Hampshire Water Transfer and Water Recycling Project

The Applicant's response to ISH1 post hearing action 1(b) and 1(c)

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1 Introduction

1.1 Purpose of this document

1.1.1 The purpose of this document is to provide Southern Water Services Limited's (hereafter referred to as 'the Applicant') response to Issue Specific Hearing 1 (ISH1) post hearing action 1(b) and 1(c) in the Action Points from Issue Specific Hearing 1 [EV5-009] published by the Planning Inspectorate on 19 November 2026 in relation to the Hampshire Water Transfer and Water Recycling Project (hereafter referred to as 'the Project').

2 The Applicant's response to ISH1 post hearing action 1(b) and 1(c)

2.1 Pilot trials – sampling and pilot timelines

2.1.1 The raw data from the pilot plant investigations has been provided at The Applicant's response to ISH1 post hearing action 1(a) (Document reference 8.17, DCO Volume 8, Version 0).

2.1.2 The pilot plant data has been used to assist the Environment Agency to understand the efficacy of water recycling and how it is to be regulated through the environmental permitting process. A timeline is provided at Table 2-1, putting the pilot plant trials in the context of applicable regulatory updates to matters including requirements for testing and analysis.

2.1.3 As regulatory updates have been made, the results of the pilot plant trials have been backchecked against the new standards as far as practicable. The Water Recycling Plant will be subject to an environmental permit, with the parameters for the outputs set by reference to the latest regulatory standards at the applicable time. The timeline provides updates in four categories:

a. Regulatory – this category identifies the changes to how the Environment Agency are reviewing and assessing discharges, including water recycling;

b. Sampling – this category includes sampling carried out by the Applicant of various sources of baseline data, across the catchment, EQS and CIP4 (defined below at paragraph 2.2);

c. Pilot plant – this category lists the key commissioning, operational and decommissioning events of the pilot plant.

d. Reporting – this category identifies the key milestones for the Project, in both the confirmation of the Project within Southern Water's Water Resource Management Plan 24 (due to be published in December 2026), and in relation to the environmental permitting process.

Table 2-1 Timeline for the HWTWRP pilot and sampling activities with wider regulatory and project development context

Event Date	Event Category	Event Description / Milestone	Event Relevance / Use
February 2016	Regulatory	EA Surface Water Pollution Risk Assessment (SWPRA) guidance first published	Basis of H1 screening process
June 2016	Regulatory	SWPRA: coastal priority substance and sewage treatment reduction factor tables updated	Substance list change
March 2017	Regulatory	SWPRA: new coastal specific pollutant and freshwater priority substance files	Substance list change

April 2018	Regulatory	SWPRA: hazardous pollutants termed "specific substances"	Specific substances assessment required
November 2019	Sampling	Sampling plan developed for catchment sampling programme (by SWS, with support from international subject matter experts)	Risk-based prioritisation of sampling parameters, including contaminants of emerging concern (CEC), based on Budds Farm catchment characteristics and international water recycling experience
December 2019	Sampling	First catchment sampling event	Samples collected at SWS WTWs and WSWs across the region and points along the Rivers Test & Itchen
May 2020	Pilot Plant	Pilot work plan completed, including pilot plant sampling plan (by SWS, with support from international subject matter experts)	Document establishes the objectives and methodology for undertaking the pilot trails, including test and sampling schedules
June 2020	Regulatory	SWPRA: limit of detection (LOD) replaced by minimum reporting value (MRV); less-than values set at MRV	Basis for non-detect handling
June 2020	Pilot Plant	Pilot plant comprising micro-filtration (MF), reverse osmosis (RO) and ultraviolet advanced oxidation and disinfenction process (UV-AOP) deployed at Peel Common WTW	Peel Common selected based on similar catchment characteristics owing to construction constraints at Budds Farm WTW
September 2020	Reporting	RAPID Gate 1 Submission	Water Recycling established as strategic alternative to Fawley Desalination project
November 2020	Sampling	Pilot plant fully commissioned and in stable operation; pilot sampling programme commences	Pilot plant sampling data provides process performance and design data
November 2020	Sampling	Catchment sampling event number 3	Catchment sampling programme expanded to include the pilot plant sample points
July 2021	Regulatory	SWPRA: freshwater and coastal specific pollutant and priority substance documents updated	Substance list change
August 2021	Regulatory	SWPRA: freshwater and coastal priority substance environmental quality standards (EQS) updated	Substance list change
September 2021	Reporting	RAPID Gate 2 Submission	Establishes water recycling as the preferred strategic resource option under Water for Life Hampshire programme
February 2022	Regulatory	SWPRA: freshwater and coastal priority substance EQSs updated	Substance list change

April 2022	Pilot Plant	Pilot plant decommissioned at Peel Common WTW	22-months at Peel Common WTW providing data for SWS's RAPID Gate 1 and 2 submissions
July 2022	Pilot Plant	Pilot plant relocated to Budds Farm WTW	Construction constraints alleviated at Budds Farm, so the pilot was relocated to Budds Farm to collect site-specific data
September 2022	Sampling	Pilot plant fully commissioned and in stable operation; pilot sampling programme commences	Pilot plant sampling data validating performance and design parameters derived from Peel Common trials
October 2022	Regulatory	First meeting of the All Company Working Group for Water Recycling	Companies notified of EQS sampling requirements for strategic resources projects
March 2023	Pilot Plant	Pilot plant decommissioned at Budds Farm WTW	Pilot plant has now exceeded its design life and is permanently decommissioned
September 2023	Sampling	EQS sampling programme starts at Budds Farm WTW following period to source the necessary laboratory analysis capability and capacity	Supporting the SWPRA H1 Screening Process as an input for environmental permitting activities with EA
August 2023	Regulatory	DWI Information Letter 03/2023	Confirms WIA 1991 and WS(WQ)R 2016 apply to recycling schemes
July 2024	Reporting	RAPID Gate 3 Submission, including first issue of Drinking Water Safety Plan	Havant Water Transfer & Water Recycling Plant confirmed as the preferred solution
December 2024	Reporting	First submission of Environmental Permit Position Statement to the EA (pre-application engagement)	Initial results of SWPRA issued to EA for review, including EQS sampling data and H1 screening results, and Havant Thicket Reservoir (HTR) modelling results
February 2025	Regulatory	SWPRA: background assumed 50% of EQS where no data	Confirms requirements related to the H1 screening process under SWPRA
March 2025	Regulatory	EA issues feedback to SWS in relation to first issue of Environmental Permit Position Statement (pre-application engagement)	Establishes requirement to gather water quality data from Havant & Bedhampton Springs as baseline condition for HTR
August 2025	Reporting	Second submission of Environmental Permit Position Statement to the EA	Update incorporating additional EQS data gathered in the 9 month interval since the first issue
September 2025	Regulatory	Chemical Investigation Programme Phase 4 (CIP4) list of priority CECs published by EA	Informs scoping of additional sampling activities in support of pre-application engagement with EA
January 2026	Sampling	Permission secured from Portsmouth Water to commence EQS sampling at Farlington Water Treatment Works; EQS sampling	Enables a baseline water quality assessment to be progressed as part of pre-application engagement with EA

		programme expanded to include Farlington	
January 2026	Reporting	EQS sampling data for Budds Farm issued to EA for review as part of pre-application engagement	Raw data from EQS sampling programme issued to EA for independent review
March 2026	Sampling	Sampling programme for CIP4 starts at Budds Farm WTW and Farlington Water Treatment Works following period to source the necessary laboratory analysis capability and capacity	Data gathering for submission to the EA as part of pre-application discussions concerning possible permit implications for CECs
February 2026	Regulatory	SWPRA: comprehensive update	Screening and modelling guidance published
July 2026	Regulatory	Third pre-application response issued to SWS by the EA (pre-application engagement)	Pre-application advice provided by the EA based on independent review of EQS sampling data and its implications for the discharge permit
July 2026	Reporting	RAPID Gate 4 Submission	Update to RAPID of progress on Bedhampton Springs sampling, submission of water quality datasets (including CIP4 compounds), and ongoing engagement with the EA to support environmental permitting and discharge assessments.
September 2026	Reporting	CIP4 sampling data issued to the EA for review as part of pre-application engagement	Reporting of first four months of data from the ongoing CIP4 sampling programme for independent review
November 2026	Regulatory	EA response to CIP4 data issue (pre-application engagement)	Pre-application advice provided by the EA based on independent review of CIP4 data and its implications for the discharge permit

2.2 Summary of sampling activities undertaken by the Applicant

2.2.1 Sampling was undertaken to support the Pilot Plant trials, carried out in the following locations and dates:

a. Peel Common: undertaken from June 2020 to April 2022

b. Budds Farm: undertaken from July 2022 to March 2023

2.2.2 **Catchment:** Catchment sampling refers to the regional sampling programme that assessed water quality across the entire network of water sources used by Southern Water. The purpose of catchment sampling was two-fold: first, it informed optioneering to determine the options for discharge of the highly treated recycled

water; second it assessed the output of final effluent from the wastewater treatment works to inform the water recycling process to be used.

2.2.3 The catchment sampling programme commenced in November 2019, measuring a risk-based list of priority contaminants of concern and indicator parameters to support design development for the water recycling plant.

2.2.4 **EQS:** Environmental Quality Standards (EQS) are the parameters that are used for the Environment Agency's permitting requirements, and compliance with the relevant EQS underpins the environmental permit. EQS are also utilised by the Environment Agency in determining the chemical status of a waterbody for the purposes of the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003.

2.2.5 Ongoing sampling at Budds Farm Wastewater Treatment Works and at Farlington Water Treatment Works (as a proxy for the spring water that will be stored in the Havant Thicket Reservoir) started in September 2023 to measure the 147 EQS substances required by the Environment Agency.

2.2.6 **CIP4**: Chemicals Investigations Programme 4 (CIP4) are parameters that the Environment Agency uses to gather data and understand the risks and regulatory requirements for contaminants of emerging concerns. They are used by the Environment Agency to inform future decisions on water quality standards.

2.2.7 Ongoing sampling at Budds Farm Wastewater Treatment Works and Farlington Water Treatment Works (as a proxy for the spring water that will be stored in the Havant Thicket Reservoir) started in March 2026 to measure the 113 CIP4 substances.

2.3 How the pilot sampling parameters were chosen

2.3.1 The sampling parameters for the pilot plant were selected based on the results of the catchment sampling, targeting known substances in the Budds Farm final effluent to understand the efficacy of the water recycling process on the source material. In addition, the current EQS substances and the CIP4 emerging substances were included for sampling of the highly treated recycled water produced by the pilot plant.

2.3.2 The Sampling parameters for the pilot plant were selected to demonstrate the performance of each barrier and of the complete treatment train. The suite combined process indicators (being substances that are representative of the wider efficacy of the treatment process), conventional wastewater parameters, microbiological indicators, metals and a broad range of contaminants of emerging concern (pharmaceuticals, hormones, PFAS, pesticides, flame retardants and VOCs).

2.3.3 A wide range of sampling parameters were identified, drawn from drinking water and Environmental Quality Standard requirements, catchment risks and recognised treatment indicators such as sucralose. This ensured the greatest possible understanding of how the water recycling process operates and its efficacy.

2.3.4 Samples were taken at the pilot feed and after MF, RO and UV-AOP. It should be noted that the Water Recycling Plant will include an additional treatment step,

utilising granulated activated carbon, and the samples from the pilot feed therefore represent the reasonable worst case output from an operational water recycling plant in this location.

2.4 Sampling & Laboratory Analysis Challenges

2.4.1 UK laboratory capability for trace Contaminants of Emerging Concern (CEC) analysis in wastewater was limited when the pilot programme began. To address this, in addition to carrying out analysis at a UK laboratory (ALS), samples were sent to a laboratory in the USA (Eurofins) for more detailed analysis than was possible in the UK. Since this time, methods for this testing have been developed and accredited in the UK, and the Applicant has facilitated technical collaboration and knowledge sharing between the laboratories to assist with the development and subsequent accreditation of the necessary analysis techniques within the UK.

2.4.2 To control matrix effects, where substances such as salinity cause interference or false detections in samples, the samples are typically diluted. However, diluting the sample increases the limit of reported limits-of-detection in the returned results. This means that, because it is necessary, in order to test for the substance at all, to dilute the sample, it becomes harder to determine if substances are present in the sample. The dilution increases the likelihood that, if a substance is present, it is only present in such small quantities that the analysis cannot detect them.

2.4.3 Sampling of the Budds Farm Final Effluent, Farlington raw water (spring source), and the coastal discharge point remains ongoing for all substances on the EA's EQS list and CIP4 list. For each of these sources, due to the need to control matrix effects, there remain some elevated limits of detection. Work is ongoing with the laboratories to lower the limits of detection.

2.4.4 The raw data from the pilot trials includes all of the data collected via the sampling activities detailed above. As a result, the data includes known incidents of sample contamination (i.e. false positives) as a result of operational issues occurring during the pilot trials.

2.4.5 For example, positive bacti samples are included in the dataset. This was confirmed to have resulted from contamination during sampling or transportation, and is not a failure of the pilot plant water recycling process. In particular, it was established that, during the transfer from Peel Common to Budds Farm, pipework located downstream of the RO membrane had become contaminated. After the issue was identified, the affected section of pipework was replaced, resolving the issue for the remainder of the trial. The data reflects that the contaminated pipework introduced substances after completion of the RO process, rather than any failure or issue with the water recycling process itself.

2.4.6 Care should also be taken when interpreting the results of the pilot plant data on the basis that it was a test facility, used for a number of different purposes. It enabled experimentation with water recycling to be carried out across its lifespan, as well as demonstrating the process as part of stakeholder engagement. The results demonstrate both the efficacy that would be achieved by a permanent water recycling facility, that would be subject to safeguards and controls to ensure consistency in the water recycling process, and also how issues with the process may arise. For example, it was found that if the point of extraction of source

material is located too low, silt and flora could enter the system in abundance leading to a failure of the process. This learning has informed the outline design of the Water Recycling Plant and will inform the detailed design of the Project.

2.4.7 It is therefore recommended that interested parties review the research carried out by the University of Brighton[1] using the results from the pilot plant trials, as that research has considered such events in context in order to draw independent conclusions as to the effectiveness of water recycling.

2.5 Treatment of Non-detects

2.5.1 A non-detect occurs where a substance is not present in levels above the limit of detection. A non-detect does not mean a substance is present, nor does it mean it is not present: it simply means that it cannot be detected in the sample.

2.5.2 It is noted that the summary data from the pilot plant trials reported non-detects as 0, i.e. not present. However this approach was used for the summary only, to obtain an early understanding of the effectiveness of water recycling.

2.5.3 Work carried out using the pilot plant data as an information source has treated a non-detect as indicating a substance to be present at the limit of detection. This approach ensures a worst-case assessment as it assumes not only that a substance is present, but that it is present in the maximum level that remains undetectable by current laboratory analysis.

2.5.4 Non-detects in the data sources have therefore been taken at the reporting limit (i.e. <10 = 10). This approach has been used for the assessment of all EQS and CIP4 substances.

2.6 Use of the Sampling Results

Havant Thicket Reservoir Modelling

2.6.1 The Havant Thicket Reservoir Modelling has been carried out for two purposes. First, it informs the environmental impact assessment, reported in ES Chapter 19 – Water Environment [REF], which looks at whether the output from the Water Recycling Plant is likely to result in significant environmental effects. Secondly, the modelling has informed the risk assessment carried out by the Applicant to inform the further treatment that will be carried out at Otterbourne Water Supply Works in order to meet the drinking water standards required by the Drinking Water Inspectorate.

2.6.2 Modelling has been used to understand the source water that will be treated at Otterbourne Water Supply Works as the Havant Thicket Reservoir is still under construction. Once the reservoir has been completed and filled with water, sampling and monitoring of the water quality in the reservoir will be carried out in accordance with the Water Supply (Water Quality) Regulations 2016. The results of the sampling will inform the Applicant's risk assessment which, in turn, informs the water treatment provision at Otterbourne Water Supply Works.

[1] Mayor-Smith, "Reflections on water recycling pilot plant performance," 2024. [Online]. Available: https://www.southernwater.co.uk/media/natd2hg5/pilot-summary-report-uob-final_.pdf

2.6.3 It is important to note that the risk assessment is a live document, kept under constant review so that, whatever the quality of the water within the reservoir, the treatment carried out at Otterbourne achieves the drinking water quality required. Modelling has therefore been used to demonstrate that the water in the reservoir will be wholesome and able to be treated to drinking water standards; however the Water Supply Regulations will control the process of ensuring that the blended water within the reservoir is treated to achieve drinking water standard.

2.6.4 Similarly, the modelling demonstrates that the Water Recycling Plant is capable of operating to produce highly treated recycled water that can be discharged into the environment without causing a significant environmental effect. The environmental permit issued by the Environment Agency will establish the exact parameters for each substance that the recycled water must not exceed in order that unacceptable impacts are not caused to the environment. The timeline in Table 2-1 includes reference to the work carried out as part of the pre-application process for the environmental permit. This, and the summary of the Surface Water Pollution Risk Assessment below, demonstrate the work that the Environment Agency, as expert regulator, is carrying out in order to ensure the environment permit is effective at controlling any pollution risk.

2.6.5 Further information on the roles of the regulators and the *Gateshead* principle are set out in Appendix D and Appendix F to The Applicant's written summaries of oral submissions at OFH1 and ISH1 and post hearing actions (Document reference 8.9, DCO Volume 8, Version 0).

2.6.6 The HTR modelling envelope represents the reasonable worst case water quality expected to enter the reservoir during normal WRP operation. The purpose of this assessment is to understand the effects of adding recycled water into the Havant Thicket Reservoir, noting that it is a matter for the Environment Agency to secure, through the environmental permit, the exact parameters required to ensure that unacceptable impacts to the environment do not occur. The modelling envelope was developed using the following process:

a. Budds Farm final effluent data collected between October 2021 and March 2023 was compiled to define the WRP feed water quality envelope.

b. The WRP mass balance was developed using performance data from the pilot plant.

c. RO performance and ion rejection were modelled using proprietary software from an RO membrane supplier.

d. Substances below the limits of detection were presumed to be present, in all cases, at 100% of the limit of detection.

e. A remineralisation strategy was chosen by the Water Quality Steering Group consisting of Southern Water, Portsmouth Water, and their respective consultants, to balance corrosion control, reservoir compatibility, carbon, and operational complexity.

f. Farlington raw water (spring source) quality data was used as representative of the spring water input to the reservoir model.

g. Minimum, average, and maximum water quality was determined for the required reservoir modelling inputs for both sources. Monthly profiles were also developed to represent seasonal variation.

h. Reservoir modelling was carried out by GHD using Aquatic Ecosystem Model 3D (AEM3D), covering normal operating scenarios and several deviations. The GHD AEM3D model includes sediment processes, particulate settling/resuspension and nutrient/metal cycling, includes sediment flux and resuspension representations, for example for manganese and particulate material.

Surface Water Pollution Risk Assessment (H1 screening)

2.6.7 The Surface Water Pollution Risk Assessment forms part of the process of obtaining an environmental permit. The H1 screening envelope is different from the reservoir modelling envelope. It is used by the Environment Agency to project the concentration and load of each substance in the relevant discharge, which are then tested against the Surface Water Pollution Risk Assessment (SWPRA) screening tests. This in turn helps inform the Environment Agency of the parameters that must be secured in the environmental permit to ensure that unacceptable impacts to the environment do not occur.

a. The WFL sampling programme includes all of the EQS substances listed by the EA in the Surface Water Pollution Risk Assessment, including priority hazardous substances, priority substances, and specific pollutants.

b. This programme now includes the substances listed in CIP4.

c. The EA convention for managing limits of detection has been used (i.e. <10 = 10).

d. This data was modelled through the WRP mass balance using process removal rates identified from a combination of pilot plant results, existing performance data, and peer reviewed literature.

e. Where no removal rate could be sourced, no removal rate was applied in the WRP mass balance. However, as this alone would underestimate the impact on the coastal discharge, an additional sensitivity analysis was carried out assuming 100% of each substance was removed by the WRP and discharged out the LSO.

f. The existing H1 Screening assessment requires River Flow Rates for Tests 2, 3, and 4. Therefore, these cannot be applied to the reservoir. As these tests allow for additional dilution, using Test 1 and Test 5 only is a more conservative approach.

g. Upon the advice of the EA, a direct comparison was made between the projected water quality of the WRP recycled water and the Farlington raw water (spring source to supply the reservoir).

h. A mass balance of the reservoir was carried out based on monthly profiles for AA and MAC using the two sources and Test 1 was repeated, as advised by the EA.

2.7 Water Recycling Plant – Treatment Process & Monitoring

2.7.1 The Applicant is mindful of the detailed submissions made during issue specific hearing 1 in relation to the efficacy of water recycling to produce highly treated water to be used as source water for drinking water supplies. In order to assist the Examination, additional detail is provided below on the water recycling process, and the relevant stage of the multi barrier recycling process where certain substances are removed.

2.7.2 This information is provided to address the concerns raised during the hearing, notwithstanding that it is beyond the scope of the Examination to consider. The output of the water recycling plant must comply with the environmental permit, which is the applicable regulatory regime to control the quality of discharges to the environment, including the degree to which any substances may be present in that water.

2.7.3 The blended water from the Havant Thicket Reservoir is a source of water for Otterbourne Water Supply Works, and the final treated water must meet the drinking water standards imposed by the Drinking Water Inspectorate. This ensures that water is only provided to customers where it meets the required quality standards.

2.7.4 Please refer to The Applicant's written summaries of oral submissions at OFH1 and ISH1 and post hearing actions (Document reference 8.9, DCO Volume 8, Version 0), particularly Appendix D and Appendix F, for detail about the relationship between the Project and these existing regulatory regimes, and how the Gateshead principle applies such that the Examination must proceed on the basis that these regulatory regimes will operate effectively to manage these risks.

Overview of Process Selection & Multi-barrier Treatment Capability

2.7.5 Table 2-2 presents a high-level summary of the function of each major component of the Water Recycling Plant (WRP) process, including the reason why it is proposed for inclusion.

Table 2-2 Timeline Summary of the WRP process train

#	Process	Function	Reason for Inclusion
1	**Equalisation Tanks**	Buffer storage dampens diurnal variation in treated wastewater flow and composition	The WRP requires a stable feed flow to achieve best efficiency
2	**Inlet Strainers**	Remove coarse solids / debris which can become entrained in treated wastewater flows	Protects downstream systems from damage or fouling
3	**Microfiltration / Ultrafiltration (MF/UF)**	Removes suspended solids, protozoa, and bacteria, and reduces	Provides robust pretreatment for the RO and increases overall pathogen removal achieved by the combined process

		turbidity and silt density index	
4	**Cartridge Filtration**	Secondary removal of suspended solids downstream of the MF/UF process	Additional protection for the RO membranes to prevent particulate fouling / damage
5	**Reverse Osmosis (RO)**	The primary barrier for removing dissolved substances, including many EQS and CECs, pathogens, and bulk inorganics and organics	Required for the removal of dissolved salts (salinity), nutrients, and a broad spectrum of possible contaminants
6	**UV Advanced Oxidation (UV-AOP)**	Destruction of residual trace organics, protozoa, bacteria or viruses in the event they pass RO.	Provides overlapping chemical treatment and disinfection capability with RO
7	**Granular Activated Carbon (GAC)**	Adsorption process, removes trace organics and transformation products from UV-AOP	Polishing step included as an additional barrier to remove CEC transformation products
8	**Remineralis-ation**	Adds alkalinity and calcium to control pH and corrosion indices	RO permeate has a low mineral content; remineralisation is required to prevent corrosion and maintain HTR ecological status

2.7.6 Table 2-3 summarises the capability of each of the key treatment technologies proposed for the WRP in terms of seven broad contaminant categories, illustrating how these capabilities overlap to achieve a robust multi-barrier treatment process.

Table 2-3 Illustration of multi-barrier treatment principle .

	Suspended Solids	**Dissolved Solids (Salinity)**	**Trace Organics (EQS & CECs)**	**Transformation Products**	**Protozoa**	**Bacteria**	**Viruses**
MF/UF	✓				✓	✓	
RO	✓	✓	✓	✓	✓	✓	✓
UV-AOP			✓		✓	✓	✓
GAC			✓	✓			

2.7.7 Table 2-4 presents an applied summary of the treatment capability of the proposed multi-barrier treatment process as it relates to a selection CECs.

Table 2-4 Overview of treatment capability in relation to specific CECs

Parameter	Treatment barriers	How it is controlled
Per- and poly-fluoroalkyl substances (PFAS)	1. RO 2. GAC	Rejected by RO. PFAS compounds, and in particular longer-chain variants, are also adsorbed by GAC.
Trifluoroacetic acid (TFA)	1. RO	PFAS are the precursors for TFAs. PFAS are removed at the RO stage, which will minimise TFA formation in the UV AOP.
Antibiotics (trimethoprim, sulfathiazole)	1. RO 2. UV-AOP 3. GAC	Removed by RO and oxidised by UV-AOP.
Other pharmaceuticals (carbamazepine, venlafaxine, ketorolac, acetaminophen, salicylic acid)	1. RO 2. UV-AOP 3. GAC	Removed by RO and oxidised by UV-AOP.
Bacteria, resistant bacteria, blood-borne pathogens	1. MF/UF 2. RO 3. UV-AOP	Three independent physical and disinfection barriers.
Radionuclides	1. RO	Removed by RO
Bisphenol A, propylparaben, TCPP	1. RO 2. UV-AOP 3. GAC	Removed by RO. UV-AOP and GAC.


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