UUWR_11.3

PR24 Draft Determination: UUW Representation

Area of representation: Appendix -Wigan WwTW

August 2024

This document outlines UUW This document is a supporting appendix to accompany UUW DD representation document UUWR_11 – Gated mechanisms providing technical information on Wigan WwTW.

Reference to draft determination documents [PR24 draft determination: Expenditure Allowances, section 4.7.3 Approach to large schemes, pages 177 - 184

United Utilities

Water for the North West

1. Key points

- **Negotiations with the Environment Agency have been complex, but now are clear:** We recognise that Environment Agency negotiations have been prolonged as we have optimised adaptive plans that deliver benefits for customers. We have a clear need for Wigan WwTW and since the October 2023 submission we have worked hard to optimise the scope, cost and delivery schedule. This has reduced AMP8 requirements by £74m for Wigan and avoids wasteful or abortive investments. We now have clarity and are ready to deliver at pace for customers and the environment based on the optimised plan.
- **UU is certain on the regulatory requirement, the solution and the associated cost to deliver to ensure all AMP8 regulatory drivers can be met at Wigan WwTW –** a considerable site intervention is necessary to meet the challenging AMP8 WINEP requirements for the technically achievable limits (TAL) for phosphorus (P) and ammonia. The proposal for a biological P removal approach at Wigan, delivers the most resilient, sustainable and efficient solution for the future. However, in comparison to the more widely used chemical removal approach, it does not perform effectively through standard cost assessment models. In addition, significant site-specific construction costs that have been identified through the detailed cost development process, are also not assessed effectively through the standard modelling approach. We discuss further our observations on the cost assessment approach for phosphorus removal in UUWR_33_Phosphorus Removal. In this appendix to UUWR_11 we present evidence for our cost assessment for Wigan WwTW.
- **We have embedded an effective adaptive planning approach and have a track history of determining the right time to replace existing secondary treatment assets when they are no longer fit for purpose:** We have built similar schemes at Blackburn, Oldham and Davyhulme in recent AMPs and believe these large AMP8 schemes are similar in nature.
- **We have done a full bottom-up estimate, assessing site specific risks:** We understand the construction complexity of the schemes and have included construction phasing, temporary treatment and land purchase costs as necessary to secure delivery to the stringent standards by the agreed regulatory date.
- **We have applied adaptive planning principles for these sites:** with awareness of the long-term drivers in the Environment Act, we have included solutions for AMP8 that enable best overall value for customers and the environment considering the AMP8 and AMP9 drivers.
- **Site specific constructability challenges have added significant additional cost to the Wigan scheme:** the constrained nature of the site and ground conditions are key factors which we consider would not be fully assessed through standard model assessment.

2. Introduction and Site Overview

This document is an appendix to UUWR_11_Gated mechanism. Here we describe the development of the Wigan scheme in detail and provide additional information around the solution development, the constructability assessment and specific challenges to Wigan. We consider that this early detail is key to understanding the delivery schedule as well as supporting a robust cost estimate.

Our PR24 submission included four large wastewater projects at some of our largest treatment works. This appendix relates to the scheme at Wigan WwTW. Due to the scale of investment and perceived uncertainty of scope and costs, Ofwat has placed Wigan WwTW into the newly proposed large scheme gated process for added scrutiny and customer protection.

The Wigan scheme is driven by improving the status of the River Douglas and the solution combines drivers for Skelmersdale WwTW (also discharging to the River Douglas) and requirements for improving the status of Pennington Flash, with all drivers documented in the WINEP. In addition, we have considered future requirements and long-term planning principles to ensure there is no abortive short-term investment for customers.

We have developed the best value solutions through an optioneering process, and we have challenged ourselves on the need and solution. Based on the knowledge and experience of our capable engineering team and those of our experienced supply chain partners we have proposed solutions that meet the requirements of the Environment Agency as set out in the WINEP, deliver the necessary significant environmental improvements and are best value for customers.

Our proposal is to move Wigan to the enhanced engagement and cost sharing scheme as described in UUWR_11_Gated mechanism. On moving we recommend cost assessment is carried out as a deep dive cost assessment rather than through a modelled approach. The scheme for Wigan is a large biological phosphorus removal process with demonstrable constructability challenges that we expect to be viewed as an outlier against the model assessment. Our observations of the limitations of the phosphorus removal cost assessment models are discussed in detail in UUWR_33_Phosphorus removal, with a summary of relevant areas as follows:

- Ofwat has developed four econometric models to assess phosphorus removal costs. Two of these models are backwards-looking, using data on the AMP7 phosphorus removal programme, while two are forward-looking, using data on companies' proposed phosphorus expenditure within AMP8. These models perform well in terms of statistical significance, though there is a noticeable deterioration in the model fit of the backward-looking AMP7 models. PR24 is the first time Ofwat has used a scheme-level econometric approach.
- Ofwat assesses outliers separately. It identifies outliers using the Cooks Distance statistic. Outliers are subject to a deep dive assessment. 'Efficient' outliers receive the business plan value rather than the (higher) modelled value. 'Inefficient' outliers receive the modelled value if insufficient evidence has been provided to support higher cost forecasts.
- Ofwat does not distinguish between chemical and biological solutions, because it considers that biological solutions will only be adopted at a small number of sites in AMP8.

The final point of not distinguishing between chemical and biological solutions being key to Wigan, as biological phosphorus removal is the best value solution. We consider that large biological phosphorus removal solutions will not perform well through existing model assessments. In our solution development, we have considered chemical supply resilience, impact to customers from traffic movements from chemical tanker deliveries and whole life cost assessments that we propose are not appropriately considered in existing model assessments.

We are supportive of biological phosphorus removal techniques, along with the Environment Agency. However, if insufficient allowance to deliver biological phosphorus removal materialises, we may be guided towards the lowest capex solution and to what we consider to be a lower value and less resilient solution of chemical P removal and the disruption that the extensive tanker movements this will result in at Wigan. Furthermore, for we have carried out bottom-up estimates and considered the constructability challenges in detail. Further information on the issues at Wigan is included in this appendix, but key to this scheme are issues such as confirmed contaminated land and constructing close to critical third-party infrastructure. These are considerable

challenges and we have assessed the impact on the costs which we consider would not be well represented through standard cost assessment modelling.

Following the October 2023 business plan submission we have used the time wisely and have continued to carry out a further review of the scope and costs for the Wigan project. This document provides information around the technical and constructability challenges and presents additional evidence to demonstrate that the solutions and costs UU submitted are accurate and efficient.

2.1 Overview - Site considerations

Stretching Permit Limits

The drivers for Wigan are documented in the WINEP and summarised in table 1.

As indicated in the table the new permit levels are at Technically Achievable Limits (TALs) and are extremely stringent. Stringent targets at significantly large WwTWs adds complexity and cost. We have applied adaptive planning principles to consider future drivers to minimise spend across AMPs and provide solutions that are resilient.

Our plans detail the best available technologies (BAT) for treating wastewater to low levels and how we arrived at our proposed solutions.

Table 1: Table showing drivers by site (red depicts new permit that will be at technically achievable limit)

Site	AMP 8 new drivers			
	BOD	Ammonia	Phosphorus	Cypermethrin
	mg/l 95%ile	mg/l 95%ie	Annual average	ug/l 99%ile
Wigan		1	0.25	0.0035885

Source: UUW analysis

The red coding in Table 1 shows where drivers include permit levels at the TAL. The term TAL is not an absolute number, but it is an indication of on average the minimum level for that driver that is currently possible. There will be examples of sites in the UK with permits lower than the TAL where companies have agreed to take on more onerous targets due to the nature of the assets on site or for use in a flexible permitting environment. However, the TAL limit indicates the minimum environmental standard expected for these determinands (BOD, ammonia etc).

As we are now clear on the long-term WINEP ambitions we have deployed adaptive planning principles and explored the potential for phased driver delivery that we considered we efficient and appropriate in seeking the lowest cost solution in AMP8 and for the whole life of the facility at Wigan.

Constructability challenges

As part of our approach to developing the submitted solutions for our major AMP8 projects we consulted with our external supply chain to ensure site specific constructability issues were identified and considered.

Two major constructability themes have been identified; constrained site conditions and the surrounding built environment. Adapting to and resolving these challenges has resulted in site specific cost increases when compared to a typical capital intervention.

Constrained Site Conditions

Wigan is at or near the site footprint capacity. There are no substantial undeveloped areas for the construction of new build assets. This results in additional constructability requirements such as the need to demolish redundant assets, construct in challenging ground conditions (including building on brown field sites / flood plains). This impacts programme sequencing and can necessitate temporary treatment to enable the continuity of existing

treatment to be maintained during construction. Where construction within the site boundary is unachievable, we have identified the need to purchase land or rent land for the location of site compounds, plant storage and equipment laydown areas.

Surrounding Built Environment

Wigan is significantly constrained by its surrounding geography and adjacent land use. These factors present several challenges that drive increased costs and prolong construction timescales at each site.

The presence of a high density of third-party assets, such as overhead and buried high voltage power lines, gas and telecom infrastructure requires significant service diversions and / or protection works.

The choice and design of our solutions is influenced by the need to give due consideration to limiting construction nuisance, such as noise, vibration and odour emissions that may impact the surrounding residential communities.

Construction activities and plant access is required near a number of strategic transport assets such as the Leeds Liverpool Canal, road bridges, and railway infrastructure that passes to an immediate site boundary. There will also be programme and cost impacts due the need to obtain specific permissions, such as National Highways Approval In Principle, (AIP), undertake monitoring works during construction and the need to employ specialist low impact construction techniques.

Wigan is located close to sensitive residential properties and commercial premises adjacent to the site boundaries. This requires the adoption of appropriate working practices, such as low noise and vibration techniques, dust and odour suppression measures and restricted working hours to ensure that disruption to customers is controlled to within acceptable levels.

Specific constructability requirements have been identified and are discussed in this appendix; they significantly contribute to increased project costs.

2.2 Overview of Wigan WwTW

In this appendix we evidence how the scope and costs for Wigan WwTW, are robust and the site is more appropriately managed through the enhanced engagement and cost sharing scheme.

The Wigan scheme is driven by the need to improve the status of the River Douglas and the solution also combines drivers for Skelmersdale WwTW (also discharging to the River Douglas) and requirements for improving the status of a nearby waterbody, Pennington Flash, important for wildlife and recreational use. The multiple drivers for this project are confirmed and documented in the WINEP. The drivers influencing the need for a significant rebuild of Wigan relate to new low cypermethrin, ammonia and phosphorus permit levels. This document details the best available technologies (BAT) for treating wastewater to low levels for these determinands and how we arrived at our proposed solutions.

3. The Need for the Project

Wigan WwTW is located between the villages of Hoscar and Parbold in the county of Lancashire and serves a population equivalent of 363,577. The AMP8 drivers in the WINEP for Wigan are 1mg/l ammonia, 0.25mg/l phosphorus and 0.0035885ug/l cypermethrin (Table 2).

However, there are also additional drivers in the catchment at Skelmersdale (a site within 0.5miles of Wigan, with linked assets) and Pennington Flash (large overflows on trunk sewers) that provide an opportunity to develop a best value catchment solution. These drivers include 0.25mg/l phosphorus at Skelmersdale WwTW, population equivalent 57,017 (Table 2), and no more than 10 spills per year on average from 7 CSOs into Hey Brook and Pennington Flash.

Table 2: Summary of the existing permit and future quality drivers for Wigan and Skelmersdale WwTW

Wigan	**Existing permit**	**AMP8 WINEP Driver 31st March 2030**
BOD mg/l 95%ile	15	
Ammonia mg/l 95%ile	3	1
Phosphorus mg/l annual average		0.25
Cypermethrin ug/l 95%ile		0.0035885
UV disinfection, mJ/cm2	35 Measured applied dose	TBC Validate dose*
Skelmersdale	**Existing permit**	**AMP8 WINEP Driver 31st March 2030**
BOD mg/l 95%ile	12	
Ammonia mg/l 95%ile	3	
Phosphorus mg/l annual average		0.25
UV disinfection, mJ/cm2	35 Measured applied dose	TBC Validate dose*

Source: UUW analysis from WINEP 5 July 2024 (*standard requirement that validated dose must be confirmed through 12 months of operational data)

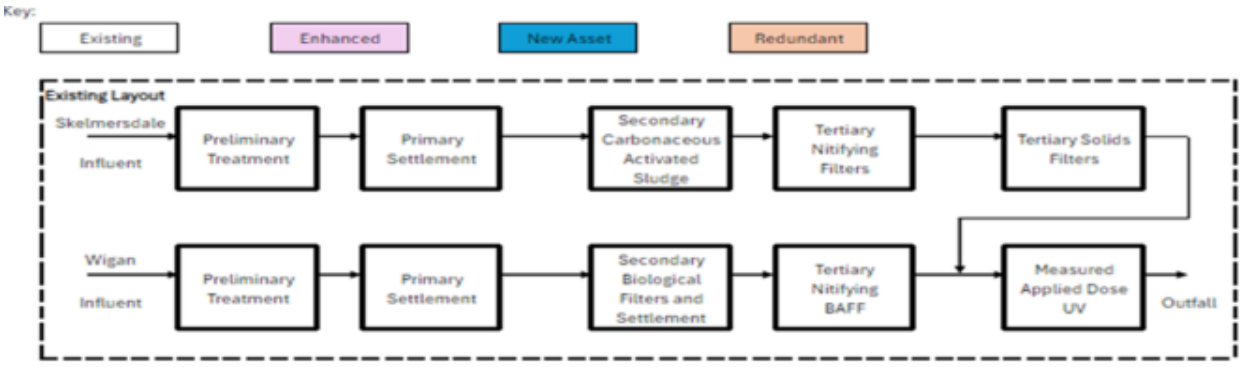
As stated above, there are also 7 CSOs within the Wigan catchment, with spill drivers of no more than 10 spills per year in AMP8. These sites are:

- WIG0255 Hindley PS
- WIG0095 Templeton Rd PS
- WIG0128 Bickershaw Lane PS
- WIG 0129 Crankwood Rd PS
- WIG0130 Abram Hall PS
- WIG0153 Strangeways CSO
- WIG0216 Abram Hall CSO

As described in our main document UUWR_11 Gated mechanism we describe our efforts to implement an adaptive plan that phased drivers, optimised across assets and ultimately how this was constrained to be fundamentally an AMP8 set of requirements.

The existing treatment processes at Wigan and Skelmersdale are depicted in Figure 1. Wigan WwTW existing process comprises preliminary and primary treatment, trickling filters and a nitrifying biological aerated flooded filter (BAFF). Whilst the existing process at Skelmersdale comprises preliminary and primary treatment with a carbonaceous activated sludge process, nitrifying filters and tertiary solids removal then both flows are combined and passed through a UV plant (currently measured applied dose).

Figure 1: Existing Treatment Processes at Skelmersdale and Wigan WwTWs



Source: UUW analysis

4. Development of the technical solution

4.1 Challenging permit conditions have driven the solution

FTFT Increase

In our business plan we describe Hindley Pumping Station Storm Overflow WIG0255SO (which covers all 7 CSOs which discharge into the Pennington Flash catchment), we demonstrate from our optioneering process that the best value solution to meet the spill drivers set out in the AMP8 WINEP is storm storage at 6 out of the 7 CSOs and an increase in the pass forward flow (PFF) to Wigan WwTW. The increase in flow to full treatment (FTFT) at Wigan is required to ensure no detriment to spills at the works.

The hydraulic capacity of the existing treatment assets at Wigan WwTW is limited to the current FTFT, the site therefore requires additional treatment capacity to treat this increase in FTFT.

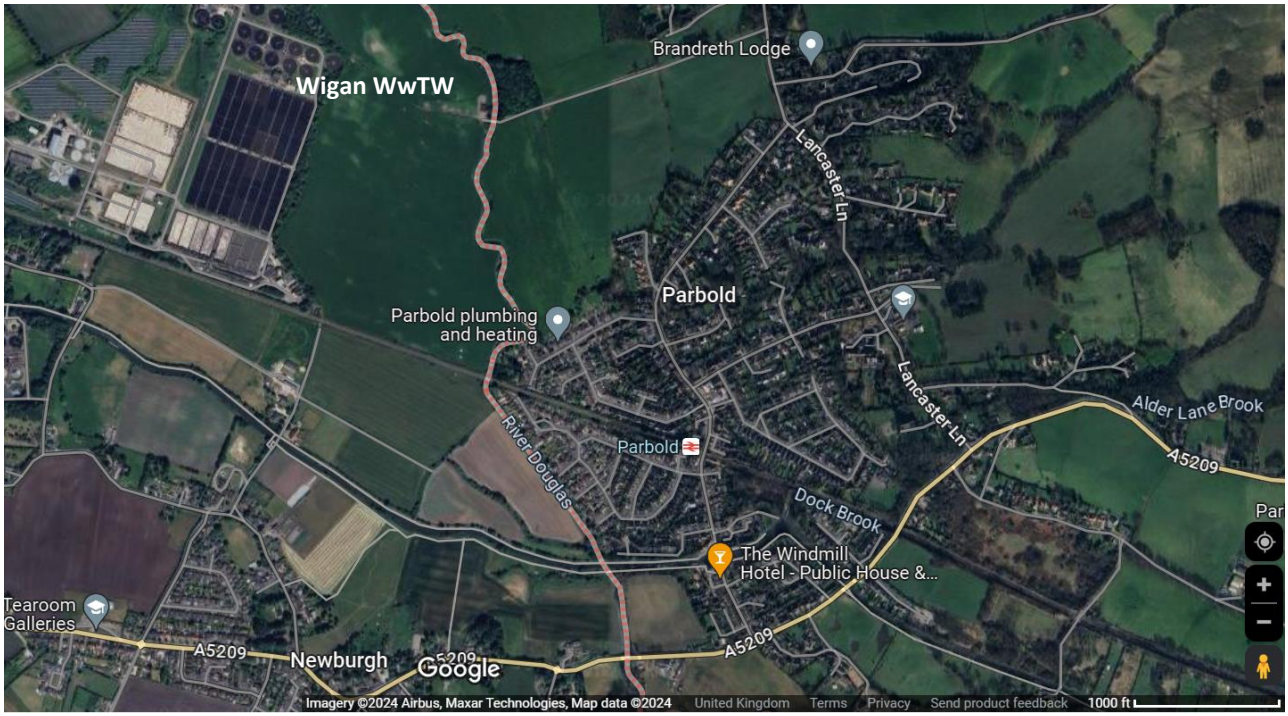
The intervention also triggers the need to replace the existing UV installation at Wigan (which currently treats both Wigan and Skelmersdale flows). The Environment Agency require UV permits to move from Measured Applied Dose (MAD) to Validated Dose when FTFT changes. It has been confirmed by a technical specialist at Stantec that the existing UV installation is not able to meet a validated dose.

Odour Risk to our Neighbours

In our optioneering process we have looked to repurpose the existing trickling filters, which currently operate in a bespoke double pass configuration, to operate in a single pass configuration to remove the hydraulic constraints of the site. However, due to the nature of trade effluent in the Wigan catchment (Heinz Manufacturing, amongst others) the crude sewage at Wigan is variable and has a risk of odour generation, which we currently control through operational interventions. An Odour Impact Assessment (OIA) of changing to a single pass trickling filter solution was carried out to understand the impact on site odour this would create and the subsequent effect it could have on local communities and customers.

As shown in Figure 2, Parbold village is immediately down wind of the prevailing westerly winds from Wigan WwTW, and the topography of the land which rises in altitude to the east of Parbold, results in the village being at high risk of experiencing unacceptable odours.

Figure 2: Location of Parbold village between Wigan WwTW and Parbold Hill



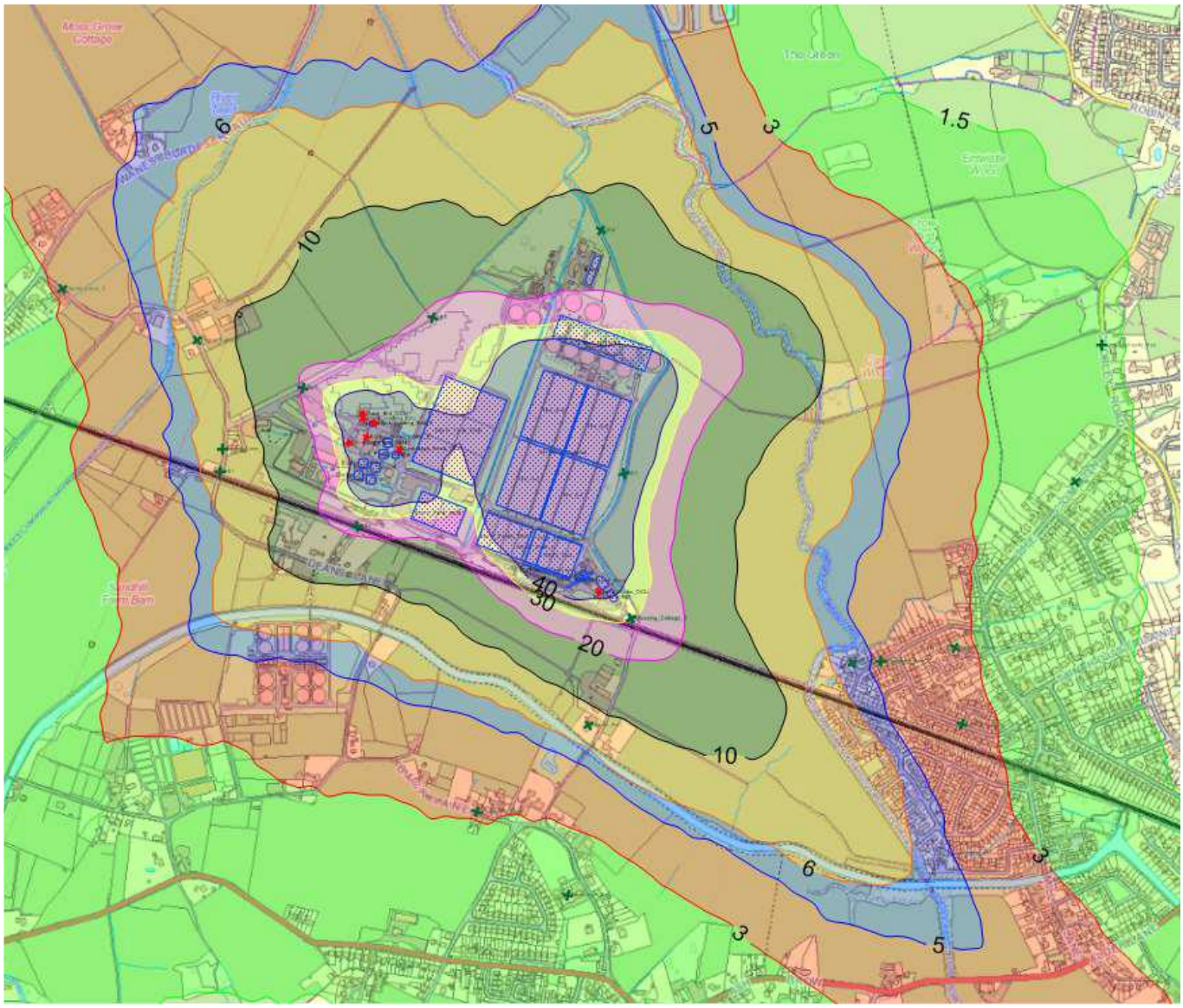
Source: Google Maps

We currently manage the risk associated with odour through operational interventions. However, the odour map in Figure 3, from the OIA, shows that a third of Parbold village lies within the >3.0 OU_E/m_3 contour and with a section of the western edge of the village within the >6 OU_E/m_3 contour if we were to convert the works to a single pass trickling filter configuration.

The Environment Agency Horizontal Guidance Note H4 considers 3 OUE/m_3 the threshold for moderately offensive odour. This increase in odour and the detrimental impact it would have on local communities is unacceptable. We have considered covering and providing odour control for all the trickling filters (circa 55,000m^2), however, given their considerable size this is not a cost efficient or sustainable option.

Repurposing of the trickling filters was therefore discounted based on unacceptable odour nuisance for customers.

Figure 3: Odour model with secondary filter emissions data from 2015 and 2020 surveys with all filters operating as single pass



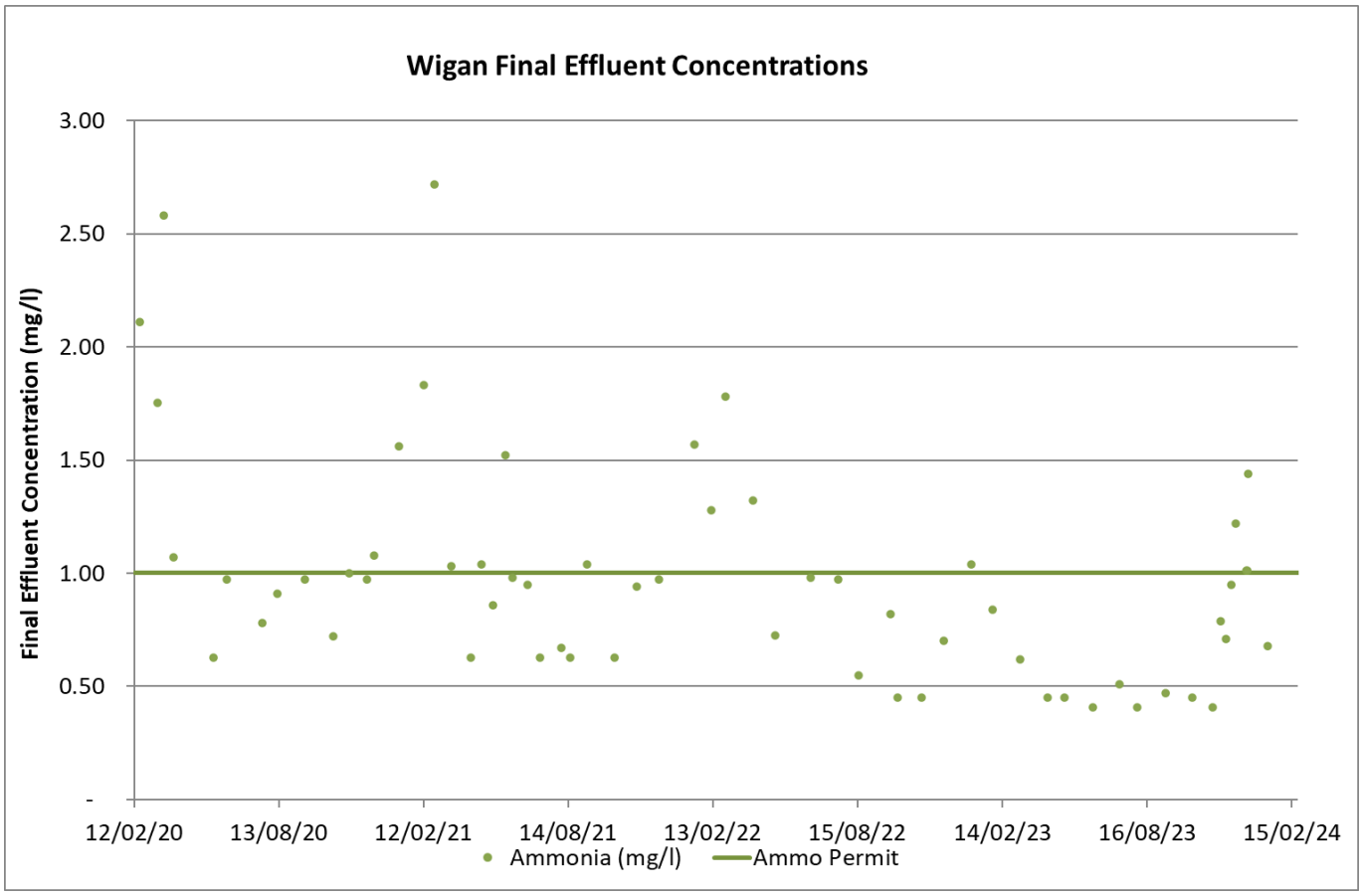
Source: UUW Odour Impact Assessment

Wigan Ammonia

The existing ammonia permit at Wigan is 3mg/l, which came into force in 2009. This was achieved at that time by the installation of tertiary nitrification downstream of the two sets of filters by the installation of a Biological Aerated Flooded Filter (BAFF). The BAFF installation was designed to meet the 3mg/l driver and is not capable of achieving 1mg/l, especially when the flow to full treatment is also increasing.

In support of the above statement Figure 4 shows the recent ammonia performance of the final effluent at Wigan. Although it comfortably meets the current ammonia permit of 3mg/l, this graph shows that it cannot meet a 1mg/l permit limit.

Figure 4: Final Effluent ammonia performance at Wigan WwTW



Source: UUW analysis

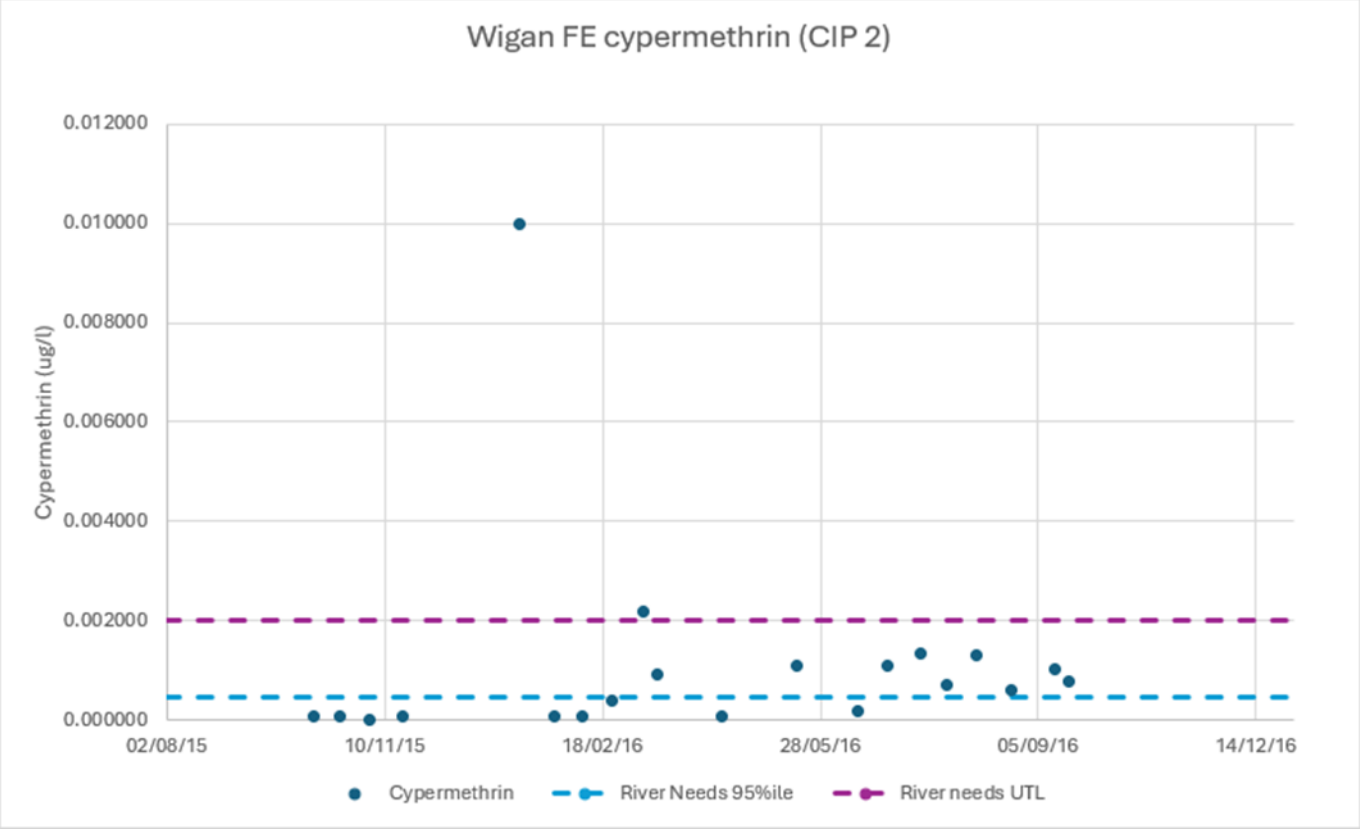
The combination of the need to provide additional nitrification capacity to meet the 1mg/l Ammonia driver and the necessary capacity increase to treat increased pass forward flow from Pennington Flash CSOs, without a detriment to odour, resulted in a necessary rebuild of the secondary treatment process at Wigan WwTW.

Wigan Cypermethrin

It is not possible to meet the new Cypermethrin permit limit at Wigan with the existing assets; trickling filters and BAFF plant. Cypermethrin removal at the treatment works is primarily associated with adsorption onto organic matter and removal in the sludge.

Figure 5 shows the concentration of Cypermethrin in the final effluent at Wigan during Chemical Investigation Programme 2 (CIP2) trials. It clearly demonstrates that the existing treatment processes (two stages of filtration, BAFF and UV) are not capable of meeting the future permit.

Figure 5: Cypermethrin in Wigan WwTW final effluent – data from CIP2 study



Source: UUW analysis

CIP2 extensively studied various wastewater treatment processes and their efficacy in removing micropollutants, including Cypermethrin. Conclusions drawn from assessment of different treatment processes in CIP2, show that Cypermethrin is most consistently removed from wastewater using activated sludge-based treatment processes. According to CIP2 results, activated sludge systems, which promote microbial degradation and adsorption, achieve higher removal rates of Cypermethrin due to their longer sludge retention times and higher biomass concentrations (UK Water Industry Research [UKWIR], 2014).

Trickling filters, which were not specifically assessed for cypermethrin removal in CIP2, generally demonstrate lower removal efficiencies for hydrophobic organic compounds like Cypermethrin. This is due to their reliance on biofilms with lower biomass concentrations and shorter hydraulic retention times, which are less effective at adsorbing and degrading such pollutants (Metcalf & Eddy, 2013).

We did consider alternative tertiary treatment processes, based on the data provided from CIP2, but there was no evidence that any would achieve the cypermethrin driver.

In conclusion, to meet the cypermethrin permit requirements based on River Needs values, it is necessary to implement an activated sludge-based treatment process in the new solution for the treatment works.

Wigan and Skelmersdale Phosphorus and Transferring Skelmersdale to Wigan

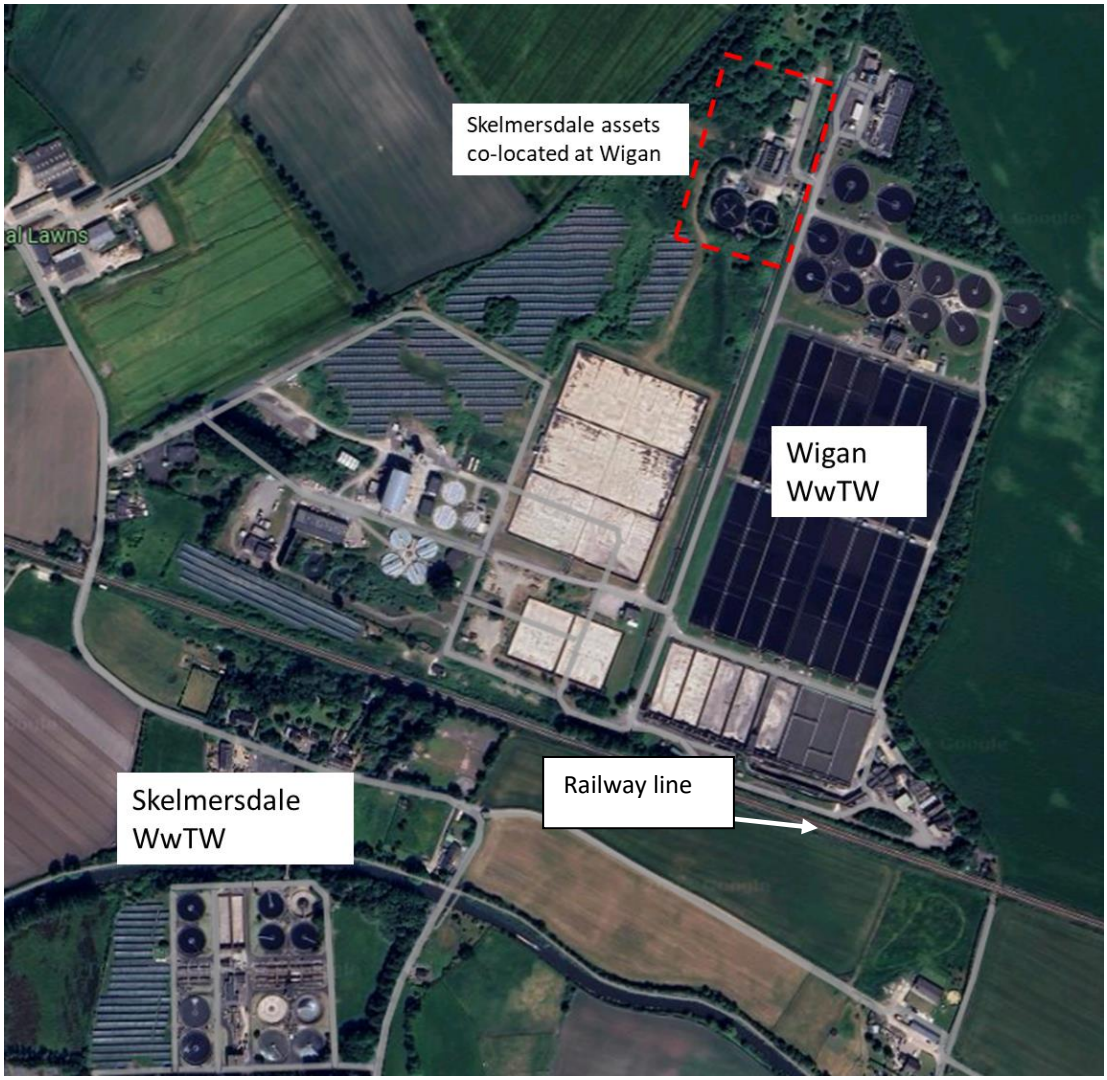
Both Wigan and Skelmersdale WwTW have phosphorus drivers at the TAL of 0.25mg/l.

As shown in Figure 6, Skelmersdale WwTW is adjacent to Wigan WwTW. The tertiary treatment assets dedicated to the Skelmersdale effluent are located on the Wigan site, and flows from the tertiary treatment are combined with Wigan effluent upstream of the combined UV facility.

Combining the interdependency of the two sites, the stringent phosphorus drivers at both sites (with the same regulatory date), and the imperative to rebuild the secondary treatment process and UV plant at Wigan as discussed above, the best value solution for customers is to combine the settled effluent from Skelmersdale within the solution for rebuilding the secondary treatment at Wigan.

As discussed in our representation for our phosphorus programme (UUWR_33_Phosporus removal), when a new secondary treatment process is part of solution for sanitary drivers, the best value sustainable solution is to deliver biological phosphorus removal at the same time for phosphorus drivers. We were also conscious of the PR24 WINEP driver guidance – nutrients and sanitary determinands (surface waters) which states on page 18 that "*Water companies are encouraged to take opportunities, where possible, to make greater use of biological phosphorus removal techniques and to recycle or recover phosphorus from WwTW when designing actions to meet environmental targets*". We therefore developed an adaptive plan to deliver biological phosphorus removal as part of the AMP8 catchment solution.

Figure 6: Location of Skelmersdale WwTW in relation to Wigan WwTW



Source: UUW with Google Map

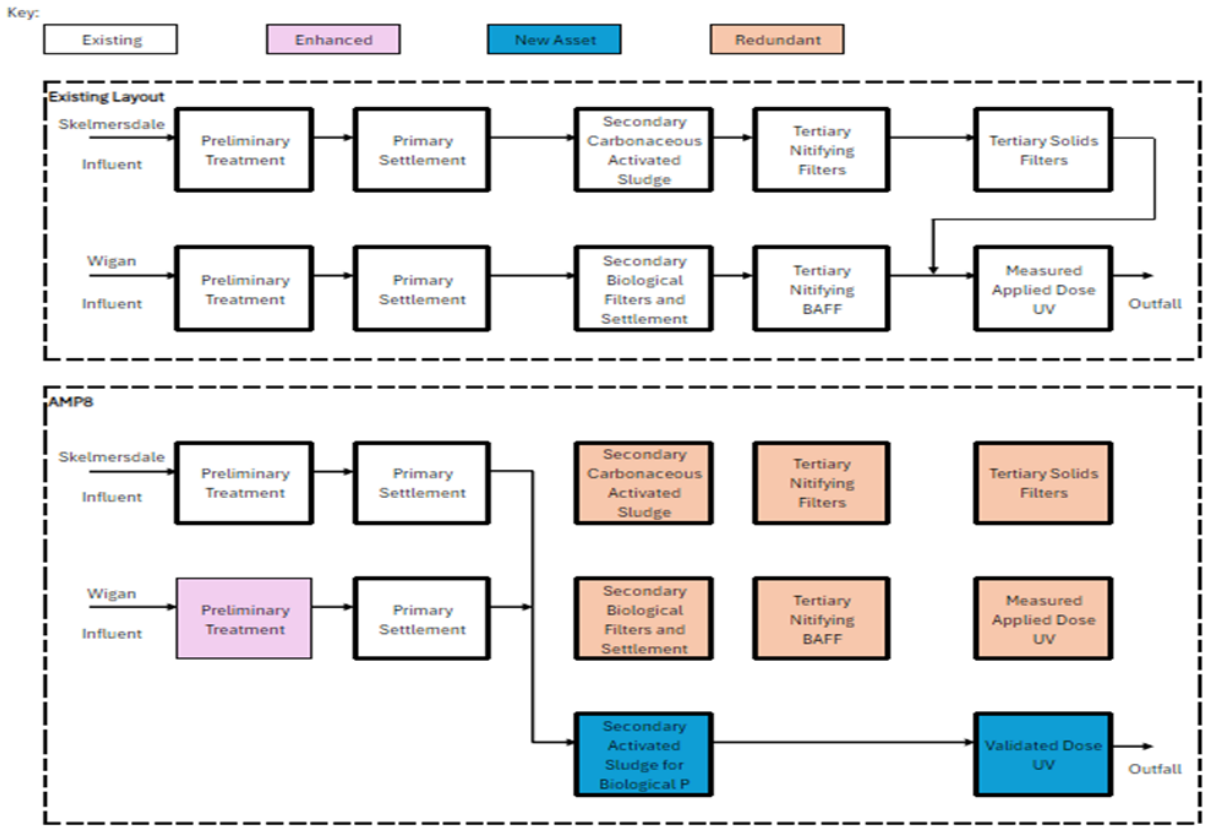
4.2 Technical Solution in the Business Plan October 2023

As described in the previous sections, the AMP8 WINEP drivers for Wigan, Skelmersdale and Pennington Flash have enabled us to develop a catchment solution to meet the combined drivers for these sites. We have considered how we could re-purpose existing assets, but as described above the combination of required additional treatment capacity (from an increase in FTFT to meet CSO 10 spill drivers), and does not have a detrimental odour impact, with the need for additional treatment capacity to meet the new ammonia and cypermethrin consents, results in a necessary re-build of the secondary treatment process at Wigan WwTW.

We have therefore combined all the drivers into an adaptive catchment solution based on a new Activated Sludge biological phosphorus installation at Wigan WwTW, which when combined with the storm storage capacity being installed at 6 CSOs, meets all the drivers in the catchment for AMP8. We are certain this represents the best value solution for customers and delivers a sustainable catchment solution.

The new solution is to combine the effluent form Wigan WwTW and Skelmersdale WwTW downstream of primary settlement, deliver a new biological phosphorus removal activated sludge process (Bio P ASP) and a new validated dose UV process (Figure 7). This will allow delivery of the new drivers whilst incorporating the additional flows.

Figure 7: Treatment assets at Wigan and Skelmersdale WwTWs pre and post AMP8



Source: UUW analysis

5. Constructability challenges and influence on cost

The Wigan AMP8 project carries significant constructability challenges around ground conditions (land make up requires significant piling to stabilise new assets) and site constraints in trying to ensure all new build assets are retained within the sites existing footprint (Figure 8 and Figure 9). Full details of these challenges, with associated costs, are detailed in this section.

5.1 Ground Conditions

Geotechnical investigations indicate that extensive deposits of made ground are present in the areas available for proposed development (up to a thickness of 5m) with low strength alluvial deposits present beneath (up to depths of 9m). Therefore, to ensure stability of assets, piled foundations will be required for all structures.

There is significant congestion of existing buried services across the site which will necessitate service diversion and protection works, this will add both time and cost to the delivery of the Wigan project.

5.2 Land and Planning Issues

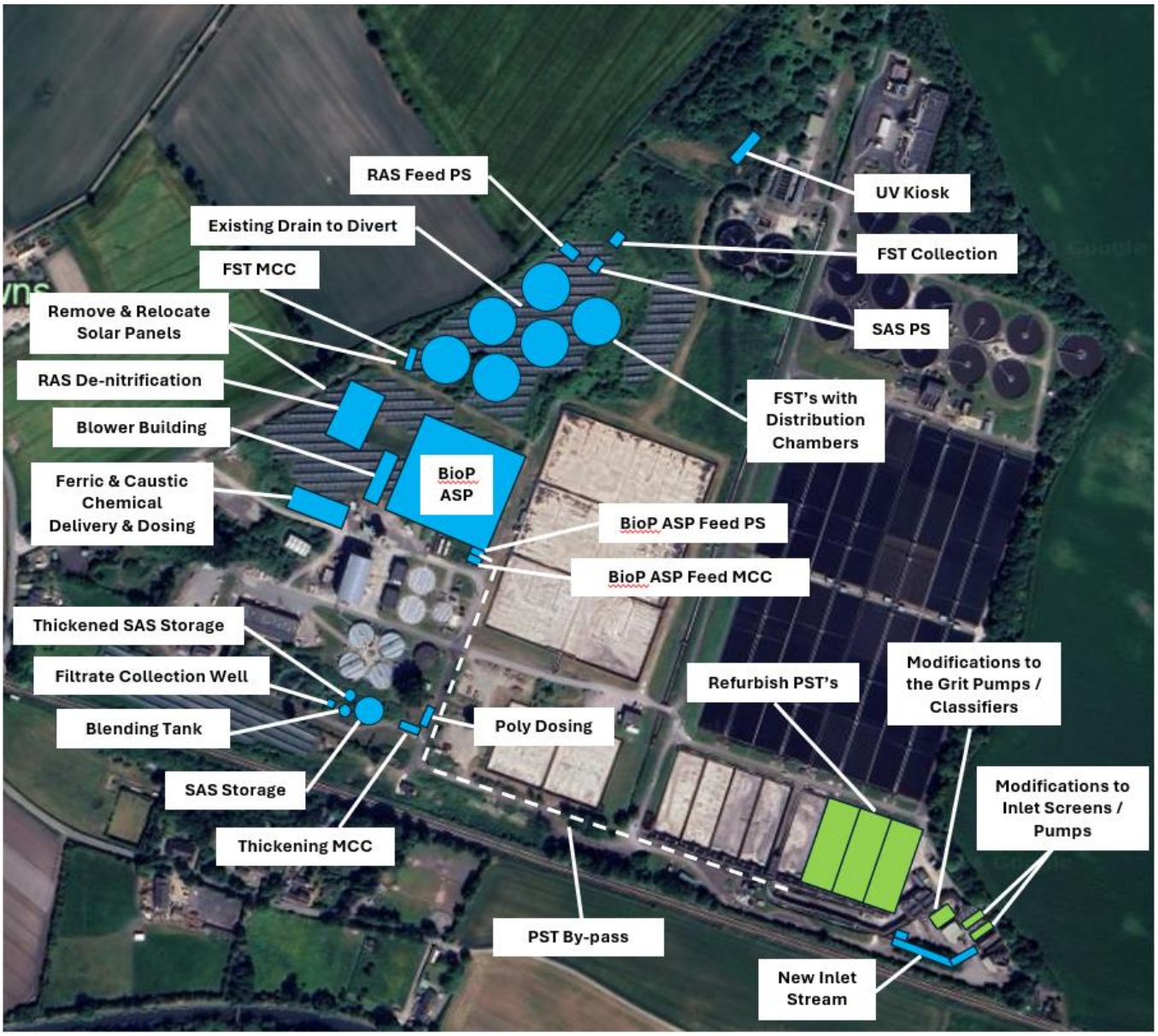
The key challenge for Wigan WwTW is the constrained site conditions to the east by the village of Parbold. Adapting to and resolving this challenge has resulted in site specific cost increases. The Wigan treatment works is near its site footprint capacity, to the south there is a railway line and access to the site is narrow and passes underneath the Leeds-Liverpool Canal and to the north is woodland and the River Douglas (Figure 6). As a result, there little substantial undeveloped areas for the construction of new build assets

To facilitate construction and access there will be a requirement to lease land to allow the existing on-site solar farm, (owned and operated by a third party) to be temporarily relocated. The solar farm will be required to be relocated prior to commencing construction activities and will be required to be re-established and relocated back onto Wigan WwTW on completion of the works.

There is limited land available for the reuse of excavated material on site. Off-site disposal costs will therefore be incurred for significant volumes of excavated material.

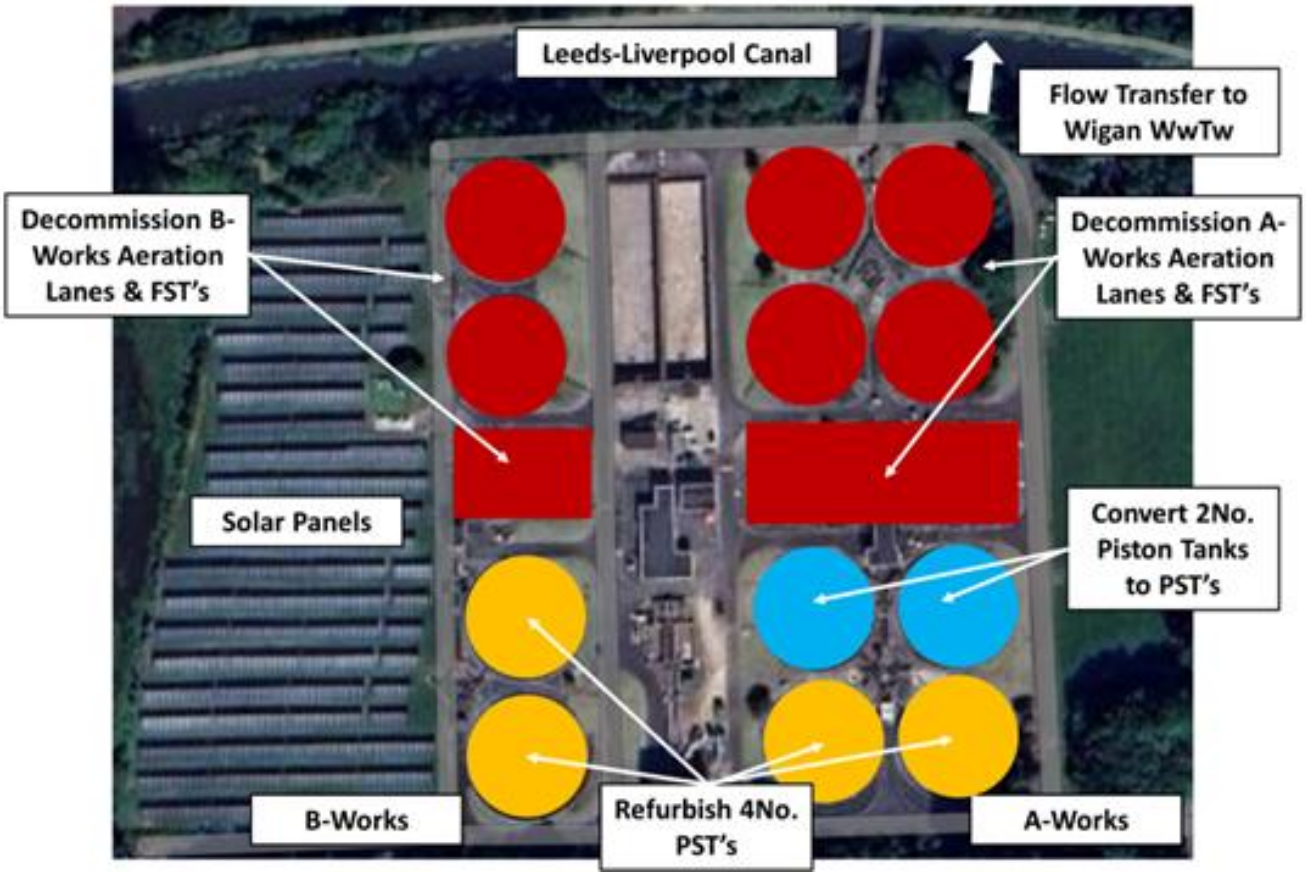
Planning advice indicates that due to the size and extent of the project, (including off site works at Pennington Flash) an Environmental Impact Assessment (EIA) screening assessment will be required. There is a significant risk that a full EIA will be required, with associated programme and cost impacts.

Figure 8: Wigan WwTW site plan indicating location of new assets



Source: UUW produced with Google Maps

Figure 9: Skelmersdale WwTW site plan indicating location of new assets and decommissioned assets



Source: UUW produced with Google Maps

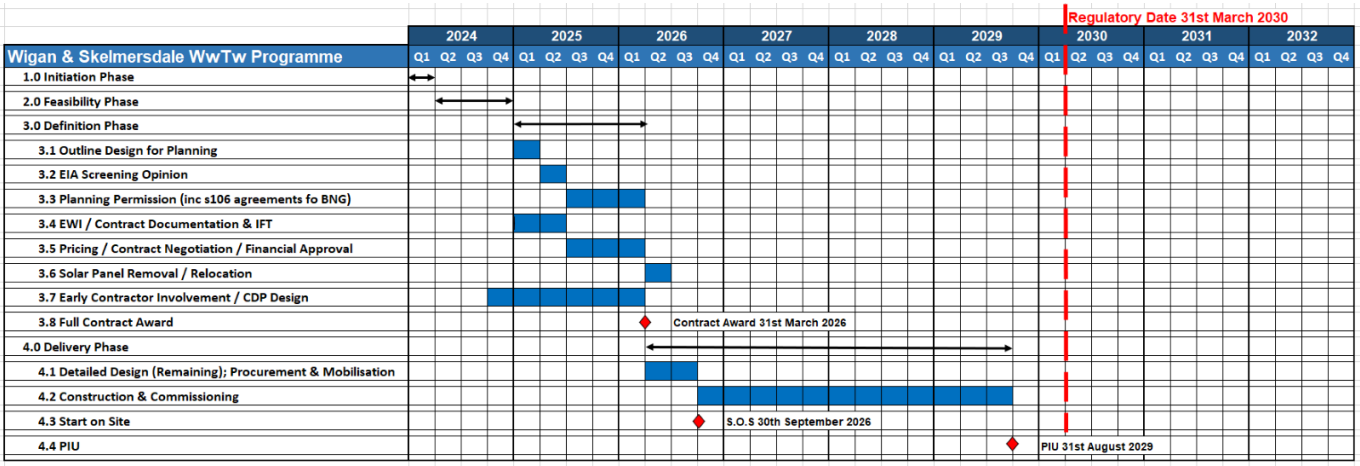
5.3 Sequencing of programme

All existing assets must be retained throughout the construction period to ensure the treatment works remains compliant with the existing permits. The current site layout presents several specific constructability and sequencing issues including:

- The incoming pressurised gravity main from Skelmersdale will require complex diversion work (including temporary works) to accommodate the new treatment assets at Wigan.
- The new secondary treatment feed pumping station will involve the construction of a deep segmental shaft and require the diversion of a significant number of existing buried services.

A high-level programme of activities to achieve delivery by the regulatory date of 31st March 2030 is shown in Figure 10.

Figure 10: High level programme indicating the sequencing of construction activities



Source: UUW analysis

6. Challenging our own costs

As set out in the document UUWR_11_Gated mechanism, the late inclusion of the WINEP drivers 1mg/l ammonia and 0.25mg/l phosphorus at Wigan, and 0.25mg/l phosphorus at Skelmersdale by the Environment Agency, meant that our opportunity to fully challenge all aspects of our technical solution prior to Business Plan submission was limited. However, following business plan submission in October 2023, we have continued to develop the catchment solution through our Transitional Investment funding. We appointed Jacobs as our Strategic Solution Partner in February 2024, and since then we have been working with their global experts to leverage advancements in technology and identify efficiencies in our catchment solution for Wigan.

6.1 Efficiencies Identified Since Business Plan Submission

Our high-level solution remains as shown in Figure 7 but by leveraging global expertise we have moved to a more intensified biological phosphorus removal technology. This has allowed us to reduce the size of the assets, and removed the need to purchase land, resulting in a reduction in project costs from £344m to £275m (post efficiency figures).

Below summarises the key elements of efficiencies identified since submission October 2023: -

- *Optimisation of volume of the reactor and the footprint of the final settlement tanks;*
- *Removal of tertiary solids removal assets, due to optimising the design of the upstream settlement tank performance, and*
- *Removal of additional primary settlement tanks due to the design of the downstream secondary treatment process*

Since the October 2023 submission we have worked with our Strategic Solution Partner, and their global experts to leverage advancements in technology and identify efficiencies in our catchment solution for Wigan. We are therefore certain this technical solution represents the best value to customers and the environment.

7. Conclusion

The AMP8 WINEP requires several drivers to be delivered in the Wigan catchment area for improvements to Hey Brook, Pennington Flash and the River Douglas. We have developed a catchment solution that addresses the drivers in an adaptive plan. Whilst the AMP8 and AMP9 phasing opportunity fell away after detailed discussions with the Environment Agency we have still explored opportunities across the catchment and driven efficiency since October 2023.

To deliver the most effective and resilient solution it has been necessary to replace the secondary treatment process at Wigan WwTW. Whilst making this significant investment we have developed a best value solution to achieve the stringent technically achievable limit phosphorus drivers of 0.25mg/l at Wigan and Skelmersdale WwTW with biological phosphorus removal.

The combined population of Wigan and Skelmersdale WwTWs is significant, with over 420,000 population equivalent. The scale and complexity of the catchment solution is significant and different to the types of solutions employed historically. We therefore consider that this solution is inappropriate for a standard cost model assessment. The costs we have developed for the Wigan catchment solution are bespoke and have been estimated in detail as part of a bottom up estimating approach, including the site constraints, as discussed in this document.

As we understand the infrastructure at Wigan and the associated assets in this catchment in detail and have robustly explored the challenges, we are confident in the deliverability, scope and costs. Therefore, we consider the requirements for Wigan to be clear and ready for delivery. As such it is inappropriate for inclusion in the large scheme gated process and alternatively appropriate for the enhanced engagement process.

8. References

- Metcalf & Eddy, Inc. (2002). Wastewater engineering: treatment and reuse. Boston: McGraw-Hill
- UK Water Industry Research [UKWIR] (2014) CIP2 Programme Report