

Leigh WwTW Sludge Treatment Facility BAT Improvement Programme October 2023



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1. Introduction

United Utilities Water Limited (UUW) submitted a permit application for the biological treatment of waste at an anaerobic digestion facility co-located at Leigh Wastewater Treatment Works (WwTW). The application was required due to the implementation of the Industrial Emission Directive (IED) for the biological treatment of waste following the issue of the waste treatment Best Available Technique Reference (BREF) document.

UUW have proposed improvements to meet all of the Best Available Techniques (BAT) requirements or have proposed suitable alternative measures to provide the same level of environmental protection. This document supplies outline information regarding proposed improvements at the site.

2. Containment

2.1. Secondary Containment Assessment and Solutions

A review of our previous Leigh secondary containment assessment submission (dated 16 May 2022) has been undertaken and as such we are proposing to construct permanent containment solutions, in relation to the sludge treatment assets, in order to meet the requirements of BAT conclusion 19.

Attached with this permit application is the updated Leigh Secondary Containment Modelling Assessment prepared by Stantec (dated 30 October 2023). The assessment has been undertaken using the Anaerobic Digestion & Bioresources Association (ADBA) Risk Assessment Tool, which is based on CIRIA C736: Containment systems for the prevention of pollution. Based on the ADBA risk assessment tool, the class of secondary containment for the site is Class 2 (moderate risk, intermediate degree of containment integrity required).

The ADBA risk assessment was used to inform the hydraulic modelling undertaken for the site. A 2D model of the Leigh site was constructed in InfoWorks ICM to assess the impact of failure or loss of containment on site. Use of the 2D hydraulic model allows the failure of a containment vessel to be represented, including the subsequent overland flow and ponding of released flow.

The following assets were modelled under a catastrophic failure scenario:

Table 2.1.1: Tank Capacities

Group	Asset Description	No. of units	Total Capacity (m ³)	110% of largest tank	25% of aggregate
1	Digested Sludge Tank	1	757	3,590	1,005
	Digester	1	3,264		
2	Screened Sludge Tank	1	948	1,043	355
	Centrate Buffer Tank (thickening centrifuges)	1	18		
	Thickened Sludge Cake Silo	1	454		
3	Digested Centrate Buffer Tank (dewatering centrifuges)	1	18	4,180	1,412
	Centrate Balancing Tank (dewatering centrifuges)	1	1,500		
	Liquor Treatment Plant (Amtreat Reactor)	1	3,800		
	Liquor Treatment Plant Settlement Tank	1	330		

A simulation was carried out for each group of tanks representing the release of 110% of the largest tank within the group. Results from the simulations indicate that the spilled flows from these tanks could reach receptors, as detailed in the Stantec report. High-level containment solutions for each critical asset have therefore been developed to meet the requirements set out in CIRIA C736. The proposed mitigation measures to be installed at Leigh to comply with Class 2 storage requirements are as follows:

- Containment kerbs;
- Containment walls;
- Sacrificial areas;
- Speed humps;
- Flood gate;
- Existing hardstanding area containment and
- Leak and spillage detection monitoring.

Based upon the conceptual design, the following containment measure quantities will be required. Detailed design will be necessary to confirm the final quantities.

Table 2.1.2: Containment Measure Quantities

Mitigation	Length (m)	Area (m ²)
Retaining wall (1.5m)	340	N/A
Retaining wall (1.0m)	337	N/A
Retaining wall (0.6m)	200	N/A
Raise concrete kerbs (0.325m)	194	N/A
Mechanical flood gates	10	N/A
Speed humps (0.15m)	31	N/A
Sacrificial area	N/A	22,000
Existing hardstanding	N/A	5,550

Solution modelling has been completed on all tanks to show the simulated flood extents and the depths of the settled sludge with the proposed mitigation measures in place. The modelling has confirmed that the solutions proposed would provide adequate containment, and thus meet the requirements under BAT conclusion 19.

Additionally, in order to manage and monitor the risk of potential leakages from the existing sealed drainage system, in particular the underground components in use, we have assessed the risk rating of all below or partially below ground assets. Further detail on this risk assessment process and the design of the containment system is provided below.

2.1.1 Containment Kerbs

All kerbing would be as a minimum to UU standard detail.

2.1.2 Containment Walls

Where containment walls have been proposed, these will be in accordance with Chapter 7 of CIRIA C736. Liquid retaining and containment structures”. Detailed design will determine the best design solution (i.e. in-situ reinforced concrete or pre-cast units) including material, dimensions and finishes. Following installation, detailed inspection shall be completed by a competent person every five years and following a spill event.

2.1.3 Speed Humps

The proposed speed humps have been provided with two objectives:

1. Containment; the 150mm high speed humps are to be located to provide containment of any spill on the site access roads.
2. Baffle; where the speed humps have been proposed in series, this is to reduce the velocity of the spill and to channel flow to achieve containment within the identified areas of the site.

The design of the speed humps will be in accordance with “The Highways (Road humps) Regulations 1999” in relation to approach gradients and crest widths. As a minimum, the ramp will be the full width of the access road to tie-in with kerbing and to a height of 150mm (deviation from above regulation) above the existing finished surface level over a minimum length of 1m, in either concrete or tarmac (to be determined during detailed design) to create an impermeable surface. Following installation, routine inspection shall be undertaken by the operational team during regular site walkovers and following a spill event.

2.1.4 Sacrificial Areas

All sacrificial areas will be reprofiled to include an impermeable membrane which will prevent spilled sludge entering the soil until the clean up operation can be completed. The final solution will be determined in detailed design with the most likely options being impermeable geosynthetic membrane or concrete.

2.1.5 Flood Gate

The proposed flood gates have been provided to comply with the containment requirement and provide a fully contained bund, whilst allowing operational and maintenance vehicular access to the assets.

Following installation, routine inspection shall be undertaken by the operational team during regular site walkovers and following a spill event.

2.1.6 Existing Hardstanding Area Containment

All existing hardstanding areas being used for secondary/tertiary containment will be routinely checked for cracks and defects to ensure they are compliant with CIRIA C736 secondary containment Class 2. Site inspection tours of the impermeable surface are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Adviser (ERA).

2.1.7 Leak and Spillage Detection

A programme of leak and spillage detection monitoring, which for Leigh, includes the use of existing flow meters or periodical surveys and interlock connection of various high level alarms to feed pumps as outlined below:

- Pipework: where no flow meters are currently installed, pipework with buried mechanical fittings will be surveyed every 2 years and every 5 years where not present, using techniques such as thermal cameras, magnetic flux leakage and in pipe crack detection technology.
- Sludge storage tanks: the high level alarms installed on the sludge storage tanks (which do not currently inhibit feeds) will, where possible be interlocked to the feed pumps to allow automatic shut offs to prevent tank overflow when a high level alarm is triggered.

As well as undertaking the monitoring identified above, site inspection tours of the impermeable surface, storage tanks and above ground drainage system are carried out daily by site-based staff and monthly by the site's Environmental Regulatory Adviser (ERA). These tours include visual inspection of the site drains to ensure they are working as expected. Regular CCTV inspections will also be carried out (every 5 years) on the drainage systems, with the next inspection being completed Autumn 2026. If any issues or concerns are identified, they will be logged on the corporate action tracker for prompt remediation.

2.2. Timescales to Achieve BAT

To reduce the timeline for delivery of improvements UU has had to split the site works into individual small projects. This is not our normal approach to delivery of a site programme of works as it leads to inefficiencies and multiple site contractor establishments. In developing dates for delivery our standard approach is to model the timeline for completion and use our P50 estimate (50% likelihood of completion) as the target date. We have applied this approach to the revised delivery model.

The timescale for completion of the spill containment improvements is December 2024 and is based on our P10 (10% likelihood of completion) forecast which means it is the best-case date for completion. Our P50 date, which is based on construction programme norms is 2027. We will endeavour to deliver the improvements as quickly as possible but, as with any construction project involving ground works there are unknowns, e.g. ground conditions, constraints from underground services etc., that can impact the timeline. It is important to note that there are also supply chain shortages currently which are impacting all industries. We will, as part of our implementation, work with the relevant EA officers to keep them informed of progress and, if required, any change in the delivery timeline.

Leigh WwTW Sludge Treatment Facility

BAT Improvement Programme October 2023

Table 2.2.1 sets out the programme of works to achieve BAT compliance, regarding secondary containment at Leigh Sludge Treatment Installation.

Table 2.2.1: Containment Improvement Programme to Achieve BAT

Activity	Timescale – Expected Completion	Interim Actions/Measures until BAT Compliant
Secondary containment (existing infrastructure) – installation of impermeable surfaces and kerbing/walls where risk of overflows and failures from mass breach has been identified, in order to meet the requirements of BAT conclusion 19d	December 2024	<p>Ongoing maintenance and inspection of tanks to ensure that integrity is maintained.</p> <p>Daily housekeeping tours by site based staff, including checks for any evidence of leaks or spills.</p> <p>The site is either manned, or when not, monitored by the Integrated Control Centre (ICC) on a 24/7 basis using SCADA and critical process alarms.</p>