Alfreton Digesters and Sludge Tank IED Containment Assessment - Proposed Options Report

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Severn Trent Water

Severn Trent IED Containment Studies
6 June 2023

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Executive summary

Alfreton Sewage Treatment works is located to the north of Alfreton town; Alfreton Brook lies on the north side of the site. The boundary of the site has fields on the east and west sides and an industrial site to the south. Figure i shows an aerial view of the site in the context of its nearby surroundings. An initial visit to Alfreton Sewage Treatment Works occurred for the purpose of site assessment and data collection.

Figure i – Aerial imagery of Alfreton Sewage Treatment Works

The secondary containment has been based on the following design parameters:

- Risk Report Identified that class 2 containment is required
- The required containment for scenario 1 is 2,579m^3 and is point of spill plus rainfall ('credible')
- The required containment for scenario 3 is 969m^3 and is point of spill plus rainfall ('credible')
- The containment recovery period is 48 hours, a 3 day 1 in 10-year event has been used for rainfall

The preferred technical solution is a combination of scenarios 1 and 3 (see figures overleaf) to provide remote secondary containment. These solutions are preferred as they separate containment solutions, which has reduced the spill volume as the credible spill volume is dominant over the 25% of total stock volume. The provision of a storage tank in the solution reduces spill depth, reducing the required wall height and enables a containment ramp to be used. The position of walls/bunds will be finalised during detailed design, ensuring storage footprint is not compromised and the bund walls compliant to site operations and other considerations (i.e. services). The storage tank location will be finalised following a constructability review.

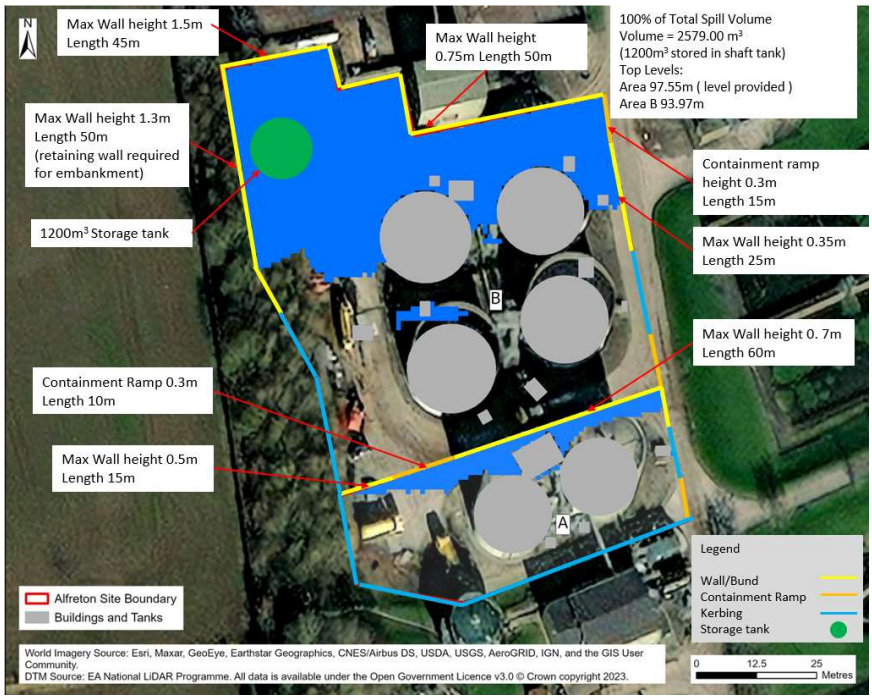

Figure ii – Plan showing recommended solution (scenario 1)

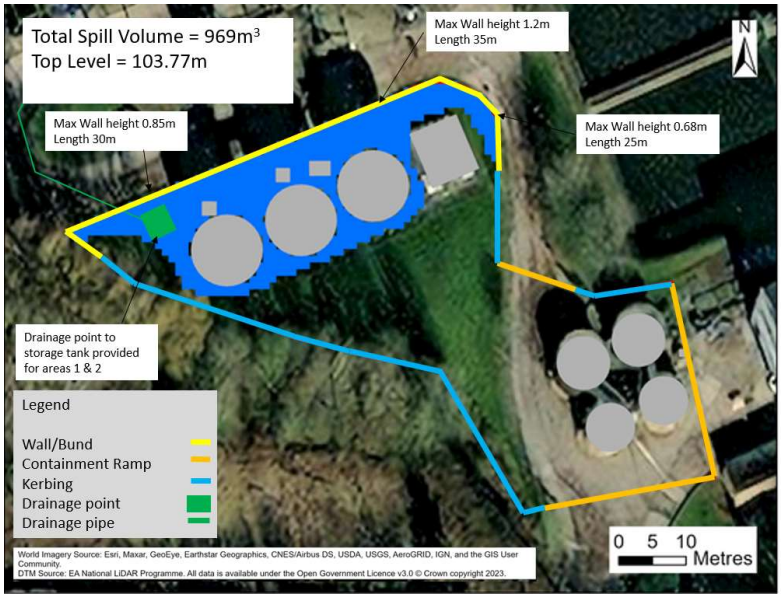

Figure iii – Plan showing recommended solution (scenario 3)

Following initial audits by the Environment Agency (EA) in 2019 that examined the primary, secondary, and tertiary containment provisions for Severn Trent's anaerobic digestion (AD) process and associated tanks, the EA reported "there is no provision of secondary containment for the AD process at any of Severn Trent's sites. Catastrophic tank failure may impact nearby receptors and the operation of adjacent sewage treatment activities". Jacobs were appointed to assess site risks and outline the options available for providing remote secondary containment of a catastrophic tank or digester failure across multiple Severn Trent sites. Based on CIRIA C736 and ADBA risk assessment tools this containment report addresses the site-specific risks at Alfreton Sewage Treatment Works (STW) and outlines the options available for providing remote secondary containment in the event of a catastrophic tank or digester failure.

This document follows 'Alfreton Digesters and Sludge Tanks, IED Containment Assessment-Risk Report, revision 1.1' which outlines the impact of an uncontained spill and the risk assessment completed and contains a complete tank list inventory for the IED permit area.

Chapter 1 provides an overview of the differing options for containment as outlined in CIRIA guidance document C736 (Containment systems for the prevention of pollution – Secondary, tertiary, and other measures for industrial and commercial premises, 2014) and the importance of this work at Alfreton.

Chapter 2 details the loss of stock and rainfall components to identify the containment volume required

Chapter 3 details the recommended options to provide remote secondary containment considering containment and transfer areas for each area investigated and discusses the optimal option at the Alfreton site.

Chapter 4 evaluates the surface water site drainage. Automated isolation valves linked to level indicators in the tanks are discussed to prevent shock loadings from being returned to the head of the works or sludge discharging into the river in the event of sludge tank failure.

Chapter 5 addresses the site-specific risks identified in Alfreton IED Containment Assessment- Risk Identification Report, namely jetting and fluvial flooding.

Chapter 6 presents the main conclusions of the containment assessment.

Appendix A presents the ADBA site hazard risk assessment completed for this site.

Appendix B presents the Site Surfacing Plan for this site.

Contents

Appendices

1. Proposed Containment at Alfreton

1.1 CIRIA C736

CIRIA guidance document C736 (*Containment systems for the prevention of pollution – Secondary, tertiary and other measures for industrial and commercial premises, 2014*) describes various options for containment of spillages from a credible failure scenario. It makes reference to a key plan, reproduced below:

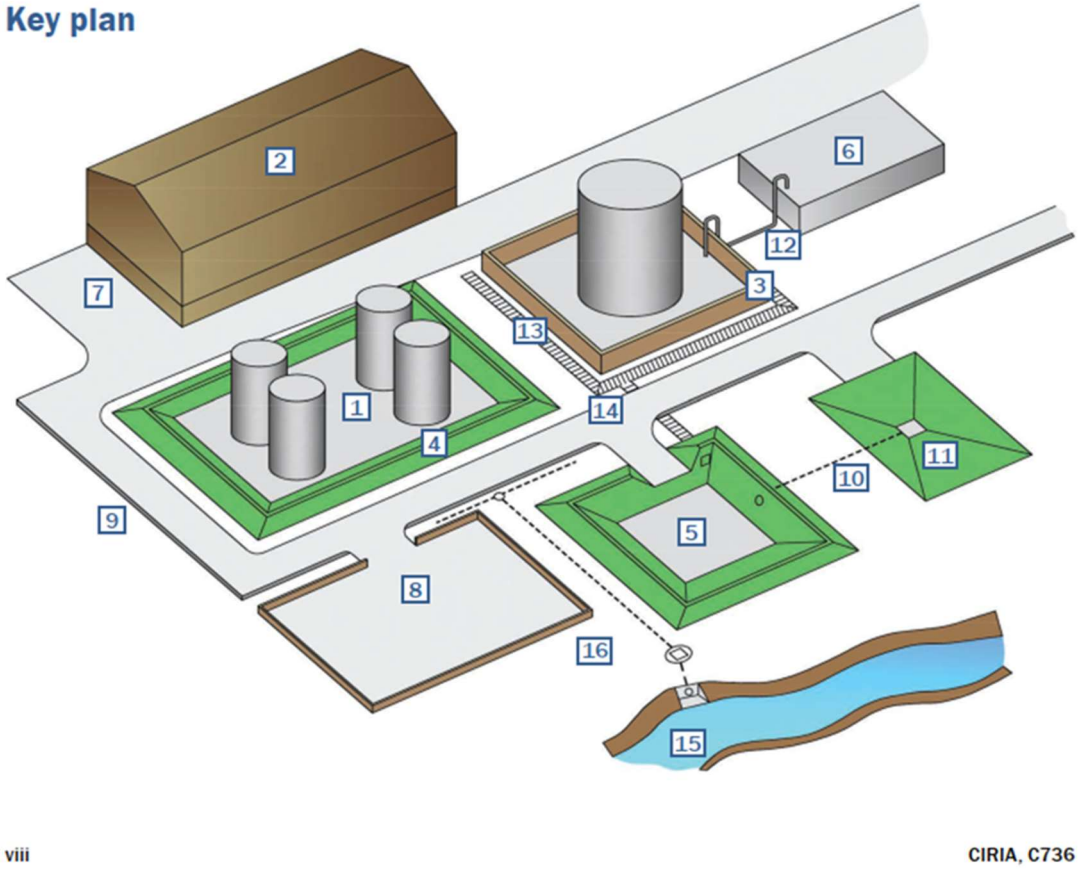

Figure 1.1 - Diagram of primary, secondary, and tertiary containment examples

-**Primary containment** is provided by the actual tank or vessel [1]

-**Secondary containment** is provided by a bund immediately surrounding the primary vessel e.g. [3] and [4], or by a lagoon [5] or tank [6]. If containment is provided away from the primary vessels this is known as **remote containment** and may be considered as either **remote secondary** or **tertiary containment**.

-**Tertiary containment** can be provided by a number of means including lagoons [5], or impermeable areas such car parks [8]. Roadways with high kerbing of sufficient height [9] can also form part of a tertiary containment system, or the **transfer system** to the remote containment.

-The distinction between remote *secondary* and *tertiary* containment is not always clear but, if properly designed, a combined system can be provided that is capable of providing the necessary degree of environmental protection.

The overriding concern is not the terminology but the robustness and reliability of the system which depends on a number of factors such as:

- Its complexity – the more there is to go wrong, the greater the risk. Passive systems relying solely on gravity are more reliable than pumped.
- Whether manual intervention is relied on to make the system work or whether the system can be automated to include fail-safes and interlocks.
- The ease of maintenance and monitoring of the system's integrity, and repair of any defects.

During and after an incident any rainfall runoff from the remote secondary storage areas, from the spillage catchment areas and from the transfer systems must also be prevented from reaching any outfall(s) to surface water by closure of control valve(s).

1.2 Site specific risks at Alfreton STW

Based on the use of the ADBA risk assessment, considering the source, pathway and receptor risk Alfreton STW site hazard rating is deemed to be high. When considering the mitigated likelihood as low a class 2 secondary containment is required

Source Risk	Pathway Risk	Receptor Risk	Site Hazard Rating	Likelihood	Overall Site Risk Rating
High	High	Medium	High	Low	Medium (Class 2)

1.3 Objectives of remote secondary containment

The objectives of the remote secondary containment measures proposed in this report are to safely contain spillages from credible failure scenarios and prevent them from:

- escaping off site
- entering surface waters
- percolating into groundwater
- being pumped back to the inlet of the sewage works in an uncontrolled manner.

The remote secondary containment will be provided by maximising the use of existing impermeable surfaced areas to provide a fail-safe passive system that relies on gravity rather than pumps. A means of leak detection that will automatically trigger isolation valves at key locations in the drainage system is also proposed.

2. Loss of Stock from Failure Scenario

In the Schedule 5 Notice dated Nov 2022, the EA has provided guidance on the failure scenarios to be modelled to assess the impact of catastrophic failure of sludge asset(s) within the IED permit boundary. The guidance stated, 'assessment of the impact of spill volumes using 110% of the largest tank or 25% of all tanks within a bunded area (whichever is greater)'. Contained spill volumes for containment areas have therefore been selected as the greater of 110% of the largest tank or 25% of all tanks within a bunded area or a credible spill volume (largest tank volume plus rainfall).

It was also later clarified with the EA that the total volume of sludge assets to be considered includes only above ground volumes of the assets.

2.1 Design allowance for rainfall

In addition to the maximum volume arising from a credible failure scenario, extra allowance for rainfall that may accumulate within the contained area before and after an incident has been made. The CIRIA guidance recommends that the containment volume should include an allowance for the total rainfall accumulated in response to a 1 in 10-year return period events for the 24 hours preceding an incident and for an eight-day period following an incident, *or other time periods as dictated by a site-specific assessment*. Given that Alfreton STW is a large, manned wastewater works with ready access to pumps and tankers, and with a (controlled) disposal route via the wastewater treatment system being available, it is considered unlikely that even a catastrophic spillage would take more than 48 hours to be pumped and drained away, therefore a 3-day event period has been selected. The average 72 hours rainfall depths for a 1 in 10-year storm for Alfreton STW is 62.8 mm. It should be noted that the rainfall depths for Alfreton STW have been estimated using the depth-duration-frequency rainfall model contained on the *Flood Estimation Handbook* (FEH 13), which provides location specific rainfall totals for given durations and return periods.

2.2 Total Design Containment Volume

For Scenario 1 a catchment of 7440m^2 area for the digesters with 62.8mm rainwater depth, the total containment volume comprises of 2112m^3 from catastrophic tank failure and 467m^3 from rainfall. This gives a total volume of 2579m^3. The containment volume is credible spill, which is greater than both 25% (1056m^3) of the volume of all sludge assets in this area and 110% (2323m^3) of the largest tank in the area.

For Scenario 2 a catchment of 5510m^2 area for the post digestion tanks with 62.8mm rainwater depth, the total containment volume comprises of 1873m^3 from catastrophic tank failure and 346m^3 from rainfall. This gives a total volume of 2219m^3. The containment volume is credible spill, which is greater than both 25% (1873m^3) of the volume of all sludge assets in this area and 110% (2060m^3) of the largest tank in the area.

For Scenario 3 a catchment of 2690m^2 area for the pre digestion tanks and sludge storage tanks with 62.8mm rainwater depth, the total containment volume comprises of 800m^3 from catastrophic tank failure and 169m^3 from rainfall. This gives a total volume of 969m^3. The containment volume is credible spill, which is greater than both 25% (737m^3) of the volume of all sludge assets in this area and 110% (880m^3) of the largest tank in the area.

3. Remote Secondary Containment

3.1 The Containment Area

3.1.1 Topography

Figure 3.1 shows the topography area containing the sludge assets at Alfreton. The highest ground is shown with the pink contours to the south of the site. The lowest elevations are shown with the blue contours to the north of the site. The site slopes steeply from south to north.

Figure 3.1 – DTM of the sludge assets showing contours at 30cm intervals

Due to the topography at Alfreton all flows would naturally collect to the North of the site. To minimise the impact of the sludge spills the areas have been split into different sludge areas. Scenario 1 contains the Digesters. Walls and containment Ramps separate the digesters from the post digestion tanks. Once a spill level is reached within the digester area the area of the post-digestion tanks is utilised to provide secondary containment. Scenario 2 provides containment for the post-digestion tanks. Scenario 3 provides secondary containment for the sludge storage tanks and pre-digestion tanks. See Figure 3.2 overleaf for labelled site plan

Figure 3.2 - Labelled site plan at Alfreton STW

3.1.2 Containment Solution

3.1.2.1 Digester area (Scenario 1)

To provide sufficient secondary containment for the Digester area, the total design containment volume of 2579m^3 needs to be securely contained. To provide separation from the post-digestion sludge tanks walls and containment ramps have been proposed in front of the digesters. To enable movement around the digesters the maximum height of the containment ramp proposed is 300mm. When the Top Water Level (TWL) in the digester area reaches 97.55m AOD this wall will spill and utilise the containment area for the post-digestion tanks. LiDAR spill modelling predicts that the TWL in the digester area is 97.55m AOD (containing 52m^3 of the spill), and the TWL in the post-digestion area is 94.65m AOD. Figure 3.3 shows the works necessary to convert the digester and post-digestion area into a secure remote secondary containment facility. The solution includes cutting into the embankment in the north-west of the area and levelling the area to 93m AOD to increase the area that can be used for storage. Containment walls will be provided to contain the spill to the north of the area. A 1200m^3 storage tank is required.

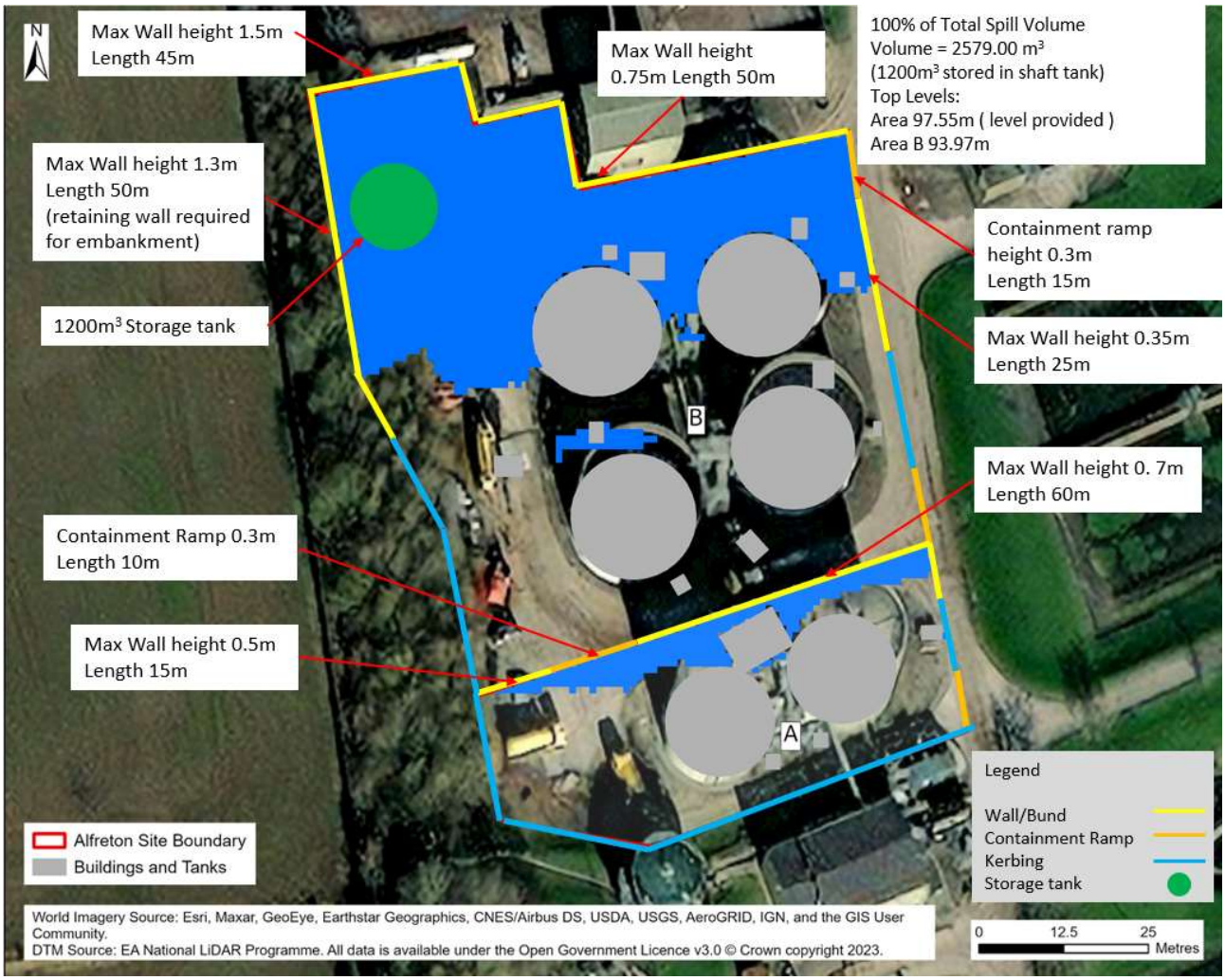

Figure 3.3 - recommended modifications to provide secondary containment for scenario 1

Due to the steep topography at Alfreton, retrofitting the secondary containment is challenging and expensive. In Scenario 1, the initial 1200m^3 spill volume can be contained with containment ramps, and walls bellow 1.5m high, which is around 50% of the total spill volume. When containing the full spill volume within the area flood gates or high walls (greater than 2m) would be required, without the provision of 1200m^3 storage tank.

The position of bund walls will be finalised during detailed design ensuring the storage footprint is not compromised, and bund walls are compliant with site operations and other considerations (e.g. services)

The location of the storage tank will be finalised following a constructability review.

3.1.2.2 Post digestion tanks (Scenario 2)

The secondary containment by scenario 1 for the digester area is sufficient to contain the spill from the post digestion tanks. The design volume spill for scenario 2 is 2219m^3. In scenario 1, the volume contained within the post-digestion tank area is 2531m^3, so therefore is sufficient for a tank failure in scenario 2.

3.1.2.3 Pre digestion and sludge holding tanks (Scenario 3)

To provide sufficient secondary containment to the pre digestion and sludge holding tanks, the design containment volume of 969m^3 needs to be securely contained. The topography of the site results in the flow settling to the north of the area. If 100% of the spill volume were to be contained by walls, the walls would need to be in excess of 2m. The proposed solution is to have drain the flows and convey the flows to the storage tank provided in scenario 1. Figure 3.4 shows the work necessary to convert the pre digestion and sludge holding area into a secure remote secondary containment facility. Ramps and kerbing would be required to guide the flows to the remote secondary containment provided by walls. A potential route for the pipe is shown in Figure 3.5.

Figure 3.4 – recommended modifications to provide remote secondary containment for scenario 3

Figure 3.5 - Indicative route of pipe to convey flow for scenario 3

The position of bund walls will be finalised during detailed design ensuring the storage footprint is not compromised, and bund walls are compliant with site operations and other considerations (e.g. services)

3.2 The Transfer System

Due to the topography of the site the transfer of liquid to the remote secondary containment occurs under gravity.

The site surfacing plan for Alfreton STW, shown in Appendix B, details the current impermeable and permeable surfacing in the containment areas. The grass areas around the transfer system and tanks should be lined for the eventuality of sludge collecting on them, either through jetting from the tanks or pipework, or spillages over kerbing.

3.3 Remote Secondary Containment Summary

A summary of the recommended containment for Alfreton STW are listed below.

Table 3.1 - Recommended containment for digesters and post digestion tanks (scenario 1)

	Impermeable Lining /m2	Walls/ Barriers	Ramps	Other (Isolation Valves/Building Protection/ local infill)
Transfer System	Approximately 1750m^2 require impermeable lining	6 sections: • Max height 1.3m length 50m • Max Height 1.5m length 45m • Max height 0.75m length 50m • Max height 0.5m length 25m • Max height 0.7m length 60m • Max height 0.5m length 15m Kerbing to be raised to 400 mm above road level to direct and contain spillages and protect buildings.	1 Ramp Max Height 0.3m Length 10m 1 Ramp Max Height 0.3m Length 15m 2 containment ramps for flow guiding	Isolation of drainage system to prevent it heading to the head of the works. Ground to be reprofiled to provide additional storage volume 1200m^3 storage tank

Table 3.2 - Recommended containment for pre-digestion and sludge holding tanks (scenario 3)

	Impermeable Lining /m2	Walls/ Barriers	Ramps	Other (Isolation Valves/Building Protection/ local infill)
Transfer System	Approximately 2000m^2 require impermeable lining	3 sections: • Max height 0.85 Length30m • Max height 1.2m Length 70m • Max height 0.7m Length 25m Kerbing to be raised to 400 mm above road level to direct and contain spillages and protect buildings.	Containment ramps for flow guiding	Isolation of drainage system to prevent it heading to the head of the works. Drainage Point Pipeline – assumed 750mm diameter length 180m

4. Site Drainage

Site drainage assessments are based on Alfreton STW treatment works layout plan drawing number DT7175/Alfreton STW

4.1 Foul Process and Effluent Drainage

The sewage works layout plan for Alfreton shows all foul/combined /process/effluent drainage pipes, indicated by red lines, go to the head of the works, shown in Figure 4.1, Figure 4.2, and Figure 4.3 (via pumping stations). If Sludge were to enter the head of the works, the shock load could adversely impact the sewage works treatment process. These lines should therefore be isolated in the event of a catastrophic loss of containment.

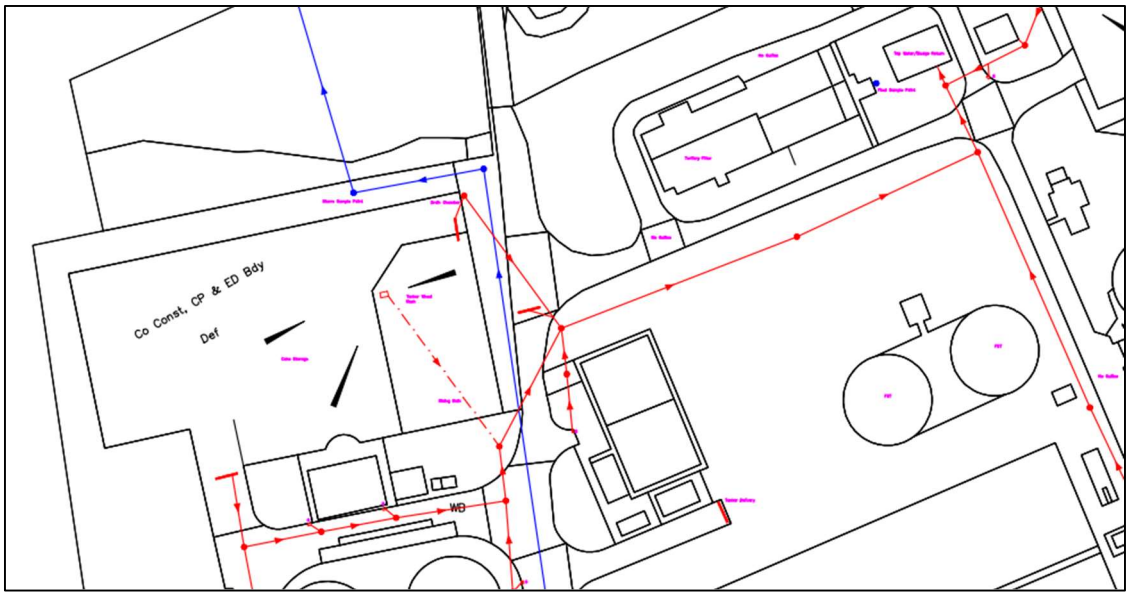

Figure 4.1 - Digester drainage line returns to pumping station

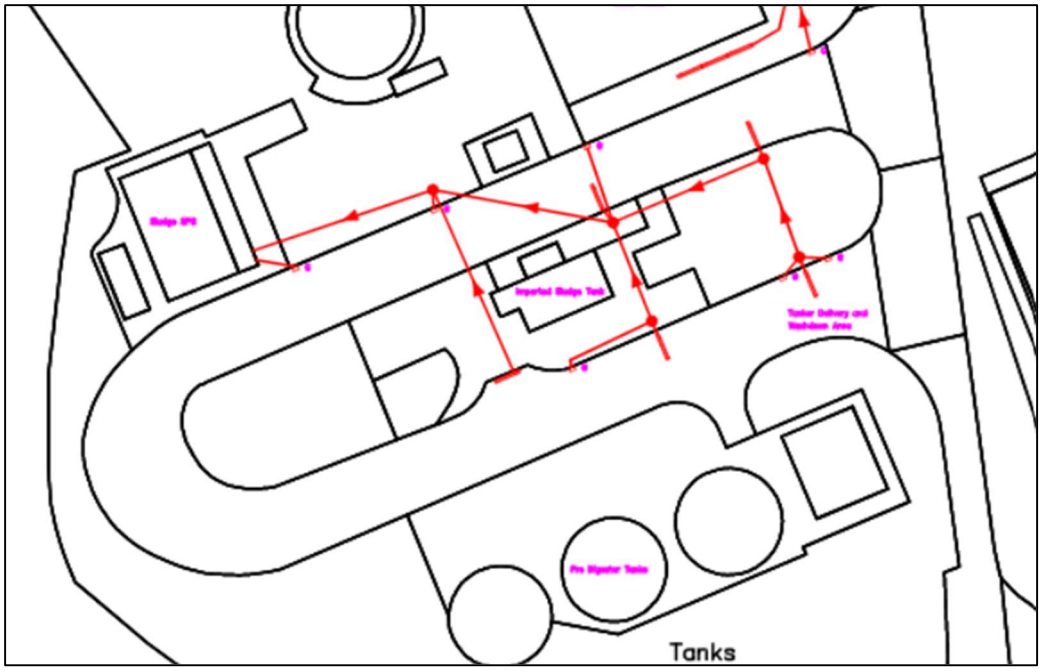

Figure 4.2 – Pre-Digester tanks drainage line to sludge pumping station

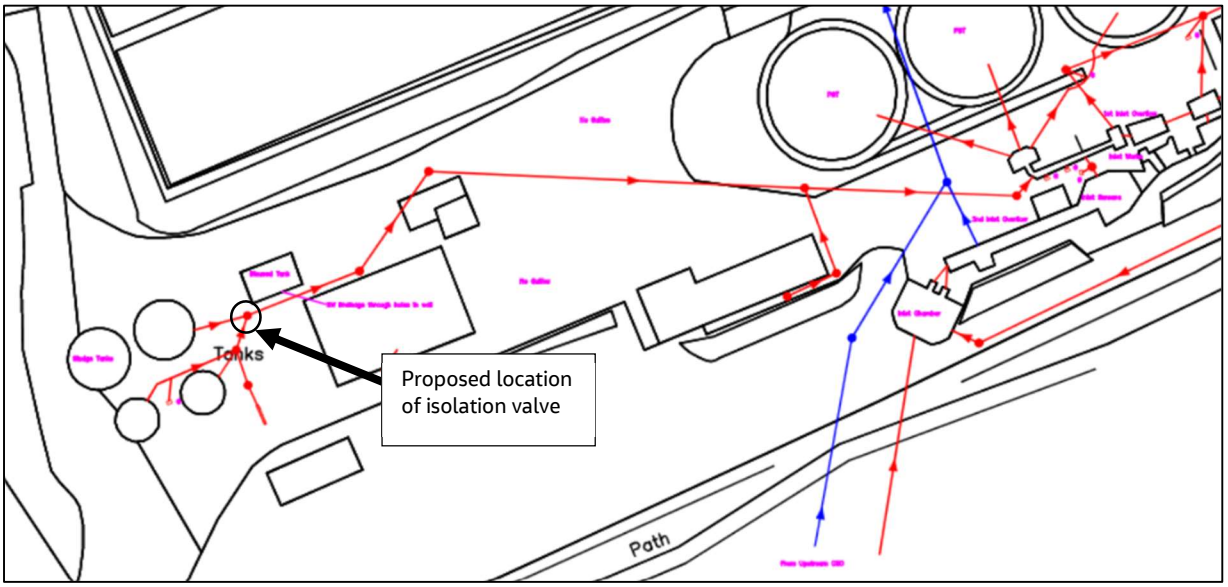

Figure 4.3 – Sludge storage tanks drainage line and suggested isolation points

4.2 Surface Water Drainage

Surface water drainage, shown by blue lines on the sewage works layout plan for Alfreton, drains into Alfreton Brook. For the loss of containment events explored in this report, any of the surface water manholes within the transfer and containment areas (circled in Figure 4.4) would send sludge into the brook. These lines should therefore be isolated in the event of a catastrophic loss of containment. To minimise the number of isolation valves installed, the connectivity of the surface water drainage system should be further investigated with the aim of identifying a common pipe that all manholes in the transfer and containment areas drain to prior to discharge in the brook, this would then be the only line that requires an automated isolation valve. If no common pipe exists, the elevations of all manholes should be determined and those identified fitted with an isolation valve.

Figure 4.4 - Containment area surface water manholes to be isolated

4.3 Automatic Isolation Valves

For the catastrophic loss of containment scenarios for sludge area discussed, such a loss could be automatically detected by the level sensors in the tanks. A catastrophic failure would be identified by the rate of change in tank level being larger than expected at normal operation. The signal from the sensors would be used to automatically prevent any adverse impact on sewage treatment.

In the event of a catastrophic sludge spill, flows entering the head of works via the drainage pipes could adversely impact the sewage works treatment process. Therefore, in the event of a catastrophic loss of containment, the drainage lines within the containment area should be isolated.

It is recommended that float operated isolation valves are installed on all outgoing drainage lines from the containment area. These valves will remain normally open but will close when high levels in the existing drainage system are encountered. This drainage configuration will have the following impacts:

- In heavy or intense rain events these drainage isolation valves may be triggered, and operators onsite will need to manually operate these valves to release flows into the existing drainage network
- In minor or slow flow tank spills, the sludge spill will flow into the exiting drainage network (and into the head of the works) unless operators intervene to isolate the drainage networks. Due to the flow to full treatment at Alfreton being large, minor spill flows will not adversely impact the process.
- In most locations, to accommodate the new isolation valves, new manholes need to be constructed over the existing drainage lines.

5. Mitigation of Site-Specific Risks

5.1 Jetting and Surge Flows

Due to the location of the tanks and provision of impermeable surfaces and their distance from the boundary of the containment area, there is no risk of contamination through jetting and surge. If there were any jetting over the containment walls, this would be picked up by the on-site drainage.

5.2 Flooding

According to the UK Government's Flood Map for Planning, Alfreton STW is not within any potential flooding zone as shown in Figure 5.1. No modifications need to be made to Alfreton STW to accommodate the risk.

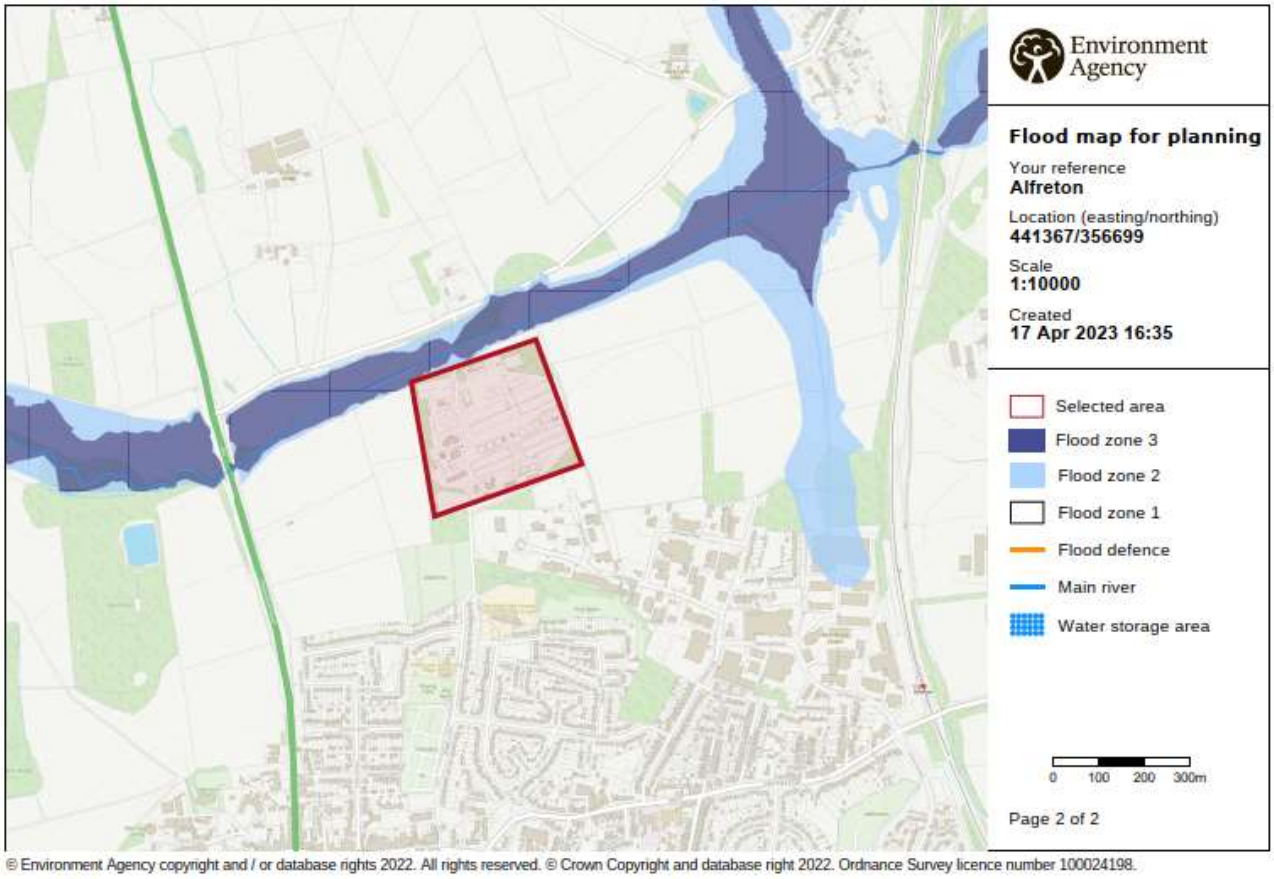

Figure 5.1 - UK Government's Flood Map for Planning

6. Conclusions

This section summarises the findings of the containment assessment options report for Alfreton Sewage Treatment Works.

In the Risk Identification Report for Alfreton STW a containment classification report was carried out. An overall site risk rating of medium was determined meaning that class 2 containment is needed. The detailed requirements for class 2 containment have been outlined in the Risk Identification Report in section 1.1.

The assessment focuses on site-specific risks and outlines the options available for providing remote secondary containment of a catastrophic tank or digester failure. Containment in scenario 1 has been provided in the form of walls, kerbs, ramps, and a storage tank. Containment in scenario 3 has been provided in the form of walls, kerbs, ramps drain to the storage tank in scenario 1. Scenarios 1 and 3 are both required to provide sufficient containment for the sire. Providing scenario 1 and 3 is the recommended technical solution. Due to the topography at Alfreton the sludge assets on site have been separated into three areas. The separation of sludge assets reduces the overall spill volume, as the point of spill rule is dominant over the 25% of total stock volume. This has limited the required wall heights in the containment areas.

The effect of Jetting and surge flows were also assessed and found to pose no issues in the containment areas. An assessment of the buildings nearby should be undertaken to check jetting within does not pose any risk.

Finally, assessment of the risk of flooding at Alfreton Sewage Treatment Works based on the UK Government's Flood Map for Planning, showed that the bioresources area is in Flood Zone 1. This means the likelihood of the sludge area flooding is very low at less than 1 in 1000 annual probability.

Appendix A. ADBA Site Hazard Risk Assessment for Alfreton STW

Site Name	**Alfreton STW Containment Classification Assessment**					
Revision	Date	Description	Author	Checked	Reviewed	Approved
1.0	23/05/2023	Final Draft	H. Rani	W Liu	C.Sfynia	K.Chiu

Material	Physical properties	Quantity	units	Storage	Flammability	Corrosive	Ecotoxicity (based on LD and quantity)	Environmental hazard rating	Justification
Process									
Digestate (fermenter)	Liquid	< 1000	m3	Covered Tank or lagoon				H	Digesters volume total of 4223 m3
	Liquid	1000 < X < 5000	m3	Covered Tank or lagoon				H	Digesters volume total of 4223 m3
Separated digestate solids	Cake			Concrete pad				M	Largely immobile therefore presents only a medium risk.
Separated digestate liquid	Liquid			Covered tank				H	
							Process Overall Rating	H	Two Digestion tanks, Four Post Digestion tanks, Three Pre Digestion tanks, Four Sludge storage tanks which contain cludge at a total capacity of 14664 m3.
Additives and site chemicals									
Ferric Chloride	Liquid	1	IVC	IVC	Not flammable	No	Low	L	Not present
Glycol	Liquid	1	IVC	IVC	Not flammable	No	Low	L	Not present
Cleaning products	Liquid	1	IVC	Consumables container	Not flammable	No	Low	L	Not present
Lab consumables	Liquid	20	litres	Consumables container	Not flammable	No	Low	L	Not present
							Chemicals Overall Rating	L	Section not relevant
Fire fighting agents and cooling water spillages									
Fire Fighting Agents harmful in their own right or contaminated by inventory	Liquid	>25	m3	NA	Not flammable	No	Low	L	Not present
Fire fighting and cooling water contaminated by inventory	Liquid	>25	m3	NA	Not flammable	No	Low	L	Not present
							Spillages Overall Rating	L	All the hazards are "Low" threfore the overall rating is low
							Sources Overall Hazard Rating	H	Justification: Digestio,Post Digestion, Pre Digestion, Sludge storage tanks are present at the site.

Pathway - the route from primary containment to receptor						Environmental hazard rating	Notes
Site layout and drainage							
If any of the site inventory has a runoff time of a few minutes…						H	Sludge would cross site boundary within 2 minutes.
If any of the site inventory has a runoff time of a few hours….						H	Not Applicable
If any of the site inventory has a runoff time of a few days…						M	Not Applicable
If any of the site inventory has a runoff time of a few weeks…						L	Not Applicable
Topography, geology and hydrology							
Site is raised above a nearby receptor						M	Site slopes from South to North therefore is raised above the near watercourse Alfreton Brook
Chalk						H	According to the British Geological Survey the site is not in the chalk aquifer area.
Fractured chalk						H	Not Applicable
Principal Aquifer						H	Aquifer at this location in of Secondary type A.
Groundwater protection zone 1						H	Groundwater Vulnerability is Medium according to Ground Water Vulnerability Map.
etc							
Mitigation - do these apply?							
If a secondary containment system is present…						L	Not present at the moment
If the rain water drainage system in the secondary containment fails safe…						L	Not present
					Path & Mitigation Overall Rating	H	Justification: Estimated runoff time to receptor will be 2 minutes - site is located on a slope towards a watercourse.
Climatic conditions							
Annual rainfall < 1000 mm						M	Annual Rainfall within 809.9 mm - 908.16 mm
Annual rainfall > 1000 mm						L	Not Applicable
Snow accumulation is possible						M	Yes
Fire Fighting Water							
Inflammable materials normally present on site in large quantities?						L	Not Applicable
Location							
Site is in a flood plain						L	IED permitted Area is Flood Zone 1
Site is at bottom of a hill						H	The site inclines from South to North, towards the watercourse. With the Digester and post-digestion tank on the north side.
Site is connected to a sewage treatment works						H	Area IED permitted is connected to sewage treatment works
					Site Considerations Overall Rating	H	Justification: The site inclines from South to North, towards the watercourse with the sludge-containing tank towards the bottom of the hill therefore the rating is High.
					Pathway Overall Hazard Rating	**H**	Justification: Estimated runoff time to receptor will be 2 minutes - site is located on a slope towards a watercourse.

Receptors	Within	units						Environmental hazard rating	Notes
Watercourses and bodies									
Rivers above potable water supplies	100	m						H	Alfreton STW is 2.6km away from River Amber and Alfreton Brook is within 80m from the STW site.
Aquifers used for public supply	150	m						H	The site is located on Secondary type A aquifer.
High quality waters	1000	m						H	Not applicable
Agricultural abstraction points	50	m						M	No Agricultural abstraction identified via desktop analysis
High value ecosystems	1000	m						M	LNR and SSSI site are identified near the site. Closest site is 2610m away from the site.
Recreational waters	50	m						M	Not applicable
Small treatment works	50	m						M	Not applicable
None of the above								L	Not applicable
							Water Overall Rating	M	Justification: The site is located on Secondary type A aquifer the rating is Medium.
Habitation									
Dwelling	250	m						M	Residential area is within 260m from the site.
Workplace	250	m						L	Environmental Waste Services is within 105m and a primary school is within 250m from the site.
None of the above								L	Not applicable
							Habitation Overall Rating	L	Justification: workplace is within 250m so the rating is High.
Other									
SSSI/SPA/SAC	1000	m						L	Ogston Reservoir SSSI 4820m to North-West
RAMSAR Site	1000	m						L	Not found
LNR	1000	m						L	Pennytown Ponds LNR 2650m to South, Oakerthorpe LNR 2610m to West, Wessington Green LNR 4170m to West and Highoredish LNR 6310m North-West.
None of the above									Not applicable
							Other Overall Rating	L	Justification: LNR and SSSI sites are at a distance to the site therefore the rating is Low.
							Receptors Overall Hazard Rating	**M**	Justification: The site is located on Secondary type A aquifer the rating is Medium.

Calculated hazard ratings:

Source	Pathway	Receptor	**Site Hazard Rating**
H	H	M	**High**

Possible Combination			Site Hazard Rating
L	L	L	Low
M	M	L	Low
H	L	L	Low
M	M	M	Medium
H	M	L	Medium
H	H	L	Medium
H	M	M	High
H	H	M	High
H	H	H	High

Risk #	Description of Risk	UNMITIGATED LIKELIHOOD	Mitigation applied	MITIGATED LIKELIHOOD	Low	Site Overall Likelihood
1	Operational failures, such as failure of plant, or human failure by operators	H	Annual HAZOPs and operator training	L		
2	Shortfalls in design – lack of alarms and fail-safe devices	M	Pre-construction HAZOP identified measures - see P&IDs	L		
3	Structural failure – materials, components, detailing, corrosion or when exposed to heat and flame	M	Inspection of vessels, asset management	L		
4	Abuse – inappropriate change of use or other misuse	L		L		
5	Impact, eg from a vehicle	L	Armco barriers and concrete bollards installed	L		
6	Vandalism, terrorism, force majeure etc	L		L		
7	Fire or explosion	L		L		
8	Geological factors -subsidence etc	L		L		
9	Ageing or deteriorating assets/sub-components.	M	Inspection of vessels, asset management	L		
10	Lightning strike	L		L		

Site Hazard Rating	Likelihood	Overall Site Risk Rating	Indicated Class of Secondary Containment Required
High	Low	**Medium**	**Class 2**

Appendix B. Alfreton STW Site Surfacing Plan


N
KEY:
Installation Boundary
Area of Unmade Ground
Area of Concrete
Area of Gravel
0 20 40 60 80 100
METRES
Jacobs
SEVERN TRENT
STC IED PERMIT
ALFRETON STW
FIGURE 3
SITE AREAS WITHN
INSTALLATION BOUNDARY
PERMITTING
DO NOT SCALE
P01
B1958992-JAC-AFN-DR-0003
ROGER'S LANE
Meadow Lane
Industrial Estate
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