Thames to Affinity Transfer SRO

Technical Supporting Document Ca

Drinking Water Quality Risk Assessment Report

Lower Thames Reservoir Option

Notice

Position Statement

- This document has been produced as the part of the process set out by RAPID for the development of the Strategic Resource Options (SROs). This is a regulatory gated process allowing there to be control and appropriate scrutiny on the activities that are undertaken by the water companies to investigate and develop efficient solutions on behalf of customers to meet future drought resilience challenges.
- This report forms part of suite of documents that make up the 'Gate 2 submission.' That submission details all the work undertaken by Thames Water and Affinity Water in the ongoing development of the proposed SROs. The intention of this stage is to provide RAPID with an update on the concept design, feasibility, cost estimates and programme for the schemes, allowing decisions to be made on their progress and future funding requirements.
- Should a scheme be selected and confirmed in the companies' final Water Resources Management Plan, in most cases it would need to enter a separate process to gain permission to build and run the final solution. That could be through either the Town and Country Planning Act 1990 or the Planning Act 2008 development consent order process. Both options require the designs to be fully appraised and in most cases, an environmental statement to be produced. Where required that statement sets out the likely environmental impacts and what mitigation is required.
- Community and stakeholder engagement is crucial to the development of the SROs. Some high level activity has been undertaken to date. Much more detailed community engagement and formal consultation is required on all the schemes at the appropriate point. Before applying for permission Thames Water and Affinity Water will need to demonstrate that they have presented information about the proposals to the community, gathered feedback and considered the views of stakeholders. We will have regard to that feedback and, where possible, make changes to the designs as a result.
- The SROs are at a very early stage of development, despite some options having been considered for several years. The details set out in the Gate 2 documents are still at a formative stage and consideration should be given to that when reviewing the proposals. They are for the purposes of allocating further funding not seeking permission.

Disclaimer

This document has been written in line with the requirements of the RAPID Gate 2 Guidance and to comply with the regulatory process pursuant to Thames Water's and Affinity Water's statutory duties. The information presented relates to material or data which is still in the course of completion. Should the solution presented in this document be taken forward, Thames Water and Affinity Water will be subject to the statutory duties pursuant to the necessary consenting process, including environmental assessment and consultation as required. This document should be read with those duties in mind.

Contents

Figures and Tables

Executive summary

The Drinking Water Quality Assessment Report is a technical supporting document prepared to support the Gate 2 submission report to the Regulator's Alliance for Progressing Infrastructure Development (RAPID) for the Thames to Affinity Transfer (T2AT) Strategic Regional Option (SRO) scheme.

Technical Supporting Document Ca covers the water quality considerations of the T2AT Lower Thames Reservoir (LTR) option. Limiting hazards and their associated risk scores have been considered for this option in the form of a Water Quality Risk Assessment (WQRA). This WQRA has been drafted in a dedicated All Companies Working Group (ACWG) approved spreadsheet tool and reviewed in a collaborative strategic WQRA workshop.

Limiting hazards are defined as any parameter that is likely to drive the development of the SRO option. Throughout the WQRA process, the list of limiting hazards for each option has been reviewed and refined to give a representative, high-level view of the parameters which are likely to need treatment at this early stage of design. The WQRA process has also identified data gaps and residual risk considerations that can now be addressed moving forward into Gate 3. This will ensure a more detailed overview of the water quality risks associated with each option and therefore enable a more informed treatment process design.

Results from the Gate 2 water quality risk assessment has confirmed the engineering concept design of this option at this stage. Key Gate 1 workshop outcomes have been incorporated into the Gate 2 WQRA process and concept design. Further data requirements and sampling location adjustments have been identified and communicated for inclusion in the SRO water quality monitoring program going forward to Gate 3.

1. Introduction

1.1 This technical supporting document accompanies the Gate 2 submission to RAPID for the Thames to Affinity Transfer (T2AT) SRO Lower Thames Reservoir transfer option (LTR). This option was formerly known as the Lower Thames Reservoir Transfer 2a option (LTR2a) in Gate 1. The report covers the water quality considerations of the scheme, which have been analysed in the form of a Water Quality Risk Assessment (WQRA).

1.2 A full description of the option is provided in Technical Supporting Document A2a of the Gate 2 submission, the Concept Design Report (CDR). A schematic diagram is provided within the WQRA outputs in Appendix A of this technical supporting document.

1.3 The WQRA process has been developed by the All Companies Working Group (ACWG) as a strategic semi-quantitative water quality risk assessment from source to supply to determine the impact of new Strategic Regional Option (SRO) schemes on drinking water quality. More specifically to this SRO, the LTR WQRA has been completed to assess the treated water quality risks associated with transfer of water from a Thames Water donor zone to an Affinity Water recipient supply zone. This risk assessment would therefore help inform the design and development of the option and ensure no deterioration in the water quality of the supply zone. The Gate 2 water treatment design for the LTR option has been updated from the Gate 1 design by considering the outputs from the WQRA process, as detailed in the Gate 2 CDR.

1.4 The purpose of this technical supporting document is to summarise the Gate 2 WQRA process from methodology through to results. The ACWG Water Quality Risk Framework Report[1] has been used to guide the risk assessment and splits the WQRA process into 5 stages, as seen in Figure 1.1.

Figure 1.1: ACWG water quality risk process approach

Source: ACWG Strategic WQ Risk Framework Report

1.5 For Gate 1, relevant data was collected in the form of Drinking Water Safety Plans (DWSPs) and Environment Agency (EA) water quality monitoring catchment data. This information was built upon in Gate 2 with the inclusion of water quality data from the SRO water quality monitoring programme. This updated data set was used

[1] B19589BJ-DOC-001 Rev 06 ACWG WQ Risk Framework Report – Final (Strategic WQ Risk Framework FINAL Report) | 19/01/21 |

to populate the WQRA spreadsheet tool for the LTR option and helped determine the relevant hazards. Following this, the risks of these hazards to drinking water safety were analysed and a draft WQRA for the LTR option was produced. An assessment team for reviewing the draft WQRA was then assembled, consisting of water quality representatives and project stakeholders from both Affinity Water and Thames Water. The draft was assessed in a collaborative strategic WQRA workshop where option-specific hazards, their risk ratings and associated mitigation techniques were discussed and agreed upon. The outputs of the workshop included identification of any data gaps, residual risk considerations and a fully populated WQRA spreadsheet.

1.6 In summary, the Gate 2 WQRA for the LTR option confirmed the concept treatment design proposed in Gate 1 and from the data available, has identified no drinking water quality parameters that pose a risk to consumers in the Affinity Water region. It should be noted however that there are still data gaps, particularly with emerging hazards and therefore further analysis is required for Gate 3.

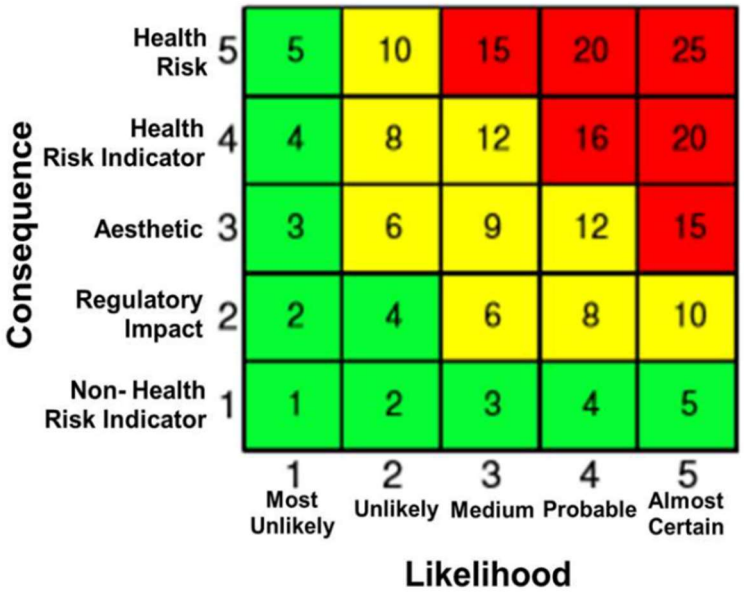
1.7 Sections 3 and 4 detail the actions to be completed for Gate 3 that will allow for a more comprehensive understanding of the water quality risks going forward. The WQRA is an iterative process and as further information becomes available, it is expected that the option and associated risk assessment will be developed in greater detail.

2. Methodology (ACWG WQRA)

2.1 The process of undertaking the steps outlined in Figure 1.1 is detailed in sections 2.1–2.6. The steps taken to complete the LTR WQRA have been guided and organised by the responsible lead technical author, Mott MacDonald. As suggested in the ACWG WQ Risk Framework Report, this party is responsible for collecting, collating, and analysing water quality risk data to provide an initial draft of the WQRA for each defined option within the SRO. The party is also responsible for convening the Strategic Water Quality Risk Assessment workshop to review and develop the risk assessment. This review must be completed to the agreement of all Water Companies affected by the SRO. The framework states a WQRA should be completed for each materially different option at each RAPID stage gate, with the resulting risk assessment remaining a live document to eventually be overtaken by the development of a drinking water safety plan (DWSP) in line with DWI regulations.

2.2 The WQ Risk Framework provides a strategy for completing the assessment of water quality risks based on existing water company risk assessment techniques. This has allowed for an easier integration of existing risk assessment data into the WQRAs. For example, the approach outlined adopts a 5 x 5 matrix of hazard likelihoods and consequences, seen in Figure 2.1, that aligns with the scoring system used by water companies.

Figure 2.1: WQ Risk Framework 5 x 5 matrix



Source: ACWG Strategic WQ Risk Framework Report - Jacobs

2.3 A key consideration in the methodology recommends focusing on only the limiting hazards likely to affect the development of an option design. These limiting hazards are defined within the WQ Framework as:

"Hazards and hazardous events which are most likely to drive the development and/or acceptability and/or viability of the SRO or water supply scheme"

2.4 This definition has been produced in recognition of the need to complete strategic, high level WQRAs appropriate for the conceptual development of options. As there are numerous waterborne pathogens and chemicals that could affect drinking water wholesomeness, as defined in the UK GOV Water Supply Regulations 2016 Part 3 2, the practical suggestion is to consider the few that are limiting. That is, where the magnitude of risks and their required mitigation determines the design of treatment. This allows for a more focussed assessment of risks, better aligned with the design development and data types and availability at early stages of RAPID gate analysis.

2.5 The methodology undertaken for this SRO therefore closely follows that set out in the Framework Report. There were however a few deviations completed during the T2AT WQRAs:

- Standardising consequence ratings - described in section 2.3.1
- Water quality assessment team - at this high-level stage, it did not seem appropriate to request full engagement of all SRO stakeholders in the workshop. The workshop consisted of Affinity Water and Thames Water representatives and only key Mott MacDonald consultants from the project team. However, it is understood full engagement of all stakeholders including regulatory bodies is required moving forward to fulfil the ACWG requirements.

2.6 It is anticipated that moving through future gates, the WQRAs will continue to follow ACWG methodology as further information becomes available and the LTR option is developed.

2.7 To complete the risk assessment, a strategic WQRA spreadsheet tool was used to capture the risks associated with hazards across seven stages from catchment through to consumer. Each stage contains a pre-mitigated risk section and post-mitigated risk section, with space for suggested controls, residual risk considerations and actions. Each stage also contains a data capture section to list the sources and certainty of data utilised. The results of the LTR workshop can be seen in Appendix A.

2.1 Data Collection

2.8 To best inform the LTR WQRA and therefore support option design considerations, data relevant to the option catchment, abstraction location, distribution networks and consumer regions were collected. As the LTR option contained existing storage capacity at Harefield service reservoir, data relevant to the storage reservoir was also collected to determine any risks currently present. Information on the hazard reduction capacity of the existing Iver water treatment works was collected in Gate 1, so inferences could be made as to the reduction capacity of similar, new water

[2] The Water Supply (Water Quality) Regulations 2016 | 2016 No.614 | 26/05/16 | UK GOV

treatment works. These inferences were maintained in the Gate 2 WQRA process.

2.9 A list of required data was produced and distributed to Affinity Water and Thames Water. Where possible, updates of the DWSP data collected in Gate 1 were requested to inform risk ratings across all stages in conjunction with water quality monitoring data sets. The appropriateness of the data selected to represent each LTR option stage was reviewed and confirmed during the WQRA workshop, and their certainty assessment reflected in the WQRA spreadsheet function. A summary of the data collected for the Gate 2 WQRAs can be seen in Table Table 2.1, including where assumptions and inferences were made. For example, the Affinity Water Iver WTW DWSPs listed in the treatment stages were collected and used to infer WTW risk reduction capacities. This is expanded upon in section 2.3.2.

2.10 At the catchment stage, DWSP data was used in conjunction with water quality monitoring data taken by Thames Water at the Datchet intake on the River Thames. For the Wraysbury Reservoir abstraction stage, DWSP data was analysed in conjunction with Wraysbury water quality monitoring data at 1m depth. These data sets contained extensive information for certain parameters over the last 5 years, but do not cover all the parameters recommended for Gate 3 DWQA studies.

2.11 The LTR option is designed to have storage at Harefield and as such, relevant DWSP data was requested. Four DWSPs were available for analysis, each representing one of the existing service reservoir chambers. All four DWSPs were reviewed in Gate 1 and as all were similar in their risk ratings, the Reservoir 3 West data was chosen. This DWSP had a small number of parameters with comparably higher risks and was therefore chosen to represent the storage risks on a worst-case scenario basis. This scoring has been retained in Gate 2.

2.12 It should be noted that there is an on-going multi-SRO water quality monitoring programme with monitoring locations on the River Thames, as agreed by the EA and Natural England. At the time of undertaking the WQRA for Gate 2, a multi-SRO programme monitoring suite was not present at Datchet intake and only algae monitoring was being carried out at Wraysbury as part of the multi-SRO programme. In addition to the Thames Water's water quality monitoring data taken at these locations, it was agreed during the Gate 2 process that further monitoring should take place, with the anticipation that the data collected would be used for the reassessment of drinking water quality risks during Gate 3. The Thames Water DWSPs and water quality monitoring data used had the advantage of reflecting hazard level trends from at least the last five years which would account for seasonal parameter concentration changes and negate the effects of acute pollution events on risk rating averages. However, these data sets do not cover all the drinking water quality parameters highlighted for study in the WQRA and so should be supplemented by the SRO water quality monitoring programme data going forward.

Table 2.1: Summary of risk data collected in Gate 2, as used to inform the drinking water risk assessment

	Catchment	Abstraction	Raw Water Conveyance	Treatment	Storage	Distribution	Consumer
Lower Thames Reservoir	Thames Water Datchet Intake Catchment DWSP & WQ monitoring Atkins Suite 5 at Sunnymeads intake Affinity Water PFAS monitoring at Sunnymeads Affinity WQ monitoring at Windsor Island	Thames Water Wraysbury Reservoir DWSP Thames Water WQ monitoring at 1m depth; CEH algae flow cytometry data	>	Affinity Water Iver Treatment DWSP and inference	Affinity Water Harefield Reservoir 3 West Storage DWSP	Affinity Water Ickenham/Denham Distribution DWSP (Includes Harefield reservoir)	Affinity Water Ickenham/Denham Consumer DWSP (Includes Harefield reservoir)
Notes	DWSP updated with new data since Gate 1 analysis New data collected in Gate 2 New data collected in Gate 2 New data collected in Gate 2	DWSP updated with new data since Gate 1 analysis	>	Maintained from Gate 1	Maintained from Gate 1	Maintained from Gate 1	Maintained from Gate 1

2.2 Develop assessment team

2.13 The ACWG Risk Framework report states that an assessment team should be convened to include representatives from any water company affected by the SRO. Therefore, staff who provided information during data collection; had experience in water quality risk assessments or were involved in the conceptual design and intended operation of the SRO were invited to participate in reviewing the WQRAs. Appropriate representatives from water quality teams were included in the workshop, as seen in Table 2.2, to ensure valuable insight was contributed.

Table 2.2: Workshop attendees and roles

Organisation	Attendee Role
Affinity Water	Strategic asset manager for non-infra and water quality
Thames Water	Lead scientist
Thames Water	Water quality strategy and assurance manager
Mott MacDonald	T2AT technical lead
Mott MacDonald	Senior process engineer
Mott MacDonald	Process engineer

2.2.1 Engagement and liaison to Gate 2

2.14 Specific engagement activities undertaken for Gate 2 can be seen in Table 2.3. It should be noted the WQRA process for the LTR option was completed in conjunction with the T2AT Beckton Reuse Indirect option WQRA and therefore many engagement activities covered both options.

Table 2.3: Engagement activities to Gate 1

Activity	Date	Organisations involved	Purpose
Water quality data requests	31/01/22	Affinity Water, Thames Water	Updated DWSP water quality data was requested to inform the WQRA draft risk ratings.
Pre-workshop meeting	31/01/22	Affinity Water, Thames Water, Mott MacDonald	To outline the WQRA process and workshop expectations.
LTR pre-workshop correspondence including a workshop preparation PowerPoint	04/02/22	Affinity Water, Thames Water, Mott MacDonald	To prepare for the WQRA workshop by providing: • An introduction to WQRAs • An overview of the transfer options progressed from Gate 1 • A summary of the data collated in Gate 2 • A methodology for the WQRA draft • A workshop plan.
LTR WQRA workshop	10/02/22	Affinity Water, Thames Water, Mott MacDonald	To conduct a review of the drafted WQRA for the LTR SRO option.

Liaison with water quality teams	Ongoing	Affinity Water, Thames Water, Mott MacDonald	To ensure changes to design are deemed appropriate by the Water Quality teams at both Thames Water and Affinity Water.
Liaison with DWI	Ongoing	Drinking Water Inspectorate, Affinity Water, Thames Water, Mott MacDonald	To provide an early draft of the Drinking Water Quality technical supporting document for comment, before formal submission of the Gate 2 report.

2.3 WQRA draft

2.15 Drafting the LTR water quality risk assessment consisted of several stages and revisions to prepare it adequately for review in the workshop. The initial stage involved collecting and processing the water quality data, then inputting the draft likelihood ratings and finally ensuring the risk scores flowed appropriately across all seven WQRA stages from catchment through to consumer.

2.3.1 Consequence ratings

2.16 To ensure consistency across all stages and options in Gate 1, a list was produced that standardised the consequence ratings of each hazardous parameter. The ratings were based on information sourced from the WHO Guidelines for Drinking Water Quality[3] and followed the 5x5 risk matrix system of grading consequences.

2.17 The ratings were built on the assumption that the hazards were present above the limits set by the Water Safety Regulations 2016 (WSR2016) and the effects would therefore range from “non-health risk indicator” to “aesthetic” impacts to “health impacts”. Where no WSR2016 limits were available, the consequence ratings were chosen assuming the hazard was present at a concentration high enough to attain the most severe consequence category possible, as seen in Figure 2.1. For example, dissolved organic carbon (DOC) has no WSR2016 limit, but can cause the production of disinfection by-products and therefore earns a consequence rating of 4. This rating is for health risk indicators, even though DOC does not inherently classify as a ‘health risk’, nor does it cause purely ‘aesthetic’ consequences. The consequence ratings standardised in Gate 1 were maintained and input into the LTR WQRA for Gate 2.

2.3.2 Likelihood ratings

2.18 Following the consequence ratings, the draft likelihood ratings were determined based on the water quality data and DWSP data listed in Table 2.1 and input into the spreadsheets.

2.19 For the catchment stage, water quality monitoring data from Thames Water at Datchet intake was reviewed and expert judgment used to assess the likelihood of a parameter breaching the WSR2016 limits. The likelihood scoring was based on how often the parameter historically breached the WSR2016 limits on an annual basis, as

[3] Guidelines for drinking-water quality: fourth edition incorporating the first addendum | 2017 | Geneva: World Health Organization | Licence: CC BY-NC-SA 3.0 IGO.

outlined in Figure 2.2, taken from the ACWG WQ Risk Framework.

Figure 2.2: Likelihood scoring according to breaches on an annual basis

Level	Likelihood *during SRO operation* – example definitions	Consequence
1	Very unlikely / rare	No impact, >50% PCV, insignificant
2	Unlikely / possibly within 5 years	Low impact, single PCV, DWI event level 1,2, minor compliance
3	Moderate / possibly within 3 years	High impact, multiple PCV, DWI event level 3, aesthetic impact
4	Likely to occur once per year	Serious impact, precautionary advice, DWI event 4, major regulatory
5	Almost certain / Likely to occur > once this year	Major impact, precautionary advice, DWI event 5, water unpotable, health impact

Source: ACWG Strategic WQ Risk Framework Report

2.20 This draft likelihood score was then combined with the fixed consequence rating to produce a final risk score, which was reviewed against the DWSP score from the Thames Water Datchet & Eton catchment DWSP. If these did not match, they were highlighted for discussion in the WQRA workshop, and the outcome of these discussions is seen in section 3.10. An identical process was followed for the abstraction stage, by reviewing Wraysbury Reservoir water quality monitoring data at 1m depth and algae flow cytometry data against the Thames Water Wraysbury Reservoir DWSP. For the remainder of the stages, risk ratings were drafted based on the relevant DWSPs.

2.21 For certain parameters where no data was available, but the hazard was deemed limiting, assumptions were made as to likelihoods based on expert opinion. An example of this is the "Trihalomethane formation potential" parameter that was deemed high risk until the treatment stage where the likelihood would fall once mitigated through organics removal. Other parameters in the catchment that required expert opinion to score included odour, taste, and viruses. There were a few parameters with no data available in the abstraction stage and these were scored according to the method set out in 2.3.3.

2.22 Where possible, likelihood ratings in the treatment stage were reduced between pre and post mitigation based on hazard reduction capacity in the existing Iver water treatment works. It was assumed the treatment stage data sourced from the Iver WTW DWSP would be like that of a new WTW located within the same region.

However, a point raised in the Gate 1 pre-workshop meeting suggested the existing Iver WTW DWSP used to infer hazard reduction capacity in the treatment stage was not truly reflective of standard reduction capacity due to operational constraints at the time. Therefore, in these specific incidences, expert opinion was instead used to determine the effectiveness of control measures on hazard reduction. These assumptions were also applied during the WQRA drafting stage of Gate 2, with the knowledge they would be reviewed and agreed upon in the WQRA collaborative workshop.

2.23 Combined with the standardised consequence ratings, the likelihood ratings populated each WQRA spreadsheet with overall risk scores for each parameter at every stage.

2.3.3 Data flow

2.24 Having populated the risk assessment with risk scores, gaps in data for certain stages or variations in scores between adjacent stages were evident. Therefore, to ensure a sensible flow of risk scores from catchment through to consumer, the data available was merged according to the following rules:

- Where no data was available for a particular stage of the WQRA, the risk rating was carried forward from an upstream stage where this data was available. This was particularly relevant during the raw water conveyance stage where no data was available, but it was anticipated that risk scores would not vary from the abstraction stages.
- For certain parameters where the risk rating increased unexpectedly from an upstream to a downstream stage, this transition was retained and discussed in the workshop. For example, the distribution network surrounding Harefield has occasionally shown historic trends of depositing iron into the water supply due to pipe corrosion and so the parameter likelihood increased post-treatment in the distribution stage.

2.3.4 Limiting hazards

2.25 An initial review of the LTR option indicated that at a minimum, the hazardous parameters that should be considered for analysis in the WQRA included pathogens, cryptosporidium, turbidity, pesticides, and metals as these parameters are key to developing the design of a water treatment works.

2.26 Following this, the ACWG Water Quality Risk Framework Report recommends including limiting hazards from the following groups associated with raw water transfers, seen in Figure 2.3:

- Pathogens
- Acceptability due to change in chemistry
- Acceptability due to taste and odour
- Pesticides

- Nitrate/nitrite
- Change in metal types and form
- Disinfection by-product formation potential

Figure 2.3: WQ risk framework limiting hazard categories

Type of SRO -> Likely limiting hazards	Reservoir source	Ground water source	Influence of sewage	Raw water transfer	Treated water transfer
Pathogens – e.g. Cryptosporidium, viruses	✓	✓	✓	✓	✓
Emerging hazards – e.g. nitrosamines, 1,4-dioxane, PFAS	✓	✓	✓		
Acceptability due to change in chemistry – e.g. alkalinity	✓	✓	✓	✓	✓
Acceptability - taste and odour	✓	✓	✓	✓	✓
Pesticides – e.g. metaldehyde	✓		✓	✓	
Nitrate/Nitrite		✓	✓	✓	
Corrosion potential					✓
Change in metal types and form	✓	✓		✓	
Disinfection byproduct formation potential	✓		✓	✓	✓

Source: ACWG Strategic WQ Risk Framework Report

2.27 Taking at least one limiting hazard from each of these categories, the list of applicable limiting hazards seen in Table 2.4 was produced.

Table 2.4: Limiting hazards

Limiting hazard	Limiting hazard category	Limiting hazard justification
Escherida Coli	Pathogens	E. Coli to be standard limiting hazard covering pathogens and is considered the most suitable indicator of faecal contamination. E. Coli is likely to drive the development of the water supply scheme due to being an indicator of health risks.
Cryptosporidium	Pathogens	Limiting hazard because the parameter is a microbiological contaminant uniquely treated. Cryptosporidium is likely to drive the development of the water supply scheme due to associated high health risks. Traditional methods of pathogen treatment are not effective against cryptosporidium.
Iron	Change in metal types and form	Naturally occurring limiting hazard requiring removal. Iron is likely to drive the development of the water supply scheme due to natural abundance.
Manganese	Change in metal types and form	Naturally occurring limiting hazard requiring removal. Manganese is likely to drive the development of the water supply scheme due to natural abundance.
Sulphate	Acceptability	Limiting hazard because sulphate is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of sulphate concentrations changing and impacting on water perception when water is supplied from a new catchment. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Trihalomethanes (THM)/THM Formation Potential	Disinfection by-product formation potential	Limiting hazard because parameter is likely to drive the viability of the water supply scheme due to introduction of disinfection by-product (DBP) health risks. DBPs would be formed through the disinfection process at the new water treatment works.
Nitrate	Nitrate/nitrite	Limiting hazard requiring removal as nitrate is likely to drive the development/viability of the water supply scheme due to increasing formational potential of nitrite and associated health risks.
Nitrite	Nitrate/nitrite	Limiting hazard requiring removal as nitrite is likely to drive the development/viability of the water supply scheme due to associated health risks.
Pesticides: total	Pesticides	Limiting agricultural chemical hazard requiring removal. Pesticides are likely to drive the development/viability of the water supply scheme due to associated high health risks.
Benzo(a)pyrene	Chemical hazard	Limiting hazard as likely to drive the development of the water supply scheme due to associated high health risks.
Dirty/discoloured water	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal.

Odour	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that odour is a key factor in the requirement for final water conditioning to Affinity Water standards.
Taste	Acceptability	Limiting hazard because parameter is likely to drive acceptability of water supply scheme by consumers and therefore requires removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that taste is a key factor in the requirement for final water conditioning to Affinity Water standards.
Change in hardness/alkalinity	Acceptability due to a change in chemistry	Limiting hazard because parameter is likely to drive the acceptability of the water supply scheme by consumers. Catchment hardness and alkalinity may be different to that in the consumer region and therefore water supply may require conditioning. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Change in source type (e.g. surface - groundwater)	Acceptability	Limiting hazard because parameter is likely to drive the acceptability of the water supply scheme by consumers. Assumption that reliance on groundwater supplies in Affinity Water zones will have to reduce in future and therefore reliance on surface water (via transfers) will increase, making this hazard a relevant consideration. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that this parameter is a key factor in the requirement for final water conditioning to Affinity Water standards.
Pathogens - Bacteria, Viruses, Protozoa	Pathogens	This parameter is to be a standard limiting hazard covering viruses and therefore requiring disinfection. Viruses are likely to drive viability of water supply scheme due to associated health risks.
Dissolved organic carbon	Disinfection by-product formation potential	Limiting hazard because parameter is likely to drive the development/viability of the water supply scheme and therefore requires removal (e.g. activated carbon). Organic carbon increases the formational potential of DBPs and therefore introduces associated health risks.
Chloride	Acceptability	Limiting hazard because chloride is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of chloride concentrations changing and impacting on water perception when water is supplied from a new catchment. Due to the close control of Larson-Skold index required as a corrosivity indicator, a combination of sulphate, chloride and alkalinity should be assessed as limiting hazards.
Turbidity	Acceptability	Turbidity is likely to drive the development of the water supply scheme, specifically plant design and operability. It is likely to reduce the acceptability of the water supply scheme by consumers and therefore requires removal.

2.28 Any further LTR-specific water quality hazards deemed likely to drive the development and/or acceptability and/or viability of the SRO or water supply scheme were then assessed. These limiting hazards were determined using existing DWSPs and water quality monitoring data sets. By choosing parameters that were either high risk in existing DWSPs; above WSR2016 limits or could not be mitigated by the treatment technology required for another limiting hazard, a list of the key parameters for the LTR option was produced. These additional limiting hazards are shown in Table 2.5. The key parameters were reviewed and confirmed during the collaborative WQRA workshop, utilising the expert knowledge of water quality representatives from both Affinity Water and Thames Water. The 'hydrocarbons' limiting hazard was highlighted in the workshop as an additional parameter for inclusion in the WQRAs going forward.

Table 2.5: Additional LTR limiting hazards

Limiting hazard	Limiting hazard justification
Lead	Limiting hazard requiring control as lead is likely to drive the development/viability of the water supply scheme due to associated health risks. Distribution/consumer zone identified as being at risk from lead so currently receives orthophosphate dosed water.
Ammonium	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring review of chlorine dosing.
Algae	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF, or through membrane filtration). Algae is likely to drive the development of the water supply scheme due to natural abundance and ability to impact water treatment capacity at WTWs; customer acceptability (taste/odour) and human health (certain algae can be damaging to human health).
Aluminium	Limiting hazard as likely to drive acceptability of water supply scheme by consumers.
Metaldehyde	High risk rating in catchment and is assumed to be a limiting agricultural chemical to be considered in the WQRA process. However, metaldehyde use is set to be outlawed from the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.
Perfluoroalkyl substances (PFAS)	Identified during Gate 2 pre-workshop meeting as emerging hazard of concern.
Hydrocarbons	To be standard limiting hazard covering hydrocarbons and requiring removal. Hydrocarbons are likely to drive the development/viability of the water supply scheme due to associated high health risks.

2.4 Strategic WQRA draft

2.29 The ACWG guidance states a collaborative workshop between all SRO stakeholders must be completed to fulfil the recommendation outlined in section 7 (RAPID) of the DWI Guidance Note on Long Term Planning for the Quality of Drinking Water Supplies [4]. The first iteration of this workshop contained high level analysis of the risks associated with each option and the Gate 2 iteration built upon this with more detailed analysis, using updated data sets and a team of experts with a more developed understanding of the LTR option.

[4] Guidance note: Long term planning for the quality of drinking water supplies | Guidance to water companies | June 2020 | Drinking Water Inspectorate

2.30 The workshop began with an introduction to Water Quality Risk Assessments and a summary of the LTR option. The WQRA draft methodology and updates since Gate 1 were then discussed before moving onto the LTR WQRA, reviewed using the spreadsheet tool. The first step of the WQRA involved a data review to confirm if the data collected for each option was representative of the actual hazards present.

2.31 Next, the spreadsheets were filtered to show limiting hazards chosen during drafting. The list of limiting hazards was discussed and agreed to be representative of the water quality risks faced by the scheme. However, towards the end of the workshop, it was agreed benzo(a)pyrene was not representative of other hydrocarbon hazards and so an extra 'Hydrocarbons' limiting hazard was added to this list. Hydrocarbons and benzo(a)pyrene were deemed by those present to be likely to drive the development of an option and therefore both were retained as limiting hazards.

2.32 Having identified the relevant limiting hazards, the drafted likelihood scores of all parameters were then reviewed across all stages. Where necessary, scores were updated based on attendees' expert opinions. During this likelihood review, appropriate control measures were discussed for each limiting hazard and updated accordingly. Where applicable, residual risk considerations were noted, and actions listed. These actions detailed the treatment technologies to be included in the option design and where further information was required for WQRA analysis in Gate 3.

2.4.1 Key workshop conclusions:

- Further water quality data is required for the Gate 3 WQRA, particularly from the Wraysbury Reservoir abstraction location
- The SRO water quality monitoring programme should be updated to include data gathering at Wraysbury reservoir
- The SRO water quality monitoring programme should be updated to include data gathering at Datchet intake
- Customer engagement would be key in reducing the risk of acceptability issues. Consumer research for changes in source type is ongoing and the results will tie into the next RAPID gated stage of the drinking water quality assessment process
- Chloride, sulphate, and alkalinity need to be considered in the risk analyses as they are foundational in understanding the Larson-Skold index
- 4-log removal or inactivation of cryptosporidium must be considered in the LTR option treatment design. Wraysbury Reservoir will provide sufficient attenuation of cryptosporidium in conjunction with the conventional treatment process outlined in the Gate 2 concept design to achieve 4-log removal.
- According to the distribution DWSPs around the Harefield area, dirty/discoloured water risks associated with iron and aluminium deposits increase in the distribution network. These existing risks are currently monitored and managed and would not change with the addition of the LTR option. They are reflected in the medium scores given to aluminium, iron, and dirty/discoloured water in the distribution stage through to the consumer stage.

2.5 Key assumptions and uncertainties

2.33 In order to progress the Water Quality Risk Assessment through Gate 2, several assumptions had to be made. These assumptions are summarised below.

2.34 It has been assumed the DWSP data collected in the initial stages of WQRA drafting are a good representation of the current water quality risks in the associated LTR option stages. As discussed in section 2.3.1, the consequence ratings taken from the DWSP information were standardised to control variations in ratings between water companies and stages. Where the DWSP data was altered to standardise consequence ratings, this method was checked with both Thames Water and Affinity Water and deemed to be appropriate. It is also assumed the Thames Water data collected from the Datchet intake and Wraysbury Reservoir is a good basis for approximating the future water quality risks in these locations.

2.35 Having assumed the data collected was reflective of the water quality risks, it was then presented during the collaborative strategic workshop for review. It was assumed that the suggestions made by the water quality experts present were accurate and the WQRA scorings were updated accordingly. Where possible, these updates were noted in the comments section of the WQRA spreadsheet tool.

2.36 When undergoing the WQRA workshop, opportunity was given for the water quality experts present to highlight any further limiting hazards of concern for the LTR option, on top of those listed in Table 2.4 and Table 2.5. This final list of limiting hazards therefore incorporates the limiting hazard assessment requirements outlined in the ACWG WQ Framework as stated in section 2.3.4 and is assumed to also include most drinking water quality parameters of relevance to the LTR option. The only known parameter group that has not been fully analysed in Gate 2 is the 'emerging hazards' category, which is discussed further in section 3.9.

2.37 Where appropriate, as discussed in section 2.3.3, the available water quality risk data was merged to ensure a coherent flow in risks from catchment through to consumer. As some data sets were not available, particularly in the abstraction stage, expert opinion was instead used to review how risks changed throughout the system. It is assumed that as more data becomes available, as discussed in section 3.11, the need for data merging will reduce.

2.38 Metaldehyde was included in the Gate 2 analysis as a limiting hazard due to it currently being a high-risk agricultural chemical. However, it has been outlawed from the end of March 2022 and so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.

2.6 Check outputs

2.39 By reviewing and agreeing on data sources in the strategic WQRA workshop, it is assumed that all the appropriate and available water quality risk information has been identified. Where data is yet to be drawn into the assessment, this has been noted in section 3.11 with the aim of filling the identified data gaps for Gate 3. These

data gaps have been communicated for inclusion in the SRO water quality monitoring program. The water quality risk assessment itself has been used to confirm that no major changes are needed to the Gate 1 concept treatment process designs.

3. Discussion of initial assessment results

3.1 General

3.1 The Gate 2 LTR WQRA confirmed the concept treatment design outlined in Gate 2. However, building on the key workshop conclusions listed in section 2.4.1, several considerations need to be made as options are progressed through the RAPID Gated process. These, along with other workshop outcomes, are discussed in sections 3.2 - 3.11.

3.2 Considering the iterative nature of the risk assessment, supplementary data may reveal updated risks from limiting hazards and this would feed into updated design considerations. Therefore, a key outcome from the initial assessment is that additional data is needed, particularly at the Wraysbury Reservoir abstraction location, as discussed in section 3.11. Analysis of emerging hazards is also imperative moving forward to Gate 3 and is discussed further in section 3.9.

3.3 A PDF summary of the LTR WQRA spreadsheet reviewed during the strategic workshop can be found in section 5. This document summarises the flow of risks from catchment through to consumer and highlights the limiting hazards that should be considered and researched as the treatment design progresses through the RAPID stage gates.

3.2 Larson-Skold index

3.4 In Gate 1 and Gate 2, Affinity Water representatives indicated that chloride, sulphate, and alkalinity need to be considered in the risk analyses as they are foundational in understanding the Larson-Skold index. This index is used by Affinity Water as an indicator of corrosivity in the network and therefore tracing these three parameters is an important aspect of the treatment design for the options. Where the Larson-Skold index is found to be such that corrosion is likely, water conditioning may be appropriate at the treatment works. This requirement would be confirmed in detailed design, but following further design development in Gate 2, pH control / alkalinity adjustment at the outlet of the concept WTW design has been added for close control of the Larson-Skold index.

3.3 Cryptosporidium

3.5 Due to water quality events highlighted during the Gate 1 workshop, it was suggested that 4-log removal or inactivation of cryptosporidium must be achieved between abstraction and the consumer. This could be accomplished using a combination of conventional treatment and bankside storage or enhanced treatment (e.g. UV or membrane filtration). It was discussed and agreed that Wraysbury Reservoir will provide sufficient attenuation of cryptosporidium in conjunction with the conventional treatment process outlined in the concept design to achieve 4-log removal without the need for enhanced treatment.

3.4 Algae

3.6 Following the Gate 1 WQRA workshop, additional data for Wraysbury Reservoir algae levels was provided and used to confirm scores given in the workshop. The workshop conclusion was that the likelihood of algae being present at Wraysbury reservoir was high and therefore at the abstraction through to treatment stages, algae presents a high risk to water quality. Since Gate 1, a more extensive data set has indicated that although algae are present, total levels (e.g. cryptophytes, cyanobacteria and green algae) are rarely present at levels of concern for human health and the treatment process proposed will provide effective treatment. A Thames Water workshop attendee confirmed Wraysbury Reservoir presents a negligible risk of toxic algae. The algae risk score was discussed accordingly in the workshop and altered to reflect a medium risk up to the treatment stage and low risk afterwards. However, it was noted a WTW in the area has had issues with processing sludge with high algae content and therefore the concept treatment design should address this.

3.5 Nitrates and nitrites

3.7 The need for nitrate/nitrite treatment was reviewed in the workshop and it was decided that dedicated treatment was unnecessary. It was agreed the parameters were not present at high enough levels in the catchment and abstraction stages to warrant dedicated treatment. This was supported by statements from Thames Water indicating nitrate treatment plants were not being added to other West-London WTWs. The WQRA spreadsheet was updated to include a medium water quality risk up to the storage stage where blending in the existing Harefield service reservoir would reduce this risk to an acceptable level for consumers.

3.6 Hydrocarbons

3.8 In the Gate 2 workshop, the use of benzo(a)pyrene as a limiting hazard covering hydrocarbons was reviewed. It was raised that benzo(a)pyrene is not representative of the hydrocarbons that would often be found in surface water catchment or abstraction stages because it is a polycyclic aromatic hydrocarbon which is mainly derived from coal-tar pitch lining on water mains. Therefore, it was agreed that a new limiting hazard for hydrocarbons should be included and a separate limiting hazard for benzo(a)pyrene should be retained. The hydrocarbons limiting hazard was set to medium risk for the catchment and pre-mitigated section of the abstraction stages to represent the likelihood of fuel leakages from boating activities in the River Thames and Wraysbury Reservoir respectively. Catchment management (fuel storage boating rules) and raw water quality monitoring at Wraysbury Reservoir are the two main mitigation measures proposed that result in a low hydrocarbons risk from the abstraction stage onwards.

3.7 Parameters affecting distribution and customer acceptability

3.9 Dirty/discoloured water; odour; taste; changes in hardness/alkalinity and changes in source type are all included in the WQRA as limiting hazards which mainly impact

customer acceptability. In the workshop, the Affinity Water representative agreed that the WQRA should reflect the existing risks in the network and therefore dirty/discoloured water retained a medium risk rating in the distribution to consumer stages to reflect the scores seen in the Ickenham/Denham DWSP. Change in source type (e.g. ground to surface water) is also captured as a medium water quality risk up to the pre-mitigated consumer stage to reflect the risk that consumers may challenge the wholesomeness of their supply due to changes in the characteristics of the water they receive. Customer engagement was listed as a mitigation measure to reduce the final consumer stage score to a low risk. It was confirmed in the workshop that Affinity Water and Thames Water customer engagement studies were ongoing to capture public opinion on the possible change in water introduced by the T2AT SRO.

3.8 Perfluoroalkyl substances (PFAS)

3.10 Perfluoroalkyl substances (PFAS) are a large group of manufactured organofluorine chemicals that have a wide range of industrial applications. Two examples of PFAS chemicals are PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid). They are widely used and break down slowly in the environment. PFAS have therefore been highlighted as a particularly significant emerging hazard and regulatory guidance from the DWI has emerged. In a pre-workshop consultation, Thames Water recommended the WQRA assess PFAS levels in the LTR option stages against the DWI Tier 3 Regulation 4 (2) (wholesomeness) guidance value for PFOS and PFOA of 0.1µg/l[5]. Any PFAS parameters present above this level should be highlighted as drinking water quality risks to wholesomeness of consumers' supply. Although analysis of Affinity Water data from Sunnymeads and Thames Water data taken at Datchet indicated PFAS levels were on average below the DWI Tier 3 guidance value, it was agreed in the workshop to retain PFAS as a high risk rating up to the treatment stage of the WQRA. This is because the data sets available were not extensive and once a long-term data set is established, this should be used as the basis for the PFAS assessment. It was therefore discussed in the workshop that the SRO water quality monitoring programme should include monthly monitoring of PFAS levels at locations relevant to the LTR option going forward.

3.11 It was also discussed whether dedicated PFAS treatment should be added into the LTR WTW concept design. It was agreed at this stage of the RAPID gated design process, dedicated treatment should not be added due to preliminary data indicating a low PFAS risk in the abstraction location and that the granular activated carbon filter (GAC) already in the Gate 2 WTW design may be effective at removing PFAS. However, as more data becomes available it essential the requirement for dedicated PFAS treatment is reviewed.

[5] Guidance on the Water Supply (Water Quality) Regulations 2016 specific to PFOS (perfluorooctane sulphonate) and PFOA (perfluorooctanoic acid) concentrations in drinking water | 2021 | Drinking Water Inspectorate (DWI)

3.9 Emerging hazards

3.12 Due to lack of available data, many parameters considered as emerging hazards have not been analysed for the LTR option, with the exception of PFAS. However, it has been confirmed an SRO technical note on emerging hazards has been commissioned by Thames Water and will be available in summer 2022. This technical note lists substances that are under potential protection measures, foreseeable protection measures and regulator watching briefs, and will be used to develop the strategy for analysing emerging hazards in the SRO RAPID gated reviews. An early inspection of the hazards list has indicated that data sets for a significant number of the parameters listed are currently unavailable in the LTR catchment and abstraction stages. The SRO technical note will indicate which of these parameters could be monitored under an extension to the current SRO monitoring programme. During the Gate 2 process, the need to progress monitoring of emerging hazards has been discussed and this is demonstrated with the agreed inclusion of PFAS 51 in the SRO monitoring programme at Datchet intake and Wraysbury Reservoir.

3.10 Differences in risk ratings

3.13 During the drafting of the catchment and abstraction stages risk scoring, several limiting hazards were highlighted for discussion in the WQRA workshop. These limiting hazards were highlighted due to a difference between the risk ratings in the DWSP at that stage and the risk ratings determined from available monitoring data, according to the method outlined in section 2.3.2. Table 3.1 and Table 3.2 detail the outcome of these discussions for the catchment and abstraction stages respectively. Using water quality data, draft likelihood scores were determined based on likelihood of breaching WSR2016 limits at consumers' taps on an annual basis as shown in Figure 2.2. This scoring method was discussed and agreed in the WQRA workshop and forms the justification for many of the final risk score decisions listed below.

Table 3.1: Draft risk ratings – catchment stage

Parameter	Based on water quality data	Based on DWSP	Decided upon in workshop	Justification
Nitrite	Medium	High	Medium	Breached WSR2016 limits at consumers' taps 0 times since 2017 = likelihood of 2 = medium risk score
Ammonium	Medium	High	Medium	Breached WSR2016 limits at consumers' taps 3no. times since 2017 = likelihood of 4 = medium risk score
Metaldehyde	Medium	High	Medium	Metaldehyde will be outlawed from the end of March 2022, so it is assumed that by the time LTR is implemented metaldehyde will be a less relevant hazard.

Table 3.2: Draft risk ratings – abstraction stage

Parameter	Based on water quality data	Based on DWSP	Decided upon in workshop	Justification

Cryptosporidium	High	Medium	High	Breached WSR2016 limits at consumers' taps 4 times since 2017 = likelihood of 4 = high risk score
Manganese	Medium	Low	Medium	No data available, so changed to match abstraction stage risk score
Nitrite	Medium	High	Medium	Breached WSR2016 limits at consumers' taps 0 times since 2017 = likelihood of 2 = medium risk score
Pesticides: total	High	Medium	High	Breached WSR2016 limits at consumers' taps over 4 times since 2017 = likelihood of 4 = high risk score
Ammonium	Medium	High	Medium	Breached WSR2016 limits at consumers' taps 3no. times since 2017 = likelihood of 4 = medium risk score

3.11 Additional data collection

3.14 Table 3.3 summarises the data collection suite discussed during the WQRA strategic workshop, where further recorded measurement of the parameters listed would help develop the option design. A key outcome of the WQRA workshop was agreement that, if possible, an SRO drinking water quality monitoring suite be collected at the Datchet intake in lieu of a monitoring site which was only relevant to one of the T2AT options that is no longer being progressed. It was also discussed whether additional monitoring could be implemented at Wraysbury Reservoir. The data requirements listed in Table 3.3 have been checked against the SRO water quality monitoring programme and it has been confirmed they can be monitored at the relevant locations. Of particular note is the addition of PFAS 51 monitoring at both locations which will aid in the understanding of emerging hazards trends.

Table 3.3: Limiting hazards data collection recommended for Gate 3

LTR option stages	Limiting Hazards
Datchet intake	PFAS E-Coli Emerging hazards (see section 3.9)
Wraysbury Reservoir	E-Coli Iron Manganese Lead Benzo(a)pyrene Dissolved organic carbon Aluminium Emerging hazards (see section 3.9)

4. Further work plan

4.1 Water quality monitoring activities

4.1 The SRO water quality monitoring program, undertaken in agreement with the EA and Natural England, has been arranged to capture key water quality data required for progression of the SRO options. It has been agreed that a monitoring suite will be implemented at Datchet intake to facilitate the drinking water quality assessment of the WQRA catchment stage, and a limited suite containing targeted parameters proposed for monitoring at Wraysbury Reservoir. These data sets will be used to inform the Gate 3 water quality risk assessment and will resolve the data gaps highlighted during the Gate 1 and Gate 2 process, apart from some emerging hazards as discussed in section 3.9. The existing water quality monitoring used in the Gate 1 and Gate 2 analyses will continue to be used to inform future iterations of the WQRAs in conjunction with the SRO water quality monitoring program data.

4.2 Future engagement

4.2 As options are further developed and a greater understanding of water quality risks is available, it will become appropriate to undertake further WQRA workshops where additional SRO stakeholders may be invited to attend for their input on option development. As stated in section 2, the Gate 2 WQRA workshop included only key members of the project development team, and this will be expanded as necessary moving forward.

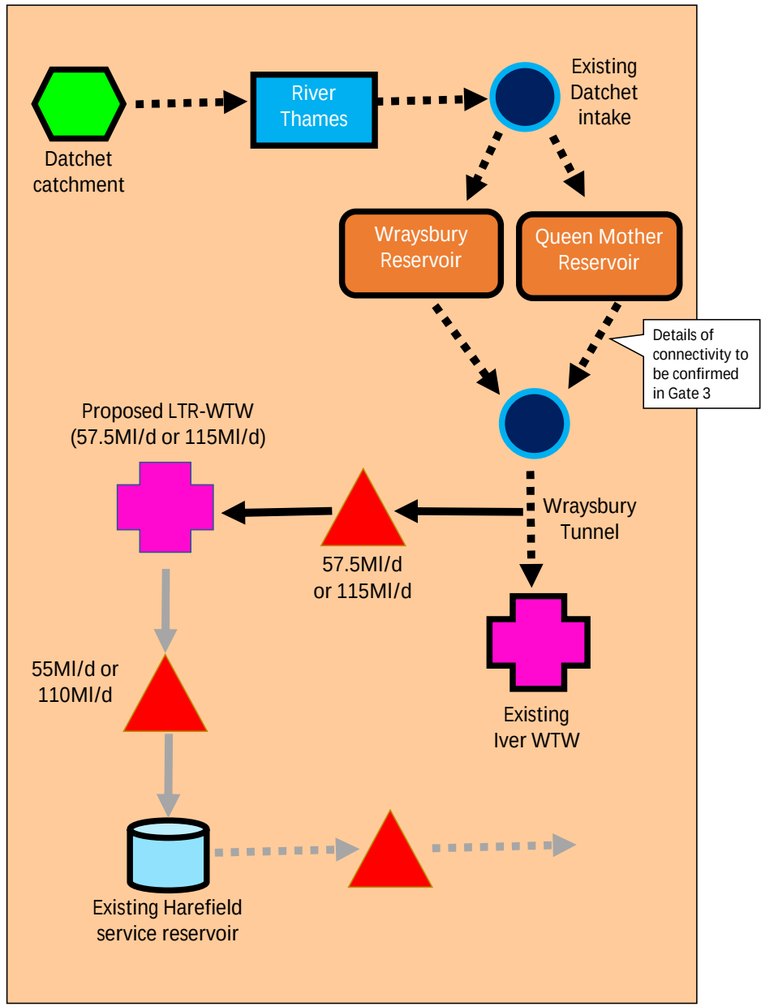
4.3 In addition, as the SRO is developed, engagement with both Affinity Water and Thames Water will be facilitated by the SRO team. Water quality representatives will continue to be included to ensure that the design is developed in line with their expert knowledge and latest updates to Water Company policies.

Appendix A WQRA Outputs

A summary of the LTR WQRA spreadsheet is provided in this Appendix. The risk assessment table shows the progression of risks through the supply stages from catchment to consumer for each of the limiting hazards identified.

Thames to Affinity Transfer Lower Thames Reservoir, Gate 2

SRO Schematic



Key

Asset	New	Existing
Booster chlorination		
Catchment		
Canal		
Final Effluent Discharge		
Potable distribution		
Pumping Station		
Raw water abstraction		
Raw Water Conditioning Plant		
Raw water transfer		
River		
Treated water storage		
Treated water transfer		
Existing tie-in point		
Wastewater Treatment Works		
Water Treatment Works		

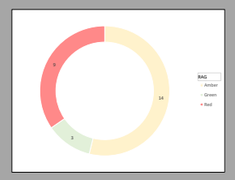
Thames to Affinity Transfer **Lower Thames Reservoir, Gate 2**

Export to PDF

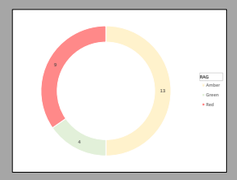
Note to user
Graphs do not auto colour to red, amber and green.
Please right click each segment of the doughnut chart to manually change the colours.

Summary of SRO Risks

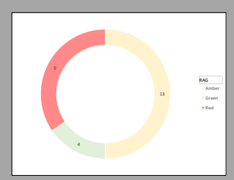
Catchment → Abstraction → Raw Water Conveyance → Treatment → Storage → Distribution → Consumer



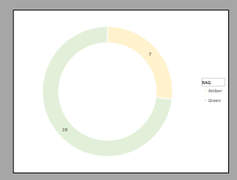
RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	20	Escherida Coli
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Turbidity
Red	25	Cryptosporidium
Red	25	Pesticides: total
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	8	Algae
Amber	9	Change in hardness/alkalinity
Amber	9	Manganese
Amber	9	Odour
Amber	9	Taste
Amber	10	Benzo(a)pyrene
Amber	10	Hydrocarbons
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite
Amber	12	Aluminium
Amber	12	Ammonium
Amber	12	Dissolved organic carbon



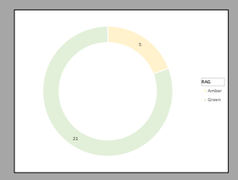
RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	20	Cryptosporidium
Red	20	Escherida Coli
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Pesticides: total
Red	20	Turbidity
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	8	Algae
Amber	9	Manganese
Amber	9	Odour
Amber	9	Taste
Amber	10	Benzo(a)pyrene
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite
Amber	12	Aluminium
Amber	12	Ammonium
Amber	12	Dissolved organic carbon



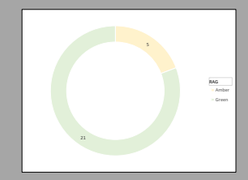
RAG	Risk score	Hazard
Red	15	Dirty/discoloured water
Red	15	Iron
Red	15	Perfluoroalkyl substances (PFAS)
Red	15	THM Formation Potential
Red	20	Cryptosporidium
Red	20	Escherida Coli
Red	20	Pathogens - bacteria, viruses, protozoa
Red	20	Pesticides: total
Red	20	Turbidity
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	8	Algae
Amber	9	Manganese
Amber	9	Odour
Amber	9	Taste
Amber	10	Benzo(a)pyrene
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite
Amber	12	Aluminium
Amber	12	Ammonium
Amber	12	Dissolved organic carbon



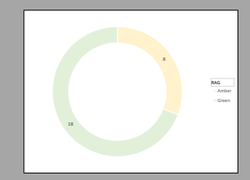
RAG	Risk Score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	6	Odour
Amber	6	Taste
Amber	10	Metaldehyde
Amber	10	Nitrate
Amber	10	Nitrite



RAG	Risk score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	6	Odour
Amber	6	Taste
Amber	10	Metaldehyde



RAG	Risk score	Hazard
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	6	Iron
Amber	8	Aluminium
Amber	9	Dirty/discoloured water
Amber	10	Metaldehyde



RAG	Risk Score	Hazard
Amber	6	Change in hardness/alkalinity
Amber	6	Change in source type (e.g. surface - groundwater)
Amber	6	Iron
Amber	6	Odour
Amber	6	Taste
Amber	8	Aluminium
Amber	9	Dirty/discoloured water
Amber	10	Metaldehyde

Thames to Affinity Transfer | **Lower Thames Reservoir, Gate 2**

Hide | Open | Filter

Data source and certainty input	Limiting Hazard	Parameter details and commentary
Escherichia Coli	Y	E. Coli to be standard limiting hazard covering pathogens and requiring disinfection. E.Coli is likely to drive the development of the water supply scheme due to being an indicator of health risks. Escherichia coli (or, alternatively, thermotolerant coliforms) is the first organism of choice in monitoring programmes for verification, including surveillance of drinking-water quality. It is considered the most suitable indicator of faecal contamination (WHO GDWQ).
Cryptosporidium	Y	Limiting hazard as microbiological contaminant uniquely treated (e.g. through RGF, UV, or membrane filtration). Cryptosporidium is likely to drive the development of the water supply scheme due to associated high health risks. Traditional methods of pathogen treatment are not effective against cryptosporidium.
Iron	Y	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF, or through membrane filtration). Iron is likely to drive the development of the water supply scheme due to natural abundance.
Manganese	Y	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF, or through membrane filtration). Manganese is likely to drive the development of the water supply scheme due to natural abundance.
Sulphate	Y	Limiting hazard as sulphate is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of sulphate concentrations changing and impacting on water perception when water is supplied from a new catchment. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.
Lead	Y	Limiting hazard requiring control as lead is likely to drive the development/viability of the water supply scheme due to associated health risks. Distribution/consumer zone identified as being at risk from lead as currently receives orthophosphate dosed water. Consumer likelihood/consequence values taken from "Lead pipes" ratings - Ickenham/Denham consumer DWSP.
THM Formation Potential	Y	This parameter is to be a standard limiting hazard covering THM formation potential only. Limiting hazard as likely to drive the viability of the water supply scheme due to introduction of disinfection by-product (DBP) health risks. DBPs would be formed through the disinfection process at the new water treatment works. Formation potential can be reduced by adhering to disinfection standards and ensuring online monitoring/water quality control.
Nitrate	Y	Limiting hazard requiring removal as nitrate is likely to drive the development/viability of the water supply scheme due to increasing formational potential of nitrite and associated health risks.
Nitrite	Y	Limiting hazard requiring removal as nitrite is likely to drive the development/viability of the water supply scheme due to associated health risks.
Pesticides: total	Y	Limiting agricultural chemical hazard requiring removal (e.g. through activated carbon or membrane filtration). Pesticides are likely to drive the development/viability of the water supply scheme due to associated high health risks.
Benzo(a)pyrene	Y	Limiting hazard as likely to drive the development of the water supply scheme due to associated high health risks.
Dirty/discoloured water	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers and therefore requiring removal (e.g. through clarification and RGF, or through membrane filtration).
Odour	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers and therefore requiring removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that odour is a key factor in the requirement for final water conditioning to Affinity Water standards.
Taste	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers and therefore requiring removal. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that taste is a key factor in the requirement for final water conditioning to Affinity Water standards.
Change in hardness/alkalinity	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers. Catchment hardness and alkalinity may be different to that in the consumer region and therefore water supply may require conditioning. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.
Change in source type (e.g. surface - groundwater)	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers. Assumption that reliance on groundwater supplies in Affinity zones will have to reduce in future and therefore reliance on surface water (via transfers) will increase, making this hazard a relevant consideration. The transfer of water from a Thames Water zone to an Affinity Water zone could lead to customers experiencing a change in perception of their water, therefore it is assumed that this parameter is a key factor in the requirement for final water conditioning to Affinity Water standards.
Pathogens - bacteria, viruses, protozoa	Y	This parameter is to be a standard limiting hazard covering viruses and therefore requiring disinfection. Viruses are likely to drive viability of water supply scheme due to associated health risks.
Dissolved organic carbon	Y	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring removal (e.g. activated carbon or membrane filtration). Organic carbon increases the formational potential of DBPs and therefore introduces associated health risks.
Ammonium	Y	Limiting hazard as likely to drive the development/viability of the water supply scheme and therefore requiring review of chlorine dosing.
Chloride	Y	Limiting hazard as chloride is likely to drive the acceptability of the water supply scheme by consumers due to its effect on taste. Possibility of chloride concentrations changing and impacting on water perception when water is supplied from a new catchment. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.
Turbidity	Y	Limiting hazard as likely to drive the acceptability of the water supply scheme by consumers and therefore requiring removal (e.g. through clarification and RGF, or through membrane filtration).
Algae	Y	Naturally occurring limiting hazard requiring removal (e.g. through clarification and RGF, or through membrane filtration). Algae is likely to drive the development of the water supply scheme due to natural abundance and ability to impact water treatment capacity at WTWs, customer acceptability (taste/odour) and human health (certain algae can be damaging to human health).
Aluminium	Y	Limiting hazard as likely to drive acceptability of water supply scheme by consumers.
Metaldehyde	Y	High risk rating in catchment and is assumed to be a limiting agricultural chemical to be considered in the WQRA process. However, metaldehyde use has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.
Perfluoroalkyl substances (PFAS)	Y	Identified during the Gate 2 pre-workshop meeting as an emerging hazard of concern. The DWI Tier 3 Regulation 4 (2) (wholesomeness) guidance value for PFOS and PFOA of 0.1µg/l has been used to assess the risk of PFAS present where data is available.
Hydrocarbons	Y	To be standard limiting hazard covering hydrocarbons (e.g. benzene, benzo(b)fluoranthene, benzo(ghi)perylene, benzo(k)fluoranthene, indeno(1,2,3-cd)pyrene) and requiring management. Hydrocarbons are likely to drive the development/viability of the water supply scheme due to associated high health risks.

Catchment

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	4	5	20	No change from Gate 1, assumed likelihood value as no data available - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Cryptosporidium	5	5	25	Likelihood value raised from Gate 1 score of 4 to 5 as max = 17no/l, 95%ile = 4no/l, 99%ile = 10.9no/l, limits at consumers' taps = 0no/l - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	5	25	Parameter will be treated at the new LTR-WTW (see Treatment section of this WQRA).	-
Iron	5	3	15	Likelihood value raised from Gate 1 score of 4 to 5 as avg conc = 368ug/l, 95%ile = 700ug/l, WSR2016 limits at consumers' taps = 200ug/l - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Manganese	3	3	9	Likelihood value reduced from Gate 1 score of 4 to 3 as max = 50.4mg/l (occurred once in 2017), avg conc = 14.6ug/l, 95%ile = 33.4ug/l, WSR2016 limits at consumers' taps = 50ug/l - (Datchet DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Sulphate	1	3	3	No change since Gate 1, WSR2016 limit 250mg/l, 95%ile = 56.6mg/l - (Datchet DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Lead	1	5	5	Likelihood reduced from Gate 1 score of 2 to 1 as WSR2016 limit 10ug/l, max = 4.1ug/l, avg conc = 0.8ug/l, 95%ile = 2ug/l - (Datchet DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing) (see treatment/distribution/consumer sections of this WQRA).	-
THM Formation Potential	3	5	15	No change since Gate 1, WSR2016 limit 100ug/l, max = 9ug/l, 95%ile = 0ug/l - (Datchet DWSP gives green risk after control for THMs (not formation potential)). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	Parameter will be controlled through Affinity Water standard disinfection procedure at the new LTR-WTW (see Treatment section of this WQRA).	-
Nitrate	2	5	10	No change since Gate 1, WSR2016 limit 50mg/l, max = 44.9mg/l, avg conc = 31.9mg/l, 95%ile = 38.2mg/l - (Datchet DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Nitrite	2	5	10	Likelihood value reduced from Gate 1 score of 4 to 2 as max = 0.18mg/l, avg conc = 0.08mg/l, 95%ile = 0.12mg/l, WSR2016 limits at consumers' taps = 0.5mg/l - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Pesticides: total	5	5	25	No change since Gate 1, WSR2016 limit 0.5ug/l total and 0.1ug/l individual pesticides, max = 1.2ug/l, avg conc = 0.08ug/l, 95%ile = 0.28ug/l - Flufenacet, carbetamide, glyphosate and propyzamide all have 95%iles above 0.1ug/l individual pesticide PCV - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	5	25	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Benzo(a)pyrene	2	5	10	No change since Gate 1, WSR2016 limit 0.01ug/l, avg conc = 0.003ug/l, 95%ile = 0.007ug/l - (Datchet DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Dirty/discoloured water	5	3	15	No change since Gate 1, WSR2016 limit 20hazen, avg = 13hazen, 95%ile = 25hazen (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Odour	3	3	9	No change since Gate 1, no data available - (Datchet DWSP gives amber risk pre-control and green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Taste	3	3	9	Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Change in hardness/alkalinity	3	3	9	Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter could be treated by pH/alkalinity correction (see Treatment section of this WQRA).	-
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Pathogens - bacteria, viruses, protozoa	4	5	20	Locate further information required for subsequent risk assessments. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Dissolved organic carbon	3	4	12	No change since Gate 1, WSR2016 specification = no significant increase, avg conc = 5.1mg/l, 95%ile = 8.9mg/l - (Datchet DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Ammonium	4	3	12	Likelihood value maintained as Gate 1 score of 4 as max = 1.97mg/l (breached PCV 3 times since 2017), avg conc = 0.09mg/l, 95%ile = 0.2mg/l, WSR2016 limits at consumers' taps = 0.5mg/l - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	3	12	If required, additional chlorine dosing (breakpoint chlorination) will achieve ammonium conversion.	-
Chloride	1	3	3	No change since Gate 1, WSR2016 limit 250mg/l, avg conc = 44mg/l, 95%ile = 57.5mg/l - (Datchet DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	May see seasonal changes in results due to wash-off from salted roads. Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Turbidity	5	4	20	Likelihood value raised from Gate 1 score of 4 to 5 as avg conc = 7.3FTU, 95%ile = 28.5FTU, WSR2016 limits at consumers' taps = 1NTU - (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	4	20	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Algae	2	4	8	Likelihood value reduced from 4 to 2. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	4	8	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Aluminium	3	4	12	Likelihood value reduced from Gate 1 score of 4 to 3 as max = 338ug/l (breached PCV in 2018 and in 2021), avg conc = 115ug/l, 95%ile = 286ug/l, WSR2016 limits at consumers' taps = 200ug/l - (Datchet DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter concentration will be controlled via careful monitoring and optimisation of coagulation and filtration at the new LTR-WTW (see Treatment section of this WQRA).	-
Metaldehyde	2	5	10	No change since Gate 1, 95%ile = 0.04ug/l (Datchet DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	3	5	15	Likelihood low as water quality monitoring results are under 'EU directive 2020/2184 on the quality of water intended for human consumption' Annex 1 Part B limits for human consumption = 0.5ug/l PFAS total, 0.1ug/l sum of PFAS and under TW Tier 3 Regulation 4(2) level of 0.1ug/l PFOS/PFOA - data indicates all results below these values, avg. at Datchet Intake TW data 0.013ug/l, avg. at 0.004ug/l - however, due to lack of long-term data, risk has been raised to 3 due to uncertainty. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	If required, parameter will be treated (e.g. ion exchange, GAC) at the new LTR-WTW (see Treatment section of this WQRA). PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	2	5	10	Risk score agreed in LTR WQRA workshop 10/02/22 to reflect hydrocarbon pollution from boating and other activities in/near the River Thames.	-	2	5	10	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop. Ongoing catchment management in Wraysbury Reservoir will reduce likelihood of contamination from boating.	-

Abstraction

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	4	5	20	No change since Gate 1, assumed likelihood as no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Cryptosporidium	4	5	20	Likelihood value reduced from Gate 1 score of 5 to 4 as max = 3no/l (occurred once in 2020), 95%ile = 0.1no/l (query LLD), 99%ile = 1.34no/l, limits at consumers' taps = 0no/l - (Wraysbury DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated at the new LTR-WTW (see Treatment section of this WQRA).	-
Iron	5	3	15	No change from Gate 1, no data available - (Wraysbury DWSP gives red risk after control). Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Manganese	3	3	9	Likelihood value reduced to 3 to match catchment stage, no data available - (Wraysbury DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Sulphate	1	3	3	No change since Gate 1, WSR2016 limit 250mg/l, 95%ile = 55.0mg/l - (Wraysbury DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Lead	1	5	5	No change since Gate 1, no data available - (Wraysbury DWSP gives green risk after control). Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing) (see treatment/distribution/consumer sections of this WQRA).	-
THM Formation Potential	3	5	15	Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	Parameter will be controlled through Affinity Water standard disinfection procedure at the new LTR-WTW (see Treatment section of this WQRA).	-
Nitrate	2	5	10	Likelihood value reduced from Gate 1 score of 3 to 2 as max = 40.8mg/l, avg conc = 30.0mg/l, 95%ile = 37.2mg/l, WSR2016 limit 50mg/l - (Wraysbury DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Nitrite	2	5	10	Likelihood value reduced from Gate 1 score of 4 to 2 as max = 0.35mg/l, avg conc = 0.1mg/l, 95%ile = 0.22mg/l, WSR2016 limits at consumers' taps = 0.5mg/l - (Wraysbury DWSP gives red risk pre-control and green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Pesticides: total	4	5	20	Likelihood value reduced from Gate 1 score of 5 to 4 as pesticides total max = 0.43ug/l, avg conc = 0.08ug/l, 95%ile = 0.27ug/l, WSR2016 limits at consumers' taps = 0.5ug/l total pesticides and 0.1ug/l individual pesticides - propyzamide 95%ile = 0.27ug/l and therefore above PCV - (Wraysbury DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Benzo(a)pyrene	2	5	10	No change since Gate 1, no data available - (Wraysbury DWSP gives amber risk for 'contamination from third party activity'). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA). DWSP used covers extra contamination (hydrocarbon input) from boating club on Wraysbury reservoir ('contamination from third party activity')	-
Dirty/discoloured water	5	3	15	Likelihood value reduced from Gate 1 score of 5 to 4 as colour avg = 7hazen, 95%ile = 13hazen, WSR2016 limits at consumers' taps = 20hazen - (Wraysbury DWSP gives red risk pre-control and amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Odour	3	3	9	No change since Gate 1, no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Taste	3	3	9	No change since Gate 1, no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Change in hardness/alkalinity	2	3	6	Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	If required, parameter could be treated by pH/alkalinity correction (see Treatment section of this WQRA).	-
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Pathogens - bacteria, viruses, protozoa	4	5	20	No change since Gate 1, no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Dissolved organic carbon	3	4	12	No change since Gate 1, no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Ammonium	4	3	12	Breached WSR2016 limits of 0.5mg/l 3 times since 2017 - (Wraysbury DWSP gives red risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	3	12	If required, additional chlorine dosing (breakpoint chlorination) will achieve ammonium conversion.	-
Chloride	1	3	3	No change since Gate 1, WSR2016 limit 250mg/l, avg conc = 41.5mg/l, 95%ile = 50.9mg/l - (Wraysbury DWSP gives green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Turbidity	5	4	20	No change since Gate 1, WSR2016 limit 1NTU, avg turbidity = 1.3FTU, 95%ile = 3.7FTU - (Wraysbury DWSP gives red risk pre-control and green risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	4	20	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Algae	2	4	8	Likelihood value reduced from Gate 1 score of 4 to 2 as CEH data indicates total levels (cryptophytes, cyanobacteria, green algae and diatoms) are not a concern for human health and should be treated effectively by proposed treatment process. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	4	8	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Aluminium	3	4	12	No change since Gate 1, no data available. Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter concentration will be controlled via careful monitoring and optimisation of coagulation and filtration at the new LTR-WTW (see Treatment section of this WQRA).	-
Metaldehyde	2	5	10	No change since Gate 1, 95%ile = 0.057ug/l (Wraysbury DWSP gives amber risk after control). Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	3	5	15	Risk score retained from catchment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	If required, parameter will be treated (e.g. ion exchange, GAC) at the new LTR-WTW (see Treatment section of this WQRA). PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	2	5	10	Risk score agreed in LTR WQRA workshop 10/02/22 to reflect hydrocarbon pollution from boating and other activities in/near Wraysbury Reservoir.	Catchment management in the form of Wraysbury Reservoir leisure activity rules (boating club rules) and raw water quality monitoring.	1	5	5	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop. Ongoing catchment management in Wraysbury Reservoir will reduce likelihood of contamination from boating.	-

Raw water conveyance

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	4	5	20	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Cryptosporidium	4	5	20	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated at the new LTR-WTW (see Treatment section of this WQRA).	-
Iron	5	3	15	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Manganese	3	3	9	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Sulphate	1	3	3	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Lead	1	5	5	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing) (see treatment/distribution/consumer sections of this WQRA).	-
THM Formation Potential	3	5	15	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	Parameter will be controlled through Affinity Water standard disinfection procedure at the new LTR-WTW (see Treatment section of this WQRA).	-
Nitrate	2	5	10	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Nitrite	2	5	10	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	If required, parameter will be treated by ion exchange, biological denitrification or membrane processes at LTR-WTW (see Treatment section of this WQRA).	-
Pesticides: total	4	5	20	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Benzo(a)pyrene	2	5	10	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Dirty/discoloured water	5	3	15	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	3	15	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Odour	3	3	9	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Taste	3	3	9	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Change in hardness/alkalinity	2	3	6	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	If required, parameter could be treated by pH/alkalinity correction (see Treatment section of this WQRA).	-
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	If required, parameter will be corrected by water conditioning (see Treatment section of this WQRA).	-
Pathogens - bacteria, viruses, protozoa	4	5	20	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	5	20	Parameter will be treated by disinfection (e.g. chlorine) at the new LTR-WTW (see Treatment section of this WQRA).	-
Dissolved organic carbon	3	4	12	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter will be removed (e.g. through activated carbon) at the new LTR-WTW (see Treatment section of this WQRA).	-
Ammonium	4	3	12	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	4	3	12	If required, additional chlorine dosing (breakpoint chlorination) will achieve ammonium conversion.	-
Chloride	1	3	3	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	-
Turbidity	5	4	20	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	5	4	20	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Algae	2	4	8	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	4	8	Parameter will be removed (e.g. through clarification and RGF) at the new LTR-WTW (see Treatment section of this WQRA).	-
Aluminium	3	4	12	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	4	12	Parameter concentration will be controlled via careful monitoring and optimisation of coagulation and filtration at the new LTR-WTW (see Treatment section of this WQRA).	-
Metaldehyde	2	5	10	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	3	5	15	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	5	15	If required, parameter will be treated (e.g. ion exchange, GAC) at the new LTR-WTW (see Treatment section of this WQRA). PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	1	5	5	Risk score retained from abstraction stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop. Ongoing catchment management in Wraysbury Reservoir will reduce likelihood of contamination from boating.	-

Treatment

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	4	5	20	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Disinfection (e.g. chlorine) alongside regular treatment, depending on loading, at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include disinfection (e.g. chlorine) alongside regular treatment, depending on loading, in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Cryptosporidium	4	5	20	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Treatment at the new LTR-WTW to provide 4-log removal or inactivation of cryptosporidium should be achieved through a combination of bankside storage at Wraysbury Reservoir and treatment at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include treatment in the design for the new LTR-WTW. Demonstrable log 4 removal of cryptosporidium should be considered in design (based off [2021] cryptosporidium events). Ensure online monitoring and water quality control.
Iron	5	3	15	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through coagulation and clarification, RGF) at the new LTR-WTW.	1	3	3	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Manganese	3	3	9	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through coagulation and clarification, RGF) at the new LTR-WTW.	1	3	3	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Sulphate	1	3	3	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required	1	3	3	Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing.	Ensure online monitoring and water quality control.
Lead	1	5	5	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Corrosion prohibitor for residual protection (e.g. through orthophosphate dosing) in distribution pipelines.	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing) (see treatment/distribution/consumer sections of this WQRA).	Include corrosion prohibitor (e.g. orthophosphate dosing) in option design.
THM Formation Potential	3	5	15	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Parameter may be formed as a result of the disinfection processes at the new LTR-WTW. Control for organics removal should therefore be included. The Affinity Water standard for disinfection will be followed at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include organics removal in the design of the new LTR-WTW. Follow the Affinity Water standard for disinfection at the new LTR-WTW. Ensure online monitoring and water quality control.
Nitrate	2	5	10	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Data available at Gate 2 indicates nitrate treatment is not required at the new LTR-WTW. If necessary, ion exchange, biological denitrification and membrane processes could be considered for nitrate treatment	2	5	10	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Data available at Gate 2 indicates nitrate treatment is not required at the new LTR-WTW. Ensure water quality monitoring continues throughout gated process in case necessity for treatment arises.
Nitrite	2	5	10	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Data available at Gate 2 indicates nitrate treatment is not required at the new LTR-WTW. If necessary, ion exchange, biological denitrification and membrane processes could be considered for nitrate treatment	2	5	10	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Data available at Gate 2 indicates nitrate treatment is not required at the new LTR-WTW. Ensure water quality monitoring continues throughout gated process in case necessity for treatment arises.
Pesticides: total	4	5	20	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through activated carbon and ozone) at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. activated carbon) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Benzo(a)pyrene	2	5	10	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through clarification and RGF) at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Dirty/discoloured water	5	3	15	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through clarification and RGF) at the new LTR-WTW.	1	3	3	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Odour	3	3	9	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, parameter to be corrected by water conditioning.	2	3	6	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	If required, install conditioning capability. Ensure online monitoring and water quality control.
Taste	3	3	9	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, parameter to be corrected by water conditioning.	2	3	6	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	If required, install conditioning capability. Ensure online monitoring and water quality control.
Change in hardness/alkalinity	2	3	6	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, alkalinity dosing and/or implementation of pH correction. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	2	3	6	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include pH/alkalinity correction in the design for the new LTR-WTW. Further investigation is required to confirm the level of pH/alkalinity correction required. Ensure online monitoring and water quality control.
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, parameter to be corrected by water conditioning. Level of control influenced by customer engagement results.	2	3	6	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	If required, install conditioning capability. Ensure online monitoring and water quality control.
Pathogens - bacteria, viruses, protozoa	4	5	20	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Disinfection (e.g. chlorine) alongside regular treatment, depending on loading, at the new LTR-WTW.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include disinfection (e.g. chlorine) alongside regular treatment, depending on loading, in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Dissolved organic carbon	3	4	12	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through activated carbon) at the new LTR-WTW. Removal necessary for mitigating THM formation potential.	1	4	4	Removal necessary for mitigating THM formation potential. Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. activated carbon) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Ammonium	4	3	12	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, additional chlorine dosing (breakpoint chlorination) will achieve ammonium conversion.	1	3	3	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include chlorine dosing in treatment design.
Chloride	1	3	3	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required.	1	3	3	May see seasonal changes in results due to wash-off from salted roads. Parameter used as indication of corrosion potential in the network. It is therefore used to dictate alkalinity dosing. Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Ensure online monitoring and water quality control.
Turbidity	5	4	20	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through clarification and RGF) at the new LTR-WTW.	1	4	4	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Algae	2	4	8	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through pre-ozonation, clarification, RGF and ozonation) at the new LTR-WTW. Ensure sludge works is designed appropriately for algae removal.	1	4	4	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and RGF) in the design for the new LTR-WTW. Ensure online monitoring and water quality control.
Aluminium	3	4	12	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Removal (e.g. through clarification and filtration) at the new LTR-WTW. Controlled via careful monitoring and optimisation of coagulation and filtration.	1	4	4	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Include removal (e.g. through clarification and filtration) in the design for the new LTR-WTW. Ensure careful monitoring and optimisation of coagulation and filtration.
Metaldehyde	2	5	10	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	GAC contactors can achieve partial removal if regeneration is carried out frequently. This is not operationally feasible or sustainable.	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	3	5	15	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	If required, removal (e.g. GAC) at the new LTR-WTW.	1	5	5	PFAS substances are an emerging hazard and should continue to be monitored.	Preliminary PFAS studies indicate levels are currently below DWI/EU guidance levels and therefore treatment does not need to be included in concept design at this stage. However, further data needs collecting to ensure a representative data series and careful monitoring must be ensured throughout gated process in case necessity for treatment arises.
Hydrocarbons	1	5	5	Risk score retained from raw water conveyance stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop. Ongoing catchment management in Wraysbury Reservoir will reduce likelihood of contamination from boating. If required, moderate removal may be possible through coagulation/filtration and GAC.	1	5	5	Post-treatment at the new LTR-WTW, the treated water will be transferred via a new pumping station to the Harefield service reservoir. This transfer will not have any impact on the level of this parameter in the treated water.	Parameter will be monitored in raw water abstraction and if detected to be out of limits, raw water abstraction will stop. Ongoing catchment management in Wraysbury Reservoir will reduce likelihood of contamination from boating. Include removal (e.g. through coagulation/filtration and GAC) in case of catchment/abstraction management failure.

Storage

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Included in the Company's Reservoir inspection programme. A roof flood test is part of the inspection process. Full details of requirements of inspection included in AM 309 [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Cryptosporidium	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Iron	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Manganese	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Monitoring carried out elsewhere [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Sulphate	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Lead	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Corrosion prohibitor (e.g. orthophosphate dosing)	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing).	Include corrosion prohibitor (e.g. orthophosphate dosing) in option design.
THM Formation Potential	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Nitrate	2	5	10	Harefield Reservoir 3 West DWSP gives amber risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Blending will reduce the likelihood of nitrates being present at a high level	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Nitrite	2	5	10	Harefield Reservoir 3 West DWSP gives green risk pre-control. Amber risk score agreed in LTR WQRA workshop 10/02/22.	Blending will reduce the likelihood of nitrites being present at a high level	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Pesticides: total	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Benzo(a)pyrene	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Monitoring carried out elsewhere [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Dirty/discoloured water	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Odour	2	3	6	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	2	3	6	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Taste	2	3	6	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	2	3	6	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Change in hardness/alkalinity	2	3	6	Risk score retained from treatment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score retained from treatment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Pathogens - bacteria, viruses, protozoa	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control for 'Viruses'. Risk score agreed in LTR WQRA workshop 10/02/22.	Included in the Company's Reservoir inspection programme. A roof flood test is part of the inspection process. Full details of requirements of inspection included in AM 309 [Harefield Service Reservoir DWSP].	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Dissolved organic carbon	1	4	4	Risk score retained from treatment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Ammonium	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Chloride	1	3	3	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Harefield Service Reservoir DWSP].	1	3	3	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Turbidity	1	4	4	Harefield Reservoir 3 West DWSP gives amber risk pre-control. Green risk score agreed in LTR WQRA workshop 10/02/22.	Control measure not yet defined or required [Harefield Service Reservoir DWSP].	1	4	4	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Algae	1	4	4	Risk score retained from treatment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Aluminium	1	4	4	Harefield Reservoir 3 West DWSP gives amber risk pre-control. Green risk score agreed in LTR WQRA workshop 10/02/22.	Monitoring carried out elsewhere [Harefield Service Reservoir DWSP].	1	4	4	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.
Metaldehyde	2	5	10	Harefield Reservoir 3 West DWSP gives green risk pre-control. Amber risk score agreed in LTR WQRA workshop 10/02/22.	Control measure not yet defined or required [Harefield Service Reservoir DWSP].	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	1	5	5	Risk score retained from treatment stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	1	5	5	Harefield Reservoir 3 West DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Post-storage at the Harefield service reservoir, the treated water will be transferred into the distribution network. This transfer will not have any impact on the level of this parameter in the treated water.	Regulatory sampling at Harefield service reservoir.

Distribution

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Robust tap disinfection carried out prior to sampling. Promote customer awareness of the Water UK looking after water in your home advice leaflet [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Residual chlorine dosing will ensure this parameter is not present in the water in Harefield service reservoir and therefore the parameter will not be present in the water distributed to the consumer using existing Affinity assets.	-
Cryptosporidium	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Iron	3	3	9	Affinity Water Ickenham/Denham distribution DWSP 2022 - Legacy assets (e.g. iron mains) in use have caused discolouration events previously. Ickenham/Denham DWSP gives amber risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Guidance note NW016 Monitoring Discolouration encompasses AW Distribution Operation and Maintenance Strategy (DOMS) document which maintains the number of customer contacts to an acceptable level. Routine flushing programmes implemented where required. NW022 Valve Operations. OP344 Valve Operations Policy. NW103 Authorisation to interrupt Supply within the Network. OP033 Network Permission and Permit Form. AW0282 Method Statement [Affinity Water Ickenham/Denham distribution DWSP].	2	3	6	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Manganese	1	3	3	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	3	3	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Sulphate	1	3	3	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	3	3	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	-
Lead	2	5	10	Ickenham/Denham DWSP gives amber risk pre-control for 'Lead pipes'. Risk score agreed in LTR WQRA workshop 10/02/22.	Include corrosion prohibitor (e.g. orthophosphate dosing) in option design. This zone identified as being at risk from lead as does receive orthophosphate dosed water. Replacement of lead pipes in schools and nursery during AMP6 and enhanced communications [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Parameter will be controlled to mitigate distribution risks from lead piping (e.g. through orthophosphate dosing).	Include corrosion prohibitor (e.g. orthophosphate dosing) in option design.
THM Formation Potential	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such should be minimal impact on the level of this parameter as part of this project.	-
Nitrate	1	5	5	Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Nitrite	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Pesticides: total	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Benzo(a)pyrene	2	5	10	Affinity Water Ickenham/Denham distribution DWSP 2022 - leaching from bitumen lined mains. DWSP gives red risk pre-control. Amber risk score agreed in LTR WQRA workshop 10/02/22.	Pressure and flow controls on network. Repair and maintenance procedures. NW022 Valve Operations. OP344 Valve Operations Policy. NW103 Authorisation to interrupt Supply within the Network. OP033 Network Permission and Permit Form. AW0282 Method Statement.	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Dirty/discoloured water	3	3	9	Ickenham/Denham DWSP gives green risk pre-control. Amber risk score agreed in LTR WQRA workshop 10/02/22 to match possibility of discolouration from legacy assets (see iron) or build-up of deposits (see aluminium).	Flushing and monitoring (mainly reactive control measures).	3	3	9	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Odour	2	3	6	Ickenham/Denham DWSP gives green risk pre-control. Medium risk score retained to reflect that even with conditioning and customer engagement, some consumers may still perceive a change in water odour. This is in line with the DWI recommendation on parameters affecting customer acceptability. Risk score updated after LTR WQRA workshop to agreement of assessment team 07/22.	Design and management of distribution system procedure AM 307. Distribution Operation and Maintenance Strategy (DOMS) document maintains the number of customer contacts to an acceptable level. Identification and recording of Bitumen lined mains/PAH issues in the distribution network. NW022 Valve Operations. OP344 Valve Operations Policy. NW103 Authorisation to interrupt Supply within the Network. OP033 Network Permission and Permit Form. AW0282 Method Statement [Affinity Water Ickenham/Denham distribution DWSP].	2	3	6	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Taste	2	3	6	Ickenham/Denham DWSP gives green risk pre-control. Medium risk score retained to reflect that even with conditioning and customer engagement, some consumers may still perceive a change in water taste. This is in line with the DWI recommendation on parameters affecting customer acceptability. Risk score updated after LTR WQRA workshop to agreement of assessment team 07/22.	Design and management of distribution system procedure AM 307. Distribution Operation and Maintenance Strategy (DOMS) document maintains the number of customer contacts to an acceptable level. Identification and recording of Bitumen lined mains/PAH issues in the distribution network. NW022 Valve Operations. OP344 Valve Operations Policy. NW103 Authorisation to interrupt Supply within the Network. OP033 Network Permission and Permit Form. AW0282 Method Statement [Affinity Water Ickenham/Denham distribution DWSP].	2	3	6	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Change in hardness/alkalinity	2	3	6	Medium risk score retained to reflect that even with conditioning and customer engagement, some consumers may still perceive a change in water hardness. This is in line with the DWI recommendation on parameters affecting customer acceptability. Risk score updated after LTR WQRA workshop to agreement of assessment team 07/22.	-	2	3	6	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Change in source type (e.g. surface - groundwater)	2	3	6	Medium risk score retained to reflect that even with conditioning and customer engagement, some consumers may still perceive a change in water taste. This is in line with the DWI recommendation on parameters affecting customer acceptability. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Pathogens - bacteria, viruses, protozoa	1	5	5	Ickenham/Denham DWSP gives green risk pre-control for 'Viruses'. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	Residual chlorine dosing will ensure this parameter is not present in the water in Harefield service reservoir and therefore the parameter will not be present in the water distributed to the consumer using existing Affinity assets.	-
Dissolved organic carbon	1	4	4	Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Ammonium	1	3	3	Ickenham/Denham DWSP gives amber risk pre-control. Green risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	3	3	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Chloride	1	3	3	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	3	3	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project. A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required.	-
Turbidity	2	4	8	Ickenham/Denham DWSP gives amber risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Distribution network maintained and operated by Network Technicians, permit required to operate on the network. Mains repair procedure NW0239 reduces risk from mains deposits. Water quality monitoring procedures for sampling NW080 and SSO-101 AW Water Quality Sampling Procedure and NW080 Water Quality Sampling Following Network Activities. NW022 Valve Operations. OP344 Valve Operations Policy. NW103 Authorisation to interrupt Supply within the Network. OP033 Network Permission and Permit Form. AW0282 Method Statement [Affinity Water Ickenham/Denham distribution DWSP].	1	4	4	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Algae	1	4	4	Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Aluminium	4	4	16	Ickenham/Denham DWSP gives red risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	Mains flushing in the distribution system to remove existing accumulated aluminium deposits [Affinity Water Ickenham/Denham distribution DWSP].	2	4	8	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such there will be no impact on the level of this parameter as part of this project.	-
Metaldehyde	2	5	10	Ickenham/Denham DWSP gives amber risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Amber risk score agreed in LTR WQRA workshop 10/02/22 to reflect lack in certainty of data.	-	1	5	5	PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	1	5	5	Ickenham/Denham DWSP gives green risk pre-control. Risk score agreed in LTR WQRA workshop 10/02/22.	No control measure required [Affinity Water Ickenham/Denham distribution DWSP].	1	5	5	Distribution from Harefield service reservoir based on existing Affinity Water assets, and as such should be minimal impact on the level of this parameter as part of this project.	-

Consumer

Parameter	Pre-mitigated Likelihood	Consequences	Risk	Risk Commentary	Control	Post mitigated Likelihood	Consequences	Residual risk	Residual risk considerations	Actions
Escherichia Coli	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Cryptosporidium	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Iron	2	3	6	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	3	6	The consumer will experience no change to the levels of this parameter due to addition of new water from this option, however the risk of deposits in the network remain.	-
Manganese	1	3	3	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Sulphate	1	3	3	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO.	1	3	3	A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required. The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Lead	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
THM Formation Potential	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Nitrate	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Nitrite	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Pesticides: total	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Benzo(a)pyrene	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Dirty/discoloured water	3	3	9	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	3	3	9	The consumer will experience no change to the levels of this parameter due to addition of new water from this option, however the risk of deposits in the network remain.	-
Odour	2	3	6	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO. Even with water conditioning and customer engagement before changing water supplies, it is unlikely that after the SRO is implemented, all customers will accept the water change immediately. Once the SRO is implemented and resulting customer concerns have been addressed, then the risk score could be reduced to low.	2	3	6	The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Taste	2	3	6	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO. Even with water conditioning and customer engagement before changing water supplies, it is unlikely that after the SRO is implemented, all customers will accept the water change immediately. Once the SRO is implemented and resulting customer concerns have been addressed, then the risk score could be reduced to low.	2	3	6	The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Change in hardness/alkalinity	2	3	6	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO. Even with water conditioning and customer engagement before changing water supplies, it is unlikely that after the SRO is implemented, all customers will accept the water change immediately. Once the SRO is implemented and resulting customer concerns have been addressed, then the risk score could be reduced to low.	2	3	6	The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Change in source type (e.g. surface - groundwater)	2	3	6	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO. Even with water conditioning and customer engagement before changing water supplies, it is unlikely that after the SRO is implemented, all customers will accept the water change immediately. Once the SRO is implemented and resulting customer concerns have been addressed, then the risk score could be reduced to low.	2	3	6	The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Pathogens - bacteria, viruses, protozoa	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Dissolved organic carbon	1	4	4	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Ammonium	1	3	3	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	3	3	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Chloride	1	3	3	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	Possibility that as a result of the change of source the consumer could experience a change in perception of their water. Therefore, proactive customer engagement should be implemented to ensure consumers are aware of potential changes in water perception as a result of this SRO.	1	3	3	A combination of sulphate, chloride and alkalinity is used to determine the Larson-Skold index corrosivity indicator. Close control of Larson-Skold index is therefore required. The consumer may perceive changes to the levels of this parameter as a result of this project.	If required, ensure comprehensive customer engagement at a later stage of the project.
Turbidity	1	4	4	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Algae	1	4	4	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	4	4	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-
Aluminium	2	4	8	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	4	8	The consumer will experience no change to the levels of this parameter due to addition of new water from this option, however the risk of deposits in the network remain.	-
Metaldehyde	2	5	10	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	2	5	10	Metaldehyde has been outlawed since the end of March 2022, so it is assumed that by the time this SRO is implemented metaldehyde will be a less relevant hazard.	-
Perfluoroalkyl substances (PFAS)	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	PFAS substances are an emerging hazard and should continue to be monitored.	-
Hydrocarbons	1	5	5	Risk score retained from distribution stage. Risk score agreed in LTR WQRA workshop 10/02/22.	-	1	5	5	The consumer will experience no change to the levels of this parameter or associated effects as a result of this project.	-


Affinity Water
Taking care of your water


Thames
Water