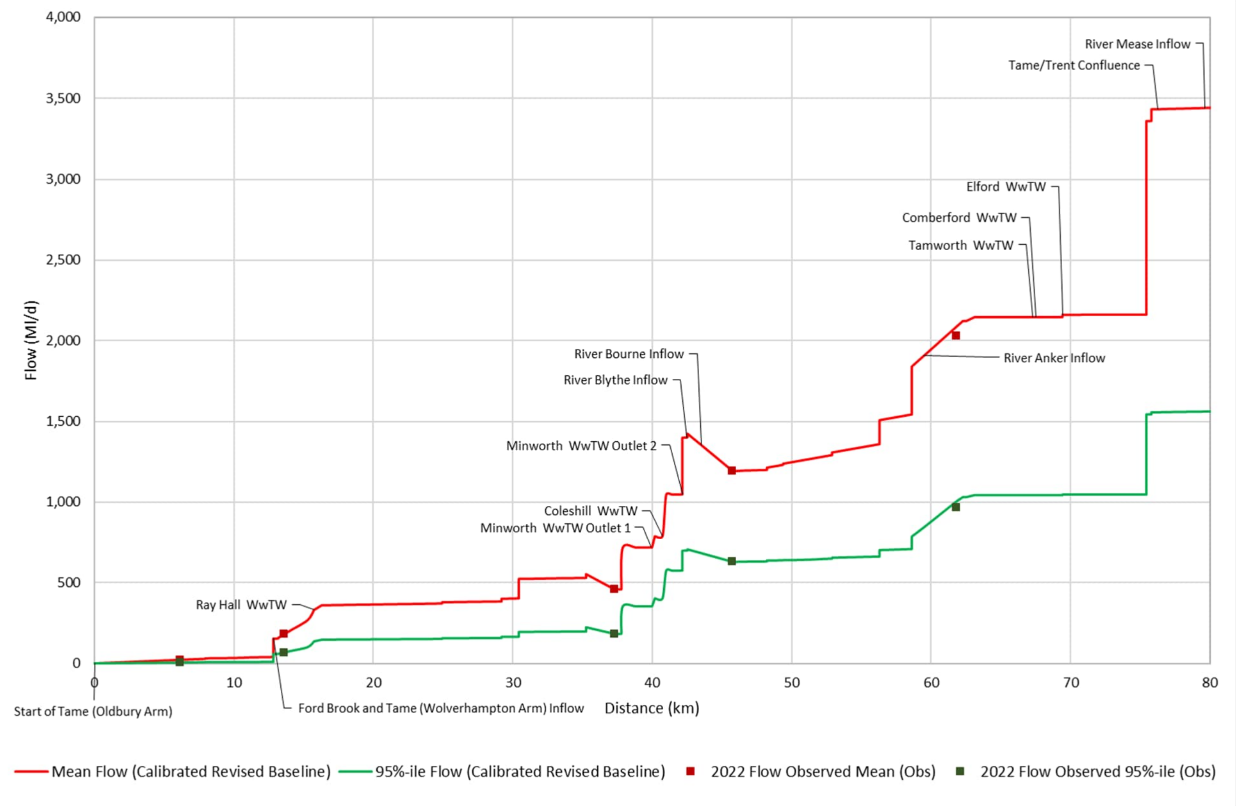


Figure 6-3: Modelled Mean and Q_{95} River Flow in the River Tame (from orthophosphate SIMCAT model)/ Baseline Scenario

6.2.8 WFD status limits for orthophosphate are set based on mean concentrations. Figure 6-4 shows the modelled mean orthophosphate concentrations along the Rivers Tame and Trent for the baseline scenario, and Figure 6-5 shows the mean orthophosphate concentrations along the River Tame only.

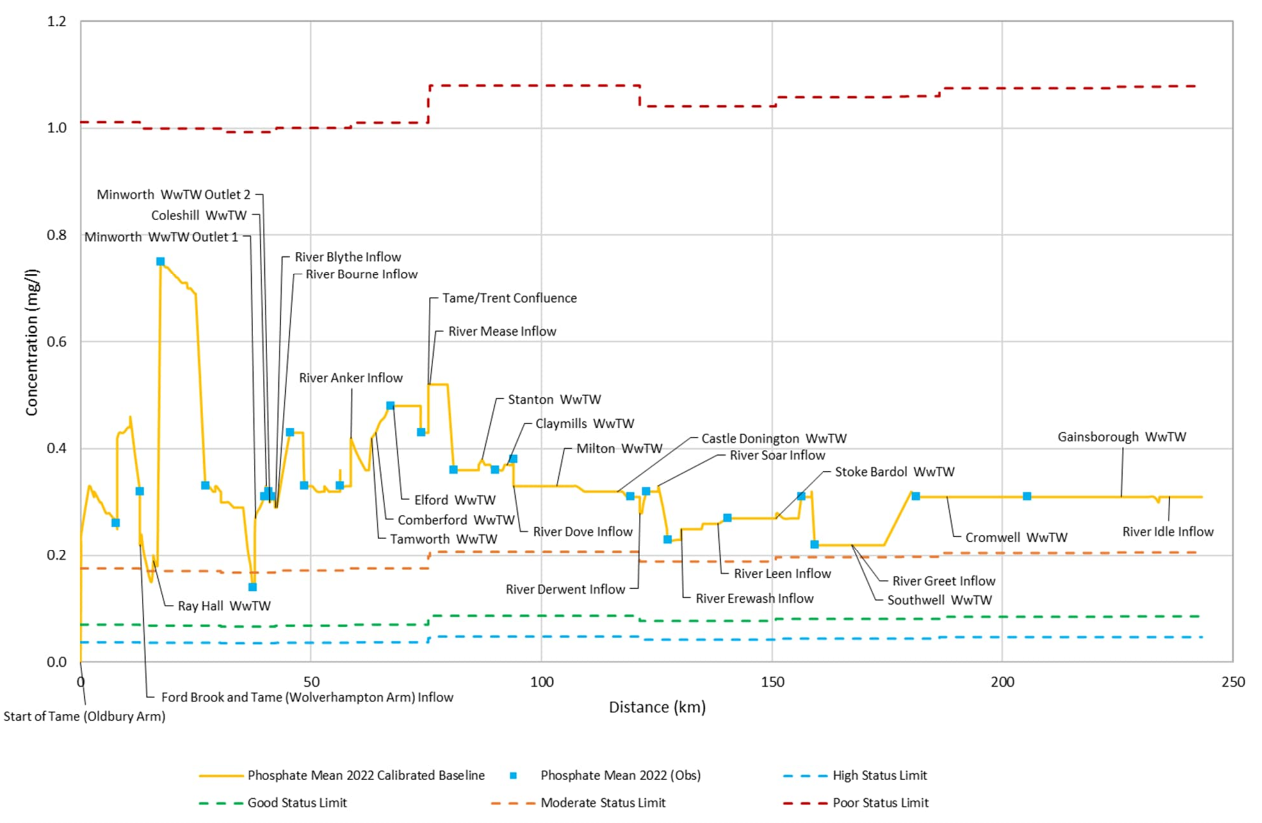


Figure 6-4: Modelled and Observed Mean Phosphate Concentrations in the Rivers Tame and Trent/ Baseline Scenario

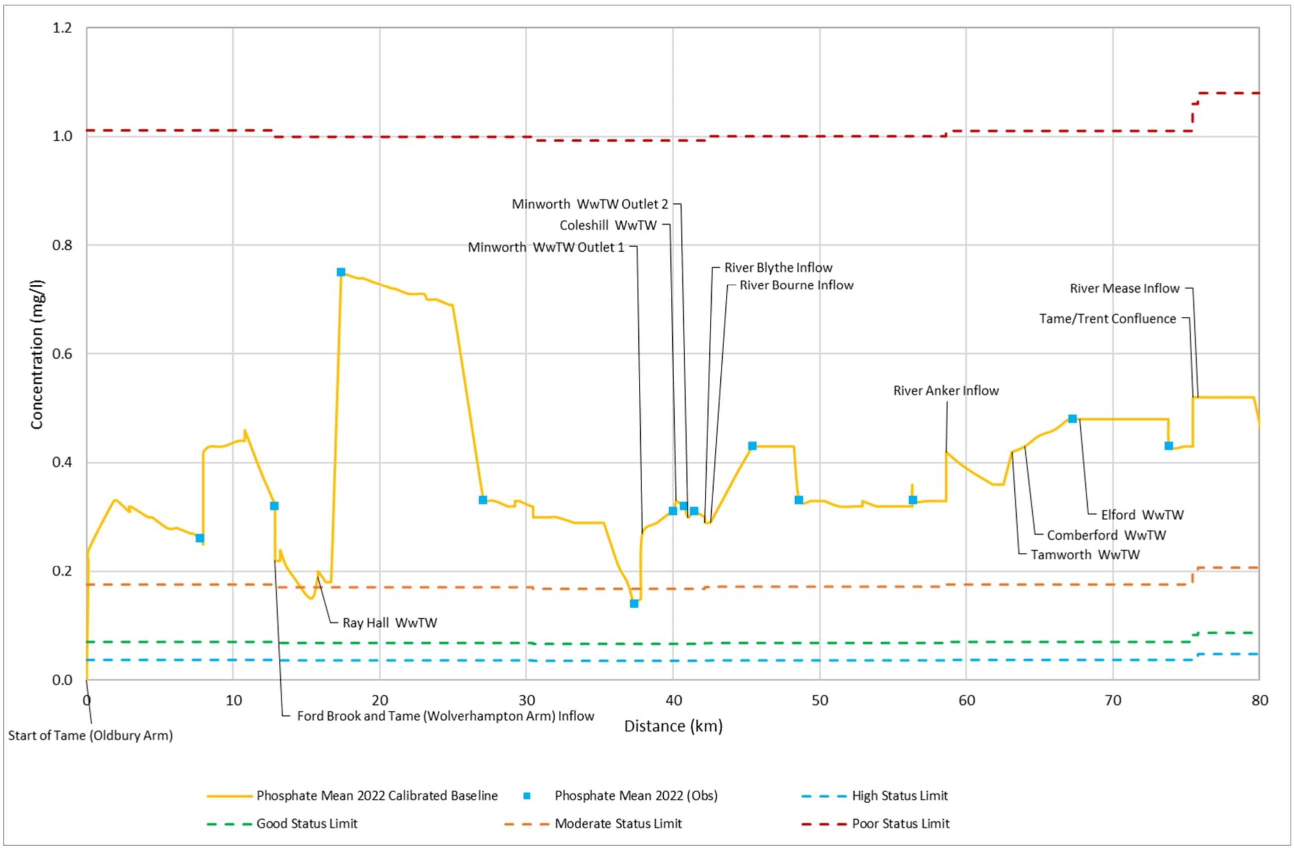


Figure 6-5: Modelled and Observed Mean Phosphate Concentrations in the River Tame/ Baseline Scenario

6.2.9 The results in Figures 6-4 and 6-5 show that the initial impact of the Minworth WwTW discharge is to increase orthophosphate concentrations in the River Tame from 0.15mg/l upstream of Outlet 1 to 0.27mg/l downstream of Outlet 1 (mean baseline scenario). The Coleshill WwTW discharge further increases orthophosphate concentrations in the River Tame but orthophosphate concentrations in the Coleshill WwTW effluent are slightly higher than in the Minworth WwTW effluent, so the further addition of effluent from Minworth Outlet 2 results in a slight dilution of orthophosphate concentrations. The overall change in orthophosphate concentration downstream of the Minworth and Coleshill WwTW outfalls is from 0.15mg/l, consistent with Moderate WFD status, to 0.31mg/l, consistent with Poor WFD status. However, Moderate status concentrations are only observed at one sample point located immediately upstream of Outlet 1, and orthophosphate concentrations throughout most of the River Tame is consistent with Poor status under WFD. The concentrations of phosphate in the River Trent downstream of the Tame-Trent confluence are also consistent with poor and moderate status concentrations are not currently observed at any location.

6.2.10 WFD status limits for BOD and ammonia are set based on 90%ile concentrations. Figure 6-6 shows the variation in 90%ile ammonia concentrations along the River Tame and River Trent downstream, while Figure 6-7 shows the 90%ile concentrations of ammonia along the River Tame only. The addition of effluent from Minworth WwTW Outlet 1 increases 90%ile ammonia concentrations from 0.58mg/l to 0.64mg/l and the addition of effluent from Coleshill WwTW further increases concentrations to 0.75mg/l. The Coleshill WwTW effluent contains higher concentrations of ammonia than the Minworth WwTW effluent, so the addition of flows from Minworth Outlet 2 dilutes 90%ile ammonia concentrations to 0.68mg/l.

6.2.11 The upstream concentration of 0.58mg/l is close to the Good Status limit of 0.6mg/l so the addition of flow at Outlet 1 increases River Tame ammonia concentrations from levels equivalent to Good Status to levels equivalent to Moderate Status. However, the addition of flow from the Rivers Blythe and Bourne reduces 90%ile concentrations back below the Good Status limit such that the Minworth and Coleshill discharges causes only a localised reduction in WFD status for ammonia. The majority of the River Tame has ammonia concentrations consistent with Good Status under WFD, improving to close to the High Status limit upstream of the Tame-Trent confluence. Modelled ammonia concentrations in the River Trent are consistent with High Status for almost the entire length downstream of the River Tame, with localised concentrations equivalent to Good Status.

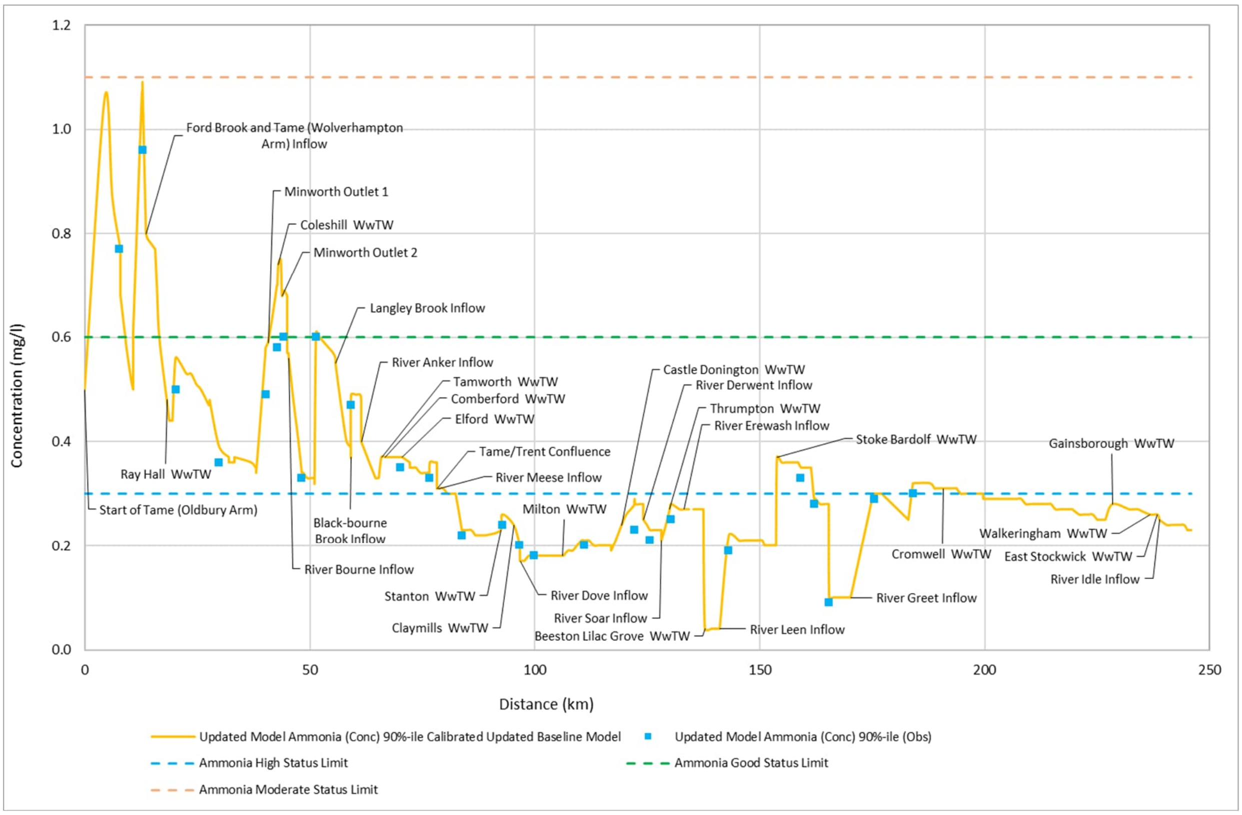


Figure 6-6: Modelled 90%ile Ammonia Concentrations in the Rivers Tame and Trent/ Baseline Scenario

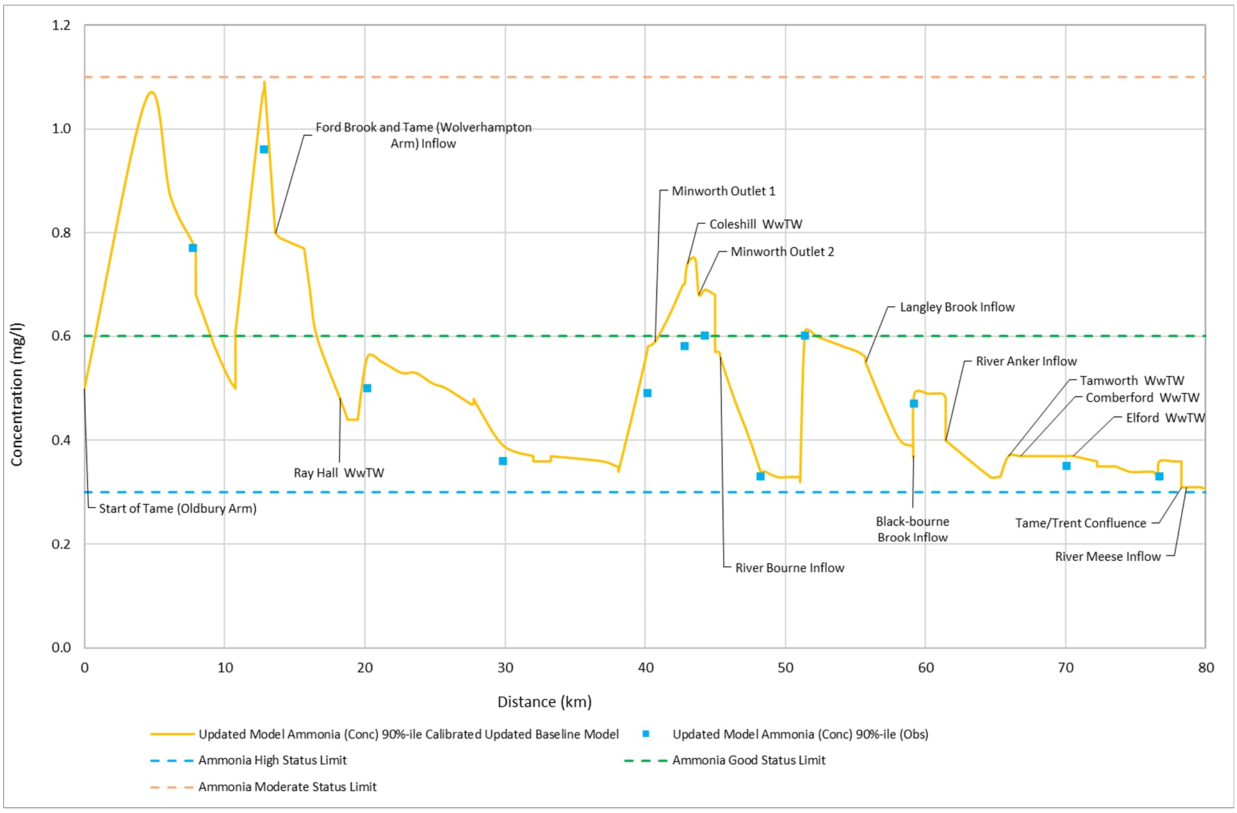


Figure 6-7: Modelled 90%ile Ammonia Concentrations in the River Tame/ Baseline Scenario

6.2.12 Figures 6-8 and 6-9 show the current modelled 90%ile BOD concentration along the River Tame and Trent or along the River Tame only. BOD concentrations in the River Tame upstream of Minworth WwTW are generally equivalent to Good or High Status, however the model is calibrated to observed data which shows a spike in 90%ile concentrations to 7.3mg/l upstream of Minworth Outlet 1 (Poor or Bad Status). The data from the sample point upstream has been checked and the timeseries contains several observations above 10mg/l with a maximum of 27.7mg/l, therefore the 90%ile value of 7.3mg/l appears realistic. Mean BOD concentrations in Minworth WwTW and Coleshill WwTW are at 2.9mg/l and 2.4mg/l respectively, so the addition of effluent from these WwTW dilutes upstream BOD concentrations in the River Tame such that concentrations equivalent to Moderate Status are achieved downstream of the outfalls and concentrations equivalent to Good Status are achieved downstream of the River Blythe and River Bourne inflows. Concentrations equivalent to High Status are achieved in the River Tame downstream of the River Anker Inflow and this is generally maintained to the Trent confluence. The River Trent is modelled to be at concentrations equivalent to High Status downstream of the Tame-Trent confluence.

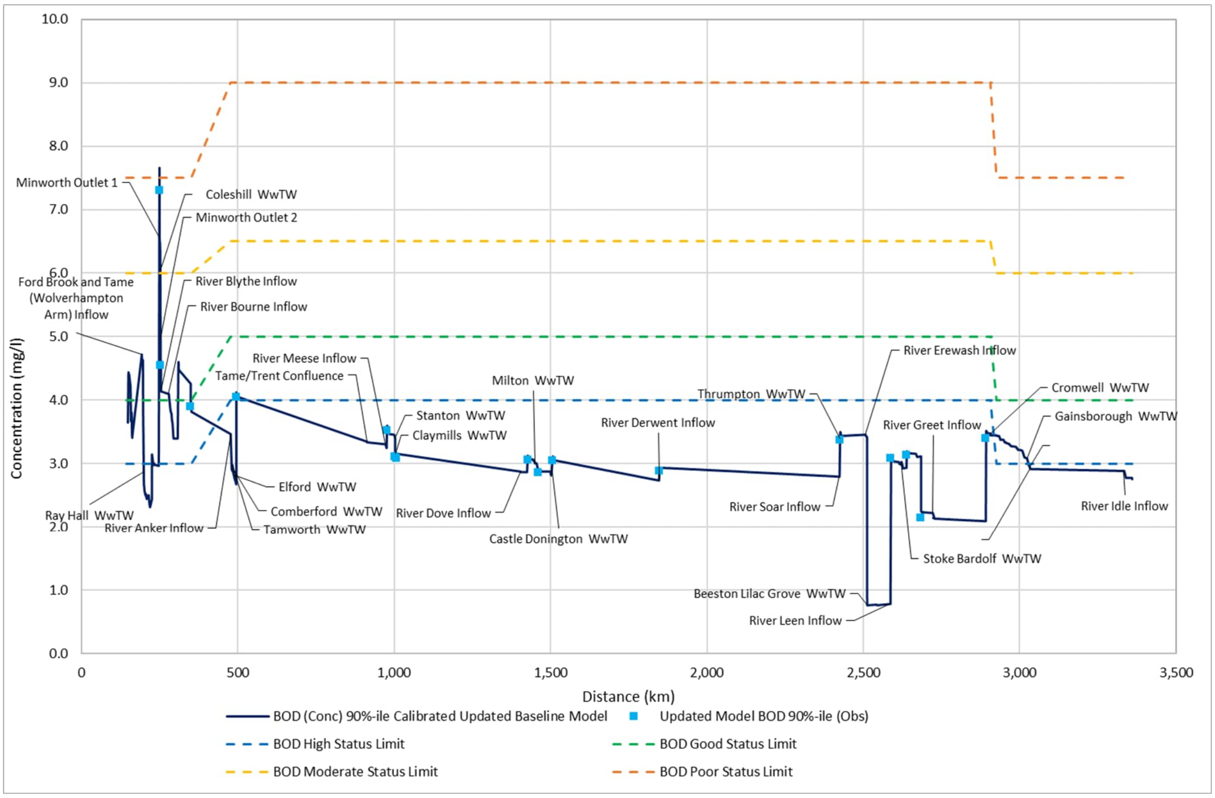


Figure 6-8: Modelled 90%ile BOD Concentrations in the Rivers Tame and Trent/ Baseline Scenario

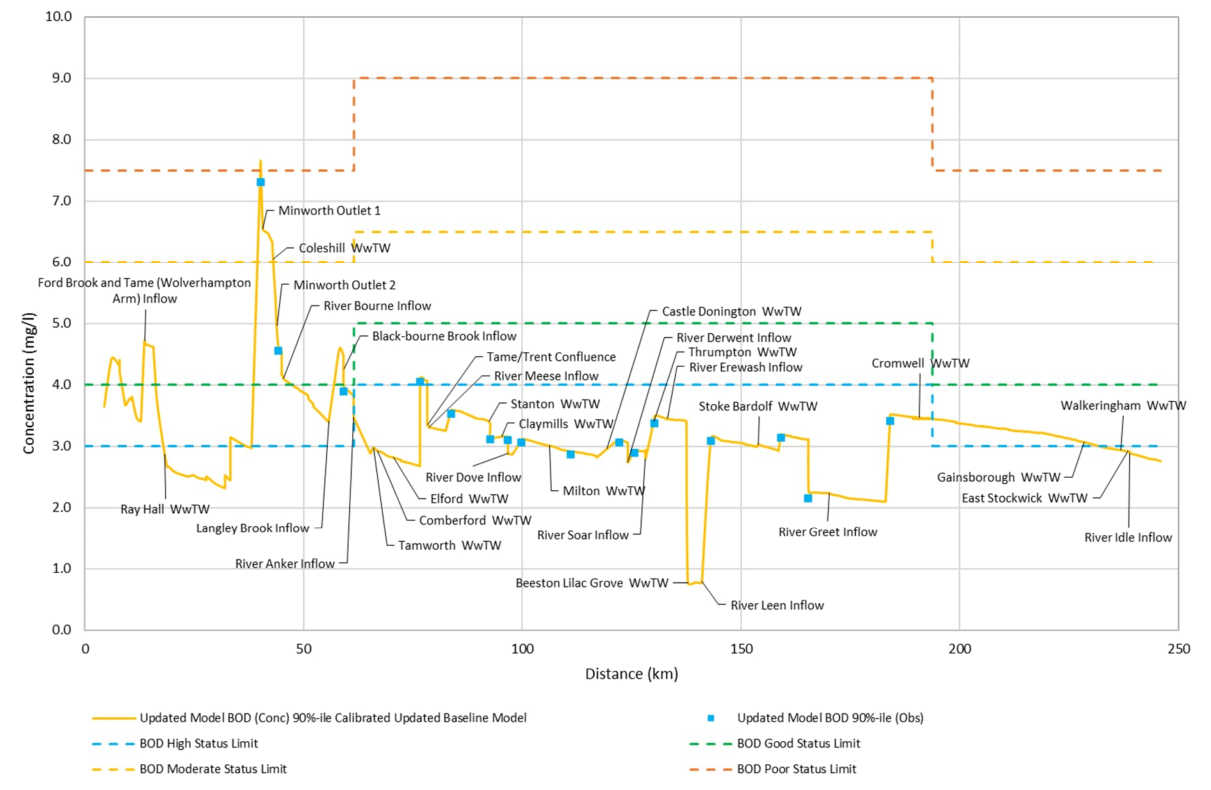


Figure 6-9: Modelled 90%ile BOD Concentrations in the River Tame/ Baseline Scenario

Proposed Scenarios

6.2.13 Figure 6-10 shows the impact of reducing flows from Minworth in line with the potential future scenarios set out in Table 6-1. There is still a significant increase in flow in the River Tame downstream of Minworth and Coleshill WwTW outfalls, however the model shows a clear reduction in both mean and Q_{95} flows from this point downstream. The reduction in flow is evident along the entire modelled reach of the Rivers Tame and Trent.

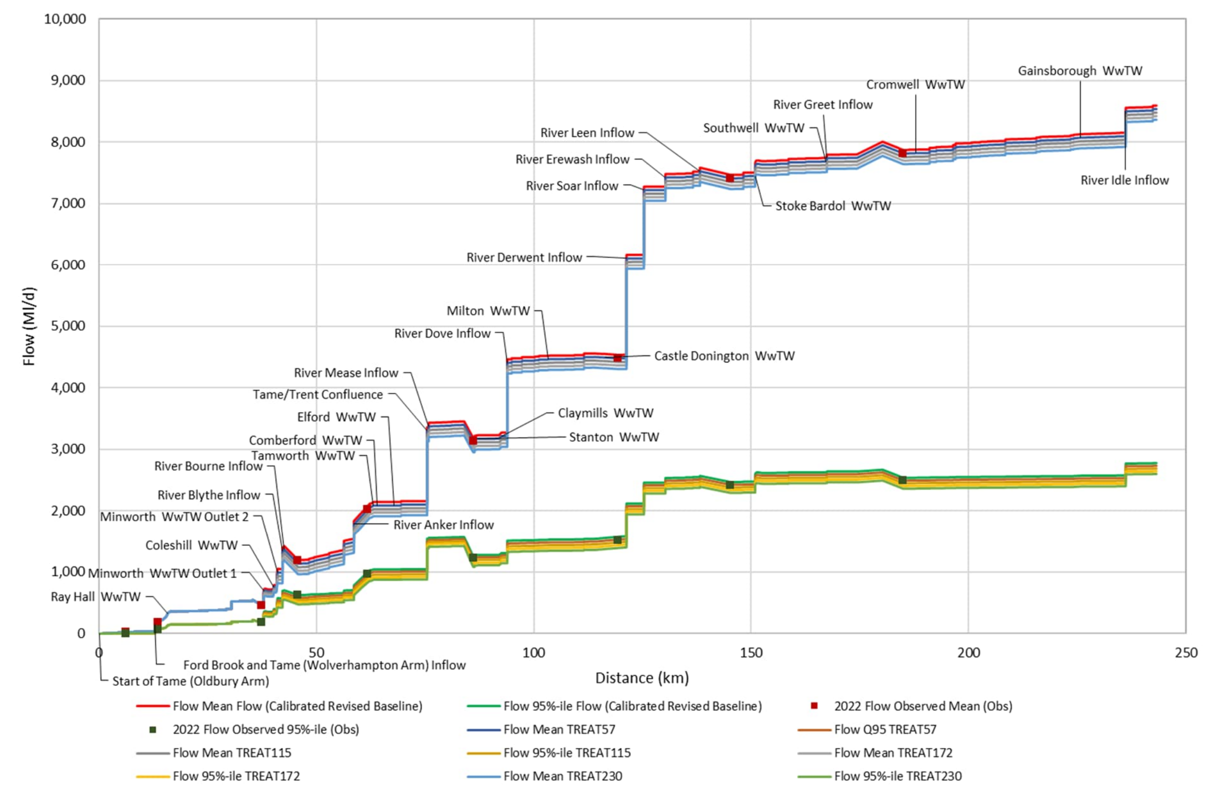


Figure 6-10: Change in Mean and Q_{95} Flow under the Proposed Future Scenarios

6.2.14 Figure 6-11 shows the significance of the change in mean and Q_{95} flow downstream of Minworth WwTW under each scenario. The mean flow is reduced by less than 5% downstream of Minworth WwTW and the Q_{95} flow is reduced by a maximum of 7.5% under TREAT57. The reduction in flow is much smaller downstream, at less than 2% for mean flows and less than 3% at Q_{95} flow for the Tame upstream of the Tame-Trent confluence. Mean flows in the River Trent are generally reduced by up to 1% while Q_{95} flows are reduced by up to 2%.

6.2.15 The change in flow under the TREAT57 scenario is therefore modest and probably within the limit of accuracy of flow measuring techniques downstream of the River Anker inflow. However, the impact becomes greater as additional flow is diverted from Minworth. In the most extreme TREAT230 scenario, the mean flow is reduced by up to 24% downstream of Minworth and the Q_{95} flow is reduced by 32%. This extent of flow reduction is only significantly reduced downstream of the River Anker inflow, after which mean flows are still reduced by 12% and Q_{95} flows are reduced by 20%. The reduction in mean flow in the River Tame at the Tame-Trent confluence is 12% and the reduction in Q_{95} flow is 19%.

6.2.16 Impact on flows in the River Trent is also evident in the model results under the TREAT230 scenario. The mean flow is reduced by 7% downstream of the Trent/ Tame confluence and the Q_{95} flows are reduced by 10% in this same reach. Additional tributary inflows result in a less significant change in flow further along the River Trent, however the reduction in flow is relatively stable from the Derwent confluence downstream, at approximately 3% for mean flow and 7% at Q_{95}. It should be noted that only a simplified representation of flow loss has been included for the water quality modelling. Operation of the SROs will vary over time according to demand and river flow conditions, and as such a simulations of the Minworth flow reductions on flow statistics and river hydraulics in the River Tame and River Trent have been modelled in Aquator and hydraulic models presented in a parallel modelling study for Gate 2. The significance of the simulated flow reductions on ecological receptors linked to the Rivers Tame and Trent have been assessed in the parallel Gate 2 environmental assessments for the relevant SRO schemes.

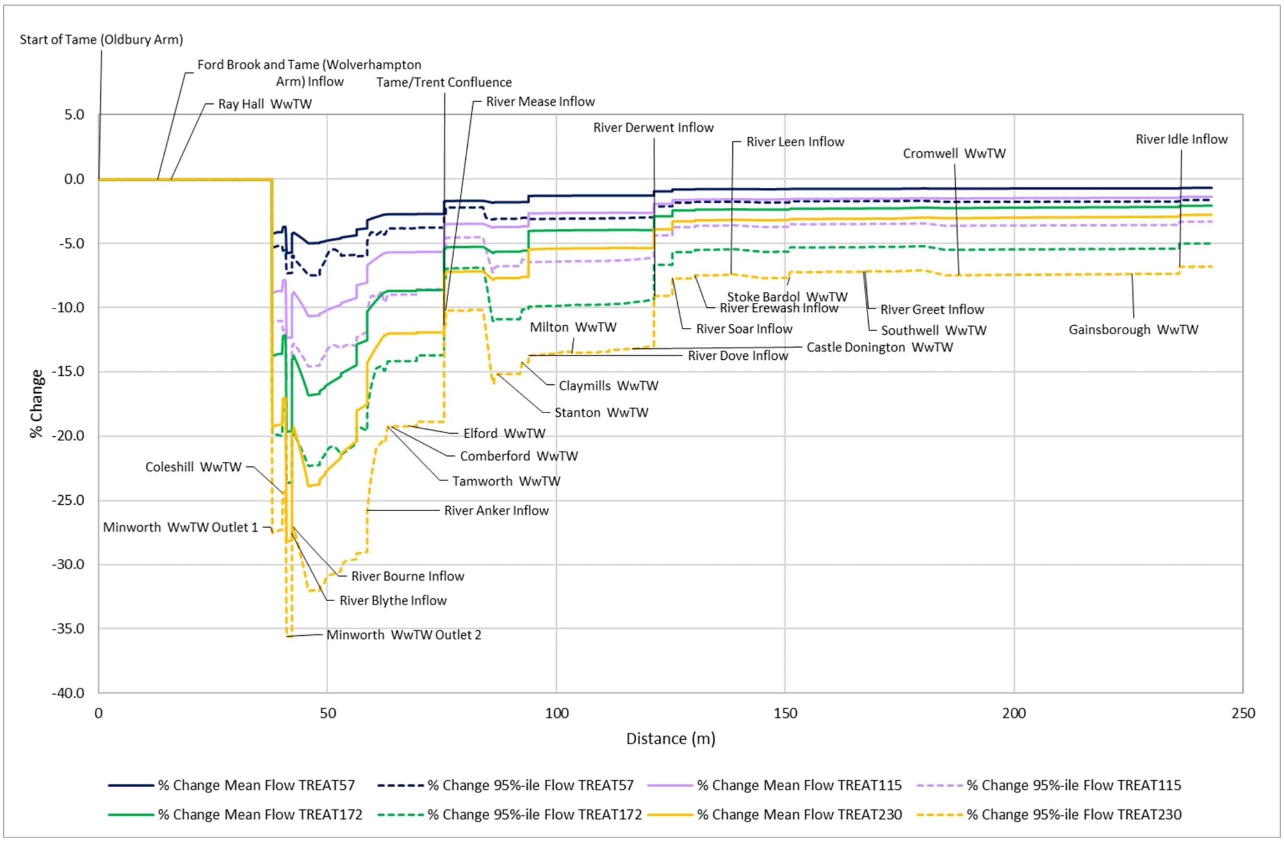


Figure 6-11: Percentage Change in Flow under the Future Scenarios for the Rivers Tame and Trent

6.2.17 Figure 6-12 shows the change in modelled mean orthophosphate concentration along the River Tame under the potential future discharge scenarios. The model results show that reduced discharges from Minworth Outlet 1 reduce orthophosphate concentrations locally by between 4% under TREAT57 to 17% under TREAT230. The reduced phosphate input to the Tame is sufficient to allow for further dilution of effluent from Coleshill WwTW, such that River Tame orthophosphate concentrations are reduced by 3% downstream of Coleshill WwTW outfall under TREAT57 and by 6% under TREAT230. A 4% overall reduction in orthophosphate concentrations in the River Tame is sustained downstream of the River Blythe confluence under TREAT230, however there is no change in orthophosphate concentrations at this location under TREAT57.

6.2.18 Further downstream, the reduction in river flow results in increases in the orthophosphate concentration in the River Tame under the proposed scenarios. These increases are generally minor, at up to 5% for TREAT230 and insignificant under the other proposed scenarios, however there is an increase in modelled orthophosphate concentrations downstream of the Comberford, Telford and Elford WwTW discharges of up to 2% under TREAT57 and 5% under TREAT230 and this increase is sustained to the Tame-Trent confluence. There is, however, no significant impact on modelled orthophosphate concentrations in the River Trent.

6.2.19 The results of reducing discharges from Minworth WwTW on orthophosphate concentrations are therefore complex and can vary along different reaches of the River Tame. However, the changes in orthophosphate concentration are small under all modelled future scenarios and are not sufficient to cause a change in WFD status classification at any location along the Rivers Tame or Trent compared to baseline conditions.

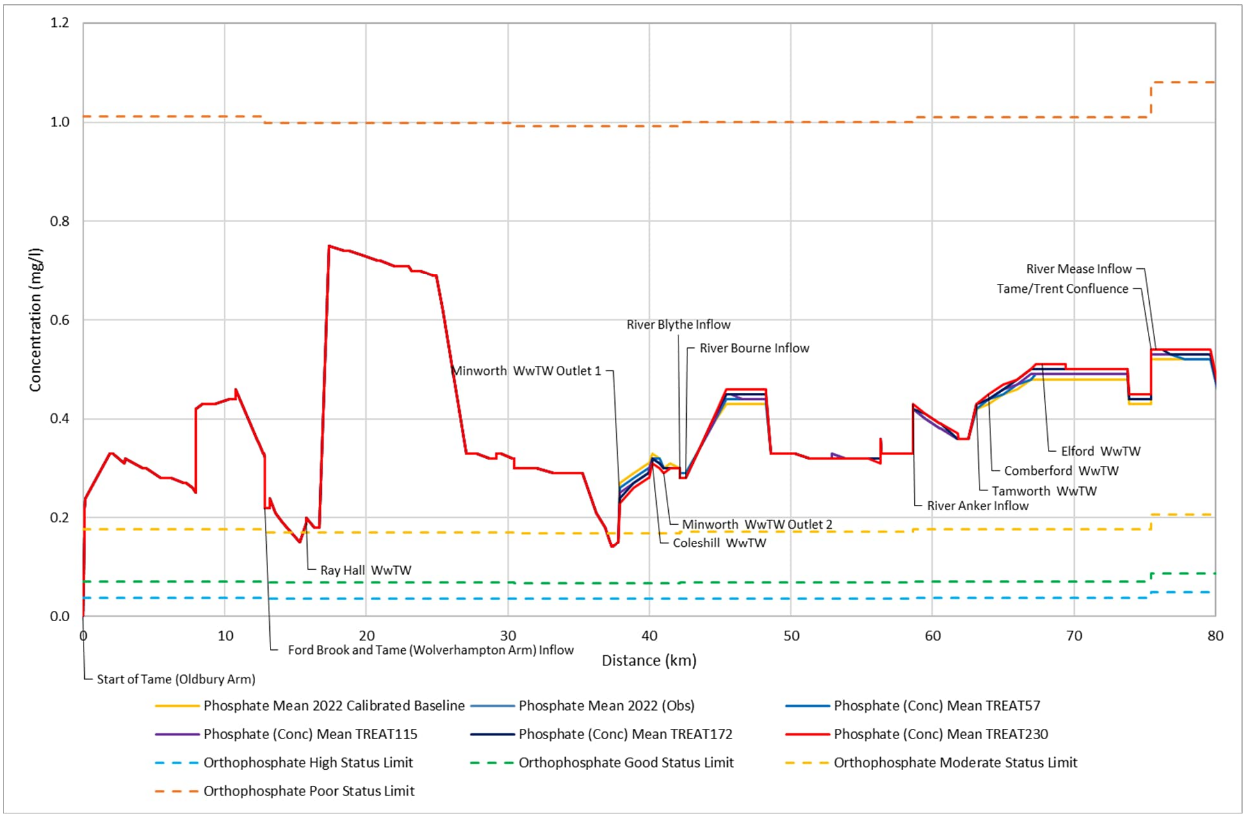


Figure 6-12: Modelled and Observed Mean Orthophosphate Concentrations in the River Tame (Baseline and Future Scenarios)

6.2.20 Figure 6-13 shows the modelled changes in 90%ile ammonia concentrations in the River Tame under the baseline and future modelled scenarios. The reduction in flows from Minworth WwTW result in a small increase in modelled River Tame ammonia concentrations due to reduced dilution between Outlet 1 and the River Bourne inflow, however this is not significant at less than 5% in all modelled scenarios. Ammonia concentrations reduce by up to 5% with reducing Minworth flows downstream of the River Blythe inflow and are further reduced by up to 10% downstream of the River Bourne inflow. In general, the reductions in discharges from Minworth WwTW result in slightly reduced ammonia concentrations in the River Tame, however the changes are small and insufficient to cause a WFD status change at any location. There are no significant impacts on the River Trent.

6.2.21 Figure 6-14 shows the modelled variation in 90%ile BOD concentrations along the River Tame under the baseline and proposed future scenarios. Results for the River Trent are not presented because there are no significant impacts on River Trent BOD concentrations. The results in Figure 14 show up to 3% increase in River Tame BOD concentrations between Minworth Outlet 1 and Coleshill WwTW due to reduced dilution of higher BOD concentrations upstream. BOD concentrations are then reduced by up to 2% downstream of Coleshill WwTW and by up to 5% downstream of Minworth Outlet 2. Concentrations of BOD change by ±2% between the River Blythe and the River Bourne inflows – this is not significant but concentrations in this section of the River Tame are very close to the Good Status Limit under WFD and Good Status concentrations may be seen in this section in future. BOD concentrations between the River Bourne and Langley Brook inflows are slightly reduced if Minworth WwTW discharges are diverted and concentrations between the Langley Brook inflow and the Black-bourne Brook inflow are slightly increased, however the changes are too small to have any impact on local compliance with WFD status limits. Reduced dilution results in very small increases in BOD concentrations downstream of Tamworth, Comberford and Elford WwTW discharge locations, but again the change is extremely small, and any WFD status impacts will be in the form of slight variation in the distance over which High Status concentrations are restored. There is no change in the modelled BOD concentration in the River Trent, downstream of the Tame-Trent confluence.

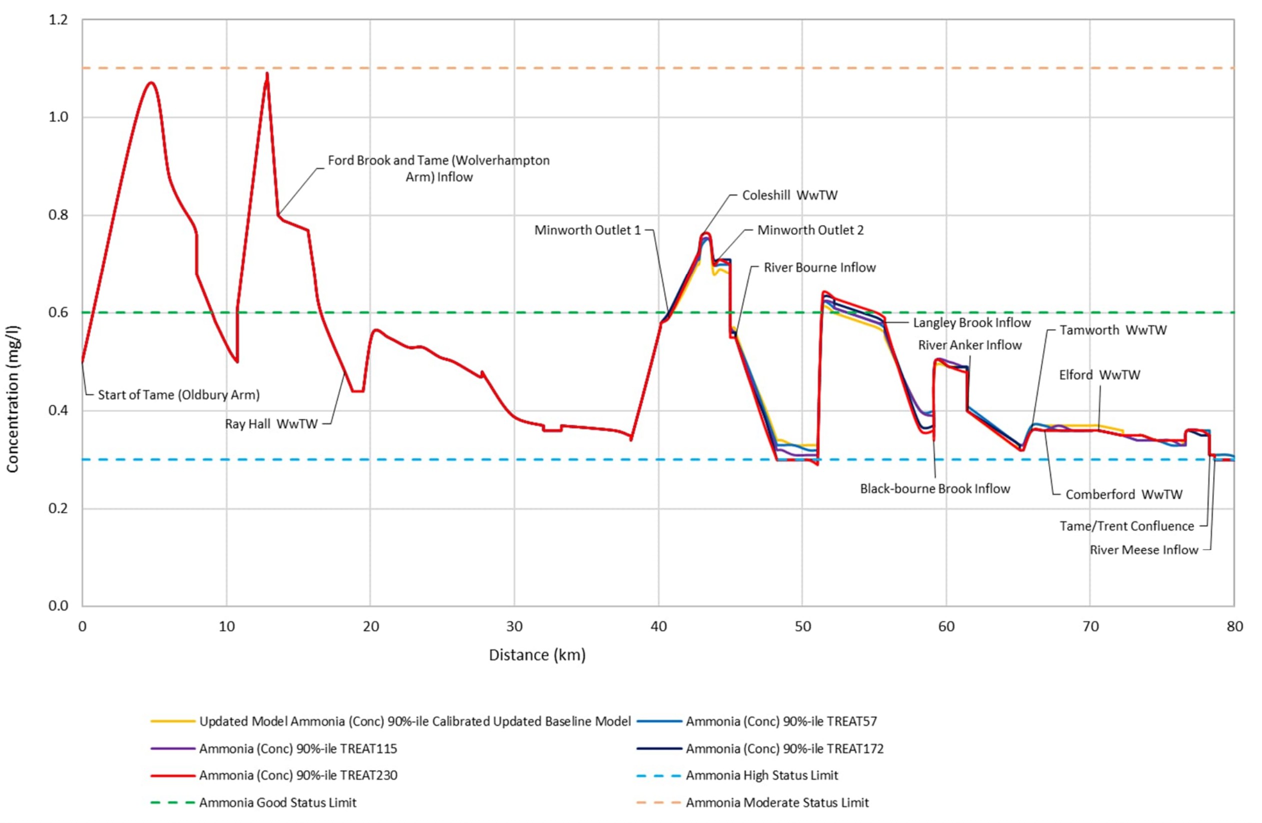


Figure 6-13: Modelled and Observed 90%ile Ammonia Concentrations in the River Tame (Baseline and Future Scenarios)

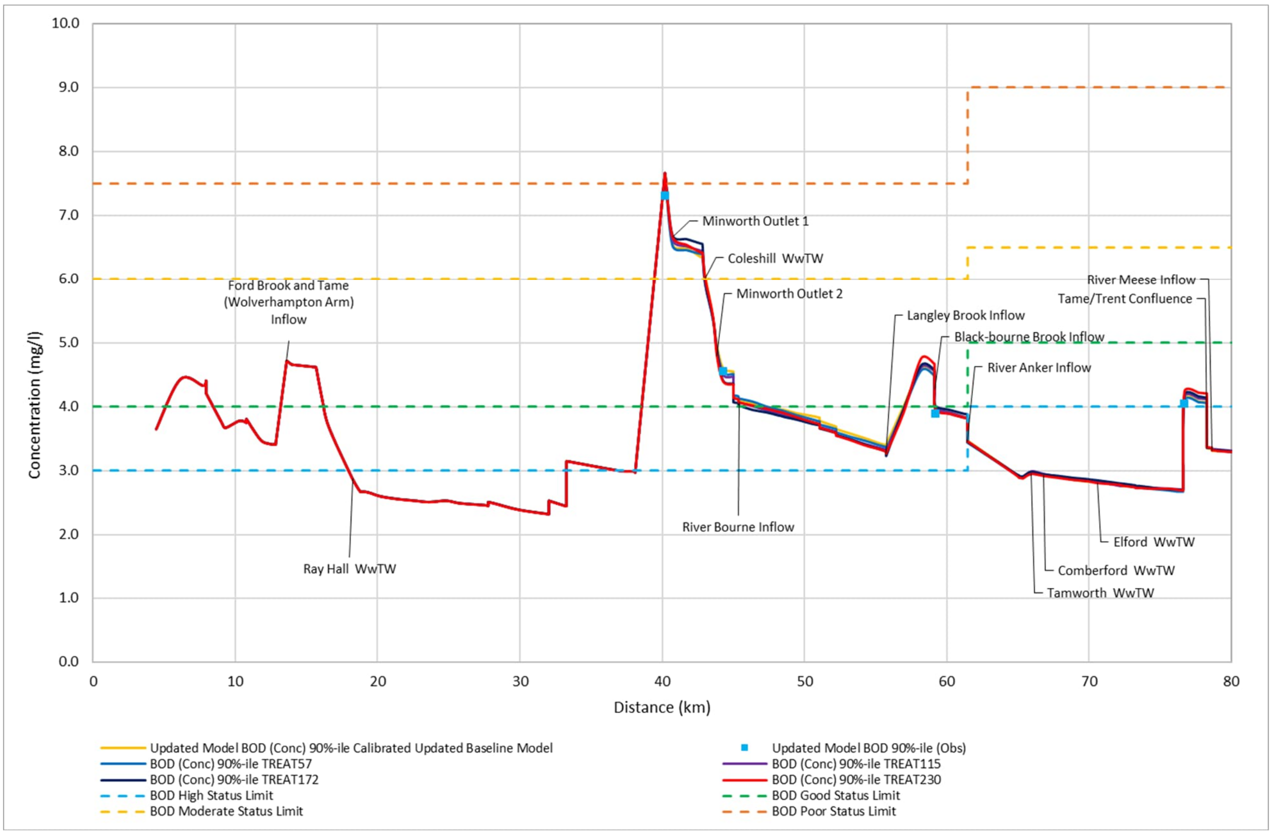


Figure 6-14: Modelled and Observed 90%ile BOD Concentrations in the River Tame (Baseline and Future Scenarios)

SIMCAT Modelling Summary

6.2.22 SIMCAT catchment modelling has been used to assess the impacts of reducing flows of treated effluent from Minworth WwTW to the River Tame and the River Trent downstream. An updated baseline model was developed using up to date water quality data, river flow data and WwTW effluent flow and quality data. Four future discharge scenarios for Minworth WwTW effluent have been tested and the results compared to the current baseline model to assess the impacts of potential future water management strategies on downstream flow statistics, mean ammonia concentrations and 90%ile ammonia and BOD concentrations which are used to set status limits under WFD. The results have been assessed in terms of the change in flow and pollutant concentrations and compliance with WFD limits.

6.2.23 The SIMCAT modelling shows that the impact of reducing discharges from Minworth WwTW on orthophosphate, ammonia and BOD concentrations is generally minor and localised. Orthophosphate concentrations in the River Tame were slightly reduced at Minworth WwTW outfall locations but slightly increased downstream due to reduced dilution capacity in the River Tame. There were no impacts in terms of WFD compliance and no significant impacts on orthophosphate concentrations in the River Tame.

6.2.24 Variations in ammonia concentrations were small, generally less than 5% and not more than 10%, with slightly reducing ammonia concentrations in response to reduced discharges from Minworth WwTW. There were no impacts on the River Trent and no change in WFD status classification. Similarly, the impacts on BOD concentrations were minor and localised; there was a slight increase in BOD concentrations at the Minworth WwTW outlets due to reduced dilution of high upstream BOD concentrations, but a reduction in BOD further downstream, however the changes were too small to have any impact on local compliance with WFD status limits and had no simulated impacts on River Trent BOD concentrations.

6.2.25 The SIMCAT modelling has therefore demonstrated the removal of effluent flows from Minworth WwTW from the River Tame, of up to 230Ml/d, will not have significant impacts on water quality in terms of orthophosphate, ammonia and BOD concentrations and WFD compliance. The significance of the flow reductions on the ecological communities in the Rivers Tame and Trent has been assessed in parallel studies.

6.3 Other Pollutant Assessment

6.3.1 Other pollutants can be present in effluent from Minworth WwTW which may result in ecological detriment in the River Tame if present in sufficient concentration in the effluent. Alternatively, reduction of discharges from Minworth WwTW may reduce River Tame water quality downstream if concentrations of pollutants are elevated above the EQS in the River Tame upstream and the addition of Minworth WwTW effluent acts to dilute pollutants.

6.3.2 Effluent from Minworth WwTW was monitored for a comprehensive set of pollutants in order to inform this water quality assessment and the data collected has been combined with the long term Environment Agency regulatory monitoring dataset. The following monitored pollutants are subject to EQS limits under the WFD but have not been detected in Minworth WwTW effluent (all samples return concentrations less than the limit of detection). Discharges from Minworth WwTW are therefore not expected to be a significant source of the following pollutants to the River Tame:

• 1,2-dichloroethane	• Carbon Tetrachloride	• Methiocarb
• 2,4-dichlorophenol	• Chlorfenvinphos	• Napthalene
• 2,4-dichlorophenoxyacetic acid (2,4-D)	• Chlorothalonil	• Octylphenol
• 3, 4 Dichloroaniline	• Chromium (VI)	• para-para-DDT
• Aclonifen	• Cybutryne	• Pendimethalin
• Alachlor	• Diazinon	• Pentachlorobenzene
• Ammonia (unionised)	• Dichlorvos	• Pentachlorophenol
• Atrazine	• Dicofol	• Quinoxyfen
• Benzene	• Dimethoate	• Simazine
• Benzyl butyl phthalate	• Diuron	• Tetrachloroethylene
• Bifenox	• Endosulfan	• Toluene

• C10-13 Chloroalkanes	• Heptachlor and heptachlor epoxide	
• Carbendazim	• Linuron	

6.3.3 Brominated diphenylether (BDPE) and hexachlorocyclohexane are also subject to WFD EQS limits, however concentrations of these substances in the effluent have not been monitored.

6.3.4 Table 6-2 provides a summary of recorded concentrations of pollutants which are limited by WFD EQS values, and which were found to be present in the effluent from Minworth WwTW. Most pollutants are present in the effluent at concentrations significantly below the EQS, showing that the current discharge of effluent from the River Tame does not significantly impact downstream water quality.

Table 6-2 – Comparison of Effluent Pollutant Concentrations with EQS Limits

Pollutant[a]	Mean Effluent Concentration	EQS	Effluent exceeds EQS?
Acid Neutralising Capacity[b]	1830mg/l	>80mg/l	✗
Anthracene	0.012ug/l	0.1ug/l	✗
Arsenic	0.887ug/l	50ug/l	✗
Benzo(a)pyrene	1.14ng/l	0.17ng/l	✓
Cadmium and Its Compounds	0.014ug/l	0.09ug/l	✗
Chlorine	Mean = 0.14ug/l 95%ile = 0.32ug/l	Mean = 2ug/l 95%ile = 5ug/l	✗
Chromium (III)	Mean = 1.68ug/l, 95%ile = 3.16ug/l	Mean = 4.7ug/l 95%ile = 32ug/l	✗
Copper	0.86ug/l (bioavailable)	1ug/l (bioavailable)	✗
Cypermethrin	0.2ng/l	0.08ng/l	✓
Dichloromethane	1.35ug/l	20ug/l	✗
Fluoranthene	1.72ug/l	6.3ug/l	✗
Glyphosate	Mean = 0.444ug/l 95%ile = 0.584ug/l	Mean = 196ug/l 95%ile = 398ug/l	✗
Hexabromocyclododecane (HBCDD)	0.95ug/l	1.6ug/l	✗
Iron	0.161mg/l	1mg/l	✗
Isoproturon	0.0025ug/l	0.3ug/l	✗
Lead and Its Compounds	0.341ug/l	1.2ug/l	✗
Manganese	17.75ug/l (bioavailable)	123ug/l (bioavailable)	✗
Mecoprop	Mean = 0.04ug/l 95%ile = 0.063ug/l	Mean = 18ug/l 95%ile = 187ug/l	✗
Mercury and Its Compounds	0.009ug/l (maximum)	0.07ug/l (MAC)	✗
Nickel and Its Compounds	3.37ug/l (bioavailable)	4ug/l (bioavailable)	✗
Nonylphenol	0.255ug/l	0.3ug/l	✗
Perfluorooctane sulphonate (PFOS)	18ng/l	0.65ng/l	✓
Permethrin	Mean = 0.00255ug/l 95%ile = 0.0062ug/l	Mean = 0.001ug/l 95%ile = 0.010ug/l	✓
Terbutryn	0.012ug/l	0.065ug/l	✗
Tributyltin Compounds	0.03ng/l	0.2ng/l	✗
Trichloroethane	Mean = 0.124ug/l 95%ile = 0.458ug/l	Mean = 140ug/l 95%ile = 1840ug/l	✗
Trichloroethylene	0.00003ug/l	10ug/l	✗
Trichloromethane (chloroform)	0.46ug/l	2.5ug/l	✗
Triclosan	Mean = 0.02ug/l 95%ile = 0.04ug/l	Mean = 74ug/l 95%ile = 380ug/l	✗
Zinc	22.14ug/l (bioavailable)	12.3ug/l (bioavailable)	✓

[a] Pollutant concentrations are mean values unless otherwise stated
[b]EQS for Acid Neutralising Capacity is a minimum limit, all others are maximum limits
[c] Bioavailable fraction for copper, nickel, manganese and zinc calculated using the Metal Bioavailability Assessment Tool provided by UKTAG

6.3.5 Table 6-2 shows that concentrations of benzo(a)pyrene, cypermethrin, PFOS and zinc present in treated Minworth WwTW effluent can exceed EQS standards. Review of AECOM and Environment Agency sampling data shows that concentrations of benzo(a)pyrene, cypermethrin and bioavailable zinc in the

River Tame upstream of Minworth WwTW[14] exceed effluent concentrations. There are no data for upstream PFOS concentrations, however Environment Agency data[15] show concentrations of close analogues, perfluorooctylsulphonate and perfluorooctanate at 0.01-0.080µg/l and 0.003-0.011µg/l respectively, suggesting that effluent concentrations of industrial pollutants in the final effluent from Minworth WwTW are likely within the range of concentrations observed in the River Tame upstream. Permethrin is present in the effluent at concentrations exceeding both EQS limits and ambient concentrations, giving potential for breaches of EQS limits in the River Tame. However, AECOM sampling did not detect permethrin downstream of Coleshill WwTW, therefore any impacts are extremely localised.

6.3.6 Upstream water quality data also show concentrations of anthracene, arsenic, chromium (III), fluoranthene, glyphosate, isoproturon, manganese and nickel exceed effluent concentrations. For these substances, as well as benzo(a)pyrene, cypermethrin and zinc, the reduction in effluent discharges from Minworth WwTW may increase concentrations in the River Tame downstream of the outfall due to reduced dilution of upstream pollutant loads. The available data also show that effluent concentrations of cadmium, copper, dichloromethane, iron, lead, mercury, terbutryn, trichloroethane, trichloromethane (chloroform) and triclosan exceed upstream ambient concentrations. Reducing the discharge from Minworth WwTW would be beneficial in terms of reducing the pollutant load for these substances. There are no upstream water quality data for acid neutralising capacity, chlorine, hexabromocyclododecane (HBCDD), nonylphenol, tributyltin compounds or trichloroethylene.

6.3.7 The potential impact on downstream water quality of reducing discharges from Minworth WwTW has been assessed through calculating the change in downstream concentrations for 25 pollutants where effluent and upstream water quality data exist; the results are presented in Table 6-3. The EQS limits in Table 6-3 are annual average and therefore mean effluent and river flows and mean effluent and river pollutant concentrations are assumed. These mass balance calculations could not be carried out for acid neutralising capacity, chlorine, hexabromocyclododecane (HBCDD), nonylphenol, tributyltin compounds or trichloroethylene due to lack of ambient water quality data. Mass balance calculations cannot be carried out for PFOS because upstream water quality has not been monitored for this substance, however since the concentrations in Minworth effluent are expected to be within the range of upstream ambient concentrations, reducing the discharge is not expected to significantly change downstream concentrations.

6.3.8 The results in Table 6-3 show that downstream river pollutant concentrations are reduced for twelve of the 25 monitored pollutants in response to reducing discharges from Minworth WwTW. Reducing the discharge rate reduces pollutant loading for permethrin such that the EQS is projected to be met downstream under the TREAT230 scenario. Downstream concentrations of mecoprop are expected to be unchanged.

6.3.9 Downstream concentrations of a further seven pollutants slightly increase under the proposed discharge scenarios but there is no risk of breaching EQS standards for any substance except nickel, for which upstream concentrations are already close to EQS limits. Effluent and ambient concentrations of nickel are similar and, given the limited sampling data available, it is likely that actual long term downstream concentrations will remain unchanged.

6.3.10 Concentrations of benzo(a)pyrene, cypermethrin, fluoranthene and zinc increase due to reduced dilution of upstream concentrations which significantly exceed EQS values. The increase in cypermethrin and zinc concentrations is small in comparison to upstream concentrations, at less than 5%. The increase in concentrations of benzo(a)pyrene and fluoranthene is more significant, however upstream concentrations of benzo(a)pyrene are 159 times greater than the EQS and upstream concentrations of fluoranthene is 7 times greater than the EQS. In this context, the changes in pollutant concentrations in the River Tame as result of reduced discharges from Minworth WwTW will not have an impact on compliance with WFD standards; upstream sources of both these pollutants control compliance with EQS standards.

[14] Upstream cypermethrin data taken from sample point location MD-59014950 (River Tame – Newton Road West Bromwich
[15] Environment Agency water quality data taken from sample point locations MD-59014950 (River Tame – Newton Road West Bromwich) and MD-59012815 River Tame – TIMET UK Ltd 100m Downstream Brookvale Road)

Table 6-3 – Percentage Change in Monitored Contaminant Concentrations Under Future Discharge Scenarios

Pollutant	Effluent value (ug/l)	Upstream Background value (µg/l)	Downstream Concentration Under Future Discharge Scenarios				EQS	Comment
			TREAT57	TREAT115	TREAT172	TREAT230		
Permethrin (ng/l)	2.55	0	1.3	1.2	1.1	1.0	1.0	Reduction in downstream concentrations. EQS met under TREAT230
Benzo(a)pyrene (ng/l)	1.14	27.0	14.1	15.0	16.0	17.1	0.17	Increase in downstream concentration, EQS breached upstream
Cypermethrin (ng/l)	0.200	0.270	0.235	0.237	0.240	0.243	0.080	Increase in downstream concentration, EQS breached upstream
Zinc (µg/l)	22.14	30.00	26.08	26.34	26.64	27.00	12.30	Increase in downstream concentration, EQS breached upstream
Cadmium and Its Compounds (µg/l)	0.0140	0.0000	0.0070	0.0065	0.0060	0.0054	0.0900	Reduction in downstream concentration
Copper (µg/l)	0.86	0.19	0.52	0.50	0.48	0.45	1.00	Reduction in downstream concentration
Dichloromethane (µg/l)	1.35	0.00	0.67	0.63	0.58	0.52	20.00	Reduction in downstream concentration
Lead and Its Compounds (µg/l)	0.341	0.270	0.305	0.303	0.300	0.297	1.200	Reduction in downstream concentration
Mecoprop (µg/l)	0.04	0.04	0.040	0.040	0.040	0.040	18.0	No change in downstream concentration
Mercury and Its Compounds (µg/l)	0.0090	0.0000	0.0045	0.0042	0.0038	0.0034	0.0700	Reduction in downstream concentration
Terbutryn (µg/l)	0.012	0.008	0.0100	0.0099	0.0097	0.0095	0.065	Reduction in downstream concentration
Trichloroethane (µg/l)	0.124	0.000	0.062	0.058	0.053	0.047	140	Reduction in downstream concentration
Trichloromethane (chloroform) (µg/l)	0.46	0.00	0.23	0.21	0.20	0.18	2.50	Reduction in downstream concentration
Triclosan (µg/l)	19.5	0.0	9.7	9.1	8.3	7.5	740	Reduction in downstream concentration
Anthracene (ng/l)	12.0	27.0	19.5	20.0	20.6	21.3	100	Increase in downstream concentrations, EQS not breached
Arsenic (µg/l)	0.89	1.54	1.21	1.24	1.26	1.29	50	Increase in downstream concentrations, EQS not breached
Chromium (III) (µg/l)	1.68	2.71	2.20	2.23	2.27	2.32	4.70	Increase in downstream concentrations, EQS not breached
Fluoranthene (ng/l)	1.72	46.0	23.9	25.4	27.1	29.1	6.3	Increase in downstream concentration, EQS breached upstream
Glyphosate (µg/l)	0.444	0.537	0.491	0.494	0.497	0.502	196	Increase in downstream concentrations, EQS not breached
Iron (mg/l)	0.161	0.064	0.112	0.109	0.105	0.101	1.0	Reduction in downstream concentration
Isoproturon (ng/l)	2.5	43.0	22.8	24.2	25.7	27.5	300	Increase in downstream concentrations, EQS not breached
Manganese (µg/l)	17.75	29.80	23.79	24.20	24.66	25.20	123	Increase in downstream concentrations, EQS not breached
Nickel and Its Compounds (µg/l)	3.37	3.84	3.61	3.62	3.64	3.66	4.0	Increase in downstream concentrations, EQS not breached

6.4 Other Pollutant Assessment Summary

6.4.1 The above calculations assess the impact of Minworth WwTW discharges on water quality in the River Tame through addition of pollutants other than orthophosphate, ammonia and BOD. Review of monitoring data shows no measurable concentrations in the effluent of 37 substances which are subject to EQS limits under WFD, therefore there is no addition of these substances to the River Tame from Minworth WwTW. A further 30 substances with EQS limits are present in the Minworth WwTW treated effluent, however 25 are present at concentrations below the EQS so that the Minworth WwTW discharge does not impact WFD compliance. Four substances (cypermethrin, benzo(a)pyrene, PFOS and zinc) are present at concentrations exceeding the EQS but lower than upstream River Tame concentrations so, again, Minworth WwTW discharges do not cause a breach of WFD limits. Only permethrin is found to be present in the Minworth WwTW effluent at concentrations exceeding both EQS limits and upstream concentrations, however permethrin is not detected in the River Tame downstream of Coleshill WwTW and therefore any increases in River Tame permethrin concentrations are limited to the immediate vicinity of the Minworth WwTW outfalls.

6.4.2 The above analysis also examines the potential for future reductions in effluent flows from Minworth WwTW to impact on water quality in the River Tame through reduced dilution of contaminants. This analysis was carried out for 24 substances for which effluent and upstream River Tame concentrations are available. The analysis found zero or beneficial impact for 13 substances for which downstream concentrations would be reduced or unchanged, including permethrin for which the localised impact on the River Tame would be reduced. Concentrations of a further six substances would be slightly increased, however maximum concentrations would remain below EQS values and there would be no impact on WFD compliance. Downstream concentrations of nickel may increase towards the EQS limit, however the actual impact of the reduced discharge at Minworth is less than 2% and the potential for breaches of the EQS limit arises entirely due to sources in the upstream catchment.

6.4.3 Concentrations of benzo(a)pyrene, cypermethrin, fluoranthene and zinc increase may increase downstream, however the increase in cypermethrin and zinc concentrations is small in comparison to upstream concentrations, at less than 5%. Concentrations of benzo(a)pyrene and fluoranthene may increase by up to 3.8ng/l and 6.5ng/l respectively, however this is only 14% of upstream ambient concentrations which significantly exceed EQS limits due to inputs in the contributing catchment upstream. Changes in Minworth WwTW effluent discharge rates will therefore have minor impact on downstream water quality for these two substances in comparison to upstream inputs.

7. Summary & Conclusions

7.1.1 Baseline water quality monitoring has been undertaken at selected locations on the Rivers Tame and Trent in support of the Minworth Strategic Resource Option. The monitoring commenced in August 2021 and concluded in May 2022 with the twelfth monitoring round.

7.1.2 Most of the early monitoring rounds during late summer and autumn 2021 took place during relatively dry conditions when rivers were at or close to base flow levels. Rounds undertaken during the winter months have seen higher river flows as would be expected for the time of year.

7.1.3 Several parameters show a marked difference in concentrations between the monitoring locations immediately upstream and downstream of the Minworth WwTW discharge. For some of these, generally fuels and metals, other land uses between the two monitoring locations may be impacting water quality in the Tame and account for the differences seen. For other parameters, specifically nitrate, phosphorus, orthophosphate (both as P and PO_4), bromide, total organic carbon and dissolved organic carbon, the difference in concentrations between the upstream and downstream sampling locations may be attributable to the Minworth WwTW discharge.

7.1.4 The data obtain from the water quality sampling has been combined with Environment Agency water quality data, river flow data and WwTW flow and effluent quality data to model the impact of future reductions in flow from Minworth WwTW on downstream water quality.

7.1.5 Catchment modelling of orthophosphate, ammonia and BOD concentrations show no significant impacts downstream, allowing for cumulative impacts and changes in pollutant loads and dilution. There is a modelled reduction in river flow rate under some future discharge scenarios, particularly at Q_{95}, however the ecological impacts of this reduced flow will be discussed elsewhere.

7.1.6 Sufficient water quality data for a further 24 pollutants subject to EQS values in watercourses exist to allow the impacts of future discharge scenarios to be quantified. From this list of 24 pollutants, River Tame concentrations of 13 are expected to be reduced or unchanged by reducing effluent discharge rates from Minworth WwTW. Concentrations of the remaining 11 pollutants may increase but the change will be insignificant, either because downstream concentrations remain well below the EQS (six pollutants) or because river concentrations and WFD compliance are controlled by upstream pollutant inputs (nickel, benzo(a)pyrene, cypermethrin, zinc and fluoranthene). The changes in discharges from Minworth WwTW will not affect WFD compliance for any substance for which data are available.

7.1.7 The results of the water quality monitoring and modelling have informed the WFD Assessment, presented as an appendix to the Minworth Environmental Assessment Report (AECOM June 2022). This includes an assessment of the likelihood of WFD non-compliance in relation to changes in water quality under different predicted Minworth flow scenarios.

8. Recommendations

8.1.1 Based on the findings of the baseline water quality monitoring undertaken to date, and the water quality modelling, the following recommendations are made in respect of further water quality monitoring.

8.1.2 Continued water quality monitoring is recommended for those parameters which have been recently added to the monitoring scope in order to augment baseline monitoring as follows:

- Dissolved cobalt
- Cypermethrin
- EDTA
- Hexabromocyclododecane (HBCDD)
- Mancozeb
- Nonylphenols
- Perfluorooctane sulfonic acid and its derivatives
- Zinc.

8.1.3 Monitoring of other parameters is recommended on the basis of the identified treatment requirements for the Minworth effluent. These parameters are:

- Dissolved chromium III
- Permethrin
- Terbutryn
- Trichloromethane

8.1.4 It is recommended that additional monitoring should take place at the locations currently specified and should continue for 3 months at a monthly frequency, with any further monitoring to be discussed and agreed in consultation with the Environment Agency. This is of particular relevance to those water quality parameters modelled to increase as a result of reduced dilution from Minworth effluent, and whether the predicted within-class deteriorations are significant in the context of WFD status.

8.1.5 The physicochemical parameters currently specified should continue to be monitored in the field.

8.1.6 An update of the water quality modelling should be undertaken as further data becomes available and this will feed through to any revised WFD and environmental assessment, in relation to the proposed flow reductions and modelled utilisation and seasonality of the Minworth and associated SROs.

8.1.7 Potential impacts on water temperature and dissolved oxygen in the River Tame as a result of reducing effluent discharge, in combination with climate change effects, are recommended for investigation at Gate 3. This will inform the assessment of potential effects on aquatic ecology, notably fish, and in turn the WFD assessment.

Appendix A Data Tables

Table A.1
Field Parameter Measurements

MIN-01	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	18:28	16:08	15:27	17:11	10:57	10:47	10:29	15:01	*probe failure*	14:54	16:04	15:13	15:46
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	18.83	17.19	17.54	14.22	7.43	6.35	5.58	8.37	*probe failure*	10.83	10.98	13.47	20.54
Actual Conductivity	µS/cm	622.31	750.40	864.21	327.75	712.70	495.35	582.37	513.47	*probe failure*	641.48	720.09	666.72	660.80
Turbidity	NTU	18.53	*probe failure*	0.65	81.19	8.84	30.41	2.23	17.24	*probe failure*	1.63	0.60	21.80	0.38
RDO Concentration	mg/L	8.23	8.43	10.39	7.16	9.86	10.66	11.32	12.19	*probe failure*	14.59	16.75	8.71	9.52
pH	pH	6.86	7.61	8.85	7.47	8.17	7.83	7.87	8.01	*probe failure*	7.94	8.76	7.48	7.53
ORP	mV	165.8	99.6	94.9	128.4	146.2	152.9	-10.6	0.3	*probe failure*	86.6	62.3	108.6	103.9

MIN-02A	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	17:00	14:52	14:26	15:59	10:03	09:56	09:42	13:24	13:41	13:36	14:22	13:26	14:17
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	20.78	18.72	19.31	15.11	9.67	7.65	8.15	10.69	9.95	13.71	13.29	15.20	21.69
Actual Conductivity	µS/cm	863.57	789.32	833.93	452.65	734.39	522.95	608.39	671.76	486.83	662.70	699.88	741.10	670.62
Turbidity	NTU	0.86	0.83	1.30	47.76	4.65	21.94	1.40	6.12	18.54	3.41	0.86	1.80	1.08
RDO Concentration	mg/L	7.84	7.58	8.98	7.25	9.49	10.28	10.56	10.24	10.06	10.53	13.06	9.52	8.09
pH	pH	7.44	7.32	8.24	7.39	7.89	7.24	7.42	7.58	*probe failure*	7.59	8.11	7.46	7.34
ORP	mV	135.3	93.2	114.7	103.0	91.8	185.0	6.4	7.7	153.2	93.3	70.7	101.5	107.2

MIN-02B	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	16:11	14:12	13:46	15:11	15:23	15:16	14:39	14:02	14:10	14:03	15:04	14:05	14:56
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	20.72	19.28	20.30	17.29	14.49	12.15	11.91	12.30	11.72	13.84	14.25	15.19	21.61
Actual Conductivity	µS/cm	612.98	615.49	646.43	519.68	636.20	498.23	515.13	579.83	446.48	532.97	581.42	584.69	703.88
Turbidity	NTU	0.41	*probe failure*	0.79	2.90	1.46	1.30	0.23	3.03	0.02	0.42	0.33	0.82	0.97
RDO Concentration	mg/L	3.12	3.37	4.71	1.34	2.86	2.71	3.92	3.82	4.65	2.60	4.00	4.85	3.31
pH	pH	6.70	6.88	7.48	6.63	6.88	6.96	6.92	6.88	*probe failure*	6.50	7.13	7.09	6.80
ORP	mV	156.2	111.7	126.9	122.6	128.8	164.1	39.7	57.1	161.8	115.3	86.7	101.0	136.9

MIN-02C	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	14:50	13:12	12:37	13:57	14:15	14:12	13:30	12:42	12:47	12:42	13:35	12:35	13:27
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	20.76	18.31	18.60	15.49	10.95	9.10	9.94	10.71	10.09	13.19	13.44	15.06	21.60
Actual Conductivity	µS/cm	841.99	746.56	806.94	414.09	707.72	489.70	618.15	656.15	478.06	640.33	682.89	723.22	669.30
Turbidity	NTU	0.75	*probe failure*	1.03	22.15	0.82	11.70	1.81	5.89	16.63	6.20	0.27	1.12	1.11
RDO Concentration	mg/L	7.46	6.54	8.50	6.89	10.12	9.42	9.79	10.09	9.86	9.90	11.61	9.20	7.77
pH	pH	7.27	7.32	8.25	7.29	7.59	7.45	7.45	7.52	*probe failure*	7.37	7.84	7.52	7.29
ORP	mV	155.8	103.6	130.2	121.2	148.2	164.0	16.4	13.8	162.1	96.9	70.4	96.4	87.9

MIN-03	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	12:51	12:04	11:33	12:24	12:44	12:49	12:03	11:33	11:31	11:26	11:57	11:26	12:17
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	20.52	18.15	18.80	15.71	10.18	7.22	8.69	9.66	9.65	12.09	12.39	14.64	21.63
Actual Conductivity	µS/cm	766.79	688.66	752.04	680.46	670.72	458.35	574.74	563.25	568.40	582.54	659.86	658.77	725.90
Turbidity	NTU	0.63	*probe failure*	0.79	2.57	2.17	24.32	3.83	12.86	16.36	4.08	1.64	0.70	0.94
RDO Concentration	mg/L	7.90	6.56	8.44	7.71	9.09	10.13	10.71	9.83	9.55	9.05	9.76	8.67	7.43
pH	pH	7.33	7.31	8.36	7.36	7.57	7.60	7.51	7.44	*probe failure*	7.56	7.94	7.46	7.49
ORP	mV	151.1	101.4	139.8	120.4	140.8	158.6	-4.0	4.3	187.6	94.7	61.5	92.9	95.3

MIN-04	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	11:23	10:43	10:25	11:04	11:48	11:42	11:05	10:29	10:35	10:33	10:53	09:45	11:04
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	20.62	18.14	17.80	15.69	8.91	6.52	7.32	8.53	9.55	10.51	11.16	14.01	20.52
Actual Conductivity	µS/cm	712.69	672.04	751.95	690.64	663.72	476.94	458.86	524.37	583.67	559.47	661.69	671.04	751.28
Turbidity	NTU	0.41	*probe failure*	0.65	7.42	1.09	15.52	6.67	32.47	15.21	4.65	0.88	5.44	0.72
RDO Concentration	mg/L	8.37	7.96	8.96	8.02	9.97	10.56	10.55	0.50	9.79	10.81	11.45	9.14	7.68
pH	pH	7.70	7.49	8.45	7.58	7.75	7.85	7.63	7.62	*probe failure*	7.76	8.07	7.37	7.49
ORP	mV	149.5	92.9	143.0	109.1	149.8	164.4	32.4	-5.4	187.0	99.4	61.5	92.7	82.6

MIN-05	Visit Number	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	Visit 7	Visit 8	Visit 9	Visit 10	Visit 11	Visit 12	Visit 13
	Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	04/05/2022	01/08/2022
	Time	09:04	09:15	09:04	09:38	10:30	10:17	09:33	09:16	09:29	09:18	09:40	08:21	09:54
Parameter	Unit	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading	Reading
Temperature	°C	18.31	17.78	16.64	15.05	8.15	5.73	6.93	8.70	7.66	9.21	10.18	13.88	19.56
Actual Conductivity	µS/cm	756.57	724.14	830.71	782.35	165.14	434.20	569.61	557.18	614.60	624.76	754.66	802.43	1023.60
Turbidity	NTU	0.52	1.01	1.52	2.56	3.07	37.27	6.24	41.34	12.99	4.72	1.78	1.10	2.13
RDO Concentration	mg/L	*probe failure*	7.23	8.90	7.65	9.06	11.14	9.89	0.53	10.19	9.88	10.12	7.85	7.03
pH	pH	7.85	7.57	8.28	7.53	7.82	7.65	7.70	7.34	*probe failure*	7.47	8.13	7.34	7.45
ORP	mV	149.7	71.3	174.9	112.1	165.1	165.8	-7.6	35.9	98.8	126.6	42.5	40.9	38.0

Table A.2
Phys-Chem Laboratory Results

		Location	MIN-01 - River Tame, Water Orton, U/S Minworth STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		237	307	335	158	311	203	308	228	199	317	336	285	219
pH	pH units	6 to 9	8.12	8.03	8.22	7.61	7.99	7.78	7.94	7.96	7.46	8.38	8.48	7.61	8.02
Alkalinity	mg/l		149	183	187	109	180	143	194	131	119	200	199	160	128
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		3.3	2.64	1.65	55.4	6.04	22.9	2.26	8.37	16.4	3.01	2.19	22.2	1.57

		Location	MIN-02A - River Tame, U/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		260	240	246	165	259	181	252	248	178	259	263	248	178
pH	pH units	6 to 9	7.97	7.75	7.75	7.35	7.72	7.51	7.89	7.76	7.5	7.92	7.7	7.53	7.58
Alkalinity	mg/l		135	125	127	102	144	114	162	46	97.5	150	148	129	95.4
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		2.42	3.81	2.97	34.6	4.08	15.6	6.08	6.2	11.3	3.43	2.88	5.15	1.87

		Location	MIN-02B - Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		172	164	161	160	165	190	181	194	164	187	191	166	146
pH	pH units	6 to 9	7.28	6.93	6.94	7.19	6.99	6.96	7.02	7.08	7.07	7.33	6.96	6.81	7.09
Alkalinity	mg/l		77.6	66.9	69.9	58	44.7	95.9	110	87.2	83.4	90	65.8	60	59.7
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		1.5	1.84	1.69	3.04	1.57	2.14	1.85	2.05	1.25	1.96	2.36	3.88	1.89

		Location	MIN-02C - River Tame, D/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		249	243	222	153	234	175	240	244	171	249	260	249	176
pH	pH units	6 to 9	7.87	7.65	7.67	7.55	7.62	7.16	7.5	7.6	7.38	7.73	7.67	7.52	7.51
Alkalinity	mg/l		111	123	117	84	116	101	129	129	94.9	145	139	125	91.5
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		1.92	2.52	2.21	17.7	3.17	9.69	4.53	4.37	11.2	2.02	2.55	4.15	1.38

		Location	MIN-03 - River Tame, Kingsbury Road												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		222	215	208	223	226	185	250	217	220	248	248	231	196
pH	pH units	6 to 9	7.9	7.53	8.01	7.65	7.53	7.54	7.62	7.37	7.62	7.8	7.65	7.62	7.8
Alkalinity	mg/l		120	109	113	97.7	119	114	142	113	126	130	132	125	111
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		2.25	1.33	1.41	5.24	3.47	21.4	6.21	8.77	13.2	3.91	3.22	4.81	1.43

		Location	MIN-04 - River Tame, Hopwas												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		232	233	241	248	265	210	278	255	241	276	283	259	212
pH	pH units	6 to 9	7.68	7.83	7.96	7.94	7.77	7.74	7.84	7.76	7.56	7.97	7.88	7.68	7.81
Alkalinity	mg/l		107	119	124	115	123	126	152	138	131	150	142	135	108
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		1.71	2.04	3.44	6.69	2.85	15.9	7.76	22.7	11.9	4.35	3.39	5.34	2.89

		Location	MIN-05 - River Trent, Burton-on-Trent												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Hardness	mg/l		277	273	309	312	319	211	309	267	325	335	344	336	295
pH	pH units	6 to 9	8.13	8	8.12	8.15	8.04	7.84	7.97	7.9	7.89	8.1	8.14	7.9	7.89
Alkalinity	mg/l		145	144	151	145	153	128	166	157	165	170	167	160	136
Salinity	none		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Turbidity	NTU		1.36	3.53	2.79	4.87	1.02	23	7.54	25.8	8.56	4.76	4.66	3.17	3.2

Table A.3
Pesticides Laboratory Results

	Location		MIN-01 - River Tame, Water Orton, U/S Minworth STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	<0.1	<0.1	<0.1	0.011	<0.01	<0.01	<0.01	<0.01	<0.1	0.066
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	0.016	<0.01	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	0.0436	<0.07	0.0163	0.0184
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	0.022	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.05	<0.02	<0.01
Clopyralid	µg/l		<0.3	<0.3	0.019	<0.3	<0.3	<0.3	<0.03	<0.03	<0.3	<0.36	<0.3	<0.3	<0.3
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.2	<0.2	<0.2	<0.02	<0.08	<0.06	<0.07	<0.04	<0.2	<0.1
Glyphosate	µg/l	196	0.471	0.294	0.171	3.63	0.391	1.01	<0.1	<0.1	0.12	<0.1	0.161	<1	0.513
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.015	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	0.01
MCPB	µg/l		<0.2	<0.1	na	<0.2	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	<0.02	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	<0.05	<0.05	<0.1	<0.1	<0.1	0.036	0.021	<0.01	0.024	0.047	<0.1	0.034
Metaldehyde	µg/l		<10	13.9	39.8	<10	<10	<10	<10	<10	<10	<10	<10	<10	24.3
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	0.0224	0.0524	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.087	<0.01	0.027	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.12	<0.01	0.284	<0.07	<0.01	<0.01	<0.01	0.0231	<0.01	<0.015	<0.09	<0.01	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.0177	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.01	<0.08	<0.08	0.0379	0.0148	0.0165	<0.01	<0.015	<0.01	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin (Note 1)	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid (Note 1)	µg/l		<0.03	0.049	0.048	<0.01	<0.04	0.012	0.023	0.016	0.016	0.036	0.036	0.029	0.03
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01

	Location		MIN-02A - River Tame, U/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	0.028
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.015	<0.015	<0.02
Atrazine	µg/l	0.6	<0.01	0.0122	0.0215	<0.05	<0.01	<0.01	<0.01	0.021	<0.01	0.0463	<0.02	0.0208	0.0144
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Clopyralid	µg/l		<0.3	<0.15	<0.015	<0.3	<0.3	<0.3	<0.03	<0.03	<0.3	<0.36	<0.33	<0.3	<0.39
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.015	<0.015	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.2	<0.2	<0.2	<0.02	<0.08	<0.06	<0.07	<0.06	<0.2	<0.1
Glyphosate	µg/l	196	0.438	0.404	0.261	1.2	0.21	1.81	0.211	<0.1	0.188	0.205	0.268	0.499	0.467
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.015	<0.015	<0.015	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.015	<0.015	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	0.046	0.019	<0.1	0.011
MCPB	µg/l		<0.2	<0.1	na	<0.2	<0.2	<0.2	<0.02	<0.02	<0.02	<0.04	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	0.094	<0.05	<0.1	<0.1	<0.1	0.055	0.049	0.042	0.061	0.04	0.271	0.043
Metaldehyde	µg/l		13.2	59.2	37.6	<10	<10	<10	<10	<10	<10	<10	<20	<10	33.2
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0693	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.075	<0.01	<0.04	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.12	<0.01	<0.01	<0.1	<0.47	0.065	<0.01	0.0571	<0.01	0.0732	<0.15	0.0659	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.0131	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.01	<0.06	<0.1	0.0271	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin (Note 1)	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid (Note 1)	µg/l		<0.06	0.082	0.074	0.026	<0.06	0.024	0.042	0.052	0.036	0.06	0.074	0.074	0.056
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.015	<0.015	<0.01

Table A.3
Pesticides Laboratory Results

		Location	MIN-02B - Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	0.116	na	<0.1	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.03
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	<0.01	<0.02	<0.01	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Clopyralid	µg/l		<0.3	<0.3	<0.015	<0.3	<0.3	<0.3	<0.03	<0.27	<0.3	<0.36	<0.42	<0.3	<0.3
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.2	<0.2	<0.2	<0.06	<0.08	<0.06	<0.07	<0.06	<0.2	<0.1
Glyphosate	µg/l	196	0.292	0.247	0.186	0.395	0.122	0.137	0.252	<0.1	<0.1	<0.1	0.115	0.251	0.28
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	0.022	0.027	<0.04	<0.02	<0.04	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.1	0.139	<0.1	<0.01	<0.01	<0.01	<0.01	0.016	<0.1	0.011
MCPB	µg/l		<0.2	<0.1	na	<0.2	<0.2	<0.2	<0.02	<0.02	<0.02	<0.04	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	<0.05	<0.05	<0.1	<0.1	<0.1	<0.01	0.015	<0.01	0.011	0.014	<0.1	0.04
Metaldehyde	µg/l		<10	<10	<10	<10	<10	<10	<10	<10	<10	<15	<10	<10	29
Metazachlor	µg/l		<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.022	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01
Simazine	µg/l	1	0.113	<0.01	<0.13	<0.01	<0.01	<0.11	0.132	<0.01	<0.01	0.131	<0.3	<0.01	<0.12
Terbutryn	µg/l		<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.02	<0.02	<0.04	<0.01	0.0135	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin (Note 1)	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid (Note 1)	µg/l		0.112	0.141	0.14	0.07	<0.2	<0.06	0.096	0.095	0.059	<0.08	0.162	0.105	0.1
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

		Location	MIN-02C - River Tame, D/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	<0.01	<0.1	<0.1	0.012	<0.01	<0.01	<0.01	<0.01	<0.1	0.028
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	<0.01	0.0187	<0.03	<0.16	<0.01	<0.01	0.0142	<0.015	0.0256	<0.01	0.0159	0.014
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	0.016	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.02	<0.01
Clopyralid	µg/l		<0.3	<0.15	<0.01	<0.03	<0.3	<0.3	<0.03	<0.06	<0.3	<0.36	<0.33	<0.3	<0.3
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.2	<0.05	<0.02	<0.2	<0.2	<0.06	<0.08	<0.06	<0.07	<0.06	<0.2	<0.1
Glyphosate	µg/l	196	0.401	0.34	0.199	1.19	0.236	0.584	0.284	<0.1	0.179	0.135	0.231	0.465	0.405
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	0.026	0.023	<0.1	0.011
MCPB	µg/l		<0.2	<0.1	na	<0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.04	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	0.078	<0.05	0.04	<0.1	<0.1	0.07	0.044	0.038	0.052	0.036	0.207	0.043
Metaldehyde	µg/l		<10	37.1	20.6	<10	<10	<10	11.6	<10	<10	<10	<10	<10	<20
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.12	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.068	0.014	<0.03	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.09	<0.01	<0.01	<0.09	<0.52	0.0992	<0.01	0.0477	<0.015	0.0739	<0.14	0.0699	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.0141	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.01	<0.08	<0.13	0.0218	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin (Note 1)	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid (Note 1)	µg/l		0.067	0.088	0.078	0.032	<0.2	<0.04	0.055	0.058	0.044	0.059	0.092	0.061	0.067
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table A.3
Pesticides Laboratory Results

		Location	MIN-03 - River Tame, Kingsbury Road												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	<0.01	<0.1	<0.1	0.012	<0.01	<0.01	<0.01	<0.01	<0.1	0.025
Aldrin	µg/l	0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	<0.01	0.0161	<0.02	<0.11	<0.01	<0.01	<0.01	<0.015	0.0182	<0.07	0.0232	<0.01
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Clopyralid	µg/l		<0.3	<0.3	<0.01	<0.03	<0.3	<0.3	<0.03	<0.06	<0.3	<0.36	<0.33	<0.3	<0.3
Dieldrin	µg/l	0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.1	<0.05	<0.05	<0.05	<0.05	0.113	0.073	0.091	<0.05	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.02	<0.2	<0.2	<0.06	<0.08	<0.06	<0.07	<0.06	<0.2	<0.1
Glyphosate	µg/l	196	0.54	0.41	0.237	0.587	0.278	0.438	0.363	0.102	0.341	0.244	0.337	0.498	0.69
Heptachlor	µg/l	0.0003	<0.01	<0.02	<0.01	<0.01	<0.02	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.01	<0.1	<0.1	<0.01	<0.01	0.023	0.013	0.038	<0.1	0.036
MCPB	µg/l		<0.2	<0.1	na	<0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.04	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	0.1	<0.05	0.06	<0.1	<0.1	0.069	0.04	0.048	0.034	0.072	0.139	0.066
Metaldehyde	µg/l		11.5	37.9	35.5	<10	<10	<10	<10	<10	<10	<10	<10	<10	<20
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	0.0602	0.138	0.0209	<0.01	<0.01	<0.015	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.029	<0.01	<0.05	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.11	<0.01	<0.01	<0.09	<0.42	0.0546	0.0549	0.0278	<0.015	0.0564	<0.14	0.0589	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.0123	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.01	<0.04	<0.11	0.0328	<0.01	<0.01	<0.015	<0.01	<0.015	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin [Note 1]	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid [Note 1]	µg/l		0.063	0.084	0.086	0.056	<0.2	0.032	0.046	0.049	0.045	<0.06	0.061	0.059	0.062
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

		Location	MIN-04 - River Tame, Hopwas												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	<0.03
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	<0.01	0.0162	<0.02	<0.05	<0.01	<0.01	<0.02	<0.015	0.0171	<0.06	0.0188	0.0151
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.042	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01
Clopyralid	µg/l		<0.3	<0.3	<0.01	<0.03	<0.3	<0.3	<0.03	<0.03	<0.3	<0.36	<0.33	<0.3	<0.3
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.05	<0.05	<0.05	<0.05	<0.05	0.229	0.31	0.406	0.082	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.02	<0.2	<0.2	<0.06	<0.08	<0.06	<0.07	<0.06	<0.2	<0.1
Glyphosate	µg/l	196	0.535	0.296	0.209	0.473	0.212	<1	0.222	0.103	0.248	0.163	0.28	0.478	0.876
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.015	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.06
MCPA	µg/l	80	<0.1	<0.05	na	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	0.021	0.038	<0.1	0.029
MCPB	µg/l		<0.2	<0.1	na	<0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	0.073	<0.05	0.043	<0.1	<0.1	0.044	0.021	0.021	0.026	0.055	0.17	0.048
Metaldehyde	µg/l		<10	33.7	30	<10	<20	<10	<10	<10	<10	<10	<20	<10	37
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	<0.11	0.122	0.0427	<0.01	<0.01	<0.02	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.087	0.013	<0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.1	<0.01	<0.01	<0.06	<0.19	0.047	0.0383	0.0534	<0.015	0.0577	<0.1	<0.01	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.02	<0.01	<0.01
Triallate	µg/l	5	<0.01	0.0242	<0.01	<0.06	<0.07	0.0382	0.0399	0.0596	<0.015	0.0205	<0.02	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin [Note 1]	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid [Note 1]	µg/l		0.051	0.071	0.069	0.057	<0.2	0.029	0.043	0.043	0.049	<0.05	0.056	0.051	0.065
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01

Table A.3
Pesticides Laboratory Results

		Location	MIN-05 - River Trent, Burton-on-Trent												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
2,4-D	µg/l	0.3	<0.1	<0.05	na	0.013	<0.1	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01	<0.1	0.284
Aldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02
Atrazine	µg/l	0.6	<0.01	<0.01	<0.01	<0.02	<0.1	<0.01	<0.01	<0.01	<0.015	<0.015	<0.05	0.0168	0.0113
Bentazone	µg/l	500	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Carbendazim	µg/l	0.15	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Carbetamide	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.011	<0.01	<0.01	<0.01	0.034	<0.01	<0.01	<0.01
Chlormequat	µg/l		<0.1	<0.1	<0.01	<1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorotoluron	µg/l	2	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Chlorothalonil	µg/l	0.035	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.02	<0.01
Clopyralid	µg/l		<0.3	<0.3	<0.01	<0.03	<0.3	<0.3	<0.03	<0.03	<0.3	<0.36	<0.33	<0.3	<0.24
Dieldrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Diuron	µg/l	0.2	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Flufenacet	µg/l		<0.05	<0.05	<0.05	<0.05	<0.05	0.269	0.272	0.317	0.109	<0.5	<0.05	<0.05	<0.05
Fluroxypyr	µg/l		<0.2	<0.1	<0.05	<0.02	<0.2	<0.2	<0.06	<0.08	<0.06	<0.07	<0.06	<0.2	<0.08
Glyphosate	µg/l	196	0.267	0.286	0.152	0.34	0.139	<1	0.189	<0.1	<0.1	0.104	0.244	0.373	<0.4
Heptachlor	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.02	<0.01	<0.02	<0.01	<0.01	<0.01	<0.01	<0.01
Heptachlor Epoxide	µg/l	0.0003	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Isoproturon	µg/l	0.3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Linuron	µg/l	0.5	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.04
MCPA	µg/l	80	<0.1	<0.05	na	<0.01	<0.1	<0.1	<0.01	<0.01	<0.01	0.016	0.03	<0.1	0.044
MCPB	µg/l		<0.2	<0.1	na	<0.02	<0.2	<0.2	<0.02	<0.02	<0.02	<0.02	<0.06	<0.2	<0.02
Mecoprop	µg/l	18	<0.1	<0.05	<0.05	0.033	<0.1	<0.1	0.032	0.025	<0.01	0.026	0.04	<0.1	0.05
Metaldehyde	µg/l		<10	15.8	56.6	20	<10	<10	<10	<10	<10	<15	<10	<10	31.9
Metazachlor	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.015	<0.01	<0.01	<0.01
Monuron	µg/l		<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Propazine	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01
Propyzamide	µg/l	100	<0.01	<0.01	<0.01	<0.01	<0.01	0.232	0.0389	0.0311	<0.01	<0.03	<0.01	<0.01	<0.01
Prosulfocarb	µg/l		<0.01	<0.01	<0.01	0.047	0.012	0.039	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Simazine	µg/l	1	<0.09	<0.01	<0.01	<0.05	<0.01	0.0384	0.0272	0.0196	<0.015	0.0512	<0.07	<0.01	<0.01
Terbutryn	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	0.019	<0.01	<0.01	<0.01	<0.03	<0.01	<0.01	<0.01
Triallate	µg/l	5	<0.01	<0.01	<0.01	<0.06	<0.14	0.032	0.0296	0.0206	<0.015	<0.015	<0.01	<0.01	<0.01
Quinmerac	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Clothianidin (Note 1)	µg/l		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Imidacloprid (Note 1)	µg/l		0.042	0.051	0.064	0.046	<0.1	0.022	<0.03	0.029	0.031	0.034	0.037	0.037	0.057
Omethoate	µg/l	0.01	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Permethrin	µg/l	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Note 1: Clothianidin and imidacloprid not included in original list of determinands

Table A.4

Fuels, Solvents, Metals Laboratory Results

		Location	MIN-01 - River Tame, Water Orton, U/S Minworth STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	0.00458	<0.002	<0.002	0.13	0.0123	0.0405	0.0131	0.0239	0.0462	<0.002	<0.002	0.046	<0.002
PAH: Total	µg/l		<0.082	<0.082	<0.082	1.59	0.258	0.586	0.0872	0.259	0.805	<0.082	<0.082	0.66	<0.082
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		21.1	<10	<10	<10	18	<10	<10	<10	10.8	<10	11.7	12.1	<10
Antimony (diss.filt)	µg/l		1.13	<1	<1	2.26	1.26	1.17	<1	<1	1.21	<1	<1	1.66	1.56
Arsenic (diss.filt)	µg/l	50	1.74	1.88	2.01	1.43	1.79	1.27	1.46	1.05	1.42	1.33	1.49	1.59	2.24
Boron (diss.filt)	µg/l	2000	260	277	321	168	313	178	293	202	170	299	357	266	223
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	1.59	1.63	2.19	1.17	2.47	1.68	1.83	1.26	1.58	2.23	12.8	2.06	2.44
Copper (diss.filt)	µg/l	1 (bioavailable)	4.96	3.03	2.41	4.62	4.97	4.47	3.66	0.364	4.97	3.9	4.14	3.75	3.28
Iron (Dis.Filt)	mg/l	1	0.0966	0.0553	0.0453	0.0425	0.0714	0.0382	0.0523	0.0313	0.0459	0.087	0.129	0.0765	0.0536
Lead (diss.filt)	µg/l	1.2 (bioavailable)	0.701	0.21	<0.2	0.301	0.481	<0.2	<0.2	0.204	0.319	<0.2	0.215	0.414	0.29
Manganese (diss.filt)	µg/l	123 (bioavailable)	49.7	38.8	24.1	27.1	51.5	62.7	78.5	54.5	63.5	61	56.2	66.8	45.1
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	10.6	9.57	12.2	8.53	12.7	8.36	12.7	7.52	7.81	12.6	13.2	11.6	8.38
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		45.6	57.4	73	24.9	71.3	58.3	58.9	55.5	50.2	54.6	63.6	58.6	45.4
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	30	60.9	49.8

		Location	MIN-02A - River Tame, U/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	0.00551	0.261	0.00788	0.0509	0.0939	0.0375	0.0907	0.0557	0.163	0.177	0.0105	0.0476	0.082
PAH: Total	µg/l		0.19	5.05	0.217	1.27	2.26	0.539	1.39	0.868	3.23	3.82	0.241	1.08	1.7
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	1.48	1.04	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		32.5	14.3	<10	<10	13.9	10	10.1	10.1	<10	10.3	<10	30.9	<10
Antimony (diss.filt)	µg/l		1.16	1.12	<1	1.35	<1	1.1	<1	1.01	1.25	<1	<1	1.54	1.42
Arsenic (diss.filt)	µg/l	50	1.45	1.42	1.28	1.29	1.4	1.09	1.25	1.15	1	1.31	1.23	1.47	1.57
Boron (diss.filt)	µg/l	2000	318	326	269	183	337	173	280	252	172	281	284	290	205
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	<1	<1	2.23	1.62	3.12	1.53	1.9	1.69	1.97	2.09	16.6	2.45	1.7
Copper (diss.filt)	µg/l	1 (bioavailable)	3.95	2.84	1.58	4.51	3.39	4.11	3.33	0.982	5.04	3.39	2.75	3.84	2.17
Iron (Dis.Filt)	mg/l	1	0.151	0.0581	0.0505	0.0506	0.0882	0.0482	0.0622	0.0535	0.0403	0.0679	0.0889	0.106	0.0443
Lead (diss.filt)	µg/l	1.2 (bioavailable)	1.45	0.879	0.36	0.494	0.238	0.293	0.22	0.331	0.493	<0.2	<0.2	2.39	0.292
Manganese (diss.filt)	µg/l	123 (bioavailable)	56.5	41.8	35.8	48.2	60.4	56.6	85.3	65.9	66.7	78.9	67.2	82.3	41
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	13.8	14.5	16.6	10.1	24.2	10.7	14.2	13.4	12.4	24.2	13.7	21.4	11.1
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		84.7	73.5	82.3	36.6	72	63.6	63.2	77.2	54.9	66.1	68.6	73.1	53.6
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	78	160	88.4

Table A.4
Fuels, Solvents, Metals Laboratory Results

		Location	MIN-02B - Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	0.0297	0.0359	0.0145	0.0082	0.056	0.035	0.0844	0.016	0.0423	0.0164	0.00956	0.0202	<0.002
PAH: Total	µg/l		0.834	0.9	0.428	0.202	1.71	0.769	1.69	0.306	0.904	0.314	0.239	0.403	<0.082
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		23.6	<10	<10	<10	12.1	<10	<10	<10	<10	<10	<10	<10	<10
Antimony (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.09	1.05
Arsenic (diss.filt)	µg/l	50	0.691	0.794	0.964	0.975	0.736	0.588	1.24	0.59	0.823	0.78	0.65	0.754	1.1
Boron (diss.filt)	µg/l	2000	192	94.8	231	95.7	102	176	102	142	81.5	113	117	121	162
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	<1	<1	<1	<1	1.25	<1	<1	1.06	<1	<1	<1	<1	1.12
Copper (diss.filt)	µg/l	1 (bioavailable)	2.16	0.657	<0.3	0.56	0.722	1.17	0.608	<0.3	0.817	0.642	0.651	0.612	<0.3
Iron (Dis.Filt)	mg/l	1	0.197	0.0442	0.0441	0.057	0.0651	0.05	0.0435	0.0448	0.0395	0.0448	0.0605	0.0542	0.041
Lead (diss.filt)	µg/l	1.2 (bioavailable)	0.514	0.216	0.205	<0.2	0.426	0.582	<0.2	<0.2	0.353	<0.2	<0.2	<0.2	0.236
Manganese (diss.filt)	µg/l	123 (bioavailable)	47.1	50	54.4	89.5	65	54.6	61.5	65.6	42.9	74.2	114	72.8	35.2
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	2.72	18.7	6.44	5.65	7.85	4.67	13.5	8.05	5.56	8.79	20.6	13	10.2
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		55.9	58.3	62.1	46.3	57.8	41.8	49	57.2	42	51.6	55.1	61	66.9
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	58.5	114	96.6

		Location	MIN-02C - River Tame, D/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	0.00993	0.172	0.289	1.03	0.503	1.74	0.136	0.128	0.92	0.644	0.0217	0.173	0.093
PAH: Total	µg/l		0.322	4.12	7.35	25.1	13.3	35.3	2.54	2.58	19	17.1	0.565	3.86	2.02
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	1.31	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		25.2	<10	<10	<10	16.8	<10	<10	14.7	<10	<10	13.6	12	<10
Antimony (diss.filt)	µg/l		1.06	1.06	<1	1.49	<1	1.03	1.01	<1	1.14	<1	<1	<1	1.37
Arsenic (diss.filt)	µg/l	50	1.21	1.37	1.41	1.37	1.18	1.03	1.21	1.04	1.02	1.24	1.07	1.43	1.47
Boron (diss.filt)	µg/l	2000	300	278	269	151	299	182	230	229	154	258	248	266	195
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	<1	<1	2.07	1.83	2.46	1.69	1.96	1.58	1.58	1.8	9.51	1.85	1.52
Copper (diss.filt)	µg/l	1 (bioavailable)	3.83	2.31	1.24	2.08	3.1	3.34	2.91	0.676	3.19	3.3	2.46	2.67	2.36
Iron (Dis.Filt)	mg/l	1	0.173	0.0502	0.0453	0.0419	0.0841	0.0497	0.0519	0.0575	0.039	0.0728	0.0884	0.0773	0.0456
Lead (diss.filt)	µg/l	1.2 (bioavailable)	0.988	0.282	0.255	0.311	0.811	0.501	0.464	0.428	0.374	0.27	0.206	0.306	0.479
Manganese (diss.filt)	µg/l	123 (bioavailable)	54.2	41.1	35.7	47.7	63.7	62.3	81.6	66.2	61.6	78.7	69.3	69.9	31.4
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	11.2	14.1	14.1	7.49	22.5	11.7	13.7	13.3	10.9	21	14.7	18.9	10.4
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		76.2	68.3	77.6	35.7	66.8	52	69.2	75.3	52.8	62.6	66.3	70.3	54.2
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	75	90.2	88.5

Table A.4
Fuels, Solvents, Metals Laboratory Results

		Location	MIN-03 - River Tame, Kingsbury Road												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	<0.002	<0.002	<0.002	0.0068	<0.002	0.0305	<0.002	0.0132	0.0423	0.0168	0.0117	<0.002	0.00393
PAH: Total	µg/l		<0.082	<0.082	<0.082	0.0964	<0.082	0.578	<0.082	0.125	0.609	0.2	0.216	<0.082	<0.082
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		35.1	<10	<10	<10	10.3	<10	<10	<10	<10	<10	<10	<10	39.2
Antimony (diss.filt)	µg/l		1.76	1.11	<1	1.2	<1	<1	<1	<1	1.22	<1	<1	<1	1.45
Arsenic (diss.filt)	µg/l	50	1.6	1.54	1.41	1.8	1.38	1.38	1.43	1.33	1.58	1.28	1.29	1.52	2.09
Boron (diss.filt)	µg/l	2000	232	214	219	264	256	150	193	164	197	188	273	191	233
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	1.05	<1	1.68	1.77	2.06	1.41	1.26	1.09	1.68	1.29	1.38	1.35	1.58
Copper (diss.filt)	µg/l	1 (bioavailable)	3.9	2.49	0.879	1.07	2.81	3.68	2.52	0.656	3.95	2.62	2.23	2.28	3.44
Iron (Dis.Filt)	mg/l	1	0.125	0.0435	0.0418	0.0707	0.0752	0.0543	0.0695	0.0462	0.0443	0.0615	0.0862	0.0826	0.125
Lead (diss.filt)	µg/l	1.2 (bioavailable)	7.39	<0.2	<0.2	0.278	0.285	0.39	0.229	0.236	0.307	<0.2	0.251	<0.2	0.961
Manganese (diss.filt)	µg/l	123 (bioavailable)	108	71.6	42.6	90	122	105	116	94.9	88.4	98.2	94.6	103	69.6
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	11.6	13.9	15.5	14.3	22.9	9.91	11.4	9.82	13.3	12.7	14.4	19.1	12.7
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		85.6	62.9	74.6	63.9	65.7	50.3	59.5	65.2	62.6	52.6	65	64.2	60.9
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	95.6	116	237.7

		Location	MIN-04 - River Tame, Hopwas												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	<0.002	<0.002	<0.002	0.011	<0.002	0.0196	<0.002	0.0196	0.0341	0.0176	<0.002	<0.002	<0.002
PAH: Total	µg/l		<0.082	<0.082	<0.082	0.219	<0.082	0.41	0.164	0.272	0.523	0.29	0.112	<0.082	<0.082
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		14.5	<10	<10	<10	27.8	<10	<10	11.4	<10	<10	<10	<10	<10
Antimony (diss.filt)	µg/l		1.28	1.12	<1	1.14	<1	<1	<1	<1	<1	<1	<1	<1	1.33
Arsenic (diss.filt)	µg/l	50	1.78	1.96	1.53	1.8	1.54	1.3	1.33	1.16	1.69	1.55	1.33	1.5	2.35
Boron (diss.filt)	µg/l	2000	199	184	191	197	226	145	153	130	166	176	264	188	235
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	<1	<1	1.46	1.46	1.87	1.35	1.15	<1	1.5	1.36	1.03	1.06	1.28
Copper (diss.filt)	µg/l	1 (bioavailable)	4.3	2.92	1.79	3.41	4.82	4	2.82	1.18	4.17	3.36	3.09	3.67	3.2
Iron (Dis.Filt)	mg/l	1	0.0532	0.0224	0.024	0.0475	0.13	0.0431	0.0421	0.0329	0.0384	0.0473	0.0726	0.0599	0.0345
Lead (diss.filt)	µg/l	1.2 (bioavailable)	0.579	<0.2	<0.2	0.245	1.49	0.414	<0.2	0.202	0.313	0.457	0.393	0.208	0.327
Manganese (diss.filt)	µg/l	123 (bioavailable)	32.4	12.3	11.7	47.1	102	56.6	81.4	56.7	86.4	78.6	105	72.6	23.9
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	8.97	9.97	13.1	11.2	18.3	8.47	8.37	6.18	11.9	9.97	13	15.2	11.5
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		60.3	56	67.6	58.8	60.4	46.9	50.6	51.5	59.4	48.5	62.5	61.1	61.8
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	54.7	90.2	32.9

Table A.4
Fuels, Solvents, Metals Laboratory Results

		Location	MIN-05 - River Trent, Burton-on-Trent												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Fuels															
Benzene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	µg/l	0.27	<0.002	<0.002	<0.002	0.0099	<0.002	0.0165	<0.002	0.0321	0.0278	<0.002	0.0111	<0.002	<0.002
PAH: Total	µg/l		<0.082	<0.082	<0.082	0.172	<0.082	0.348	<0.082	0.352	0.674	0.138	0.288	<0.082	<0.082
Solvents															
1,2-dichloroethane	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Epichlorohydrin	µg/l		<0.5	<0.5	<0.01	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Tetrachloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trichloroethene	µg/l	10	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Tetrachloromethane	µg/l	12	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Trihalomethanes: Total	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals															
Aluminium (diss.filt)	µg/l		14.3	<10	<10	<10	<10	10.6	11.4	<10	<10	<10	10.7	12.1	<10
Antimony (diss.filt)	µg/l		<1	1.02	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Arsenic (diss.filt)	µg/l	50	1.91	1.79	1.68	1.69	1.56	1.23	1.38	1.31	1.33	1.29	1.49	1.63	2.07
Boron (diss.filt)	µg/l	2000	172	145	167	156	177	102	126	120	138	148	213	175	249
Cadmium (diss.filt)	µg/l	1.5	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08	<0.08
Chromium (diss.filt)	µg/l	4.7	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	1.63
Copper (diss.filt)	µg/l	1 (bioavailable)	3.93	3.25	2.24	3.4	3.82	3.65	3.38	1.6	3.12	3.64	3.42	3.81	3.72
Iron (Dis.Filt)	mg/l	1	0.0453	<0.019	<0.019	0.0331	0.047	0.0414	0.0409	0.0281	0.0331	0.0374	0.0442	0.0497	0.0251
Lead (diss.filt)	µg/l	1.2 (bioavailable)	0.678	<0.2	<0.2	0.245	<0.2	<0.2	<0.2	<0.2	0.201	0.241	<0.2	0.248	0.291
Manganese (diss.filt)	µg/l	123 (bioavailable)	24.6	11.7	16.8	19.7	40.4	32.3	43.5	28.9	52.7	44.5	38.5	33.4	17.3
Mercury (diss.filt)	µg/l	0.07	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nickel (diss.filt)	µg/l	4 (bioavailable)	4.78	5.68	7.37	6.76	12.1	4.61	5.05	4.28	6.86	6.34	7.22	9.03	8.61
Selenium (diss.filt)	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Sodium (Dis.Filt)	mg/l		61	53.3	67.9	58.5	66	34.8	45.9	48.9	48	48.7	63.2	66.9	85.7
Zinc (diss. filt)	µg/l	10.9 (bioavailable)	na	na	na	na	na	na	na	na	na	na	42.3	65.6	114.7

Table A.5
Microbiology, Nutrients, Algal Indicators Laboratory Results

		Location	MIN-01 - River Tame, Water Orton, U/S Minworth STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>100	>10	>100	>100	>100	na	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.962	<0.03	<0.98	<0.893	<0.926	<0.971	<0.952	<0.952	<0.971	<0.926	<0.98	<0.917
Enterococci	CFU/100ml		na	2	<0.01	>100	>100	>100	>100	>100	>90	87	>100	>100	>100
E. coli	CFU/100ml		na	35	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	<0.2	0.596	<0.2	0.448	0.383	<0.2	0.699	0.288	<0.2	0.319	<0.2
Ammonium	mg/l		<0.2	<0.2	<0.2	0.631	<0.2	0.474	0.406	<0.2	0.740	0.305	<0.2	0.338	<0.2
Nitrate as NO3	mg/l		19.3	29.5	36.7	8.8	29.8	18.9	31.8	21.5	26.7	31.2	37.2	24.4	26.8
Nitrite as NO2	mg/l		0.34	0.412	0.297	0.261	0.299	0.277	0.236	0.216	0.404	0.212	0.45	0.477	0.305
Phosphorus (total)	µg/l		248	165	185	725	250	275	149	266	267	106	99.7	423	340
Orthophosphate (as P)	mg/l	See report	0.0832	0.118	0.11	0.0734	0.0858	0.0571	0.0675	0.0385	0.0643	0.0411	<0.02	0.0741	0.149
Orthophosphate (as PO4)	mg/l		0.255	0.361	0.338	0.225	0.263	0.175	0.207	0.118	0.197	0.126	0.053	0.227	0.458
Algal Indicators															
Chlorophyll-a	µg/l		na	<4	<0.02	30.5	19.2	<7	<7	98.3	15.8	8.95	31.7	120	na
Cyanobacteria	cells/ml		2910	0	407	223	0	0	0	0	67	0	0	0	1070

		Location	MIN-02A - River Tame, U/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>100	>30	>100	>60	>100	na	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.909	<0.03	<0.952	<0.943	<0.917	<0.98	<0.962	<0.962	<0.952	<0.901	<0.952	<0.926
Enterococci	CFU/100ml		na	13	<0.01	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
E. coli	CFU/100ml		na	>100	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	<0.2	3.2	0.441	0.419	0.308	<0.2	<0.2	0.571	<0.2	0.306	<0.2
Ammonium	mg/l		<0.2	<0.2	<0.2	3.389	0.467	0.444	0.326	<0.2	<0.2	0.605	<0.2	0.324	<0.2
Nitrate as NO3	mg/l		57.9	63.6	64.9	32.6	57.4	33.2	49.9	40.7	31.3	48.3	54	60.1	47.1
Nitrite as NO2	mg/l		0.289	0.291	0.171	0.346	0.394	0.283	0.492	0.332	0.39	0.969	0.286	0.312	0.317
Phosphorus (total)	µg/l		291	290	233	915	331	278	309	241	336	303	200	466	561
Orthophosphate (as P)	mg/l	See report	0.1	0.104	0.0985	0.271	0.107	0.076	0.0806	0.0486	0.0855	0.0907	0.0274	0.153	0.409
Orthophosphate (as PO4)	mg/l		0.307	0.318	0.302	0.831	0.328	0.233	0.247	0.149	0.262	0.278	0.084	0.468	1.25
Algal Indicators															
Chlorophyll-a	µg/l		na	4.07	<0.02	25.3	<7	<7	<7	10.7	8.81	8.81	19.6	13	na
Cyanobacteria	cells/ml		776	0	543	290	0	0	0	0	0	0	0	0	0

		Location	MIN-02B - Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>100	>30	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.901	<0.03	<0.971	<0.98	<0.909	<1.01	<0.952	<0.962	<0.952	<0.87	<0.971	<0.935
Enterococci	CFU/100ml		na	37	<0.01	>60	>100	>100	>90	>100	>100	>100	>100	>100	>100
E. coli	CFU/100ml		na	>100	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	0.46	1.82	<0.2	1.26	2.11	1.23	<0.2	0.596	0.869	<0.2	<0.2
Ammonium	mg/l		<0.2	<0.2	0.487	1.927	<0.2	1.334	2.234	1.303	<0.2	0.631	0.920	<0.2	<0.2
Nitrate as NO3	mg/l		48.8	54.1	66.5	47.3	65.6	40.5	41.1	50.8	35.7	37.1	52.3	57.2	54.3
Nitrite as NO2	mg/l		0.214	0.146	0.168	0.685	0.255	2.16	2.15	0.384	0.077	0.707	1.31	0.665	0.243
Phosphorus (total)	µg/l		480	551	755	1240	582	443	1150	572	693	610	459	812	870
Orthophosphate (as P)	mg/l	See report	0.305	0.404	0.576	0.869	0.388	0.252	0.956	0.432	0.594	0.485	0.186	0.609	0.672
Orthophosphate (as PO4)	mg/l		0.934	1.24	1.77	2.66	1.19	0.771	2.93	1.32	1.82	1.49	0.569	1.87	2.06
Algal Indicators															
Chlorophyll-a	µg/l		na	<4	<0.02	<7	<7	<7	<7	<7	<7	<7	<7	<7	na
Cyanobacteria	cells/ml		12600	0	179	201	0	0	0	0	0	0	0	335	0

Table A.5
Microbiology, Nutrients, Algal Indicators Laboratory Results

		Location	MIN-02C - River Tame, D/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>100	>30	>100	>100	>100	>90	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<1.25	<0.03	<0.909	<0.971	<0.943	<0.99	<1.01	<0.98	<1.01	<0.935	<0.901	<0.962
Enterococci	CFU/100ml		na	14	<0.01	>100	>100	>100	>100	>100	>100	>90	>100	>100	>100
E. coli	CFU/100ml		na	>100	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	<0.2	0.279	0.284	0.464	0.444	<0.2	<0.2	0.562	<0.2	<0.2	<0.2
Ammonium	mg/l		<0.2	<0.2	<0.2	0.295	0.301	0.491	0.470	<0.2	<0.2	0.595	<0.2	<0.2	<0.2
Nitrate as NO3	mg/l		56.2	57.2	64.5	30.1	67.9	36.5	51.1	43.4	31.3	46.8	51.7	38.2	45.5
Nitrite as NO2	mg/l		0.248	0.342	0.183	0.224	0.387	0.624	0.562	0.381	0.37	0.997	0.417	0.399	0.347
Phosphorus (total)	µg/l		371	503	324	510	334	321	397	249	368	341	266	432	445
Orthophosphate (as P)	mg/l	See report	0.13	0.211	0.189	0.2	0.0751	0.114	0.219	0.0747	0.167	0.131	0.0861	0.168	0.342
Orthophosphate (as PO4)	mg/l		0.399	0.648	0.579	0.614	0.23	0.348	0.67	0.229	0.512	0.402	0.264	0.515	1.05
Algal Indicators															
Chlorophyll-a	µg/l		na	<4	<0.02	16.7	<7	<7	<7	9.37	<7	<7	17.9	13.6	na
Cyanobacteria	cells/ml		1360	0	1120	179	0	0	0	0	0	0	0	0	0

		Location	MIN-03 - River Tame, Kingsbury Road												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>89	>100	>100	>100	>100	>80	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.901	<0.03	<0.943	<1.01	<0.893	<1.04	<1.05	<1.02	<0.926	<0.901	<0.926	<0.926
Enterococci	CFU/100ml		na	0	<0.01	>100	>80	>100	>100	>100	>100	>100	>100	>100	>100
E. coli	CFU/100ml		na	20	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		0.695	<0.2	<0.2	<0.2	0.699	0.769	0.624	0.559	1.34	0.521	0.245	0.423	0.291
Ammonium	mg/l		0.736	<0.2	<0.2	<0.2	0.740	0.814	0.661	0.592	1.419	0.552	0.259	0.448	0.308
Nitrate as NO3	mg/l		55.1	58.6	61.2	68.4	65.3	34.3	51.1	50.5	30.4	51.6	54.9	37.6	44.3
Nitrite as NO2	mg/l		0.764	0.446	0.24	0.351	0.709	0.624	0.802	0.939	1.77	0.911	0.519	0.538	0.653
Phosphorus (total)	µg/l		396	299	257	445	265	417	430	278	706	323	236	327	675
Orthophosphate (as P)	mg/l	See report	0.254	0.2	0.187	0.3	0.0985	0.159	0.295	0.138	0.447	0.191	0.0711	0.203	0.609
Orthophosphate (as PO4)	mg/l		0.779	0.612	0.574	0.919	0.302	0.487	0.903	0.422	1.37	0.586	0.218	0.622	1.87
Algal Indicators															
Chlorophyll-a	µg/l		na	4.13	<0.02	7.71	<7	7.73	<7	8.74	<7	<7	11.2	<7	na
Cyanobacteria	cells/ml		0	0	402	357	0	0	0	0	0	0	0	0	582

		Location	MIN-04 - River Tame, Hopwas												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	50	>10	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.909	<0.03	<0.99	<0.935	<0.971	<0.952	<0.99	<0.99	<0.971	<0.877	<0.901	<0.952
Enterococci	CFU/100ml		na	2	<0.01	>100	>100	>100	>100	>100	>100	>100	57	79	>100
E. coli	CFU/100ml		na	12	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	79	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	<0.2	<0.2	<0.2	0.347	<0.2	<0.2	0.958	<0.2	<0.2	<0.2	<0.2
Ammonium	mg/l		<0.2	<0.2	<0.2	<0.2	<0.2	0.367	<0.2	<0.2	1.015	<0.2	<0.2	<0.2	<0.2
Nitrate as NO3	mg/l		48.4	54	60.9	56.3	65.9	39.1	49.7	36.1	42.2	41.5	51.8	36.1	51
Nitrite as NO2	mg/l		0.364	0.18	0.089	0.262	0.49	0.619	0.547	0.322	1.24	0.426	0.341	0.468	0.424
Phosphorus (total)	µg/l		479	359	350	453	314	318	431	290	635	284	233	355	953
Orthophosphate (as P)	mg/l	See report	0.348	0.263	0.298	0.318	0.204	0.192	0.24	0.141	0.419	0.167	0.118	0.228	0.851
Orthophosphate (as PO4)	mg/l		1.07	0.807	0.913	0.973	0.626	0.588	0.735	0.432	1.28	0.511	0.361	0.699	2.61
Algal Indicators															
Chlorophyll-a	µg/l		na	na	<4	<7	<7	<7	<7	10.1	<7	9.64	22.3	16.6	na
Cyanobacteria	cells/ml		0	0	871	134	1940	0	0	0	1120	0	0	0	388

Table A.5

Microbiology, Nutrients, Algal Indicators Laboratory Results

		Location	MIN-05 - River Trent, Burton-on-Trent												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Microbiology															
Clostridium perfringens	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Colony counts	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Coliform bacteria	CFU/100ml		na	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Cryptosporidium	Oocysts/10L		na	<0.909	<0.03	<0.98	<0.917	<0.893	<0.943	<1.03	<1.04	<1.02	<0.909	<0.877	<0.935
Enterococci	CFU/100ml		na	0	<0.01	>100	>100	>100	>100	>100	>100	>100	62	>100	>100
E. coli	CFU/100ml		na	22	<0.02	>100	>100	>100	>100	>100	>100	>100	>100	>100	>100
Nutrients															
Ammoniacal nitrogen as NH3	mg/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.336	<0.2	<0.2	<0.2
Ammonium	mg/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	0.356	<0.2	<0.2	<0.2
Nitrate as NO3	mg/l		38.7	38.6	50.3	46.3	57.3	34.3	43.6	31.8	39	45.5	44.5	26.5	53.9
Nitrite as NO2	mg/l		0.14	0.084	0.068	0.19	0.309	0.308	0.364	0.272	0.378	0.369	0.176	0.276	0.145
Phosphorus (total)	µg/l		411	354	390	470	349	334	359	320	339	393	295	368	668
Orthophosphate (as P)	mg/l	See report	0.321	0.272	0.317	0.365	0.235	0.176	0.26	0.159	0.219	0.269	0.153	0.262	0.569
Orthophosphate (as PO4)	mg/l		0.983	0.835	0.971	1.12	0.719	0.538	0.798	0.487	0.672	0.823	0.47	0.802	1.74
Algal Indicators															
Chlorophyll-a	µg/l		na	<4	<0.02	18.3	<7	<7	<7	7.91	<7	9.38	21.6	16.6	na
Cyanobacteria	cells/ml		0	0	246	536	0	0	0	0	1300	0	0	0	0

Key: na = not analysed

Table A.6
Other Parameters Laboratory Results

Location			MIN-01 - River Tame, Water Orton, U/S Minworth STW Discharge												
Round			1	2	3	4	5	6	7	8	9	10	11	12	13
Sample Date			04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.05	<0.04	<0.04	<0.08	<0.04	<0.05	<0.04	<0.05	<0.04	<0.06	<0.04	<0.12	<0.04
Gross Beta Activity	Bq/l		0.22	0.4	0.51	0.24	0.41	0.3	0.25	0.34	0.22	0.36	0.34	0.36	0.3
Acrylamide	µg/l		<0.05	<0.05	na	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.153	0.204	0.354	<0.06	0.277	0.133	0.248	0.188	0.101	0.188	0.252	0.224	0.222
Chloride	mg/l	250	61.1	86.7	118	32	115	107	92.8	87.4	77.6	85.1	107	80.4	68.8
True Colour	mg/l Pt/Co		9.8	12.5	11.3	11.5	10.8	12.4	11.6	10.2	10.8	9.84	11.7	7.87	11.1
Conductivity @ 20 deg.C	mS/cm		0.606	0.769	0.938	0.347	0.85	0.665	0.8	0.643	0.596	0.833	0.85	0.753	0.605
Fluoride	mg/l	5	<0.5	0.553	0.814	<0.5	0.628	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphate	mg/l	400	81.4	121	133	41.2	123	67.7	111	78.5	61.7	118	126	104	84.2
Total Organic Carbon	mg/l		8.55	4.84	<3	6.67	5.93	5.84	4.8	5.65	5.99	6.05	6.7	9.01	6.61
Dissolved Organic Carbon	mg/l		7.17	5.99	6.8	6.4	7.23	6.85	5.1	5.27	6.39	6.56	6.46	6.71	6.4
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Location			MIN-02A - River Tame, U/S Coleshill STW Discharge												
Round			1	2	3	4	5	6	7	8	9	10	11	12	13
Sample Date			04/08/2021	25/08/2021	23/09/2021	20/10/2021	26/11/2021	08/12/2021	13/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.04	<0.06	<0.05	<0.09	<0.04	<0.04	<0.04	<0.04	<0.05	<0.06	<0.04	<0.15	<0.04
Gross Beta Activity	Bq/l		0.56	0.44	0.69	0.33	0.55	0.28	0.49	0.44	0.29	0.35	0.31	0.33	0.37
Acrylamide	µg/l		<0.05	<0.05	na	<0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.15
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.413	0.377	0.467	0.2	0.392	0.17	0.276	0.316	0.126	0.291	0.21	0.369	0.212
Chloride	mg/l	250	106	107	122	53.8	112	115	94	116	82.2	98.4	101	99.9	75.3
True Colour	mg/l Pt/Co		25	28.1	24	17.1	25.6	17.6	21.6	16.8	15.3	21.1	24.6	21.3	22.7
Conductivity @ 20 deg.C	mS/cm		0.819	0.786	0.85	0.474	0.838	0.679	0.761	0.773	0.584	0.812	0.784	0.798	0.607
Fluoride	mg/l	5	0.65	0.729	0.912	<0.5	0.786	<0.5	<0.5	<0.5	<0.5	0.522	0.598	0.62	<0.5
Sulphate	mg/l	400	103	99.5	102	59.3	111	64.9	101	90.4	56.1	101	109	96.4	73
Total Organic Carbon	mg/l		9.87	10.3	9.02	10.8	10.4	6.75	6.2	7.25	6.69	9.86	9.51	12	9.08
Dissolved Organic Carbon	mg/l		10.2	11.2	9.89	9.42	11.4	8.65	7.4	7.93	8.08	10.2	8.69	11	9.03
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Location			MIN-02B - Coleshill STW Discharge												
Round			1	2	3	4	5	6	7	8	9	10	11	12	13
Sample Date			04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.04	<0.04	<0.04	<0.04	<0.04	<0.05	<0.04	<0.04	<0.04	<0.05	<0.04	<0.07	<0.04
Gross Beta Activity	Bq/l		0.4	0.43	0.54	0.37	0.62	0.43	0.49	0.56	0.31	0.47	0.52	0.46	0.44
Acrylamide	µg/l		<0.05	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.2
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<60	<60	<5	<150	<60	<5	<60	<60	<5
Bromide	mg/l		0.145	0.141	0.137	0.162	0.166	0.118	0.171	0.215	0.091	0.142	0.134	0.228	0.384
Chloride	mg/l	250	76.7	85.4	96.7	67.9	90.1	70.3	65.3	85.5	61.5	81.3	92.7	84.5	99.2
True Colour	mg/l Pt/Co		14	20.2	17.9	16.5	15.9	14.9	18.8	15.1	13	15.8	16.6	15.6	21.3
Conductivity @ 20 deg.C	mS/cm		0.605	0.608	0.655	0.518	0.661	0.532	0.574	0.662	0.512	0.648	0.647	0.644	0.636
Fluoride	mg/l	5	0.589	0.666	0.67	0.604	1.65	0.516	0.57	<0.5	<0.5	0.606	0.634	0.685	0.623
Sulphate	mg/l	400	83.3	86.6	85.5	69.6	92.9	80.1	80.1	92.9	65.3	86.9	93.2	86.8	76.7
Total Organic Carbon	mg/l		8.33	7.97	3.84	7.22	8.17	8.42	7.2	8.06	6.06	9.08	10.9	10.9	10.6
Dissolved Organic Carbon	mg/l		8.91	8.79	8.88	7.99	9.38	9.21	7.7	8.58	6.95	9.06	9.71	9.74	9.91
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table A.6
Other Parameters Laboratory Results

		Location	MIN-02C - River Tame, D/S Coleshill STW Discharge												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.04	<0.04	<0.04	<0.08	<0.06	<0.05	<0.04	<0.04	<0.04	<0.04	<0.07	<0.1	<0.06
Gross Beta Activity	Bq/l		0.51	0.5	0.68	0.3	0.69	0.29	0.49	0.48	0.3	0.5	0.34	0.42	0.32
Acrylamide	µg/l		<0.05	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.37	0.311	0.424	0.156	0.44	0.15	0.285	0.211	0.128	0.347	0.197	0.324	0.228
Chloride	mg/l	250	99.5	100	118	51.8	97.6	87.2	105	113	78.8	94.2	101	82.5	78.9
True Colour	mg/l Pt/Co		20.3	25.2	21.9	16.7	26.2	17.9	20.9	16.8	15.5	20.3	20	18.6	20.4
Conductivity @ 20 deg.C	mS/cm		0.798	0.752	0.82	0.433	0.781	0.598	0.733	0.772	0.566	0.81	0.761	0.784	0.604
Fluoride	mg/l	5	0.592	0.628	0.856	<0.5	0.919	<0.5	<0.5	<0.5	<0.5	<0.5	0.607	0.593	<0.5
Sulphate	mg/l	400	103	98.9	102	50.1	106	86.5	88	89.1	57.2	99.9	106	97.8	73.9
Total Organic Carbon	mg/l		9.09	9.12	8.41	7.08	11.2	8.62	8	7.16	6.57	7.9	9.57	10.3	10.1
Dissolved Organic Carbon	mg/l		9.89	9.7	8.96	6.96	12.3	9.81	8.3	7.94	7.8	9.96	8.96	9.94	8.67
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

		Location	MIN-03 - River Tame, Kingsbury Road												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.04	<0.04	<0.05	<0.04	<0.05	<0.08	<0.04	<0.05	<0.04	<0.04	<0.07	<0.07	<0.04
Gross Beta Activity	Bq/l		0.44	0.46	0.62	0.4	0.52	0.28	0.44	0.38	0.3	0.36	0.43	0.41	0.36
Acrylamide	µg/l		<0.05	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.333	0.247	0.331	0.336	0.271	0.195	0.251	0.16	0.153	0.178	0.206	0.199	0.241
Chloride	mg/l	250	94.7	90.6	112	93.5	94.7	88.3	92.7	97	92.7	83.3	103	83.6	87.2
True Colour	mg/l Pt/Co		22.9	26.5	23.6	28	29.5	20	24.6	19.2	16.9	21.3	22.2	21.1	24.5
Conductivity @ 20 deg.C	mS/cm		0.727	0.687	0.796	0.69	0.764	0.583	0.72	0.675	0.677	0.757	0.759	0.757	0.66
Fluoride	mg/l	5	0.545	0.621	0.956	0.579	1.01	<0.5	<0.5	<0.5	<0.5	<0.5	0.6	0.629	<0.5
Sulphate	mg/l	400	87.4	86.6	96.6	84	97.3	65.4	85.8	77.6	72	94	101	108	82.2
Total Organic Carbon	mg/l		11.5	9.22	8.83	9.23	11.7	7.61	8.4	7.51	7.49	10.3	10.6	10.2	11.1
Dissolved Organic Carbon	mg/l		10.7	10.5	8.93	9.75	13	9.78	8.6	8.59	8.59	10.1	10	10	10.1
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

		Location	MIN-04 - River Tame, Hopwas												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.04	<0.04	<0.04	<0.1	<0.06	<0.05	<0.05	<0.08	<0.05	<0.04	<0.06	<0.04	<0.06
Gross Beta Activity	Bq/l		0.37	0.41	0.59	0.39	0.48	0.34	0.34	0.29	0.3	0.33	0.35	0.4	0.4
Acrylamide	µg/l		<0.05	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.3
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.272	0.188	0.32	0.247	0.233	0.12	0.139	0.0839	0.148	0.132	0.186	0.176	0.351
Chloride	mg/l	250	81	79.2	106	85.7	89.6	84.3	79.9	77.8	88.2	72.2	98.3	80.6	89.9
True Colour	mg/l Pt/Co		19.4	21.8	21.7	24.4	24	19.6	21.7	22.1	17.4	18.8	19.2	18	25
Conductivity @ 20 deg.C	mS/cm		0.688	0.685	0.791	0.689	0.777	0.628	0.705	0.655	0.694	0.758	0.781	0.753	0.692
Fluoride	mg/l	5	<0.5	0.575	0.931	0.535	0.883	<0.5	<0.5	<0.5	<0.5	<0.5	0.537	0.521	<0.5
Sulphate	mg/l	400	110	95.8	105	99.2	113	84	94.3	86.9	80.7	103	114	103	87.6
Total Organic Carbon	mg/l		9.63	8.66	8.04	8.38	10.7	7.19	7.9	6.87	7.51	10.5	9.56	13.6	9.6
Dissolved Organic Carbon	mg/l		9.14	9.38	8.96	9.72	11.4	9.64	7.9	7.94	9.03	9.34	9.03	9.63	10.1
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Table A.6
Other Parameters Laboratory Results

		Location	MIN-05 - River Trent, Burton-on-Trent												
		Round	1	2	3	4	5	6	7	8	9	10	11	12	13
		Sample Date	04/08/2021	25/08/2021	23/09/2021	20/10/2021	25/11/2021	07/12/2021	12/01/2022	08/02/2022	01/03/2022	22/03/2022	11/04/2022	05/05/2022	01/08/2022
Determinand	**Units**	**WS (WQ)**													
Other - High Impact															
Gross Alpha Activity	Bq/l		<0.06	<0.05	<0.04	<0.11	<0.05	<0.06	<0.04	<0.12	<0.06	<0.04	<0.07	<0.04	<0.04
Gross Beta Activity	Bq/l		0.32	0.31	0.46	0.38	0.43	0.25	0.29	0.24	0.32	0.26	0.37	0.42	0.61
Acrylamide	µg/l		<0.05	<0.05	na	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.3
Cyanide, Total	mg/l		<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Indicative Dose	mSv/y	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Radon	Bq/l		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Tritium	Bq/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Other - Low impact															
Bromate	µg/l		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Bromide	mg/l		0.215	0.151	0.284	0.225	0.22	0.101	0.151	0.193	0.112	0.15	0.417	0.216	0.649
Chloride	mg/l	250	83	81.1	107	92.6	97.2	63.5	75	76.6	74.1	81.3	109	91.8	138
True Colour	mg/l Pt/Co		16.3	18.8	17.6	19.6	19.9	22	19.2	20	17.1	17.2	15.9	15	21.9
Conductivity @ 20 deg.C	mS/cm		0.777	0.709	0.88	0.781	0.881	0.568	0.716	0.658	0.762	0.847	0.864	0.87	0.935
Fluoride	mg/l	5	<0.5	<0.5	0.524	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Sulphate	mg/l	400	118	120	140	123	138	82	110	100	118	128	151	143	136
Total Organic Carbon	mg/l		7.38	6.48	7.07	7.14	7.38	8.4	7.4	6.91	6.7	7.41	8.48	8.91	8.63
Dissolved Organic Carbon	mg/l		7.38	7.17	8.1	7.99	8.97	10.5	8.1	7.89	8.32	8.17	8.06	8.37	9.47
Vinyl Chloride	µg/l		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

Appendix B Laboratory Analytical Certificates

Note: due to the large file size, this appendix is provided as a separate document

Appendix C SIMCAT Modelling Calibration Summary

Water quality modelling has been undertaken using existing SIMCAT models provided by the Environment Agency to understand the impacts of reducing effluent discharges from Minworth WwTW on the water environment in the Rivers Tame and Trent. River water quality modelling using the Environment Agency's SIMCAT modelling software is recognised as the standard approach to support decision making for water quality management and planning to limit the impacts of proposed development on the water environment.

SIMCAT is used to help understand the current situation and predict the potential impacts of future changes. There are two SIMCAT models for the River Trent catchment – Cal_Permit.dat was used to model orthophosphate pollution and Trent_Model2Cal.dat used to model ammonia and BOD concentrations. An alternative orthophosphate model was provided by the Environment Agency, Cal_Dif_bks_p.dat, which was used to model predicted water quality following water industry investment in wastewater treatment in AMP6 (2015-2020), however this model was not used as data following this investment are now available and therefore the Cal_Permit.dat model could be updated to reflect the actual changes in water quality following AMP6.

The 2015 River Trent Catchment SIMCAT models provided covers the entire River Trent catchment, including the Rivers Anker, Soar, Derwent, Dove and their tributaries. The model also includes additional watercourses which discharge into the Humber. Water quality on these tributaries and additional watercourses will not be affected by changes in Minworth WwTW effluent discharge rate and results for these watercourses have not been considered in this assessment.

The supplied models were updated using river water quality, flow and effluent monitoring observations to create a revised baseline model. This was run and then revised further to enable modelling of the impacts of future discharge scenarios at Minworth WwTW on downstream water quality and compliance with WFD standards. This technical summary provides the input data used to update the baseline model and the resulting changes in modelled water quality in the Rivers Tame and Trent.

C.1 Model Input Data

The Trent catchment SIMCAT model covers an extremely large geographic area (Figure C-1) and includes 66 river flow gauges, 303 WwTW continuous discharges and 786 river water quality monitoring locations in the orthophosphate model. Many of these features are on tributaries which will not be affected by changes in Minworth effluent WwTW discharges. A targeted approach was therefore taken to updating water quality, effluent quality and river flow data, as follows:

- All river flow gauging station data (mean flow and Q_{95} flows) were updated to match current 2022 observations at gauging stations. This ensures that river flow from all gauged tributaries to the River Trent is appropriate and includes updated data for seven flow gauges on the River Trent and six on the River Tame.
- Observed river water quality data were updated for all sample points on the Rivers Tame and Trent and the final water quality sampling point on each tributary. This ensures that current water quality on the Rivers Tame and Trent is properly characterised and takes account of changes to water quality, including upgrades to WwTW, in the main tributary inflows without requiring a full update of all WwTW flows and loads and all water quality sampling points in the unaffected tributaries.
- Flows and effluent quality for all WwTW discharging directly to the Rivers Tame and Trent have been updated based on flow data obtained from Severn Trent Water and effluent quality data obtained from the Environment Agency water quality archive[16].

By preference, water quality data from 2014 onwards have been used to represent current conditions as a compromise between use of the most recent data and ensuring a sufficient number of samples for confidence in the water quality statistic values. This was subject to a review of the data and confirmation that data from 2014 was still representative of current conditions and there had been no more recent step changes in water quality, e.g. improvements in WwTW effluent quality and downstream river water quality. If the older data is unrepresentative then only more recent data were used. If there was insufficient post-2014 water quality data available at a location then older data to the year 2000 were reviewed and included if there is no clear change in the observed data for a given substance.

[16] https://environment.data.gov.uk/water-quality/view/explore

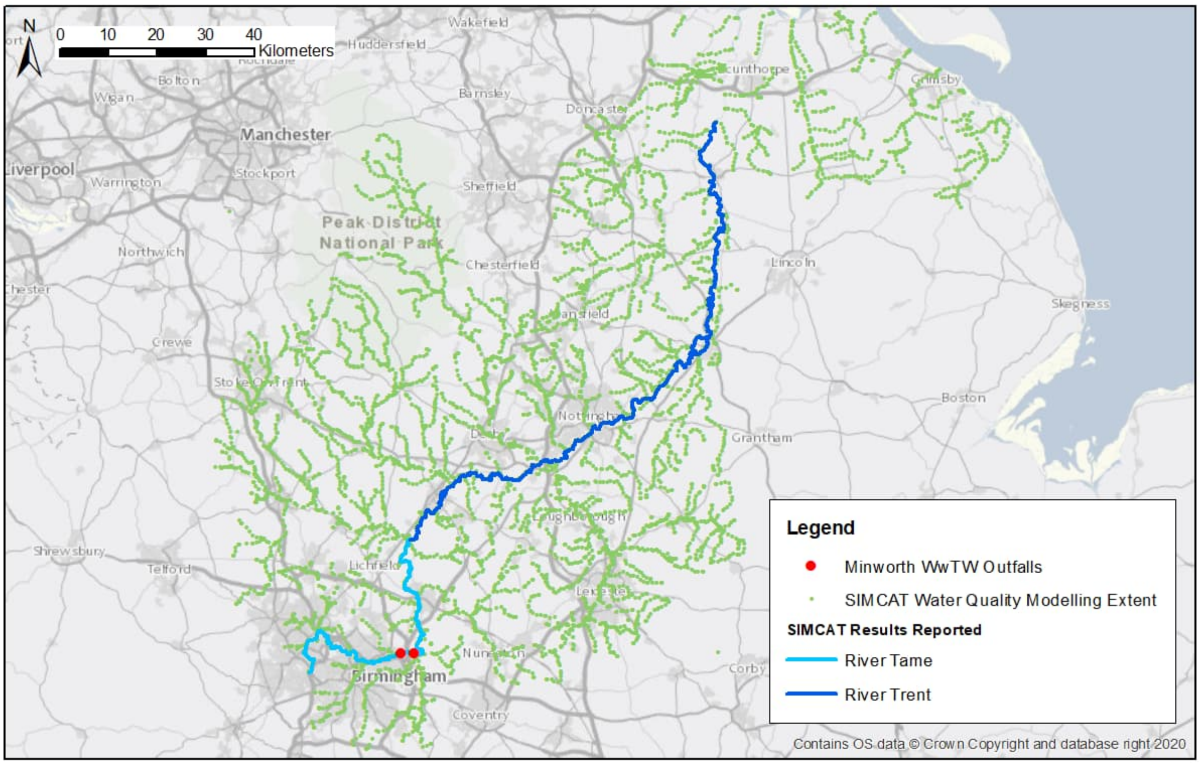


Figure C-1: Geographic Extent of the River Tame SIMCAT Model

Current river flow statistics provided by the NFRA based on the entire reliable data period of each gauge have been used in the revised baseline modelling. Five gauges present in the model are not part of the NFRA database and updated flow data are not available. Effluent flow rates from WwTW have been obtained from Severn Trent Water for the period 2017-2022.

Figure C-2 below shows the locations of the WwTW, river flow gauges and water quality data for which data were obtained, analysed and updated. This includes 62 river flow gauges, 47 WwTW and 68 water quality sampling points. An additional 17 water quality sampling points were added into the models to better represent water quality data along the Rivers Tame and Trent. A further 15 water quality samples points were present in the supplied model but with no data for ammonia, 18 were present without data for BOD and 23 were present without data for orthophosphate; all these sample points were updated with observed data. The input data and original model values are included at the end of Appendix C.

The SIMCAT modelling does include one important assumption for orthophosphate in WwTW final treated effluent. Phosphate emissions for 11 important WwTW, including Minworth and Coleshill WwTW, are limited through application of a total phosphorus limit rather than an orthophosphate limit. This means that only observed total phosphate concentrations are given in the effluent quality monitoring data. A correction was applied to the total phosphate data based on the observed orthophosphate fraction of total phosphate in Minworth WwTW effluent, which has been monitored as part of background information to assess the impacts of the proposed future discharges from Minworth WwTW to the River Tame. This monitoring data shows that an average of 70% of total phosphate in Minworth WwTW effluent is comprised of orthophosphate, and this fraction has been applied to the other ten WwTW sites.

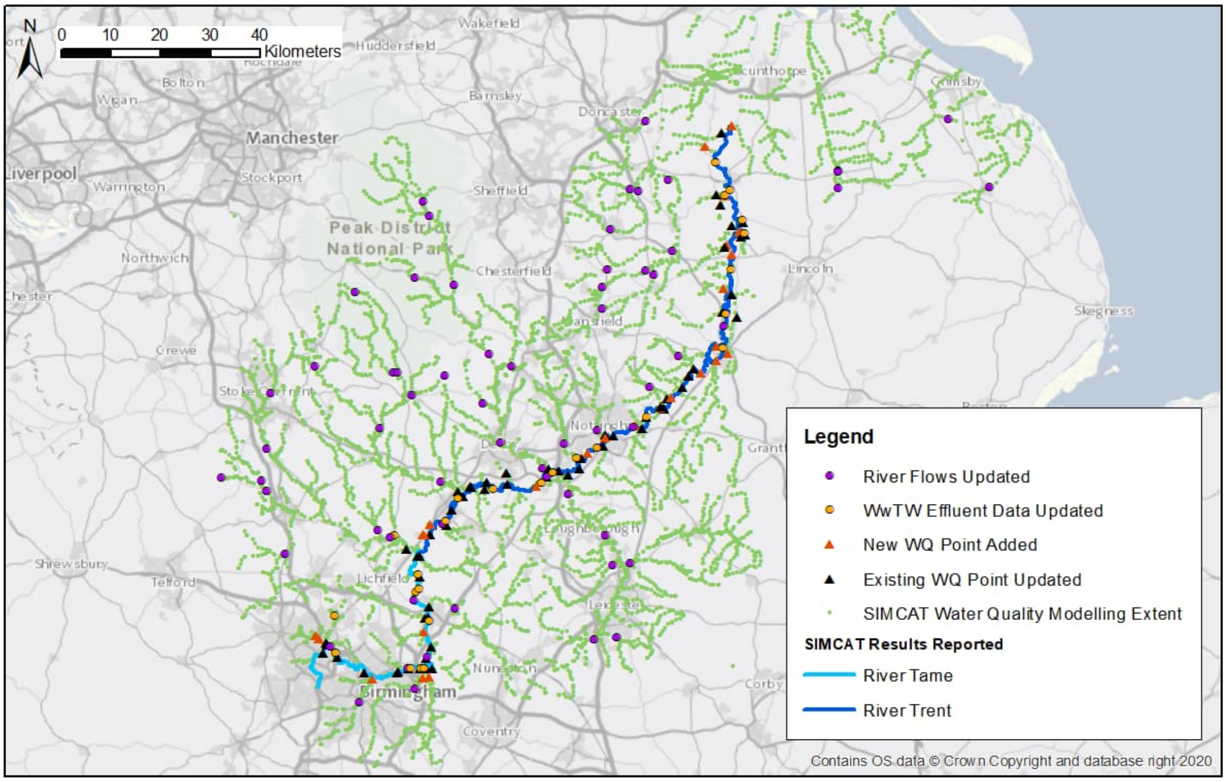


Figure C-2: SIMCAT Model Data Update Locations

C.2 SIMCAT Model Runs

The SIMCAT model was run as follows:

1) The Original SIMCAT model, as received from the Environment Agency, was run in mode 0 (to ensure the model ran correctly and did not produce erratic results), then in mode 6 to recalibrate with the original model datasets for flow and quality.

2) The Baseline model was developed by updating the corrected original model using observed river flows and water quality and updated WwTW effluent quality and flows. This model was also run initially in mode 0

3) A Calibrated Baseline model was created by re-running the Baseline model in mode 6 to calibrate it using the updated datasets. The Calibrated Model shows the impacts of the existing inputs on water quality in the Rivers Tame and Trent.

4) Scenario Testing: The Calibrated Baseline model was run in mode 4 with reduced flows at Minworth WwTW, as set out in Table 6-1, to model water quality impacts downstream.

The scenario testing results are discussed in Section 6 of the main report. The changes between the received and updated baseline model are set out below.

C.3 Revised Baseline Modelling

The SIMCAT model results for river flow are presented in Figure 8-3 for the Original, Baseline and Calibrated Baseline model for locations along the Rivers Tame and Trent only (orthophosphate model results presented). The Original model predicts higher river flows when uncalibrated compared to received model flow predictions when the model is calibrated to its internal observed data. However, the observed river flow data in the Original model is notably low when compared to current 2022 flow data records, with flow data for many gauges 10-30% lower than in the current dataset. The revised Calibrated Baseline model produces flow values for the Trent which are more consistent with the uncalibrated Original model. There is less difference in the river flow predictions for the River Tame, particularly upstream of the River Anker inflow.

The very large geographic area represented in the SIMCAT models results in more than 1,000 individual inflow points, which means that the model cannot carry out a full back calculation process. This results in a drop in flow predicted upstream of some gauges as the model force-fits the outputs to the observed data, which would not be observed in reality. This is not ideal, however the reductions in flow are generally small compared to the overall flow and very localised, essentially acting as a periodic correction to flow estimates rather than a determining factor for flow distribution across the wider model area. These corrections will improve predictions of downstream water quality and do not reduce confidence in the model simulation results.

Figure C-4 compares the modelled and observed mean phosphate concentrations in the Original model and the 2022 Calibrated Baseline model. The Original model contains notably high observed and modelled orthophosphate concentrations compared with the Calibrated Baseline model. This is likely due to recent efforts to reduce river orthophosphate concentrations, particularly though improved wastewater treatment. The Original model also overestimates WwTW discharge rates – this overestimate is small at Minworth but can exceed 30% for other WwTW (see embedded excel file above). The extensive and diverse catchment areas of the Rivers Tame and Trent means that these watercourses are still poor status in terms of orthophosphate concentrations under WFD; this is attributed to diffuse and non-WwTW point sources of orthophosphate.

Figure C-5 compares the modelled and observed 90%ile ammonia concentrations in the Original model and the 2022 Calibrated Baseline model. These models are far more consistent in comparison to the orthophosphate models, although there is an observed trend towards reduced ammonia concentrations in the Rivers Tame and Trent, particularly in the upper Tame catchment, which is reflected in the updated Calibrated Baseline model. This reduction is attributed to mitigation of diffuse and non-WwTW sources of ammonia since the Original model does not contain the same overestimate of WwTW discharge rates and ammonia concentrations as is seen in the Original orthophosphate model.

Figure C-6 compares the modelled and observed 90%ile BOD concentrations in the Original model and the 2022 Calibrated Baseline model. The Original model predicts significantly lower BOD concentrations when uncalibrated to its internal data and the 2022 Calibrated Baseline model predicts higher concentrations compared to the Original model. This is attributed to a combination of the limited BOD dataset used to inform the Original model, which may miss actual BOD pollution, and potentially to increased diffuse pollution. It is not attributed to higher WwTW effluent flows or BOD loads because the 2022 model updates generally reduce both modelled BOD loads and effluent flow rates.

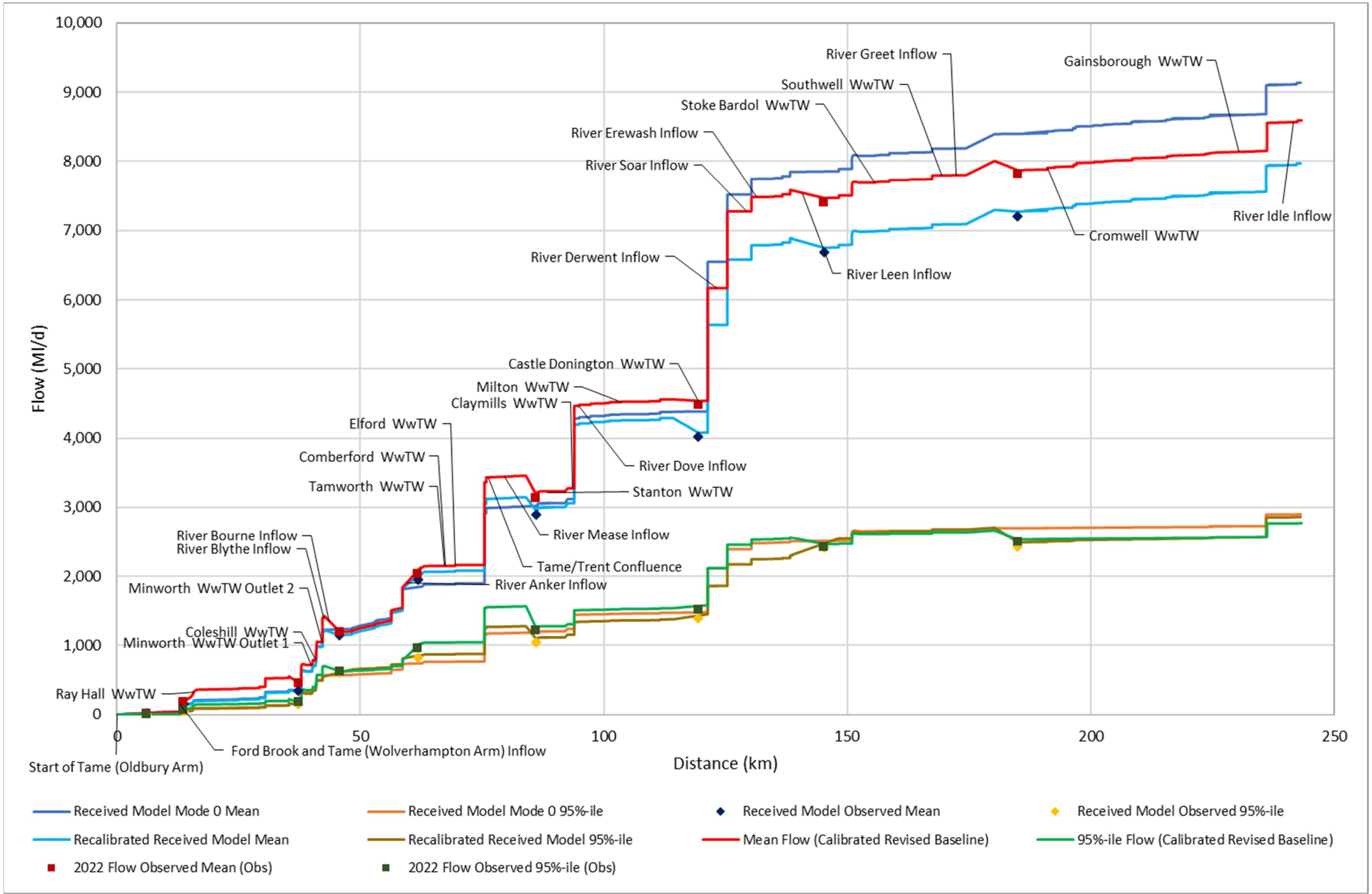


Figure C-3: Mean and Q_{95} River Flow Rates in Original and 2022 Calibrated Baseline SIMCAT Model

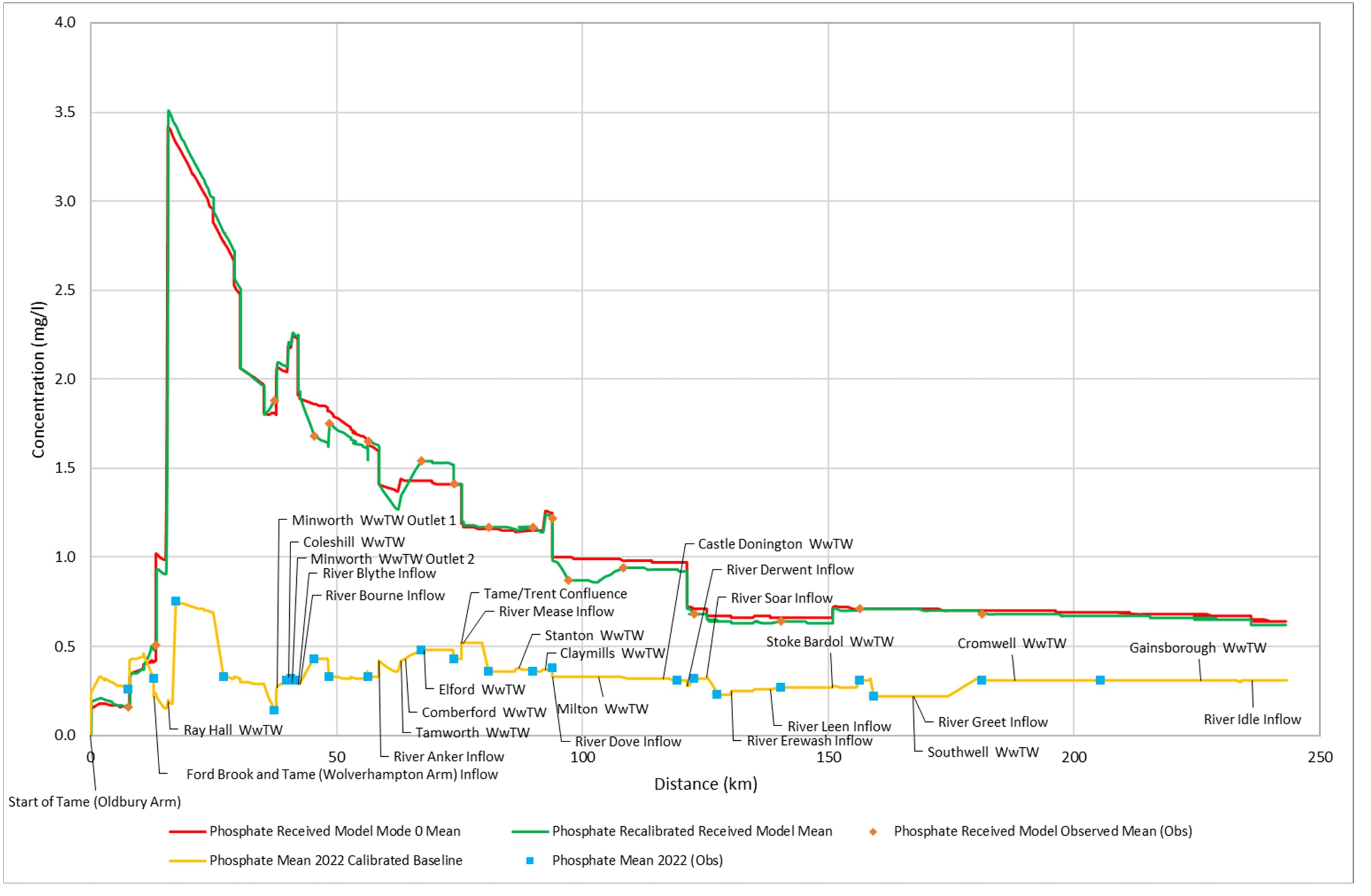


Figure C-4: Mean Orthophosphate Concentrations in Original and 2022 Calibrated Baseline SIMCAT Model

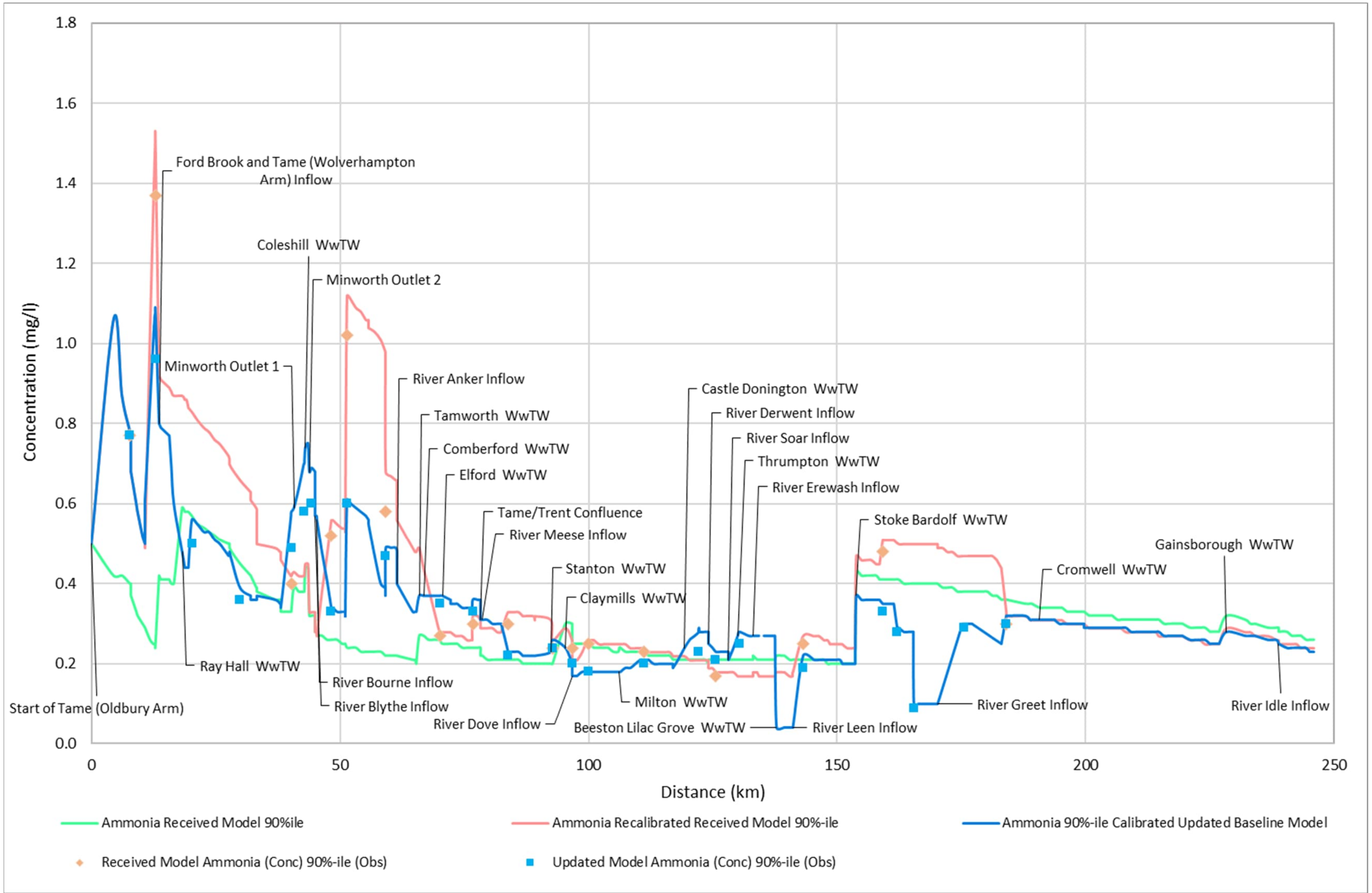


Figure C-5: 90%ile Ammonia Concentrations in Original and 2022 Calibrated Baseline SIMCAT Model

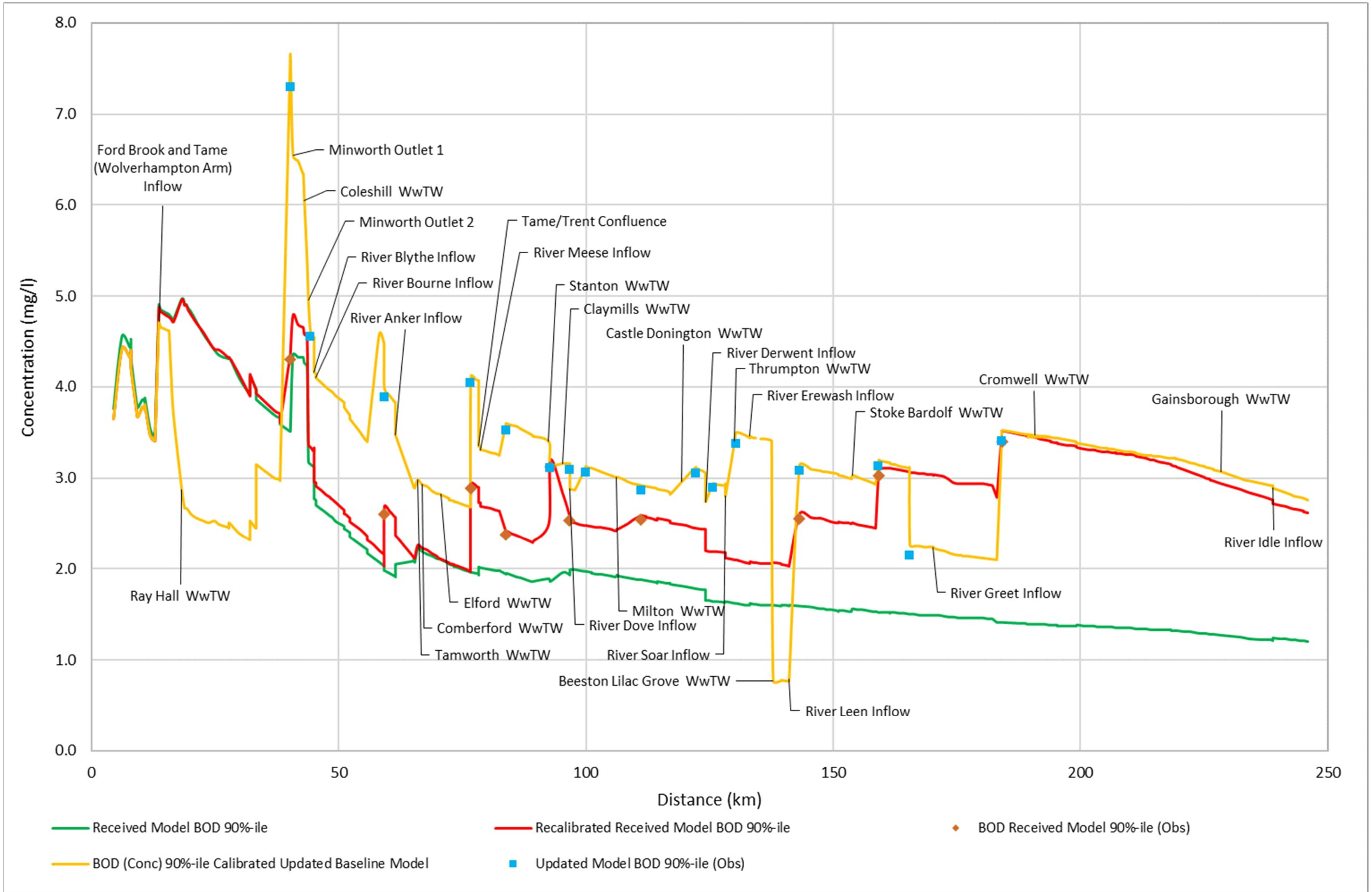


Figure C-6: 90%ile BOD Concentrations in Original and 2022 Calibrated Baseline SIMCAT Model

Gauge references for continued monitoring locations redacted

RIVER FLOW GAUGES

Gauge	Mean (Received SIMCAT Model)	95%ile (Received SIMCAT Model)	Comment	NFRA Number	2022 NFRA Mean Flow (m3/s)	2022 NFRA Q95 (m3/s)	2022 NFRA Mean Flow (Ml/d)	2022 NFRA Q95 (Ml/d)	% Change	% Change
FS Amber Wingfield P	124.416	28.512		28[redacted]48	1.425	0.357	123.12	30.84	-1.0	8.2
FS Ancholme Bishopbr	58.752	7.776		29[redacted]04	0.538	0.031	46.48	2.68	-20.9	-65.6
FS Ancholme Toft New	45.86	0.259		29[redacted]09	0.138	0.004	11.92	0.35	-74.0	33.4
FS Anker Polesworth	291.168	69.984		28[redacted]26	3.091	0.76	267.06	65.66	-8.3	-6.2
FS Blithe Hamstall Ridware	70.848	21.6		28[redacted]02	1.132	0.306	97.80	26.44	38.0	22.4
FS Churnet Basford B	157.248	36.288		28[redacted]61	1.885	0.443	162.864	38.2752	3.6	5.5
FS Cole Coleshill	76.896	12.96		28[redacted]66	0.963	0.208	83.2032	17.9712	8.2	38.7
FS Derwent Chatswort	580.608	108		28[redacted]43	6.438	1.48	556.2432	127.872	-4.2	18.4
FS Derwent Church Wi	1551.744	349.056		28[redacted]67	18.815	4.94	1625.616	426.816	4.8	22.3
FS Derwent Mytham Bridge	0	0		28[redacted]37	4.989	0.994	431.0496	85.8816		
FS Derwent St. Marys	1486.944	373.248		28[redacted]85	17.519	4.63	1513.6416	400.032	1.8	7.2
FS Derwent Whatstand	1212.192	324.864		28[redacted]17	14.724	4.408	1272.1536	380.8512	4.9	17.2
FS Derwent Yorkshire	188.352	60.48		28[redacted]01	2.106	0.542	181.9584	46.8288	-3.4	-22.6
FS Dove Hollinscloug	25.056	5.184		28[redacted]33	0.276	0.047	23.8464	4.0608	-4.8	-21.7
FS Dove Izaak Walton	146.016	37.152		28[redacted]46	1.95	0.517	168.48	44.6688	15.4	20.2
FS Dove Marston on D	1147.392	293.76		28[redacted]18	13.9	3.66	1200.96	316.224	4.7	7.6
FS Dove Rocester Wei	590.112	142.56		28[redacted]08	7.539	1.79	651.3696	154.656	10.4	8.5
FS Dover Beck Lowdha	17.28	5.184		28[redacted]60	0.174	0.051	15.0336	4.4064	-13.0	-15.0
FS Ecclesbourne Duff	46.656	6.912		28[redacted]55	0.639	0.099	55.2096	8.5536	18.3	23.8
FS Erewash Sandiacre	159.84	47.52		28[redacted]27	1.915	0.505	165.456	43.632	3.5	-8.2
FS Greet Southwell	25.056	7.776		28[redacted]73	0.309	0.103	26.6976	8.8992	6.6	14.4
FS Henmore Brook Ash	30.24	7.776		20[redacted]58	0.425	0.083	36.72	7.1712	21.4	-7.8
FS Henmore Brook Car	3.456	2.592		28[redacted]03	0.046	0.031	3.9744	2.6784	15.0	3.3
FS Idle Mattersey	181.44	65.664		28[redacted]15	2.378	0.849	205.4592	73.3536	13.2	11.7
FS Leen Triumph Road	58.752	22.464		28[redacted]35	0.692	0.238	59.7888	20.5632	1.8	-8.5
FS Lud Louth	36.288	10.368		29[redacted]03	0.455	0.126	39.312	10.8864	8.3	5.0
FS Manifold Ilam	289.44	49.248		28[redacted]31	3.593	0.633	310.4352	54.6912	7.3	11.1
FS Maun Mansfield The Dykes	61.344	38.88		28[redacted]15	0.694	0.437	59.9616	37.7568	-2.3	-2.9
FS Maun Whitewater B	76.896	43.2		28[redacted]16	0.912	0.494	78.7968	42.6816	2.5	-1.2
FS Mease Clifton Hall	62.4	13.997		Gauge not in [redacted]FRA database					No data	No data
FS Meden Church Wars	44.928	19.008		28[redacted]32	0.588	0.241	50.8032	20.8224	13.1	9.5
FS Meden Perlethorpe	62.208	29.376		28[redacted]18	0.795	0.38	68.688	32.832	10.4	11.8
FS Meece Brook Shall	47.52	8.64		28[redacted]79	0.63	0.134	54.432	11.5776	14.5	34.0
FS Oldcoates Dyke Bl	71.712	26.784		28[redacted]47	0.712	0.255	61.5168	22.032	-14.2	-17.7
FS Penk Penkridge	176.256	39.744		28[redacted]53	2.32	0.559	200.448	48.2976	13.7	21.5
FS Poulter Cuckney	23.328	12.96		28[redacted]44	0.318	0.164	27.4752	14.1696	17.8	9.3
FS Poulter Twyford Bridge	43.2	17.28		28[redacted]36	0.649	0.236	56.0736	20.3904	29.8	18.0
FS Rase Bishopbridge	44.612	7.43		29[redacted]05	0.555	0.066	47.952	5.7024	7.5	-23.3
FS Rea Calthorpe Par	54.432	14.688		28[redacted]39	0.748	0.182	64.6272	15.7248	18.7	7.1
FS Rothley Brook Rot	56.16	8.64		28[redacted]56	0.741	0.122	64.0224	10.5408	14.0	22.0
FS Ryton Blyth	139.968	63.072		28[redacted]91	1.582	0.588	136.6848	50.8032	-2.3	-19.5
FS Ryton Worksop	39.744	8.64		28[redacted]49	0.46	0.091	39.744	7.8624	0.0	-9.0
FS Sence South Wigst	75.168	11.232		28[redacted]86	0.953	0.136	82.3392	11.7504	9.5	4.6
FS Soar Kegworth	904.608	256.608		28[redacted]74	11.884	3.45	1026.7776	298.08	13.5	16.2
FS Soar Littlethorpe	107.136	20.736		28[redacted]82	1.355	0.249	117.072	21.5136	9.3	3.8
FS Soar Pillings Loc	785.376	229.824		28[redacted]93	9.602	2.569	829.6128	221.9616	5.6	-3.4
FS Sow Great Bridgfo	89.856	17.28		28[redacted]52	1.212	0.355	104.7168	30.672	16.5	77.5
FS Sow Milford	587.893	221.184		28[redacted]14	6.333	1.667	547.1712	144.0288	-6.9	-34.9
FS Sow Walkmill	5.184	3.456		28[redacted]09	0.077	0.039	6.6528	3.3696	28.3	-2.5
FS Tame Bescot	149.472	52.704		28[redacted]31	2.083	0.779	179.9712	67.3056	20.4	27.7
FS Tame Hopwas Bridg	1948.32	820.8		28[redacted]95	23.483	11.17	2028.9312	965.088	4.1	17.6
FS Tame James Bridge	0	0		Gauge not in [redacted]FRA database					No data	No data
FS Tame Lea Marston	1146.528	609.984		28[redacted]30	13.827	7.27	1194.6528	628.128	4.2	3.0
FS Tame Sheepwash	22.79	5.357		Gauge not in [redacted]FRA database					No data	No data
FS Tame Water Orton	348.192	148.608		28[redacted]03	5.303	2.11	458.1792	182.304	31.6	22.7
FS Torne Auckley	72.576	26.784		28[redacted]60	0.895	0.331	77.328	28.5984	6.5	6.8
FS Trent Colwick	6688.224	2410.56		28[redacted]09	85.751	28.02	7408.8864	2420.928	10.8	0.4
FS Trent Darlaston	280.8	115.776		28[redacted]33	3.656	1.466	315.8784	126.6624	12.5	9.4
FS Trent Drakelow Pa	2898.72	1051.488		28[redacted]19	36.227	14.14	3130.0128	1221.696	8.0	16.2
FS Trent North Muskh	7210.08	2427.84		28[redacted]22	90.431	28.9	7813.2384	2496.96	8.4	2.8
FS Trent Shardlow	4018.464	1397.088		28[redacted]07	51.837	17.54	4478.7168	1515.456	11.5	8.5
FS Trent Stoke on Tr	47.52	7.776		28[redacted]40	0.628	0.117	54.2592	10.1088	14.2	30.0
FS Trent Yoxall	873.504	304.992		28[redacted]12	12.69	4.59	1096.416	396.576	25.5	30.0
FS Tutbury Millfleam	31.104	2.592		Gauge not in [redacted]FRA database			0	0	No data	No data
FS Waithe Beck Brigs	21.6	4.32		29[redacted]01	0.304	0.063	26.2656	5.4432	21.6	26.0
FS Wreake Syston Mil	199.584	15.552		28[redacted]24	2.82	0.305	243.648	26.352	22.1	69.4
FS Wye Ashford	281.664	86.4		28[redacted]23	3.335	1.052	288.144	90.8928	2.3	5.2

Grid references for continued monitoring locations redacted

Wastewater Treatment Works		Mean (Received P Model)	Std Dev (Received P Model)	Count	Quality Monitoring Point Name	Easting	Northing	Reference	2022 Mean	2022 Std Dev	2022 count	% diff Mean	% diff SD	TP standard?	2022 Tp Mean	2022 TP Std Dev	Comment
EAST BRIDGFORD STW Wastewater Discharge	Flow	0.599	0.215	6	East Bridgford STW	[redacted]			0.470	0.190	5777	-21.5	-11.5	N	0.47	0.19	
	Orthophosphate	7.078	1.699	44					8.000	2.486	98	13.0	46.3				
	Ammonia	1.577	1.416	24					1.207	0.545	14	-23.5	-61.5				
	BOD	15.375	5.822	24					11.162	4.617	241	-27.4	-20.7				
	Flow (AB model)	0.477	0.156	6					0.470	0.190	5777	-1.5	21.8				
CASTLE DONINGTON STW Wastewater Discharge	Flow	3.881380661	1.089958698	6	Castle Donington STW				2.51	0.8	6116	-35.3	-26.6	N			
	Orthophosphate	2.2316	1.2172	45					3.08	1.65	104	37.9	35.2				
	Ammonia	4.615	1.747	36					4.553	2.409	523	-1.3	37.9				
	BOD	11.521	2.806	48					10.533	4.001	315	-8.6	42.6				
	Flow (AB model)	2.278	0.799	6					2.510	0.800	6116	10.2	0.1				
CLAYMILLS STW Wastewater Discharge	Flow	57.17913582	14.5730562	6	Claymills STW (Spt 2)				41.93	10.36	5885	-26.7	-28.9	Y			
	Orthophosphate	6.1542	1.3175	175					0.286	0.142	181	-95.4	-89.2		0.408	0.203	
	Ammonia	5.038	1.834	72					2.088	1.234	185	-58.6	-32.7				
	BOD	10.122	3.523	144					3.138	2.695	370	-69.0	-23.5				
	Flow (AB model)	37.714	9.199	6					41.93	10.36	5885	11.2	12.6				
CLIFTON NORTH & SOU Wastewater Discharge	Flow	0.101923621	4.07E-02	6	Clifton STW				0.08	0.03	5695	-21.5	-26.4	N			
	Orthophosphate	11.4063	2.1033	46					11.78	2.36	88	3.3	12.0				
	Ammonia	0.693	0.984	46					0.599	1.840	86	-13.6	87.0				
	BOD	2.347	3.716	46					1.503	1.836	233	-36.0	-50.6				
	Flow (AB model)	0.075	0.03	6					0.080	0.030	5695	6.7	0.0				
COLESHILL STW Wastewater Discharge	Flow	85.38427941	31.13205623	6	Coleshill STW				71.1	22.65	5314	-16.7	-27.2	Y			
	Orthophosphate	3.224	0.994	127					0.545	0.288	193	-83.1	-71.1		0.779	0.411	
	Ammonia	0.524	0.78	127					0.740	1.277	737	41.3	63.8				
	BOD	3.389	2.534	127					2.379	4.444	385	-29.8	75.4				
	Flow (AB model)	61.762	22.053	6					71.10	22.65	5314	15.1	2.7				
CROMWELL STW - TIDAL Wastewater Discharge	Flow	1.787398601	0.426804196	6	Cromwell STW				1.47	0.35	5643	-17.8	-18.0	N			
	Orthophosphate	4.7731	1.1897	42					4.77	1.18	42	0.0	-1.2				
	Ammonia	3.352	1.863	42					3.352	1.841	42	0.0	-1.2				
	BOD	17.125	5.944	24					11.740	6.091	220	-31.4	2.5				
	Flow (AB model)	1.426	0.38	6					1.470	0.350	5643	3.1	-7.9				
ELFORD STW Wastewater Discharge	Flow	0.243905263	0.113616667	6	Elford STW				0.16	0.08	5271	-34.4	-29.6	N			
	Orthophosphate	6.0793	1.2639	43					6.597	2.145	98	8.5	69.7				No recent data, ends 2008. Model not updated
	Ammonia	2.962	2.466	43					2.666	2.668	99	-10.0	8.2				
	BOD	11.333	5.263	43					9.118	5.116	162	-19.5	-2.8				
	Flow (AB model)	0.148	0.079	6					0.160	0.080	5271	8.1	1.3				
TAMWORTH STW Wastewater Discharge	Flow	32.71029425	16.48729581	6	Tamworth STW				24.04	11.37	4952	-26.5	-31.0	N			
	Orthophosphate	4.852781955	0.690019299	99					5.663	1.963	202	16.7	184.6				No recent data, ends 2008. Model not updated
	Ammonia	3.676	2.375	72					2.921	1.775	513	-20.5	-25.3				
	BOD	13.833	5.987	144					12.727	5.405	991	-8.0	-9.7				
	Flow (AB model)	22.167	10.201	6					24.04	11.37	4952	8.4	11.5				
GAINSBOROUGH - TIDAL Wastewater Discharge	Flow	11.72903746	3.499730987	6	Gainsborough				7.93	2.62	4567	-32.4	-25.1	Y			
	Orthophosphate	1.8	0.9	43					0.617	0.511	97	-65.7	-43.2		0.882	0.73	
	Ammonia	22.571	7.743	40					21.488	7.744	197	-4.8	0.0				
	BOD	5.531	4.402	48					3.477	3.220	177	-37.1	-26.8				
	Flow (AB model)	8.033	2.326	6					7.93	2.62	4567	-1.3	12.6				
GOSCOTE STW Wastewater Discharge	Flow	31.7650033	8.769853301	6	Goscote STW				29.5	8.33	4670	-7.1	-5.0	Y			
	Orthophosphate	3.287981203	0.773170454	99					0.118	0.069	49	-96.4	-91.0		0.169	0.099	New limit from 2020 onwards
	Ammonia	0.476	1.286	72					0.282	0.736	196	-40.8	-42.7				
	BOD	2.368	2.334	144					1.425	2.148	385	-39.8	-8.0				
	Flow (AB model)	27.195	8.264	6					29.5	8.33	4670	8.5	0.8				
MARTON STW Wastewater Discharge	Flow	0.190491057	8.19E-02	6	Marton STW				0.17	0.08	5216	-10.8	-2.3	N			
	Orthophosphate	7.6484	1.7779	45					8.32	2.27	100	8.8	27.7				
	Ammonia								2.08	2.61	54						No ammonia data in received model
	BOD								1.92	2.44	196						No BOD data in received model
MILTON STW Wastewater Discharge	Flow	4.501292981	1.638541626	6	Milton STW				4.470	1.610	6104	-0.7	-1.7	Y			
	Orthophosphate	5.1196	1.7206	45					0.619	0.391	97.00	-87.9	-77.3		0.884	0.559	
	Ammonia	2.572	1.471	36					2.442	2.342	85	-5.1	59.2				
	BOD	16.917	5.938	72					4.305	3.401	167	-74.5	-42.7				
	Flow (AB model)	4.085	1.473	6					4.470	1.610	6104	9.4	9.3				
MINWORTH STW Outlet 1 Wastewater Discharge	Flow	267.4009469	110.2830499	6	Minworth STW				256.725	70.65	5693	-4.0	-35.9	Y	513.45	141.3	
	Orthophosphate	2.4294	1.011	199	Minworth STW (Dis 1 & 2)				0.429	0.295	193	-82.3	-70.9		0.613	0.421	
	Ammonia	0.248	0.31	72					0.270	0.406	196	8.8	30.9				
	BOD	3.306	2.723	144					2.949	3.043	1198	-10.8	11.7				
	Flow (AB model)	213.127	37.337	6					256.725	70.650	5693	20.5	89.2				
MINWORTH STW Outlet 2 Wastewater Discharge	Flow	267.4009469	110.2830499	6					256.725	70.65	5693	-4.0	-35.9				
	Orthophosphate	2.4294	1.011	199					0.429	0.295	193.000	-82.3	-70.9				
	Ammonia	0	0	72					0.270	0.406	196	8.8	30.9				
	BOD	0	0	144					2.949	3.043	1198	-10.8	11.7				
	Flow (AB model)	262.488	196.836	6					256.725	70.650	5693	-2.2	-64.1				
NEWARK (CRANKLEY POINT STW)	Flow	12.39059749	2.617048632	6	Newark STW				12.391	2.617	6	0.0	0.0	Y			No flow data provided
	Orthophosphate	1.1262	0.7249	90					0.231	0.158	90.000	-79.5	-78.2		0.33	0.226	
	Ammonia	0.979	1.594	36					0.500	0.918	85	-49.0	-42.4				
	BOD	2.958	3.211	108					1.799	2.829	258	-39.2	-11.9				
	Flow (AB model)	9.763	2.095	6					9.763	2.095	6.000	0.0	0.0				
NOTTINGHAM STOKE BA Wastewater Discharge	Flow	183.7908335	67.00725473	6	Nottingham Stoke Bardolph STW				180.63	36.08	2568	-1.7	-46.2	Y			
	Orthophosphate	3.1142	0.8722	129					0.573	0.344	180	-81.6	-60.6		0.819	0.491	Improved treatment from 2015 onwards
	Ammonia	4.313	4.394	72					2.876	3.321	703	-33.3	-24.4				
	BOD	3.003	1.895	144					3.182	2.967	1137	6.0	56.6				
	Flow (AB model)	170.831	58.347	6					180.63	36.08	2568	5.7	-38.2				

Grid references for continued monitoring locations redacted

SHARDLOW STW Wastewater Discharge	Flow	2.728393386	1.039146214	6	Shardlow	[redacted]	1.8	0.68	5593	-34.0	-34.6	N			
	Orthophosphate	5.3409	1.6451	44		[redacted]	5.46	1.68	86	2.2	1.9				
	Ammonia	1.899	2.426	36		[redacted]	0.487	0.639	84	-74.4	-73.7				
	BOD	6.188	6.076	48		[redacted]	3.482	2.222	113	-43.7	-63.4				
	Flow (AB model)	1.53	0.605	6		[redacted]	1.8	0.68	5593	17.6	12.4				
STANTON STW Wastewater Discharge	Flow	9.290538484	3.069626936	6	Stanton STW (Dis 1)	[redacted]	9.360	2.750	3134	0.7	-10.4	Y			
	Orthophosphate	4.8478	1.3209	89		[redacted]	0.930	0.344	78	-80.8	-73.9		1.329	0.492	
	Ammonia	1.504	0.836	36		[redacted]	1.390	1.598	98	-7.6	91.2				
	BOD	11.194	3.602	72		[redacted]	4.582	3.033	190	-59.1	-15.8				
	Flow (AB model)	8.601	2.858	6		[redacted]	9.360	2.750	3134.000	8.8	-3.8				
TORKSEY STW Wastewater Discharge	Flow	0.22634624	0.12335424	6	Torksey STW	[redacted]	0.190	0.110	5302	-16.1	-10.8	N			
	Orthophosphate	7.8666	1.335	44		[redacted]	8.325	2.271	100	5.8	70.1				
	Ammonia	1.172	1.182	36		[redacted]	1.277	1.201	83	8.9	1.6				
	BOD	4.917	3.065	36		[redacted]	4.792	2.538	84	-2.5	-17.2				
	Flow (AB model)	0.174	0.092	6		[redacted]	0.190	0.110	5302	9.2	19.6				
TOTON STW Wastewater Discharge	Flow	28.5632091	6.985394677	6	Toton STW	[redacted]	22.530	5.780	6082	-21.1	-17.3	Y			Improved treatment - TP lower after 2016
	Orthophosphate	0.401678873	0.159838552	72		[redacted]	0.251	0.095	127	-37.6	-40.4		0.358	0.136	
	Ammonia	1.105	0.822	36		[redacted]	0.998	0.685	85	-9.6	-16.7				
	BOD	4.736	2.474	108		[redacted]	4.601	2.956	1014	-2.8	19.5				
	Flow (AB model)	21.911	6.106	6		[redacted]	22.530	5.780	6082	2.8	-5.3				
WALKERINGHAM - TIDAL Wastewater Discharge	Flow	2.806973719	0.880777748	6	Walkeringham STW	[redacted]	1.970	0.690	5849	-29.8	-21.7	N			
	Orthophosphate	3.3704	0.7819	46		[redacted]	3.437	0.848	75	2.0	8.4				
	Ammonia	3.023	2.584	36		[redacted]	1.887	1.633	252	-37.6	-36.8				
	BOD	10.292	3.803	48		[redacted]	8.630	3.648	320	-16.1	-4.1				
	Flow (AB model)	1.919	0.662	6		[redacted]	1.970	0.690	5849	2.7	4.2				
WEST BURTON - TIDAL Wastewater Discharge	Flow	0.873930137	0.38231583	6	West Burton STW	[redacted]	0.660	0.300	4403	-24.5	-21.5	N			
	Orthophosphate	5.3224	1.2552	45		[redacted]	5.247	1.436	102	-1.4	14.4				
	Ammonia	3.45	2.036	45		[redacted]	2.912	2.071	102	-15.6	1.7				
	BOD	11.833	5.206	24		[redacted]	8.242	4.203	276	-30.3	-19.3				
	Flow (AB model)	0.583	0.272	6		[redacted]	0.660	0.300	4403	13.2	10.3				
RAY HALL STW Wastewater Discharge	Flow	43.537	5.584	6	Ray Hall	[redacted]	39.120	6.340	5478	-10.15	13.54	Y			
	Orthophosphate	10.9481	2.0947	27		[redacted]	0.529	0.362	180	-95.17	-82.72		0.755	0.517	
	Ammonia	0.585	1.201	36		[redacted]	0.558	1.062	195	-4.64	-11.61				
	BOD	4.399	2.702	109		[redacted]	2.919	2.606	378	-33.64	-3.56				
	Flow (AB model)	43.54	9.49	6		[redacted]	39.120	6.340	5478	-10.15	-33.19				
SAGIS WwTW 1914 Beaston Lilac Grove	Flow	6.611	1.9833		Beaston Lilac Grove	[redacted]	6.910	1.520	5804	4.52	-23.36				
	Orthophosphate	5	2.5			[redacted]	No phosphate limit			#VALUE!	-100.00				
	Ammonia	20.322	10.161			[redacted]	2.238	1.461	331	-88.99	-85.62				
	BOD	59.877	29.939			[redacted]	8.553	3.099	554	-85.72	-89.65				
	Flow (AB model)	0.0001	0.0001			[redacted]	6.910	1.520	5804	6909900.00	1519900.00				
SAGIS WwTW 1969 Freasley	Flow	0.0124	0.00372		Freasley	[redacted]	No data	No data	No data	No data	No data				
	Orthophosphate	5	2.5			[redacted]	No data	No data	No data	No data	No data				Site not updated for orthophosphate data
	Ammonia	0.039	0.019			[redacted]	7.724	6.149	34	19705.66	32264.55				Ammonia data ends 2008
	BOD	0.072	0.036			[redacted]	4.323	4.759	85	5904.41	13118.39				BOD data continues in 2021
	Flow (AB model)	0.0001	0.0001			[redacted]	0.0124	0.00372		12300.00	3620.00				

Grid references for continued monitoring locations redacted

WQ_Ref	Easting	Northing	Ammonia Count	Ammonia Mean	Ammonia standard dev	Ammonia First Date	Ammonia Last Date	Original NH3 Mean	Original NH3 std dev	Original NH3 count	% NH3 Mean Diff	% NH3 Std Dev Diff
MD-36701570	[redacted]		267	0.120	0.110	11/01/2000	17/03/2022	No data	No data	No data	No data	No data
MD-36735800	[redacted]		60	0.174	0.132	02/01/2014	01/12/2021	0.262	0.183	36	-50.43	-38.63
MD-36741880	[redacted]		86	0.096	0.091	06/01/2014	04/04/2022	0.133	0.105	36	-38.00	-15.32
MD-36745280	[redacted]		92	0.120	0.120	08/05/2000	08/12/2021	0	0	0	No data	No data
MD-36748340	[redacted]		24	0.107	0.092	03/01/2014	02/12/2019	0.095	0.063	36	11.32	31.66
MD-36749220	[redacted]		31	0.105	0.149	03/01/2014	03/12/2021	0	0	0	No data	No data
MD-36751680	[redacted]		19	0.113	0.103	10/01/2014	09/12/2019	0.131	0.077	37	-15.50	25.45
MD-36753920	[redacted]		15	0.104	0.060	30/05/2019	09/12/2021	0.145	0.082	36	-40.05	-35.97
MD-36754350	[redacted]		34	0.111	0.071	06/01/2014	17/03/2020	0.125	0.094	36	-12.55	-32.70
MD-36756680	[redacted]		34	0.122	0.108	06/01/2014	03/03/2020	0.12	0.104	36	1.23	3.82
MD-36761800	[redacted]		34	0.124	0.078	03/01/2014	03/03/2020	0.158	0.126	20	-27.36	-60.57
MD-38315200	[redacted]		20	0.155	0.253	03/01/2014	20/04/2018	0	0	0		
MD-38471380	[redacted]		63	0.071	0.058	03/01/2014	10/12/2021	0.098	0.123	36	-38.37	-110.61
MD-40307040	[redacted]		44	0.028	0.025	06/01/2014	13/12/2021	0.039	0.078	35	-40.89	-206.03
MD-40415330	[redacted]		254	0.040	0.070	06/01/2014	28/03/2022	0.035	0.034	36	12.35	51.37
MD-40608020	[redacted]		75	0.074	0.103	06/01/2014	18/08/2021	0.078	0.099	28	-6.07	4.22
MD-40719020	[redacted]		56	0.202	0.490	02/01/2014	06/12/2021	0	0	0	No data	No data
MD-40719100	[redacted]		12	0.055	0.065	08/01/2021	06/12/2021	0	0	0	No data	No data
MD-40782150	[redacted]		57	0.274	0.297	02/01/2014	06/12/2021	0	0	0	No data	No data
MD-40898020	[redacted]		46	0.037	0.042	02/01/2014	03/12/2019	0.031	0.032	36	17.24	24.09
MD-41514100	[redacted]		53	0.102	0.114	10/01/2014	06/12/2021	0.12	0.183	37	-17.39	-61.21
MD-41515120	[redacted]		39	0.035	0.052	23/01/2014	13/04/2022	0.03	0.022	36	15.46	58.08
MD-41820270	[redacted]		31	0.046	0.056	04/02/2014	09/12/2021	0.39	0.269	36	-744.86	-382.80
MD-43757100	[redacted]		110	0.070	0.060	19/01/2000	07/12/2021	0	0	0	No data	No data
MD-43902300	[redacted]		30	0.054	0.061	03/03/2014	04/12/2019	0.079	0.128	36	-46.93	-108.30
MD-44049100	[redacted]		33	0.470	0.426	03/03/2014	01/12/2021	1.903	2.231	36	-304.61	-424.18
MD-44071000	[redacted]		14	0.128	0.096	05/03/2014	09/06/2017	No data	No data	No data	No data	No data
MD-44071350	[redacted]		8	0.053	0.045	04/05/2021	07/12/2021	0	0	0	No data	No data
MD-44205010	[redacted]		36	0.493	1.142	03/02/2014	03/12/2021	0.215	0.302	37	56.43	73.56
MD-44283100	[redacted]		87	0.297	0.361	02/01/2014	07/03/2022	0.522	0.467	32	-76.00	-29.47
MD-44505050	[redacted]		54	0.169	0.085	02/01/2014	02/12/2021	0.182	0.125	37	-7.55	-46.30
MD-44922100	[redacted]		32	0.046	0.036	13/01/2014	01/12/2021	0.06	0.055	38	-31.51	-52.34
MD-45212050	[redacted]		22	0.249	0.182	13/01/2014	01/12/2021	0.271	0.214	36	-8.95	-17.30
MD-49690300	[redacted]		82	0.084	0.073	13/01/2014	02/03/2022	0.086	0.085	36	-2.48	-16.64
MD-53962650	[redacted]		61	0.133	0.080	10/01/2014	09/12/2019	0.177	0.189	36	-33.28	-136.78
MD-54085180	[redacted]		46	0.016	0.003	15/01/2014	11/12/2019	No data	No data	No data	No data	No data
MD-54141020	[redacted]		86	0.070	0.080	20/01/2000	01/05/2007	No data	No data	No data	No data	No data
MD-54364350	[redacted]		53	0.047	0.028	31/01/2014	07/02/2019	0.04	0.03	39	14.24	-7.96
MD-54509300	[redacted]		87	0.050	0.042	17/01/2014	16/03/2022	0.054	0.054	36	-8.17	-28.74
MD-58248060	[redacted]		37	0.161	0.167	03/02/2014	08/03/2022	No data	No data	No data	No data	No data
MD-58470100	[redacted]		64	0.039	0.046	03/01/2014	06/04/2022	0.058	0.086	37	-49.44	-85.85
MD-59000500	[redacted]		88	0.166	0.155	21/01/2014	06/04/2022	0.159	0.117	37	4.06	24.36
MD-59002450	[redacted]		36	0.183	0.144	03/01/2014	04/04/2017	0.165	0.084	32	9.81	41.52
MD-59006100	[redacted]		26	0.252	0.186	04/03/2014	02/03/2020	0.269	0.319	36	-6.76	-71.62
MD-59008500	[redacted]		25	0.382	0.169	06/03/2014	04/03/2020	0.509	0.47	32	-33.40	-177.70
MD-59008980	[redacted]		13	0.199	0.101	06/03/2014	02/03/2017	0.269	0.216	36	-35.07	-113.08
MD-59009850	[redacted]		33	0.288	0.306	05/02/2014	01/12/2021	No data	No data	No data	No data	No data
MD-59010550	[redacted]		26	0.262	0.362	05/02/2014	06/03/2020	No data	No data	No data	No data	No data
MD-59010850	[redacted]		19	0.231	0.270	02/05/2019	07/12/2021	0.218	0.148	36	5.63	45.09
MD-59012815	[redacted]		38	0.180	0.159	04/03/2014	04/04/2022	No data	No data	No data	No data	No data
MD-59014950	[redacted]		14	0.249	0.232	04/03/2014	05/06/2017	No data	No data	No data	No data	No data
MD-59016020	[redacted]		26	0.467	0.468	13/02/2014	04/03/2020	0.689	0.609	9	-47.67	-30.04
MD-59023160	[redacted]		27	0.463	0.261	03/01/2014	02/03/2020	No data	No data	No data	No data	No data
MD-59392220	[redacted]		49	0.070	0.043	03/01/2014	02/12/2021	0.08	0.082	36	-14.82	-90.26
MD-60864380	[redacted]		63	0.118	0.120	03/01/2014	02/08/2021	0.228	0.276	37	-92.52	-129.60
MD-61471060	[redacted]		33	0.063	0.055	06/03/2014	11/03/2020	0.056	0.062	36	10.90	-12.84
MD-61642420	[redacted]		34	0.070	0.092	10/01/2014	12/03/2020	0.05	0.095	20	28.24	-3.77
MD-61671530	[redacted]		26	0.091	0.091	10/01/2014	06/03/2020	0.089	0.105	56	1.74	-15.98
MD-64177220	[redacted]		26	0.073	0.054	17/03/2014	02/03/2020	No data	No data	No data	No data	No data
MD-64201050	[redacted]		90	0.350	0.270	17/01/2000	18/05/2007	No data	No data	No data	No data	No data
MD-64496050	[redacted]		118	0.450	0.220	24/01/2000	02/03/2020	No data	No data	No data	No data	No data
MD-65497020	[redacted]		111	3.940	1.560	23/02/2000	07/01/2013	No data	No data	No data	No data	No data
MD-65793180	[redacted]		60	0.424	0.729	03/01/2014	04/03/2020	No data	No data	No data	No data	No data
MD-66332150	[redacted]		26	2.306	2.531	03/03/2014	02/03/2020	2.882	1.258	13	-24.96	50.31

WQ_Ref	BOD count	BOD mean	BOD standard dev	BOD First Date	BOD Last Date	Original BOD Mean	Original BOD std dev	Original BOD count	% BOD Mean Diff	% BOD Std Dev Diff
MD-36701570	198	1.943	1.36	11/01/2000	03/10/2014					
MD-36735800	296	1.911	0.955	10/01/2000	01/12/2021	1.718	1.066	36.000	10.10	-11.62
MD-36741880	208	1.954	0.87	10/01/2000	06/12/2019	1.600	0.736	36.000	18.12	15.40
MD-36745280	91	1.794	1.338	08/05/2000	08/12/2021	0.000	0.000	0.000	100.00	100.00
MD-36748340	107	1.771	0.873	20/01/2000	02/12/2019	No data	No data	No data	No data	No data
MD-36749220	94	1.867	0.926	20/01/2000	03/12/2021	No data	No data	No data	No data	No data
MD-36751680	183	1.815	0.809	20/01/2000	09/12/2019	1.723	0.621	36.000	5.07	23.24
MD-36753920	115	1.915	0.893	20/01/2000	09/12/2021	No data	No data	No data	No data	No data
MD-36754350	129	1.944	0.943	17/01/2000	04/09/2014	1.768	0.582	18.000	9.05	38.28
MD-36756680	132	1.927	0.918	17/01/2000	04/09/2014	1.879	0.978	18.000	2.49	-6.54
MD-36761800	131	2.107	1.114	17/01/2000	09/09/2014	1.803	0.437	18.000	14.43	60.77
MD-38315200	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-38471380	156	1.906	1.23	18/01/2000	10/12/2021	1.472	1.052	18.000	22.77	14.47
MD-40307040	117	1.284	1.158	17/01/2000	13/12/2021	No data	No data	No data	No data	No data
MD-40415330	102	1.88	1.552	17/01/2000	03/12/2019	No data	No data	No data	No data	No data
MD-40608020	110	1.514	1.109	17/01/2000	18/08/2021	No data	No data	No data	No data	No data
MD-40719020	110	2.053	2.559	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40719100	100	1.577	1.307	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40782150	115	1.637	1.23	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40898020	103	1.404	1.286	11/01/2000	03/12/2019	No data	No data	No data	No data	No data
MD-41514100	178	2.387	2.048	11/01/2000	06/12/2021	1.844	1.556	36.000	22.75	24.02
MD-41515120	127	0.993	0.513	11/01/2000	13/04/2022	No data	No data	No data	No data	No data
MD-41820270	113	1.594	0.893	11/01/2000	09/12/2021	No data	No data	No data	No data	No data
MD-43757100	100	0.884	0.516	19/01/2000	07/12/2021	No data	No data	No data	No data	No data
MD-43902300	111	1.601	0.748	10/01/2000	04/12/2019	No data	No data	No data	No data	No data
MD-44049100	110	3.996	2.631	19/01/2000	01/12/2021	No data	No data	No data	No data	No data
MD-44071000	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-44071350	55	1.668	1.913	19/01/2000	07/12/2021	No data	No data	No data	No data	No data
MD-44205010	116	2.44	4.296	11/01/2000	03/12/2021	No data	No data	No data	No data	No data
MD-44283100	115	1.632	1.025	18/01/2000	07/03/2022	No data	No data	No data	No data	No data
MD-44505050	176	2.51	3.138	28/01/2000	02/12/2021	2.249	1.939	36.000	10.40	38.21
MD-44922100	119	1.485	0.902	18/01/2000	01/12/2021	No data	No data	No data	No data	No data
MD-45212050	289	3.627	1.971	17/01/2000	01/12/2021	2.639	1.042	35.000	27.24	47.13
MD-49690300	191	1.383	0.981	14/02/2000	02/08/2021	1.119	0.977	36.000	19.09	0.41
MD-53962650	99	2.189	2.635	28/01/2000	09/12/2019	No data	No data	No data	No data	No data
MD-54085180	62	1.015	0.619	14/01/2000	11/12/2019	No data	No data	No data	No data	No data
MD-54141020	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-54364350	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-54509300	174	1.627	1.085	31/01/2000	11/03/2014	1.667	1.061	36.000	-2.46	2.21
MD-58248060	95	2.127	0.806	17/01/2000	29/11/2007	No data	No data	No data	No data	No data
MD-58470100	148	1.443	0.867	07/01/2000	06/04/2022	1.377	0.543	19.000	4.57	37.37
MD-59000500	173	2.428	1.266	30/01/2000	06/03/2014	1.968	0.704	37.000	18.95	44.39
MD-59002450	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59006100	155	2.308	1.255	31/01/2000	02/08/2013	1.758	0.645	36.000	23.83	48.61
MD-59008500	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59008980	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59009850	77	2.926	1.252	25/01/2000	01/12/2021	No data	No data	No data	No data	No data
MD-59010550	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-59010850	172	3.548	3.588	11/01/2000	07/12/2021	2.599	1.335	36.000	26.75	62.79
MD-59012815	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59014950	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59016020	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59023160	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-59392220	147	1.557	0.643	06/01/2000	02/12/2021	1.317	0.595	18.000	15.41	7.47
MD-60864380	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-61471060	157	1.477	0.872	20/01/2000	07/08/2013	1.139	0.646	36.000	22.88	25.92
MD-61642420	133	2.096	1.139	04/01/2000	14/10/2014	1.701	0.376	18.000	18.85	66.99
MD-61671530	96	3.161	3.278	13/01/2000	18/12/2007	No data	No data	No data	No data	No data
MD-64177220	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-64201050	No data	No data	No data	No data	No data	No data	No data	No data	No data	No data
MD-64496050	88	4.613	3.594	24/01/2000	17/05/2007	No data	No data	No data	No data	No data
MD-65497020	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-65793180	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data
MD-66332150	No Data	No Data	No Data	No Data	No Data	No data	No data	No data	No data	No data

WQ_Ref	PO4 count	PO4 mean	PO4 standard dev	PO4 First Date	PO4 Last Date	Original PO4 Mean	Original PO4 std dev	Original PO4 count	% PO4 Mean Diff	% PO4 Std Dev Diff
MD-36701570	266	0.678	0.401	11/01/2000	17/03/2022	No data	No data	No data	No data	No data
MD-36735800	321	0.828	0.463	10/01/2000	01/12/2021	0.707	0.314	36	14.61	32.18
MD-36741880	287	0.652	0.437	10/01/2000	04/04/2022	0.641	0.288	36	1.69	34.10
MD-36745280	12	0.233	0.057	15/01/2021	08/12/2021	0.891	0.847	288	-282.40	-1385.96
MD-36748340	145	0.785	0.401	20/01/2000	03/07/2017	0.679	0.266	36	13.50	33.67
MD-36749220	106	0.941	0.515	20/01/2000	03/12/2021	No data	No data	No data	No data	No data
MD-36751680	159	0.981	0.481	21/02/2000	17/10/2014	0.942	0.474	36	3.98	1.46
MD-36753920	136	1.044	0.512	20/01/2000	09/12/2021	0.87	0.344	49	16.67	32.81
MD-36754350	175	1.136	0.619	17/01/2000	17/03/2020	1.218	0.464	20	-7.22	25.04
MD-36756680	197	1.131	0.603	17/01/2000	03/03/2020	1.167	0.47	36	-3.18	22.06
MD-36761800	179	1.14	0.654	17/01/2000	03/03/2020	1.168	0.457	20	-2.46	30.12
MD-38315200	130	0.087	0.192	23/01/2000	20/04/2018	No data	No data	No data	No data	No data
MD-38471380	227	0.536	0.453	18/01/2000	10/12/2021	0.273	0.077	36	49.07	83.00
MD-40307040	195	0.383	0.487	17/01/2000	13/12/2021	0.35	0.206	35	8.62	57.70
MD-40415330	390	0.152	0.099	17/01/2000	28/03/2022	0.173	0.089	0	-13.82	10.10
MD-40608020	234	0.582	0.296	17/01/2000	18/08/2021	0.476	0.284	0	18.21	4.05
MD-40719020	151	0.111	0.071	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40719100	100	0.101	0.118	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40782150	168	0.12	0.136	17/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-40898020	171	0.99	0.634	11/01/2000	22/05/2017	0.684	0.365	48	30.91	42.43
MD-41514100	183	0.197	0.143	11/01/2000	06/12/2021	No data	No data	No data	No data	No data
MD-41515120	162	0.07	0.051	11/01/2000	13/04/2022	0.037	0.023	50	47.14	54.90
MD-41820270	162	0.372	0.356	11/01/2000	09/12/2021	0.157	0.053	16	57.80	85.11
MD-43757100	110	0.058	0.047	19/01/2000	07/12/2021	No data	No data	No data	No data	No data
MD-43902300	186	1.062	0.549	10/01/2000	04/02/2019	0.843	0.298	36	20.62	45.72
MD-44049100	186	2.473	1.724	19/01/2000	01/12/2021	2.591	1.519	36	-4.77	11.89
MD-44071000	93	0.2	0.11	27/01/2004	09/06/2017	0.243	0.099	56	-21.50	10.00
MD-44071350	No Data	No Data	No Data	19/01/2000	07/12/2021	No data	No data	No data	No data	No data
MD-44205010	156	0.307	0.188	11/01/2000	03/12/2021	0.274	0.081	49	10.75	56.91
MD-44283100	250	1.226	0.692	18/01/2000	07/03/2022	1.35	0.606	36	-10.11	12.43
MD-44505050	183	0.166	0.086	28/01/2000	02/12/2021	0.234	0.107	50	-40.96	-24.42
MD-44922100	155	0.578	0.328	18/01/2000	01/12/2021	0.566	0.323	0	2.08	1.52
MD-45212050	288	0.891	0.847	17/01/2000	01/12/2021	0.279	0.065	36	68.69	92.33
MD-49690300	257	0.204	0.19	14/02/2000	02/03/2022	No data	No data	No data	No data	No data
MD-53962650	217	0.2	0.094	28/01/2000	20/06/2019	0.126	0.03	36	37.00	68.09
MD-54085180	105	0.081	0.026	14/01/2000	10/07/2017	No data	No data	No data	No data	No data
MD-54141020	86	1.057	0.837	20/01/2000	01/05/2007	No data	No data	No data	No data	No data
MD-54364350	194	0.244	0.117	20/01/2000	07/02/2019	0.101	0.026	4	58.61	77.78
MD-54509300	256	0.178	0.078	31/01/2000	16/03/2022	0.147	0.049	36	17.42	37.18
MD-58248060	148	1.236	0.942	17/01/2000	08/03/2022	No data	No data	No data	No data	No data
MD-58470100	214	0.485	0.413	07/01/2000	06/04/2022	0.445	0.184	25	8.25	55.45
MD-59000500	259	1.152	0.807	30/01/2000	06/04/2022	1.409	0.545	37	-22.31	32.47
MD-59002450	187	1.394	0.826	31/01/2000	04/04/2017	1.541	0.502	32	-10.55	39.23
MD-59006100	186	1.464	0.837	31/01/2000	02/03/2020	1.65	0.479	36	-12.70	42.77
MD-59008500	268	1.844	1.096	06/01/2000	04/03/2020	1.745	0.521	36	5.37	52.46
MD-59008980	275	1.941	1.763	06/01/2000	02/03/2017	1.675	0.512	36	13.70	70.96
MD-59009850	107	1.78	1.305	25/01/2000	01/12/2021	No data	No data	No data	No data	No data
MD-59010550	139	1.666	1.215	11/01/2000	06/03/2020	No data	No data	No data	No data	No data
MD-59010850	143	1.467	1.079	11/01/2000	07/12/2021	1.878	1.154	48	-28.02	-6.95
MD-59012815	121	1.663	1.401	04/01/2000	04/04/2022	No data	No data	No data	No data	No data
MD-59014950	130	2.462	1.598	14/01/2000	05/06/2017	No data	No data	No data	No data	No data
MD-59016020	169	0.246	0.291	14/01/2000	04/03/2020	0.507	0.477	22	-106.10	-63.92
MD-59023160	112	1.164	1.278	31/01/2000	02/03/2020	No data	No data	No data	No data	No data
MD-59392220	192	0.921	0.932	15/02/2000	02/12/2021	0.252	0.091	19	72.64	90.24
MD-60864380	209	1.225	0.437	14/01/2000	02/08/2021	1.008	0.386	14	17.71	11.67
MD-61471060	192	0.396	0.161	20/01/2000	11/03/2020	0.378	0.153	36	4.55	4.97
MD-61642420	179	0.366	0.243	04/01/2000	12/03/2020	0.18	0.044	20	50.78	81.89
MD-61671530	154	0.176	0.081	13/01/2000	06/03/2020	0.157	0.09	48	10.74	-11.11
MD-64177220	123	0.119	0.148	17/01/2000	02/03/2020	No data	No data	No data	No data	No data
MD-64201050	90	0.147	0.064	17/01/2000	18/05/2007	No data	No data	No data	No data	No data
MD-64496050	118	0.202	0.096	24/01/2000	02/03/2020	No data	No data	No data	No data	No data
MD-65497020	111	0.064	0.046	23/02/2000	07/01/2013	No data	No data	No data	No data	No data
MD-65793180	83	1.451	1.212	17/02/2012	04/03/2020	No data	No data	No data	No data	No data
MD-66332150	161	3.013	1.757	24/01/2000	02/03/2020	3.054	1.339	13	-1.36	23.79

Additions to Phosphate Model

WQ_Ref	Easting	Northing	PO4 count	PO4 mean	PO4 standard dev	PO4 First Date	PO4 Last Date	Identifier	Type	Reach	Distance from start of re	Flow code	Quality code	Flow Code 2	Quality Code 2	Target	Grid Ref	
MD-59022840	[redacted]		201	0.51	0.544	31/01/2000	03/04/2017	'WQ-59022840'	1	74	0.45	0	9995	0	9995	4	'399000297500'	
MD-61079610	[redacted]		111	1.045	4.509	20/05/2010	02/08/2021	'WQ-61079610'	1	106	4.50	0	9994	0	9994	4	'420061298783'	
MD-58326380	[redacted]		83	0.259	0.208	26/05/2010	07/04/2017	'WQ-58326380'	1	294	1.90	0	9993	0	9993	3	'421329320444'	
MD-36744720	[redacted]		No Data	No Data	No Data	No Data	No Data	'WQ-36744720'	1	720	0.86	0	0	0	0	4	'452920334644'	Inserted but no data
MD-44911020	[redacted]		64	0.318	0.18	28/01/2000	07/05/2014	'WQ-44911020'	1	727	1.36	0	9990	0	9990	4	'456500337800'	
MD-36737670	[redacted]		No Data	No Data	No Data	No Data	No Data	'WQ-36737670'	1	742	7.66	0	0	0	0	4	'462400340200'	Inserted but no data
MD-RSN1788	[redacted]		16	0.217	0.057	20/01/2021	01/04/2022	'WQ--RSN1788'	1	758	0.68	0	9988	0	9988	4	'469823345719'	
MD-43532250	[redacted]		158	0.657	0.349	19/01/2000	07/12/2021	'WQ-43532250'	1	767	12.30	0	9986	0	9986	4	'474300351500'	
MD-40898007	[redacted]		35	0.878	0.486	15/03/2011	06/02/2014	'WQ-40898007'	1	824	1.25	0	9983	0	9983	4	'480960376416'	
MD-36700740	[redacted]		No Data	No Data	No Data	No Data	No Data	'WQ-36700740'	1	825	4.51	0	9982	0	9982	4	'483460379090'	
MD-36699629	[redacted]		No Data	No Data	No Data	No Data	No Data	'WQ-36699629'	1	832	0.70	0	9981	0	9981	4	'480450386400'	
MD-36697570	[redacted]		No Data	No Data	No Data	No Data	No Data	'WQ-36697570'	1	834	11.50	0	9980	0	9980	4	'478600394500'	
MD-38263140	[redacted]		39	0.39	0.242	10/01/2011	10/02/2014	'WQ-38263140'	1	1006	12.58	0	9979	0	9979	4	'481907400463'	
MD-46289020	[redacted]		111	0.164	0.132	13/01/2000	04/12/2019	'WQ-46289020'	1	540	0.99	0	9999	0	9999	4	'449124330244'	
MD-42167030	[redacted]		119	0.798	0.446	05/04/2006	29/06/2018	'WQ-42167030'	1	800	2.4	0	9997	0	9997	4	'478910353210'	
MD-41296200	[redacted]		73	0.125	0.058	30/07/2010	24/04/2017	'WQ-41296200'	1	814	3.50	0	9996	0.00	9996	4	'480300367800'	
MD-36732370	[redacted]		48	0.395	0.154	01/02/2013	07/04/2017	'WQ-36732370'	1	776	3.4	0	9998	0	9998	4	'478777356237'	

Additions to BOD Amm Model

WQ_Ref	Easting	Northing	Ammonia Count	Ammonia Mean	Ammonia standard dev	Ammonia First Date	Ammonia Last Date	BOD count	BOD mean	BOD standard dev	BOD First Date	BOD Last Date	Identifier	Type	Reach	Distance from star	Flow code	Quality code	Flow Code 2	Quality Code 2	Target	Grid Ref	
MD-65793180	[redacted]		60	0.424	0.729	03/01/2014	04/03/2020	No Data	No Data	No Data	No Data	No Data	'WQ-65793180'	1	65	0.21	0	9987	0	9987		'400490296520'	replaces MD-65793200, previously in the BOD Amm model but with no data
MD-59022840	[redacted]		40	0.424	0.162	08/01/2014	03/04/2017	No Data	No Data	No Data	No Data	No Data	'WQ-59022840'	1	74	0.45	0	9995	0	9995	4	'399000297500'	
MD-61079610	[redacted]		67	0.084	0.082	06/01/2014	02/08/2021	7	2.994	1.978	22/10/2012	29/04/2013	'WQ-61079610'	1	106	4.50	0	9994	0	9994	4	'420061298783'	
MD-58326380	[redacted]		40	0.072	0.034	17/01/2014	07/04/2017	No Data	No Data	No Data	No Data	No Data	'WQ-58326380'	1	294	1.90	0	9993	0	9993	3	'421329320444'	
MD-46289020	[redacted]		44	0.123	0.360	14/01/2014	04/12/2019	No data	No data	No data	No data	No data	'WQ-46289020'	1	540	0.40	0	9989	0	9989	4	'449124330244'	
MD-36744720	[redacted]		121	0.150	0.180	14/04/2004	10/12/2013	108	4.351	2.853	14/04/2004	02/08/2013	'WQ-36744720'	1	720	0.86	0	9984	0	9984	4	'452920334644'	
MD-RSN1788	[redacted]		16	0.190	0.070	20/01/2021	01/04/2022	No Data	No Data	No Data	No Data	No Data	'WQ--RSN1788'	1	758	0.68	0	9988	0	9988	4	'469823345719'	
MD-43824020	[redacted]		67	0.049	0.039	06/01/2014	07/12/2021	111	1.146	0.853	19/01/2000	07/12/2021	'WQ-43824020'	1	762	0.10	0	9978	0	9978	4	'472015347960'	
MD-43532250	[redacted]		37	0.044	0.065	06/02/2014	07/12/2021	136	1.59	0.858	19/01/2000	07/12/2021	'WQ-43532250'	1	767	12.30	0	9986	0	9986	4	'474300351500'	
MD-RSN0100	[redacted]		16	0.180	0.090	27/01/2021	07/04/2022	No Data	No Data	No Data	No Data	No Data	'WQ--RSN0100'	1	770	2.75	0	9977	0	9977	4	'475811350871'	
MD-36732370	[redacted]		48	0.100	0.100	01/02/2013	07/04/2017	No Data	No Data	No Data	No Data	No Data	'WQ-36732370'	1	776	3.60	0	9996	0	9996	4	'478777356237'	
MD-42167030	[redacted]		25	0.117	0.054	16/01/2014	29/06/2018	80	1.456	0.864	05/04/2006	20/10/2014	'WQ-42167030'	1	800	2.33	0	9999	0	9999	4	'478910353210'	
MD-41516360	[redacted]		27	0.570	0.560	11/02/2013	13/03/2017	No Data	No Data	No Data	No Data	No Data	'WQ-41516360'	1	804	0.20	0	9976	0	9976	4	'481120354645'	
MD-41296200	[redacted]		36	0.024	0.014	06/01/2014	24/04/2017	178	2.387	2.048	11/01/2000	06/12/2021	'WQ-41296200'	1	814	4.48	0	9991	0	9991	4	'480300367800'	
MD-36701570	[redacted]		267	0.120	0.110	11/01/2000	17/03/2022	198	1.943	1.36	11/01/2000	03/10/2014	'WQ-36701570'	1	823	0.91	0	9998	0	9998	4	'481920374460'	
MD-40898007	[redacted]		35	0.040	0.070	15/03/2011	06/02/2014	35	1.631	1.374	15/03/2011	06/02/2014	'WQ-40898007'	1	824	1.25	0	9983	0	9983	4	'480960376416'	
MD-38263140	[redacted]		39	0.140	0.120	10/01/2011	10/02/2014	39	1.863	1.254	10/01/2011	10/02/2014	'WQ-38263140'	1	1006	12.58	0	9979	0	9979	4	'481907400463'	

aecom.com

aecom.com