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Planning & Development

Flood Risk Assessment

Wakefield Acoustics Limited

Land Off St Peg Lane, Cleckheaton, BD19 3SA

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Executive Summary

Ashfield Flood Risk Solutions ("Ashfield") was commissioned by Wakefield Acoustics Limited ("the client") to undertake a Flood Risk Assessment ("FRA"), for Land Off St Peg Lane, Cleckheaton, BD19 3SA ("the site"). This report has been prepared in support of a planning application (planning application 2024/62/90792/E) relating to a change of use at the site. Utilising the currently vacant land for the assembly and storage of genset enclosure generator units, including the siting of security and welfare cabins. This revised report (Rev B) addresses the Environment Agency (EA) response as statutory consultee to the planning application dated 09th August 2024 (2024/90792) and includes updates based on a revised site layout. The original drawings (excluding Drawing 06) remain unchanged, as there has been no alteration in the flood risk associated with the site. Drawing 06 has been altered to show the new design layout of the proposed developments.

The proposed development will utilise the existing hardstanding concrete areas to place 24, reinforced acoustic genset enclosure housing generators within them. These genset enclosures will be set on wooden sleepers, raising each of the genset enclosures approximately 0.15m above ground level.

The EA Flood Map for Planning (FMFP) indicates that the majority of the site is located within Flood Zone 2 (Land that has been assessed as having between 1% and 0.1% AEP of river flooding); however, Flood Zone 3 (Land that has been assessed as having a 1% AEP of river flooding) is shown to encroach upon the eastern boundary. Flood modelling data derived from the River Spen Flood Warning Improvements Hydraulic Modelling Report (2009) undertaken by JBA Consulting indicated that the proposed development (genset enclosure, Welfare & Security Units and Electrical Distribution Pod) will be unaffected by flooding up to and including the 1 in 100-year event plus 20% Climate Change. This data shows that the genset enclosures will be elevated 0.05m above the 'design flood' level. Therefore, the risk of fluvial flooding is considered to be **Low** for the proposed development at the site.

The EA Surface Water mapping projects that surface water will encroach upon the site eastern boundary in the High and Medium-Risk extents. However, the projected surface water flooding in these extents is shown to be aligned with the River Spen. The proposed development is projected to be unaffected by surface water across both the High and Medium-Risk extents. The genset enclosures are shown to only be marginally at risk of surface water flooding in the Low-Risk extent up to a maximum depth of 0.3m. Due to this, the risk of surface flooding is considered to be **Low**.

The risk of flooding from groundwater, reservoirs and artificial sources is considered to be **Low** at the site, whereas the risk of tidal flooding is considered to be **Negligible**.

As part of this FRA revision, the EA and LLFA have requested that a Sequential test be completed for the site. In the context of the Sequential test conducted as part of this FRA, none of the sites examined proved to be a viable alternative location for the proposed development. This determination was based on factors such as being situated beyond the identified search area, possessing inadequate site size, obstructions preventing reasonable storage of the genset enclosures on site, or exhibiting a consistent level of flood risk without mitigation (Flood Zone 3).

All aspects of the proposed site layout are shown to be outside of the design event flood extent (1 in 100 plus 20% CC). In order to protect against the residual risk from greater magnitude flood events,

where possible the floor level of the Welfare and Security units or lowest point of flood vulnerability should be positioned a further 0.3m above ground levels. The following are recommendations for protecting against residual risk of flooding at the site:

- Ground levels around the Welfare Unit should be raised to 72.32mAOD (0.3m + 72.02mAOD);
- Ground levels around the Security Unit should be raised to 72.37mAOD (0.3m + 72.07mAOD);
- Internal electricals within the Electrical Distribution Pods raised to 72.42mAOD (0.5m + 71.92mAOD);
- All drainage features within the site boundary should be jetted and inspected regularly by an appointed maintenance contractor.
- Flood warning and evacuation procedures should be implemented at the site as stated in the Flood Warning and Evacuation Plan.

This report therefore demonstrates that the proposed development:

- Is suitable in the location proposed and will be adequately flood resistant and resilient;
- Is unlikely to place additional persons at risk of flooding, and will offer a safe means of access and egress; and,
- Is unlikely to increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water runoff.

1 Introduction

1.1 Authorisation and Context

Ashfield Flood Risk Solutions ("Ashfield") were commissioned by Wakefield Acoustics Limited ("the client") to undertake a Flood Risk Assessment ("FRA"), for Land Off St Peg Lane, Cleckheaton, BD19 3SA ("the site"). The site location can be seen in Drawing 01 and in Appendix A for reference. This report has been prepared in support of a planning application at the site, for which the development proposals are discussed further in Section 1.6 of this report.

This revised report (Rev B) addresses the Environment Agency (EA) response as statutory consultee to the planning application dated 09th August 2024 (2024/90792) and includes updates based on a revised site layout. The original drawings (excluding Drawing 06) remain unchanged, as there has been no alteration in the flood risk associated with the site. Drawing 06 has been altered to show the new design layout of the proposed developments.

1.2 Aim and Objective

The aim of this report is to address the requirements of the National Planning Policy Framework (NPPF) through meeting the following objectives:

- Assessing whether the site is likely to be affected by flooding from different sources;
- Providing an assessment of the vulnerability of the proposed development and its suitability in relation to the identified flood risks;
- Providing an opinion in relation to the likely impacts of the proposed development on flooding elsewhere; and,
- Where required, presenting flood risk mitigation measures necessary to ensure that the proposed development and occupants will be safe, whilst ensuring flood risk is not increased elsewhere.

1.3 Information Sources Used

In order to prepare this FRA, the following information sources and general guidance documents have been used:

- Calder Catchment Strategic Flood Risk Assessment (SFRA)[1] – JBA Consulting, April 2016;
- Kirklees District Council Preliminary Flood Risk Assessment (PFRA)[2] – Kirklees Council, June 2011;
- Kirklees District Council Preliminary Flood Risk Assessment Addendum [3] - Kirklees Council, December 2017;
- Kirklees Surface Water Management Plan (SWMP)[4] – Kirklees Council, February 2011

[1] https://www.kirklees.gov.uk/beta/planning-policy/strategic-flood-risk-assessment.aspx
[2] https://www.kirklees.gov.uk/beta/flooding-and-drainage/pdf/PreliminaryFloodRisk.pdf
[3] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/698264/PFRA_Kirklees_District_Council__2017.pdf
[4] https://www.kirklees.gov.uk/beta/flooding-and-drainage/flood-risk-assessments.aspx

- Kirklees Local Flood Risk Management Strategy (LFRMS)[5] – Kirklees Council, February 2013;
- 1m resolution LiDAR data – downloaded online January 2024;
- Environment Agency (EA) Product 6 Data – received September 2023;
- Environment Agency interactive flood maps – accessed online January 2024; and,
- British Geological Survey (BGS) Drift & Geology Maps – accessed online January 2024.

1.4 Report Limitations

This assessment of flood risk has looked to use the most accurate and up-to-date flood mapping for the location. The site boundary has been supplied by the client and the assessment of risk is based on this. This report has been prepared with due care and diligence in accordance with industry best practice and guidance. The conclusions in this report are valid only to the extent that the information provided to Ashfield was accurate and complete at the time of receipt.

1.5 Site Setting

The site is located on the eastern side of Cleckheaton, approximately 240m east of King Edwards VII Memorial Park (coordinates XY: 419465, 425161), with the nearest postcode being BD19 3SA. The site occupies an overall area of approximately 0.997 hectares (ha) and currently comprises the remnants of the historic engineering works (no buildings) and open spaces. From a review of available street-level imagery, the current surface of the site comprises hardstanding surfaces, with areas of vegetation encroaching upon these areas. The client has confirmed that the vegetation has been cleared since the street-level imagery was taken.

The site is bound to the north by residential properties, the west by Howard Park Community School and residential properties, and the south by a storage compound. The site can be accessed via St. Peg Lane to the north.

1.6 Development Proposals

This report has been prepared in support of a planning application relating to a change of use at the site. Utilising the currently vacant land for the assembly and storage of genset enclosure-based generator units, including the siting of security and welfare cabins (Office and Canteen). Plans for the site can be seen in Appendix B for reference.

The proposed development will utilise the existing hardstanding concrete areas to place watertight, reinforced acoustic genset enclosure housing generators within them. These genset enclosures will be set on heavy wooden sleepers raising each of the genset enclosures approximately 150mm above ground level. All genset enclosures will be housed in the southern region of the site outside of the Flood Zone 3 extent.

The maximum number of on-site operators anticipated at any given time is 10, responsible for maintaining the site. Welfare cabins, which include lockers, toilets, a canteen, and meeting room facilities, as well as a security unit, are positioned on an elevated strip of land parallel with the western boundary of the site.

[5] https://www.kirklees.gov.uk/beta/flooding-and-drainage/pdf/FloodRiskStrategy.pdf

1.7 Topographic Mapping

A site topographic survey was made available to Ashfield to inform this report. This was undertaken by Met Geoenvironmental Limited in August 2023 and is included in Appendix C for reference.

The topographic survey shows that the site has a general slope to the southeast. The greatest ground level within the site is 72.18mAOD, located within the northwest corner of the site. The lowest ground level within the site is located along the eastern boundary of the site adjacent to the River Spen (69.83mAOD). This is a difference of 2.18m across the northern region.

Drawing 02 illustrates a visual representation of ground levels within the site and the wider area the site is located within as derived from 1m government LiDAR data available under open license. Ground levels derived from LiDAR correlate with those seen within the topographical survey. Ground levels for the wider area are shown to the general slope towards the River Spen.

1.8 Local Hydrology

The nearest Environment Agency (EA) designated Main River to the site is the River Spen (open channel), which runs along the site's eastern boundary, flowing in a southerly direction. This Main River discharges into the River Calder (also Main River) approximately 6km to the south-east of the site.

In addition, an ordinary watercourse (Syke Beck) is located approximately 76m south of the site and flow in an easterly direction. The Syke Beck is shown to be an open channel that discharges into the River Spen.

All aforementioned waterbodies are illustrated in Drawing 03 for reference.

1.9 Local Drainage

A drainage plan (Commercial DW 2019) has been provided by the client; a copy of this plan is included in Appendix D. A review of these plans indicates that there are two public foul networks within the western region of the site. These foul networks connect to the wider public network beneath St Peg Lane and the adjacent field on the eastern side of the River Spen. The review also reveals that there are no public surface water drainage networks located beneath the site. Therefore, it is assumed that all surface water drains into the River Spen or the public surface water sewer network beneath St Peg Lane.

As stated in Section 1.6 of this report, the proposed layout of the development will utilise existing hardstand areas and does not look to decrease the number of permeable areas across the site. From a review of Google Streetview, no external drainage features could be determined.

1.10 Flood History

The following section will discuss any historic flooding that has been identified at or within the vicinity of the site.

Recorded Flood Outlines

From a review of the EA open-source data of recorded flood outlines (Drawing 04), it was indicated that two flooding incidents were reported in close proximity (within 50m) of the site. The first of which was recorded in June 2007, the source of this incident was reported to have been the River Spen, the cause of the flooding is unknown; However, the event was most likely to have been by the River Spen exceeding its channel capacity. The second incident recorded happened in February 2020 after the River Spen exceeded it is channel capacity.

As seen in Drawing 04, the 2007 flooding incident was identified to have impacted the open space south of the site. Whereas the 2020 incident was recorded to have been restricted to its channel and surrounding banks. This data set contains no records of surface water flooding at or within the vicinity of the site; however, this may be due to the data not being regularly updated.

Online Documentation

A review of the documents mentioned in Section 1.3, identified that Kirklees County was impacted by a storm event that had a return period of around 1 in 200 year event (0.5%AEP) in 2007. Comparing this event with the EA recorded flood outlines previously discussed, the 2007 event did not impact the site. The source of this event was contributed to a combination of fluvial and surface water flooding, within all of the aforementioned documents. There were no other reportable incidents from any sources identified at or within the vicinity of the site.

1.11 The Design Flood

The Planning Practice Guidance identifies that new developments should be designed to provide adequate flood risk management, mitigation, and resilience against the 'design flood' for their lifetime.

This is a flood event of a given annual flood probability, which is generally taken as fluvial (river) flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), or tidal flooding with a 0.5% annual probability (1 in 200 chance each year), surface water flooding likely to occur with a 1% annual probability (a 1 in 100 chance each year), against which the suitability of a proposed development is assessed and mitigation measures, if any, are designed.

1.12 Climate Change

In July 2021, the predicted future change in peak river flows were updated by the Environment Agency. This replaced the previous February 2016 update which was based around a range of projections applied to regionalised 'river basin districts'. The July 2021 update now requires consideration of the management catchment climate change allowances from the peak river flow map as benchmarks. This supersedes the previous 'regional' climate change allowances.

The site is located within the Aire and Calder Management Catchment. Table 1 identifies the relevant peak river flow allowances from this management catchment.

Table 1 – Peak River Flow Allowance for the Aire and Calder Management Catchment

Allowance Category	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper End	24%	31%	51%
Higher Central	15%	18%	31%
Central	11%	13%	23%

When determining the appropriate allowance for use in a Flood Risk Assessment the Flood Zone classification, flood risk vulnerability and the anticipated lifespan of the development should be considered. Table 2 provides a matrix summarising the EA's guidance on determining the appropriate allowances.

Table 2 - Environment Agency Guidance on the Application of Climate Change

Flood Zone	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
2	Use the higher central allowance	Use the central allowance	Use the central allowance	Use the central allowance	Use the central allowance
3a	Use the higher central allowance	Development should not be permitted	Use the central allowance	Use the central allowance	Use the central allowance
3b	Use the higher central allowance	Development should not be permitted	Development should not be permitted	Development should not be permitted	Use the central allowance
*If (exceptionally) development is considered appropriate when not in accordance with Flood Zone vulnerability categories, then it would be appropriate to use the upper-end allowance.					

The site is located within Flood Zone 2. The development is classified as 'less vulnerable'. Typically a lifespan for a commercial development is 75-years; however, due to the client's lease being for 12 years with no option to extend, the anticipated lifespan for this development will be 12 years. Based on this anticipated lifespan, the proposed development will fall within the '2020s' epoch. Therefore, the central allowance should be considered, equating to an additional 11% on flow volumes atop the 1% annual probability (1 in 100 years) of predicted flood events.

> To ensure that the development is designed adequately for its lifetime, an allowance of 11% should be applied to the design flood (1 in 100-year event). EA Product 6 flood model data includes a 20% allowance for Climate Change (CC) for the 1 in 100-year flood event and will be considered further within Sections 2 and 3 of this report. However, it should be noted that this exceeds the 11% allowance that is stated in the Climate Change Allowance Guidelines for the Aire and Calder Management Catchment. Therefore, analysis of the CC is considered to be overly conservative.

1.13 Other Relevant Guidance

Flood Risk to People and New Developments

The Flood Risk to People (FD2321/TR1)[6] document was prepared as a research project considering flood hazards and factors that affect them.

Flood Risk Assessment Guidance for New Development (FD2320/TR2)[7] provides a framework and guidance for assessing and managing flood risks for new developments and sets flood hazard thresholds.

Hazard ratings are derived using the following equation in line with the above:

$$\text{Hazard Rating} = D * (V+0.5) + DF$$

Where:
D = depth;
V = velocity; and,
DF = debris factor

A supplementary note[8] provides clarification of the hazard rating thresholds which should be used for development planning and control use. Table 3 identifies the thresholds of the flood hazard categories.

Table 3 – Hazard to People[9].

Threshold for Flood Hazard Rating	Degree of Flood Hazard	Description
< 0.75	Low	Caution "Flood zone with shallow flowing water or deep standing water"
0.75 - 1.25	Moderate	Danger for some (i.e.: children, the elderly and the infirm) "Danger: Flood Zone with deep or fast flowing water"
1.25 - 2.0	Significant	The danger for most (including the general public) "Danger: Flood Zone with deep fast flowing water"

Hazard ratings are discussed further in the assessment of surface water flood risk in Section 2.2.

[6] Flood Risk to People Methodology (FD2321/TR1), Defra/Environment Agency, 2006
[7] Flood Risk Assessment Guidance for New Development (FD2320/TR2), Defra/Environment Agency, 2005
[8] Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purpose – Clarification of the Table 13.1 of FD2320/TR2 and Figure 3.2 of FD2321/TR1. (http://randd.defra.gov.uk/Document.aspx?Document=FD2321_7400_PR.pdf)
[9] 2008, DEFRA. Supplementary Note on Flood Hazard Ratings and Thresholds for Development Planning and Control Purposes.

2 Flood Risk Evaluation

The following sections provide an evaluation of the risk posed by the key flood sources in relation to the site location. Consideration is given to the severity of flood risk to the site as a whole, making use of existing flood mapping, high-level local strategic studies and available topographic information.

2.1 Fluvial Flood Risk

Fluvial flood risk originates from a watercourse of any size that may affect a site when the channel capacity is exceeded. This type of flooding often occurs following an extreme rainstorm event or a prolonged period of wet weather.

As previously mentioned within Section 1.8, the nearest EA-designated Main River to the site is the River Spen, which runs along the site's eastern boundary as an open channel, flowing in a southerly direction. This watercourse discharges into the River Calder approximately 6km to the southeast of the site. Additionally, there is an ordinary watercourse (Syke Beck) that is also shown to be an open channel is located approximately 76m south of the site and flows in an easterly direction. The Syke Beck is shown to discharge into the River Spen approximately 51m east of the site.

EA Flood Mapping

The EA's Flood Map for Planning (Rivers and Sea) (FMFP) divides the floodplain into risk-based categories and provides an indication of flood risk for the site. The EA Flood Map for Planning (Rivers and Sea) (Drawing 03) indicates that the majority of the site is located within **Flood Zone 2**; however, **Flood Zone 3** is shown to encroach ever so slightly upon the eastern boundary. The following is the definition of each of the three Flood Zone categories:

- **Flood Zone 3** - Land that has been assessed as having a 1% or greater annual probability of river flooding, or a 0.5% or greater annual probability of sea.
- **Flood Zone 2** - Land that has been assessed as having between 1% and 0.1% annual probability of river flooding, or a 0.5% or between 0.5% and 0.1% annual probability of sea.
- **Flood Zone 1** – Land that has been assessed as having a less than 0.1% annual probability of river or sea flooding.

The Flood Zones show the 'undefended' scenario, where any flood defences in the locality are not represented within the mapping.

The Risk of Flooding from Rivers and Sea (ROFRAS) mapping (Drawing 05) indicates that the majority of the site is located within an area of **Medium Risk**. Some areas of the site adjacent to the River Spen, being located within an area of **High Risk**. The ROFAS mapping is based upon a 50x50m grid square output, this means that the mapping is not accurate on a site-specific level and can be overly conservative. The following is the definition of the high, medium, low and very low-risk categories:

- **High Risk** has a greater than 1 in 30 (3.3%) chance of flooding within any given year.
- **Medium Risk** has between a 1 in 30 (3.33% AEP) chance and a 1 in 100 (1% AEP) chance of flooding within any given year.
- **Low Risk** has between a 1 in 100 (1% AEP) chance and a 1 in 1000 (0.1% AEP) chance of flooding within any given year.

- **Very Low** has less than 1 in 1000 (0.1% AEP) chance of flooding within any given year.

Defences

Flood defences have been identified along both the River Spen and Syke Beck in both the open-source GIS dataset. Interrogation of the defences within the open-source outlines indicated that the defences along the River Spen comprise a concrete wall. The Standard of Protection (SoP) for these defences could not be confirmed. The defences along the Syke Beck comprise natural high ground and provide a SoP of 1 in 50-year flooding events.

River Spen Flood Warning Improvements Hydraulic Modelling Report

Product 6 data was obtained from the EA and comprises linked Flood Modeller-Tuflow 1D-2D model data at the site location. This has been derived from the River Spen Flood Warning Improvements Hydraulic Modelling Report undertaken in 2009 by JBA Consulting. This data contains flood depths grids for the 1 in 5 years to 1 in the 1000 year (including the 1 in 100 years plus CC) undefended scenarios.

Table 4 outlines the maximum modelled flood depths projected at the proposed development based on flood modelled data from the River Spen Flood Warning Improvements Hydraulic Modelling Report utilising the undefended scenario flood depths. The flood levels are calculated via a comparison of the maximum flood depths and the lowest ground levels shown within the 2023 topographic survey in Appendix C for the site.

As seen within Drawing 06, the first modelled return period to pose a risk to the site is the 1 in 25-year event. This projects the flood water to encroach upon a small area of the eastern boundary and is restricted to the banks of the River Spen. Fluvial flooding within this extent is shown to not encroach upon the area of the proposed genset enclosures, Welfare & Security Units (Canteen and Office) and Electrical Distribution Pod.

Table 4 – Flood depths and maximum calculated flood levels at the Proposed Development in the undefended scenario

Proposed development		Return Periods				
		1 in 25-year event	1 in 50-year event	1 in 100-year event	1 in 100-year + 20% CC event	1 in 1000-year event
Genset Enclosure	Ground level (mAOD)	71.71				
	Maximum Flood Depth (m)	-	-	-	-	0.76
	Maximum calculated Flood Level (mAOD)	-	-	-	-	72.47
Welfare & Security Units	Ground level (mAOD)	72.02				
	Maximum Flood Depth (m)	-	-	-	-	0.41
	Maximum calculated Flood Level (mAOD)	-	-	-	-	72.43
Electrical Distribution Pod	Ground level (mAOD)	71.92				
	Maximum Flood Depth (m)	-	-	-	-	0.41
	Maximum calculated Flood Level (mAOD)	-	-	-	-	72.33

Drawing 06, Appendix B and Table 4 collectively demonstrate the resilience of the all the proposed developments against fluvial flooding up to and including the 1 in 100-year plus 20%CC. The proposals on site are only shown to be at risk of fluvial flooding in an extreme scenario (1 in 1000-year), with depths ranging from 0.41m to 0.76m. However, this analysis is considered to be overly conservative, as it uses the undefended scenario despite defences being identified along the River Spen.

It is important to note that the aforementioned analysis is based on modelled data for an undefended scenario. While defences are identified along the River Spen's banks, the Standard of Protection (SoP) regarding these defences could not be confirmed. Nonetheless, it is acknowledged that these defences offer protection to the site. Although it's unlikely they will protect up to a 1000 year event but this is not confirmed.

As previously mentioned in Section 1.10 of this report, the River Spen was reported to have exceeded its channel capacity in 2007, resulting in the open area south if the site being inundated with water from the River Spen.

In summary, the overall risk of fluvial flooding is considered to be **Low.** Further considerations are made within Section 3 in relation to keeping this risk to a low designation in the long-term.

2.2 Tidal Flood Risk

Tidal flood risk can affect the coastline as well as estuaries and rivers that are tidally influenced. Flood events often coincide with the tidal regime, high rainfall events or other natural phenomena, which can lead to water levels covering low-lying land or exceeding natural or man-made defences.

The nearest tidal extent of the River Ouse is understood to be located approximately 75km to the east of the site (near Goole).

In summary, the overall risk to the site from tidal flooding is considered to be **Negligible**. No further consideration is deemed necessary as part of this FRA.

2.3 Surface Water Flooding

Surface water flooding occurs when local drainage networks are overwhelmed during an extreme rainfall event, causing water to flow over the surface and follow gravity to the lowest point where it often pools. This flood source is increasingly becoming one of the major contributors of flood risk, due to changing weather patterns and increased extreme rainfall events occurring across the UK. This places more pressure than ever on drainage systems, which are often overwhelmed during flash flood events, normally only designed to take between a 1 in 20 and a 1 in 30 return period event.

When interpreting the surface water flood map information, it needs to be taken into account that surface water mapping is generated from largely high-level information. The flood mapping must be correctly interpreted to give a fair representation of the site's surface water flood risk and used only as a guide.

The EA Surface Water Flood Map (Drawing 07) is split into **High**, **Medium** and **Low** which are designated as follows:

- **High Risk** – each year, this area has a chance of flooding of greater than 1 in 30 (3.3%);
- **Medium Risk** – each year, this area has a chance of flooding of between 1 in 100 (1%) and 1 in 30 (3.3%); and,
- **Low Risk** – each year, the area has a chance of flooding of between 1 in 1000 (0.1%) and 1 in 100 (1%).

The following analysis is based on national scale mapping and does not take into account local detail which may reduce the degree to which flooding could affect the site including, for example, the positive effect of below-ground surface water drainage networks (also known as storm drains), where this is functioning to its design capacity.

The EA Surface Water Flood Map (Drawing 07) shows that surface water is projected to encroach upon the site's eastern boundary in the **High** and **Medium**-**Risk** extents. Drawing 07 also indicates that the proposed development are projected only to be at risk in the **Low-Risk** extent.

Drawings 08 and 09 show the projected surface water depths in the **High** and **Medium-Risk** extents. As stated previously, surface water is shown to encroach upon the eastern boundary of the site and to be restricted to the River Spen channel.

Drawing 10 shows the projected depths of surface water flooding at the site in the **Low-Risk** extent. Within this extent, localised surface water is shown to pool at the Security unit (north Welfare & Security Units) with depths estimated to reach up to 300mm. The general velocity of the surface water within this area is shown to be less than 0.25m/s. Hazard mapping shows a 'significant' hazard rating at the Security unit. As stated in Section 1.6 of this report, the Security unit will be located on the elevated strip of land parallel with the western boundary of the site as seen on the right-hand side of Figure 1 below. The surface water mapping is based on topographic levels derived from LiDAR. In this incidence the surface water mapping has identified an area of lower topography east of the elevated strip and issued an estimated surface water depth as stated above. However, in reality surface water is likely to disperse across the area of lower topography and is unlikely to encroach upon the security unit located on the elevated strip.

Figure 1 – Image of the site facing south, displaying the elevated strip (right-hand side) and the area of lower topography

Additionally, in the **Low-Risk** extent, the genset enclosures are shown to be encroached upon by surface water flooding, with depths projected to reach up to 300mm. Directional surface water mapping shows that the surface water projected within this area is aligned with the River Spen. Velocity mapping indicates that surface water flooding within this area has an average velocity of less than 0.25m/s. Surface water hazard mapping identifies that surface water provides a 'moderate' hazard within this area.

From a review of the documents that were mentioned in Section 1.3 of this report, it was indicated that the 2007 flooding event that was previously mentioned impacted an open area adjacent to the site, was a combination of fluvial and surface water flooding. As previously stated, this event was caused by a 1 in 200-year storm event that impacted the Kirklees area.

> In summary, the proposed development are situated outside of the High and Medium-Risk extents. Therefore, the overall risk of flooding from surface water at the site is considered to be **Low**. Further

considerations are made within Section 3 in relation to keeping this risk to a low designation in the long term.

2.4 Reservoir Failure

Assessment of risk of a reservoir failure may be interpreted as the extent of flooding that would occur, should any reservoir that has a capacity larger than 25,000m^3, suffer a catastrophic failure. Mapping of this nature is described by the Environment Agency as a very worst-case scenario, with a flood event of this type being extremely unlikely to occur.

The EA Risk of Flooding from Reservoir Failure mapping (Drawing 11) is based on two extents:

- **Wet Day (National)** - This data shows the individual flood extents for all large, raised reservoirs if they were to fail and release the water held on a "wet day" when local rivers had already overflowed their banks.
- **Dry Day (National)** - This data shows the individual flood extents for all large, raised reservoirs if they were to fail and release the water held on a "dry day" when local rivers are at normal levels.

The Risk of Flooding from Reservoir Failure mapping shows that the site is located within an area that is predicted to be at risk in the dry day failure event. Current legislation ensures that reservoirs are inspected regularly, and essential safety work is carried out as required.

From a review of the documents referenced in Section 1.3 of this report, it was indicated that there are several large-scale reservoirs located within the Kirklees area. There are also a number of smaller reservoirs located within the wider area of the site. However, as stated above current legislation ensures that reservoirs are inspected regularly, and essential safety work is carried out as required.

The site is located within an area predicted to be at risk of reservoir failure. However, due to current legislation, all reservoirs are inspected regularly and the likelihood of failure occurring is considered to be Low and the resultant risk is also considered to be **Low**. No further consideration is deemed necessary as part of this FRA.

2.5 Groundwater

Flooding from a groundwater source often occurs during or following a period of prolonged wet weather within areas that are low-lying lying underlain by permeable rocks (aquifers). When aquifers are at their maximum holding potential, flooding at surface level can occur from beneath the ground.

Groundwater as a sole flooding mechanism is often regarded as low risk as it often relies on a coinciding rainfall, or flood event from an additional source to become a flood risk. The main contributory factor that will enhance the risk of groundwater flooding, is prolonged periods of high rainfall, which result in the groundwater saturation level rising to the point where it reaches the surface.

Online BGS mapping shows the bedrock geology beneath the site comprises Pennine Lower Coal Measures Formation – Mudstone, Siltstone and Sandstone. This is classified by EA as a 'Secondary A' aquifer. This is defined as permeable layers capable of supporting water supplies at a local rather than

strategic scale and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers.

The bedrock geology is overlain by Alluvium - Clay, Silt, Sand and Gravel superficial deposits. This is also classified by EA as a 'Secondary A' aquifer.

The closest public borehole record to the site (BGS ref: SE12NE1115), that has information on groundwater, is located approximately 41m to the west and has a depth of approximately 2.35m below ground level (bgl). Groundwater is shown to have been encountered at 1.94m bgl.

There are no records of groundwater flooding at or within the vicinity of the site in the documentation outlined in Section 1.3 of this report. The Calder catchment SFRA mapping indicates that the site is located within an area 25-50% susceptible to groundwater flooding, which is considered to be low to moderate in terms of susceptibility. Susceptibility does not necessarily define the likelihood of groundwater flooding, but rather the susceptibility of the underlying geology to groundwater fluctuation. It should also be noted that this is based on high-level, district-scale mapping, and may not be an accurate representation of groundwater risk at the site.

> The risk of flooding from groundwater is considered to be **Low**. No further consideration is deemed necessary as part of this FRA.

2.6 Artificial Flood Sources

Flood risk from artificial sources would include the failure of man-made drainage or water supply networks. Although the likelihood of such an occurrence is highly unpredictable, it is recommended that any proposed works in future at the site take into account the location of any existing below-ground services, to avoid any inadvertent flooding taking place during the construction phase.

Sewer flooding was reported within the wider area in 2007. This was caused by insufficient capacity of local drainage systems resulting in several highway drains and culverts surcharging. However, there are no records of sewer flooding at or within the vicinity of the site in the documentation outlined in Section 1.3 of this report.

> In summary, the overall risk of flooding from artificial sources is considered to be **Low**. Considerations relating to the maintenance of drainage on site are made in Section 3.

2.7 Summary

Table 5 provides a summary of the classification of risk to the site from all flood sources and indicates where further considerations are required.

Table 5 - Flood Risk Summary

Flood Source	Overall Risk Classification	Additional Considerations
Fluvial	Low	See Section 3.
Tidal	Negligible	None.
Surface Water	Low	See Section 3.
Reservoir Failure	Low	None.
Groundwater	Low	None.
Artificial Sources	Low	See Section 3.

3 Sequential Test

A Sequential Test ensures that all new developments are steered towards areas with the lowest probability of flooding. As part of flood risk management, this test aims to avoid flood risk by directing developments away from high and medium flood risk zones. The goal is to prioritise the use of land that is least susceptible to flooding, thereby minimizing the risk to people and property.

3.1 Sequential test Search Area

A sequential test is not required as per Annex 3 of the Planning Practice Flood Risk and Coastal Change Guidance. However, the LLFA and EA have requested that a Sequential Test be undertaken.

Following the request for sequential test by the EA and LLFA, an appropriate 'search area' has been initially identified. As explained in Section 1.6, the development/use proposed relates fundamentally to the movement of large genset enclosures by road from the client's factory at Flush Mills (approximately 2.4km south of the site), to the storage site and onward to the motorway network. The loads are 'oversized' and taken by specialist transportation company using low-loader vehicles (i.e. larger than normal HGV).

All deliveries currently go to third-party sites in Mirfield or Euroways before progressing to the M62. The client has already relocated the assembly to these less desirable sites, as they do not have space at Flush Mills. All movements use Junction 26 of the M62 via the A638. The proposed site at St Peg Lane is well suited to meet this requirement, simplifying transportation and reducing road impacts by eliminating the need for third-party sites. It is also located close to Flush Mills, the A638, and Junction 26.

Notwithstanding this, routes to junctions 25 and 27, incorporating the A-roads were considered within the search area. However, discussions held with Wakefield Acoustics and its transport provider indicated that the physical form of the highway across parts of this network is unsuitable to accommodate the oversized vehicles' movements. This may be due to road width, gradient, low bridge, tight corners, junction restrictions, weight restrictions and in some cases a police escort.

The client cannot consider occupation of a site to which access is constrained, or where movements require additional authorisation or police escort. The effect of this is that any sequential test search area is more tightly bound than originally anticipated. In particular, the following locations are not suitably accessible and have been **excluded** from the search area:

- Sites accessed via A62 Huddersfield Road between M62 J25 and Flush Mills are not feasible due to the weight limit at Mirfield and turning manoeuvre restriction to A638 at Heckmondwike.
- Sites accessed via A649 Halifax Road between A643 junction and Flush Mills are not feasible due to turning manoeuvre restriction to A643 at Hartshead Moorside and to A638 at Heckmondwike.
- Sites accessed via A643 Moorside/Westgate between A649 junction and A638 junction at Cleckheaton are not feasible due to low bridge and turning manoeuvre restriction at A649.
- Sites accessed via A643 Spen Bank/Spen Lane east of St Peg Lane are not feasible due to road gradient, bends and turning manoeuvre restrictions at A651 junction.

- Sites accessed via A62 Huddersfield Road east of A652 Bradford Road are not feasible due to width restriction at the junction.

Accessible sites are therefore located broadly around the A638, A58 and A651. However, the gradient and arrangement at the A651/A58 junction is not ideal for such movements, which could lead to increased transportation distance within the urban area i.e. going back from the A651 via Heckmondwike and the A638 to J26.

The search area for this sequential test can be seen in Drawing 12.

Due to the proposed development at the site comprising to storing large genset enclosures, a minimum of 0.5ha land coverage is required. However, a site larger than this is more desirable.

3.2 Identifying Alternative Sites

To prepare for this Sequential test, the following information was reviewed:

- Kirklees Council Site Allocations Plan[10];
- Kirklees Council Land and Property registry [11];
- Kirklees Brownfield Land Register[12];
- Kirklees Council Commercial, Retail, office or industrial property[13]; and
- Online Searches
- Consultation with a commercial property agent

The Kirklees Council Site Allocation Plan was reviewed in July 2024. Table 6 below lists the sites identified within the search area and assesses their suitability for the proposed development.

Table 6 – Sites identified within the Kirklees Council Site Allocation Plan and comments about suitability for the proposed development

Site Code	Site Address	Site Size (Ha)	Flood Zone	Comments
HS109	Land east of, Boundary Street, Heckmondwike	1.58	3	Located within Flood Zone 3, therefore there is no difference in identified flood risk at the proposed site (Peg Lane). This site has been allocated for housing. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.
HS115	Stubley Farm, Leeds Road, Heckmondwike	1.33	1	The access road to the site is a single-lane farm road which is not suitable for the low-loader vehicles that are required. The site is only available for housing allocations. Since the proposed development is not intended for housing,

[10] https://www.kirklees.gov.uk/beta/planning-policy/pdf/local-plan-allocations-and-designations.pdf and Kirklees Development Plan | Kirklees Council
[11] https://www.kirklees.gov.uk/beta/premises-and-land/council-land-and-property.aspx
[12] https://www.kirklees.gov.uk/beta/planning-policy/brownfield-land-register.aspx#:~:text=The%20Kirklees%20Brownfield%20Land%20Register,It%20is%20updated%20annually.
[13] https://www.eddisons.com/property-search

Site Code	Site Address	Site Size (Ha)	Flood Zone	Comments
				any planning applications or acquisition of the site are likely to be refused.
HS83	Land south of, Mill Street, Birstall	7.72	3	Located within Flood Zone 3, therefore there is no difference in identified flood risk at the proposed site (Peg Lane). A review of the latest Google Street View shows that this site has already been built upon.
HS108	Land north of, 2 - 4, Traith Court, White Lee	1.06	1	This site is located just outside of the search area. This site can only be accessed via B6122 and Sunny View. The low-loader vehicles are not suited for travelling along these roads. This site has been allocated for housing. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.
ES8	Land south east of , Spen Valley Industrial Park , Rawfolds way , Cleckheaton	1.52	3	Located within Flood Zone 3, therefore there is no difference in identified flood risk at the proposed site (Peg Lane). The site is only available for employment allocations. Since the proposed development is not intended for employment allocations, any planning applications or acquisition of the site are likely to be refused. Several industrial units are present at the site limiting the space that is available for storing the genset enclosures. Google Earth Pro aerial photography indicates this allocation site was constructed in 2017/18. It is not therefore an available site. (Yard/parking/circulation space within such development is not available for separate storage/assembly use).
HS103	Land north of, Tesco Superstore, Northgate, Cleckheaton	1.38	3	Located within Flood Zone 3, therefore there is no difference in identified flood risk at the proposed site (Peg Lane). A review of Google Street View shows that this site has already been built upon.
HS105	Land to the East of Hightown Road, Cleckheaton	1.38	3	Located within Flood Zone 3, therefore there is no difference in identified flood risk at the proposed site (Peg Lane). Access to the site is along the A643. A low-lying bridge prevents access to the site. A review of Google Street View shows that this site has already been built upon.
MXS8	Moorlands Business Centre, Balme Road, Cleckheaton	0.46	3	Is a mixed-use site; however, the site is below the 0.5ha minimum that the client requires. Is a largely developed site; it is not a site suitable for open storage/assembly use. Wouldn't be feasible or appropriate to acquire and demolish.

Site Code	Site Address	Site Size (Ha)	Flood Zone	Comments
HS118	Land Adjacent, Halifax Road, Hightown, Liversedge	1.23	1	Access to this site is narrow and requires low-loader vehicles to negotiate between two buildings to get access to the site. This site has been allocated for housing. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.
HS119	Land to the South of Halifax Road, Hightown	0.66	1	Low-lying overhead cables may prevent the loading and unloading of the genset enclosures and may restrict access for the low-loader vehicles. This site has been allocated for housing. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.
HS121	Land at, Gomersal Primary School, Oxford Road, Gomersal	1.42	1	Several industrial units are present at the site limiting the space that is available for storing the genset enclosures. The site is only available for housing allocations. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.
HS114	Land at, 7, Church Lane, Gomersal	0.67	1	Narrow entrance that is not suitable for low-loader vehicles. The site is only available for housing allocations. Since the proposed development is not intended for housing, any planning applications or acquisition of the site are likely to be refused.

As indicated in Table 6, all available sites within the search area identified in the Kirklees Council Site Allocation Plan fail to meet the requirements of the proposed development.

Table 7 lists the sites available on the Kirklees Council Land and Property registry. A review of these sites in July 2024 revealed that only one site was located within the search area.

Table 7 - Sites identified within the Kirklees Council Land and Property registry and comments about suitability for the proposed development

Site Address	Comments
Land Adjacent, 59 Heckmonwike Road, Dewsbury, WF13 3PL	This is for a single property and would not accommodate the land required for the storage of genset enclosures.
The Homestead, Hurst Knowle, Almondbury, Huddersfield, HD5 8SG	Not located within the search area.
Paddock Young Peoples Centre, Beech Street, Paddock, Huddersfield, HD1 4JN	Not located within the search area.

Further investigation showed that this site is suitable for a single property and cannot accommodate the land necessary for storing the genset enclosures. In addition to the Kirklees Council Land and Property registry, we also reviewed the commercial, retail, office, or industrial property registry via

Eddisons. The Eddisons interactive mapping revealed no available sites within the search area that meet the proposed development requirements.

Table 8 lists the sites within the search area that meet the initial development requirements as per the Kirklees Brownfield Land Register.

Table 8 - Sites identified within the Kirklees Brownfield Land Register and comments about suitability for the proposed development

Site Code	Site Address	Site Size (Ha)	Flood Zone	Comments
BLR_071	Cleckheaton Mills, Bradford Road, Cleckheaton, BD19 5BD	2.66	3	Located within Flood Zone 3, therefore there is no difference in identified Flood Risk at the proposed site (Peg Lane). A review of Google Street View shows that this site has already been built upon.
BLR_089	Land at, Serpentine Road, Cleckheaton, BD19 3NA	1.38	3	Located within Flood Zone 3, therefore there is no difference in identified Flood Risk at the proposed site (Peg Lane). A review of Google Street View shows that this site has already been built upon.
BLR_095 (Same site as HS119)	Former Parkham Foods Site, 395, Halifax Road, Liversedge, WF15 8DU	0.66	1	Low-lying overhead cables may prevent the loading and unloading of the genset enclosures and may restrict access for the low-loader vehicles.
BLR_148	Land at, Ings Road, Littletown, Liversedge, WF15 6HL	0.3	3	Below the 0.5ha minimum that the client requires
BLR_078	Former White Lee Colliery, Leeds Road, Heckmondwike	0.31	1	Below the 0.5ha minimum that the client requires
BLR_090	Calder Mould Services, Headlands Road, Liversedge, WF15 7NT	1.2	1	The access is only available via a B road. A narrow road connects to the entrance of the site. Several industrial units are present at the site limiting the space that is available for storing the genset enclosures.

As shown in Table 8, none of the sites identified within the Kirklees Brownfield Land Register and located within the search area meet all the requirements of the proposed development.

As part of this Sequential Test, online property portals such as LoopNet[14] and Savills[15] were also reviewed. No sites within the search area, apart from the site at Land Off St Peg Lane, Cleckheaton, BD19 3SA, met the requirements for the proposed development[16].

[14] https://www.loopnet.co.uk/

[15] https://search.savills.com/vn/en/list?SearchList=Id_27570+Category_TownVillageCity&Tenure=GRS_T_R&SortOrder=SO_PCDD&Currency=GBP&Period=Year&CommercialPropertyType=GRS_CPT_I&Receptions=-1&CommercialSizeUnit=SquareMeter&Category=GRS_CAT_COM&LocationKey=englandwestyorkshirecleckheatonbd19&Shapes=W10

[16] https://www.loopnet.co.uk/Listing/St-Peg-Lane-Cleckheaton/21972396/

Sequential Test Summary

In summary, none of the sites identified in Section 3.4 of this report are suitable alternatives to the site at Land Off St Peg Lane, Cleckheaton, BD19 3SA. Reasons include being outside the search area, transport constraints, inappropriate size, or location in Flood Zone 3.

4 Flood Risk in Planning Context

This report has so far evaluated all potential flood risk sources that may affect the site. The following sections describe the identified flood risks in the context of the proposed development and provide recommendations, where required, for the mitigation or reduction of those risks to enable safe development.

4.1 Flood Risk Status

The EA flood maps have been analysed for potential flood risk at the site. The majority of the site is located within Flood Zone 2; however, Flood Zone 3 is shown to slightly encroach upon the eastern boundary. A review of the Flood Modeller-Tuflow 1D-2D model data derived from the River Spen Flood Warning Improvements Hydraulic Modelling Report (2009) indicated that the proposed development will be unaffected by flooding up to and including the 1 in 100-year plus 20% Climate Change event. Therefore, the risk of fluvial flooding is considered to be **Low** at the site.

The EA Surface Water mapping projects that the proposed development will be unaffected by surface water in both the High and Medium-Risk extents. The genset enclosures are shown to marginally at risk of surface water flooding in the Low-Risk extent. Due to this, the risk of surface flooding is considered to be **Low** for the proposed development at the site.

The risk of flooding from tidal, groundwater, reservoirs and artificial sources is considered to be **Negligible** or **Low**.

4.2 Development Viability

The Environment Agency classifies different types of development according to their perceived vulnerability to flood risk. The proposed development is understood to comprise a change of use at the site. Utilising the currently vacant land for the assembly and storage of genset enclosure-based generator units, including the siting of security and welfare cabins.

Based on the EA vulnerability classification system outlined in Annex 3 of the Planning Practice Flood Risk and Coastal Change Guidance, the proposed development would be classed as 'less vulnerable'. Table 2 of the Planning Practice Flood Risk and Coastal Change Guidance indicates that due to the site being in Flood Zone 2 and classified as 'less vulnerable', the site is not required to produce an exception test.

4.3 Design Principles for Development

The following Section will talk about the individual design elements for the proposed development in relation to their flood risk.

As stated in 1.10 of this report the site is located within Flood Zone 2, with an anticipated lifespan of 12 years. Based on this anticipated lifespan, the proposed development will fall within the '2020s' epoch. Therefore, the central allowance should be considered, equating to an additional 11% on flow volumes atop the 1% annual probability (1 in 100 year) flood event ('Design flood'). The model data provided by

the EA only contains flood level data for the 20% allowance for CC at the 1 in 100 year event, and no lower allowance values such as the 11%. Therefore, the 20% allowance has been used and is considered to be more conservative than the newer 11% allowance. Despite the greater CC allowance, all of proposed features that form the proposed development are not located within the 1 in 100 year plus 20% CC event. Therefore, the proposed developments will not impact the site's floodplain storage during a 1 in 100 year plus 20%CC or lower flooding event.

In order to protect against the residual risk from greater magnitude flood events (extreme 1 in 1000), where possible the floor level of the welfare and security units or lowest point of flood vulnerability should be positioned a further 0.3m above the current proposed levels.

- Welfare Unit raised to 72.32mAOD (0.3m + 72.02mAOD)
- Security Unit raised to 72.37mAOD (0.3m + 72.07mAOD)
- Internal electricals within the Electrical Distribution Pods raised to 72.42mAOD (0.5m + 71.92mAOD)
- All drainage features within the site boundary should be jetted and inspected regularly by an appointed maintenance contractor.

Due to a residual risk of flooding at the genset enclosures in the extreme 1 in 1000 year flooding event, Wakefield Acoustics have undertaken buoyancy calculations for the genset enclosures in the extreme event, a copy of these calculations can be seen in Appendix E. These calculations indicate that the buoyancy force generated by the genset enclosures is insufficient to overcome their unloaded weight, preventing them from floating. Consequently, fencing or anchoring is not necessary.

A Flood Warning & Evacuation Plan (FWEP) has been completed by Ashfield for the site (Ref 182623) and will be issued alongside this FRA by the client as part of the planning application.

EA Flood Warnings and Weather Warnings

Aside from the aforementioned forward considerations, the following should also be considered with a view to raising flood awareness.

- **Weather Warnings**: It is recommended that the client sign up to receive weather warnings for the area in which the site is located.
- **EA Flood Warnings**: The site is shown to be located within the River Spen at Cleckheaton warning area (Ref No. 123FWF281). It is recommended that the client sign up to receive EA flood warnings as a precaution, as stated in the FWEP (discussed below).

Flood Warning and Evacuation Plan

Ashfield has outlined a separate FWEP (Ref: 182623) that details the action necessary before, during and following a potential flood event. These actions should be informed by the aforementioned weather warnings and EA flood warnings. These precautions will help to manage the residual risk of flooding in the extreme 0.1% AEP, ensuring that the site is vacated after a flood warning is issued.

4.4 EA/ LLFA comments

The following bullet points address the comments raised by the EA (August 2024) on the FRA (182623-F02 Rev A).

- **EA Comment:** Adequately assess flood risk to the site. We note that there are flood walls along the River Spen at the proposed development site. The FRA and any Flood Warning and Evacuation Plan should be updated with a consideration of residual risk arising from the flood walls.
  - **Ashfield Response:** Any potential overtopping or failure of the flood walls would result in water flowing south, consistent with the site's natural topography, and would move away from generator units and associated facilities. The residual risk has been incorporated into a separate Flood Warning and Evacuation Plan (Ref: 182623) to ensure that appropriate measures are in place to safeguard the users of the site, by the way of an appropriate flood warning and evacuation procedure.
- **EA Comment:** Demonstrate that the proposed development does not increase flood risk to others. We note that the FRA states "The proposed development [...] Is unlikely to increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water runoff" but does not provide any evidence to support this claim.
  - **Ashfield Response:** The careful design and strategic siting of the genset enclosure-based generator units and associated facilities ensure that the development is resilient to identified flood risks and maintains the natural floodplain functionality. All proposed features are situated outside of the design flood extent (1 in 100 year plus 20% CC). Therefore, the development is not considered to impact on flood storage at the site. A meeting between Ashfield and the Kirklees as the LLFA was held on 30th August 2024 (Appendix F) to discuss flood risk and drainage at the site following their consultation response. The LLFA confirmed that as there is no 'built' development proposed at the site or any changes to ground surfacing, they are satisfied that there is no increase in flooding, and that no changes are required regarding drainage/attenuation/discharge rates. The Genset Enclosures (containers) will discharge water onto the ground, which will be managed by the existing drainage at the site. Therefore, the LLFA confirmed they had no objections to the proposed development at the site.

5 Conclusion

The site has been assessed for flood risk from a variety of flood sources. The majority of the site is located within Flood Zone 2; however, Flood Zone 3 is shown to encroach upon the eastern boundary. A review of the Flood Modeller-Tuflow 1D-2D model data derived from the River Spen Flood Warning Improvements Hydraulic Modelling Report (2009) indicates that the proposed development will be unaffected by flooding up to and including the 'design flood' event (1 in 100-year plus 20% Climate Change). Therefore, the risk of fluvial flooding is considered to be **Low to Moderate** for the proposed development at the site.

The EA Surface Water mapping projects that the proposed development will be unaffected by surface water in both the High and Medium-Risk extents. The genset enclosure and Electrical distribution Pod are shown to be marginally at risk of surface water flooding in the Low-Risk extent. Due to this, the risk of surface flooding is considered to be **Low** for the proposed development at the site.

The risk of flooding from tidal, groundwater, reservoirs and artificial sources is considered to be **Low** or **Negligible**.

As part of this FRA revision, the EA and LLFA have requested the completion of a Sequential Test for the site. The test revealed that none of the examined sites offered a viable alternative location for the proposed development. This conclusion was reached due to factors such as being located outside the designated search area, having insufficient site size, containing obstructions that prevent reasonable storage of the genset enclosures, or exhibiting a flood risk level (Flood Zone 3) the same as the site at St Peg Lane.

Outlined recommendations for the proposed development to incorporate during the design stage. These will seek to reduce and negate flood risk designations of fluvial and surface water.

All aspects of the proposed site layout are shown to be outside of the design event flood extent (1 in 100 plus 20% CC). In order to protect against the residual risk from greater magnitude flood events, where possible the floor level of the Welfare and Security units or lowest point of flood vulnerability should be positioned a further 0.3m above ground levels. The following are recommendations for protecting against residual risk of flooding at the site:

- Ground levels around the Welfare Unit should be raised to 72.32mAOD (0.3m + 72.02mAOD);
- Ground levels around the Security Unit should be raised to 72.37mAOD (0.3m + 72.07mAOD);
- Internal electricals within the Electrical Distribution Pods raised to 72.42mAOD (0.5m + 71.92mAOD);
- All drainage features within the site boundary should be jetted and inspected regularly by an appointed maintenance contractor.

This report therefore demonstrates that the proposals at the site are:

- Suitable in the location proposed and will be adequately flood resistant and resilient;
- Unlikely to place additional persons at risk of flooding, and will offer a safe means of access and egress; and,

- Are not considered to increase flood risk elsewhere as a result of the proposed development through the loss of floodplain storage, impedance of flood flows or increase in surface water runoff.

Limitations of this report

This report has been prepared by Ashfield Flood Risk Solutions Limited (Ashfield) for the sole benefit of Wakefield Acoustics Limited (the "Client") and has not been assigned to any other third parties. If reliance on this report was required by a third party, this could be arranged for an agreed fee. This report should not be used by the client in relation to any other matters not covered specifically by the scope of the report. If this report does not contain a signature in the Document Control window, then this is an uncontrolled electronic copy and should not be relied upon by the client or any other recipient, as Ashfield cannot give assurances on the source or content of the document. Ashfield has used all reasonable skill, care and diligence in the preparation of this report.

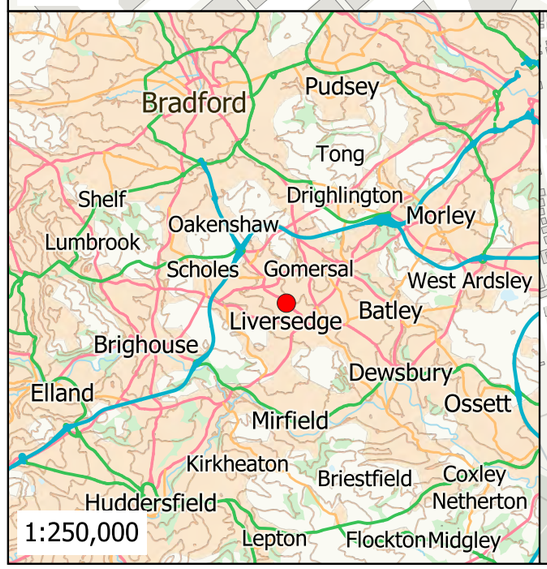
The Flood Risk Assessment report has been designed to satisfy client requirements, as outlined in Section 1. It is a desktop review of information provided by the client and from selected private and public databases. It only includes a site investigation where specifically referenced. This report does not make a detailed site-specific assessment of the suitability of the existing drainage at the site. Ashfield accepts no responsibility for the accuracy or completeness of third-party data reviewed within this assessment.

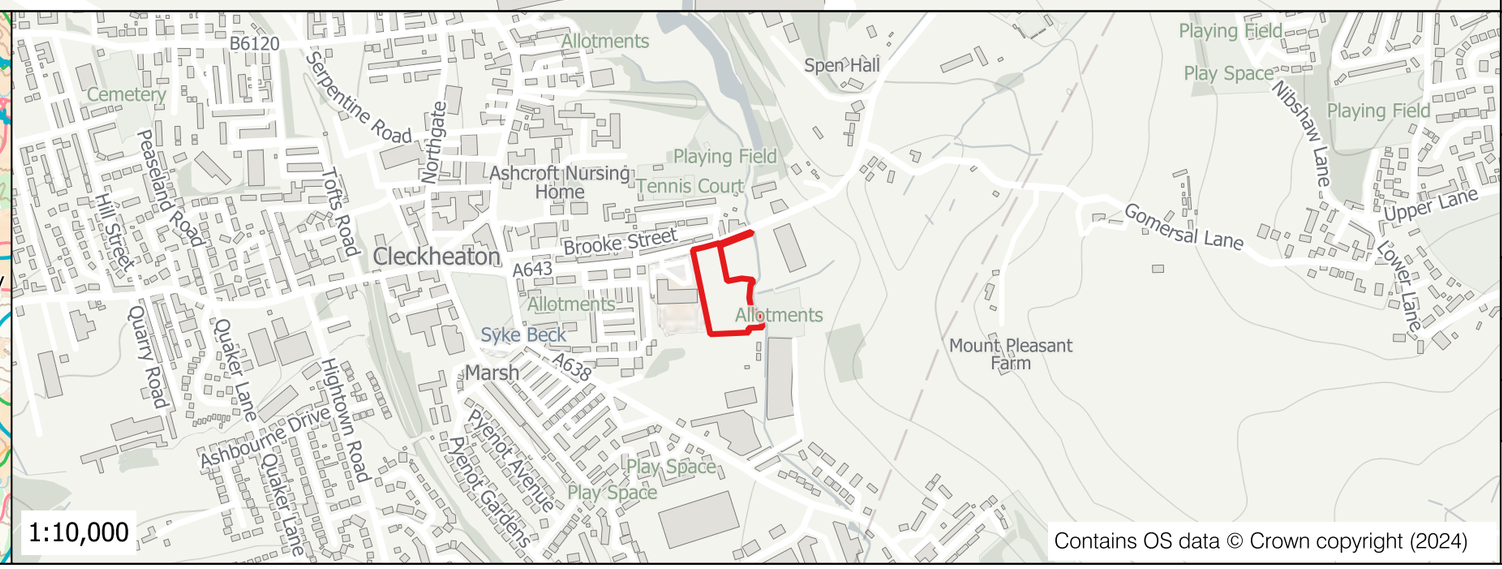
This report is provided under Ashfield Solutions Limited Standard Terms and Conditions.

Drawings

Legend

- Site Boundary
- Site Location





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Client

Wakefield Acoustics Limited

Project

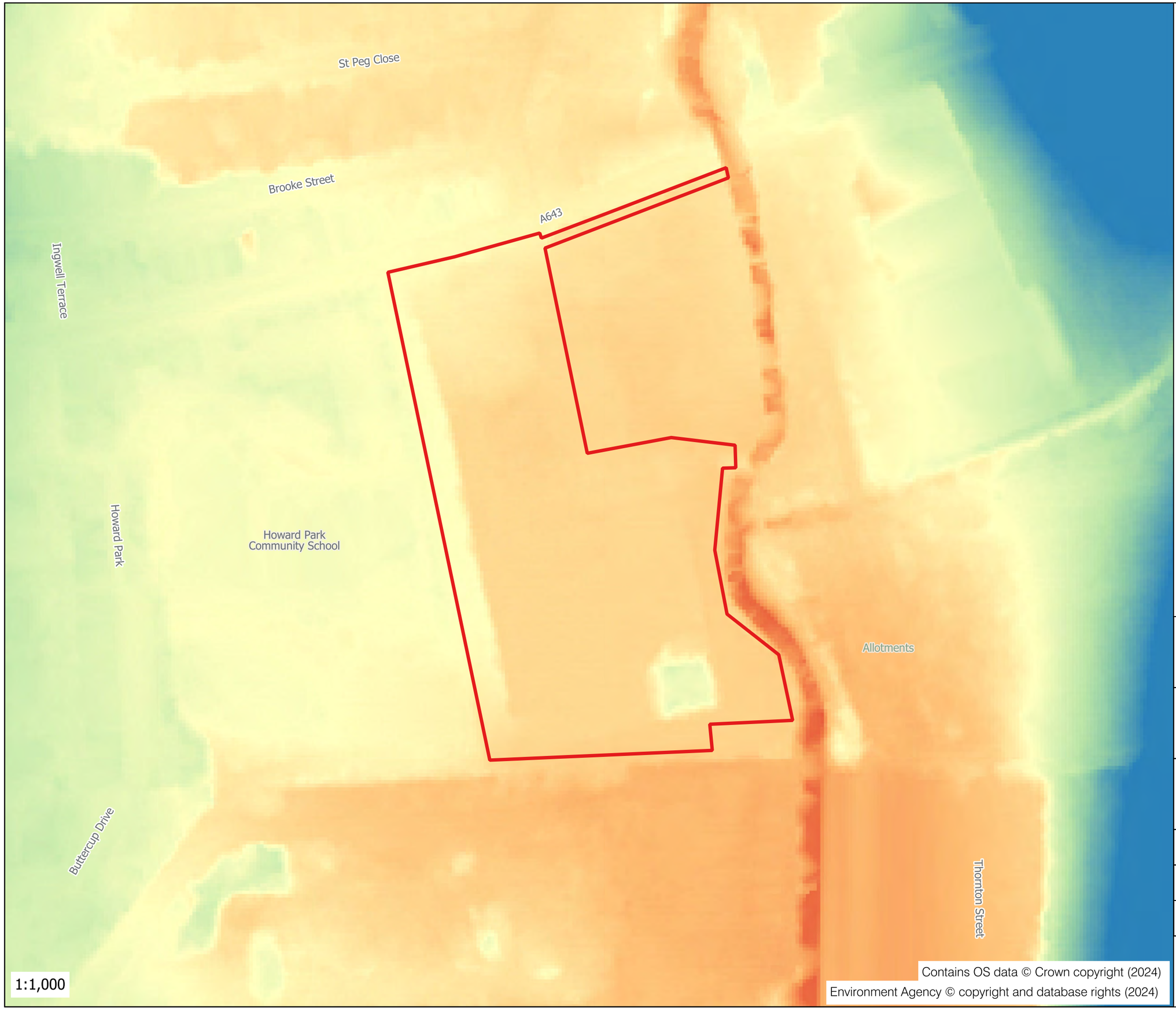
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

Site Location Plan

Report No.	Drawing No.	Revision
182623-F02	01	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

ASHFIELD — SOLUTIONS GROUP —



Contains OS data © Crown copyright (2024)
Environment Agency © copyright and database rights (2024)

Legend

- Site Boundary

LiDAR Derived Ground Levels (mAOD)

- =< 67
- 68
- 69
- 70
- 71
- 72
- 73
- 74
- 75
- 76
- => 77

Client

Wakefield Acoustics Limited

Project

Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

LiDAR Derived Ground Levels Plan

Report No.	Drawing No.	Revision
182623-F02	02	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

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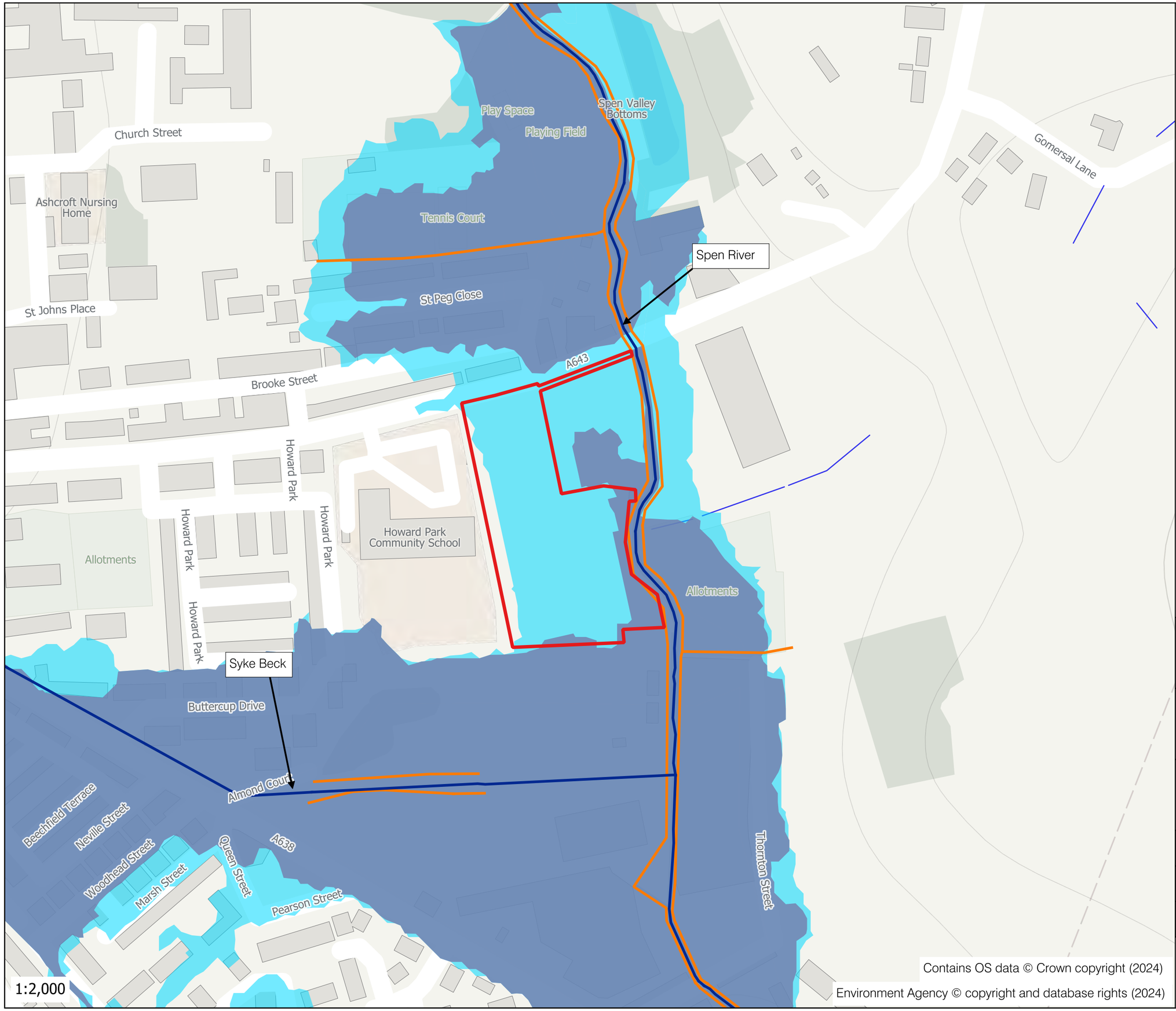

Legend

- Site Boundary
- Main Rivers
- OS Ordinary Watercourse
- Flood Defences
- Areas Benefiting from Flood Defences
- Flood Zone 3
- Flood Zone 2

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Client
Wakefield Acoustics Limited

Project
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title
EA Flood Map for Planning

Report No.	Drawing No.	Revision
182623-F02	03	-
Scale	Date	Frame Size
As Shown	26/01/2024	A3
Produced By	Drawn By	Approved By
LC	LC	RW

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Legend
- Site Boundary
- Recorded Flood Outlines

Client
Wakefield Acoustics Limited

Project
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title
EA Recorded Flood Outlines

Report No.	Drawing No.	Revision
182623-F02	04	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

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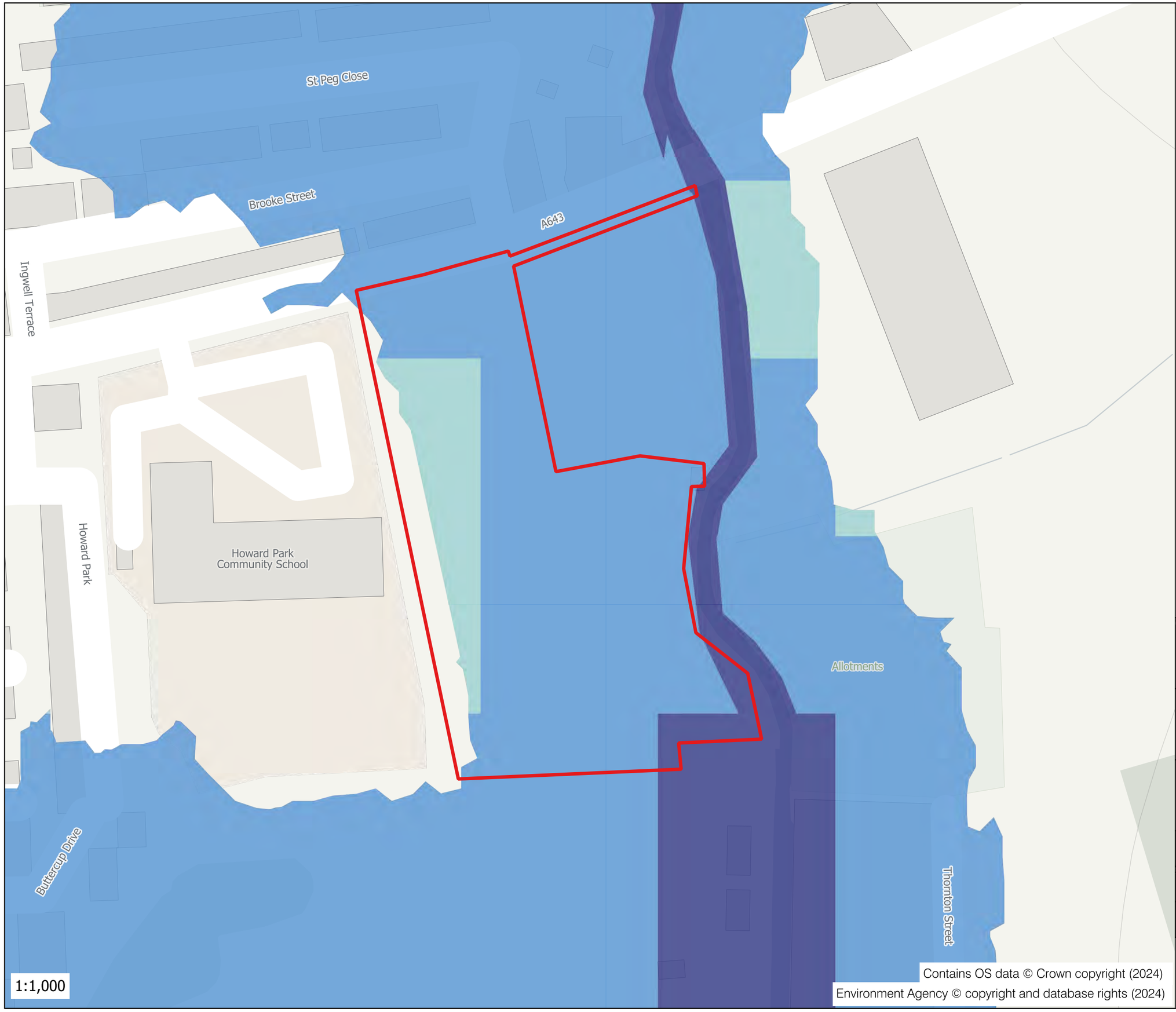

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Environment Agency © copyright and database rights (2024)

Legend

Site Boundary

EA Risk of Flooding from Rivers and Sea (ROFRAS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

Client

Wakefield Acoustics Limited

Project

Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

EA Risk of Flooding from Rivers and Sea Mapping (ROFRAS)

Report No.	Drawing No.	Revision
182623-F02	05	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

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Environment Agency © copyright and database rights (2024)

Legend

- Site Boundary

Proposed Developments

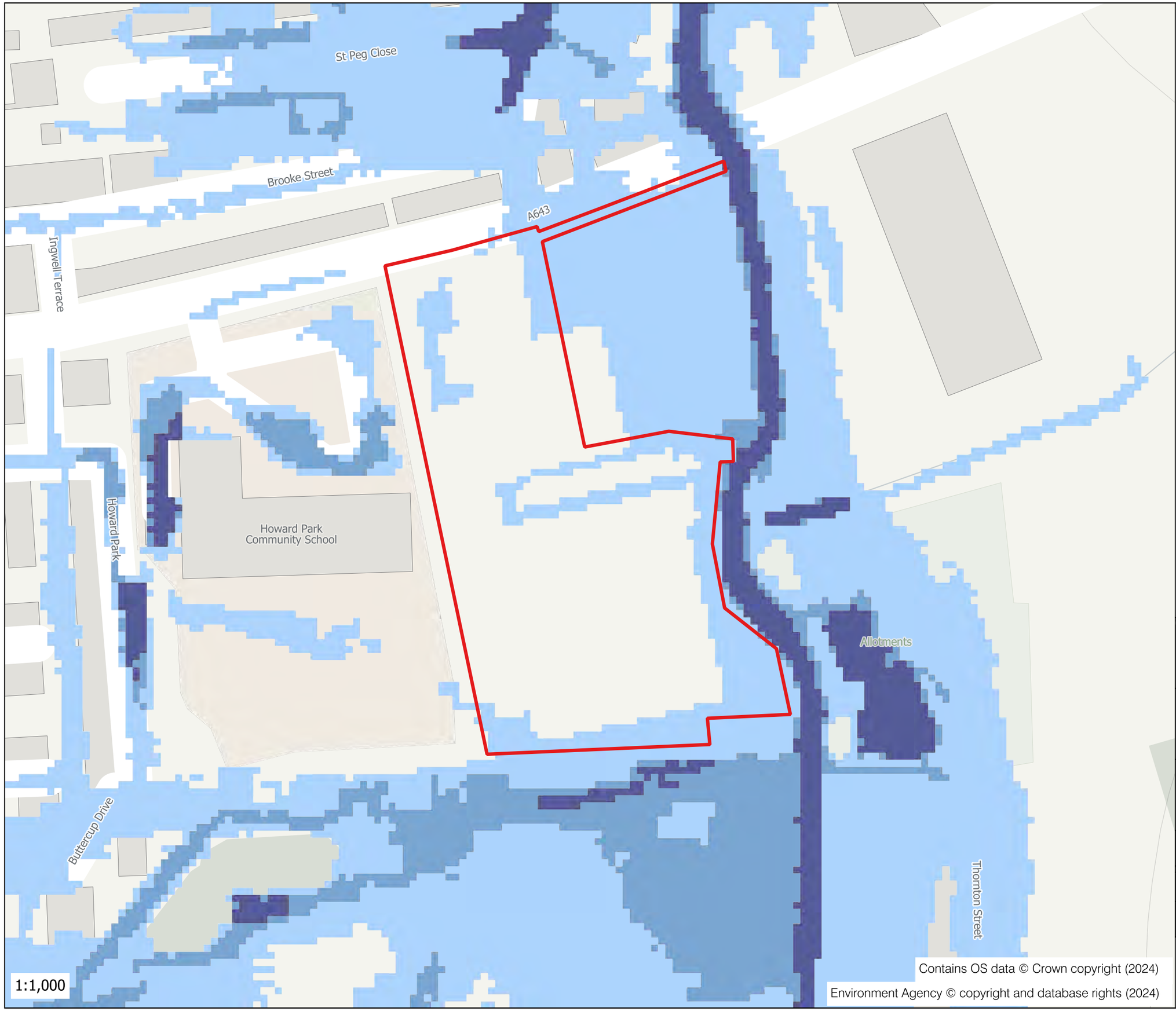
- Canteen
- Electrical Distribution Pod
- Genset Enclosures
- Office
- Security Cabin

Return Periods

- 1 in 25 year (25%)
- 1 in 50 (2%)
- 1 in 100 year (1%)
- 1 in 100 + 20% climate Change
- 1 in 1000 year (0.1%)

Client		
Wakefield Acoustics Limited		
Project		
Land Off, St Peg Land, Clekheaton, BD19 3SA		
Title		
Modelled Flood Outlines from the 2009 Studt (JBA Consulting)		
Report No. 182623-F02	Drawing No. 06	Revision B
Scale As Shown	Date 24/09/2024	Frame Size A3
Produced By RW	Drawn By RW	Approved By JR

ASHFIELD
SOLUTIONS GROUP



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Legend

- Site Boundary
- High Risk - 1 in 30 Year Extent
- Medium Risk - 1 in 100 Year Extent
- Low Risk - 1in 1000 Year Extent

Client

Wakefield Acoustics Limited

Project

Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

EA Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
182623-F02	07	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

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Environment Agency © copyright and database rights (2024)

Legend

- Site Boundary

High Risk Depths (m)

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Wakefield Acoustics Limited

Project

Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

High Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
182623-F02	08	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

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Legend

- Site Boundary

Medium Risk Depths

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Wakefield Acoustics Limited

Project

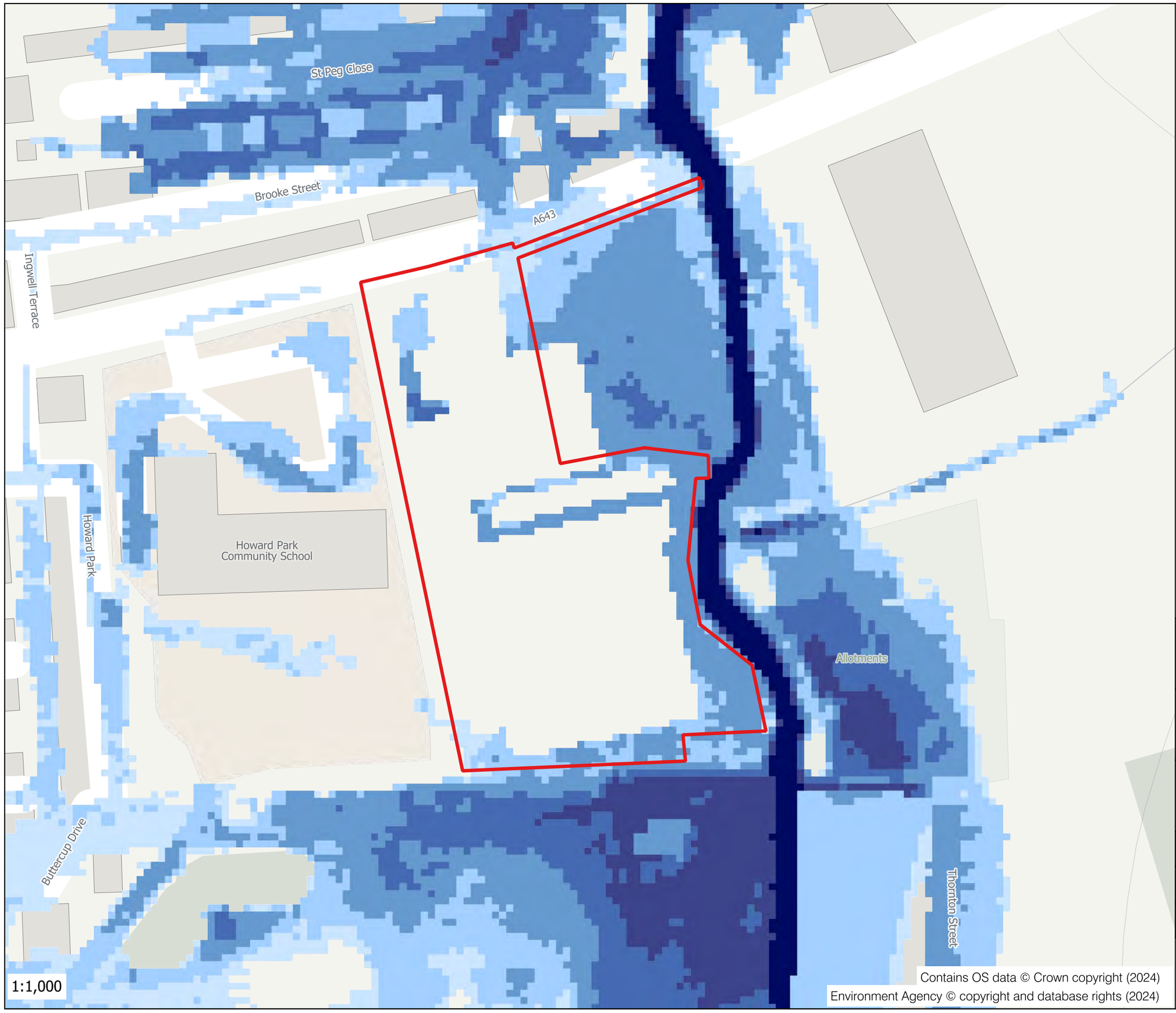
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

Medium Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
182623-F02	09	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

ASHFIELD
SOLUTIONS GROUP



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Legend

- Site Boundary

Low Risk Depths

- Below 150mm
- 150 - 300mm
- 300 - 600mm
- 600 - 900mm
- 900 - 1200mm
- Over 1200mm

Client

Wakefield Acoustics Limited

Project

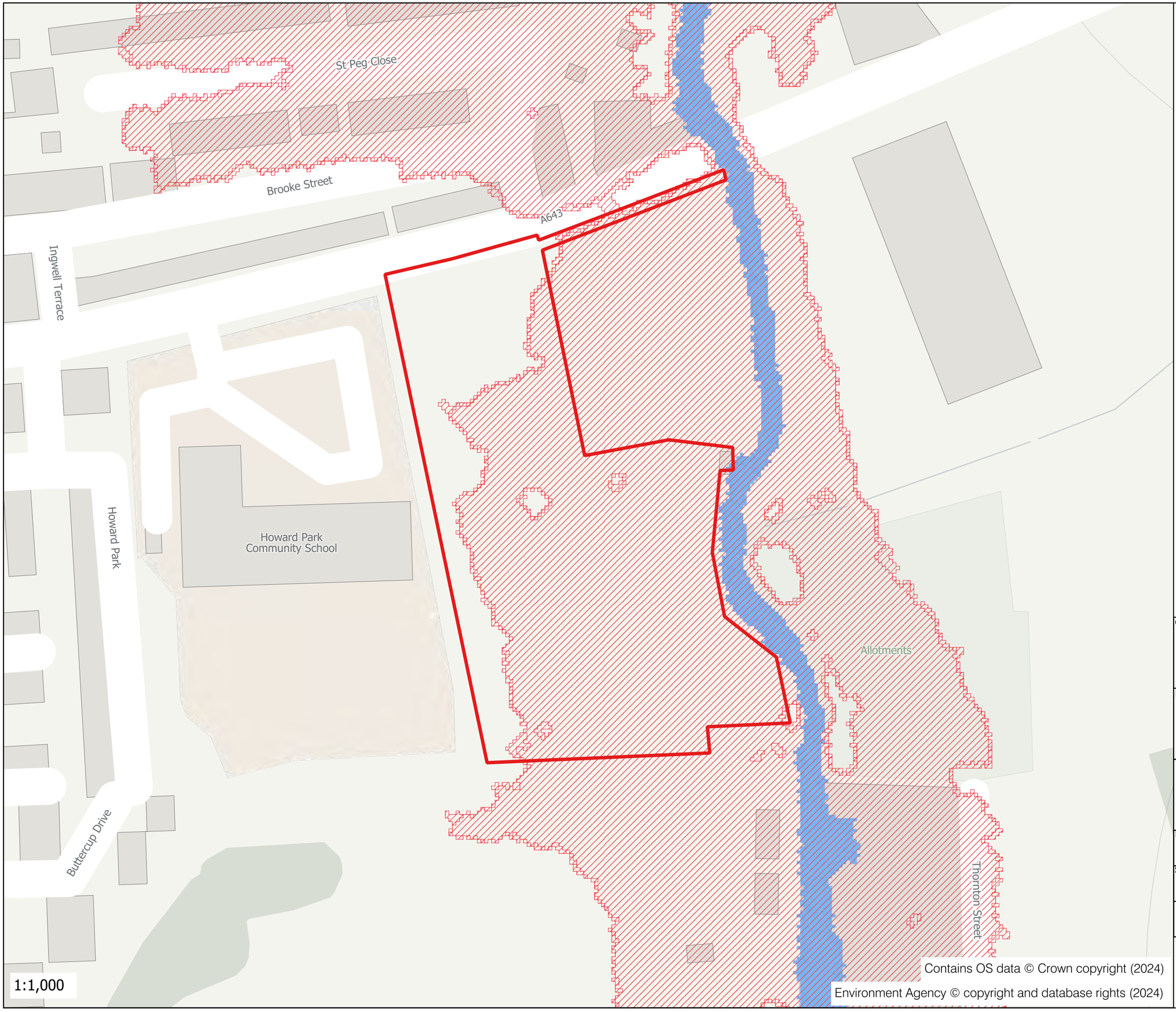
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

Low Risk of Flooding from Surface Water

Report No.	Drawing No.	Revision
182623-F02	10	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

ASHFIELD
SOLUTIONS GROUP



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Legend

- Site Boundary
- Dry Day Reservoir Extent
- Wet Day Reservoir Extent

Client

Wakefield Acoustics Limited

Project

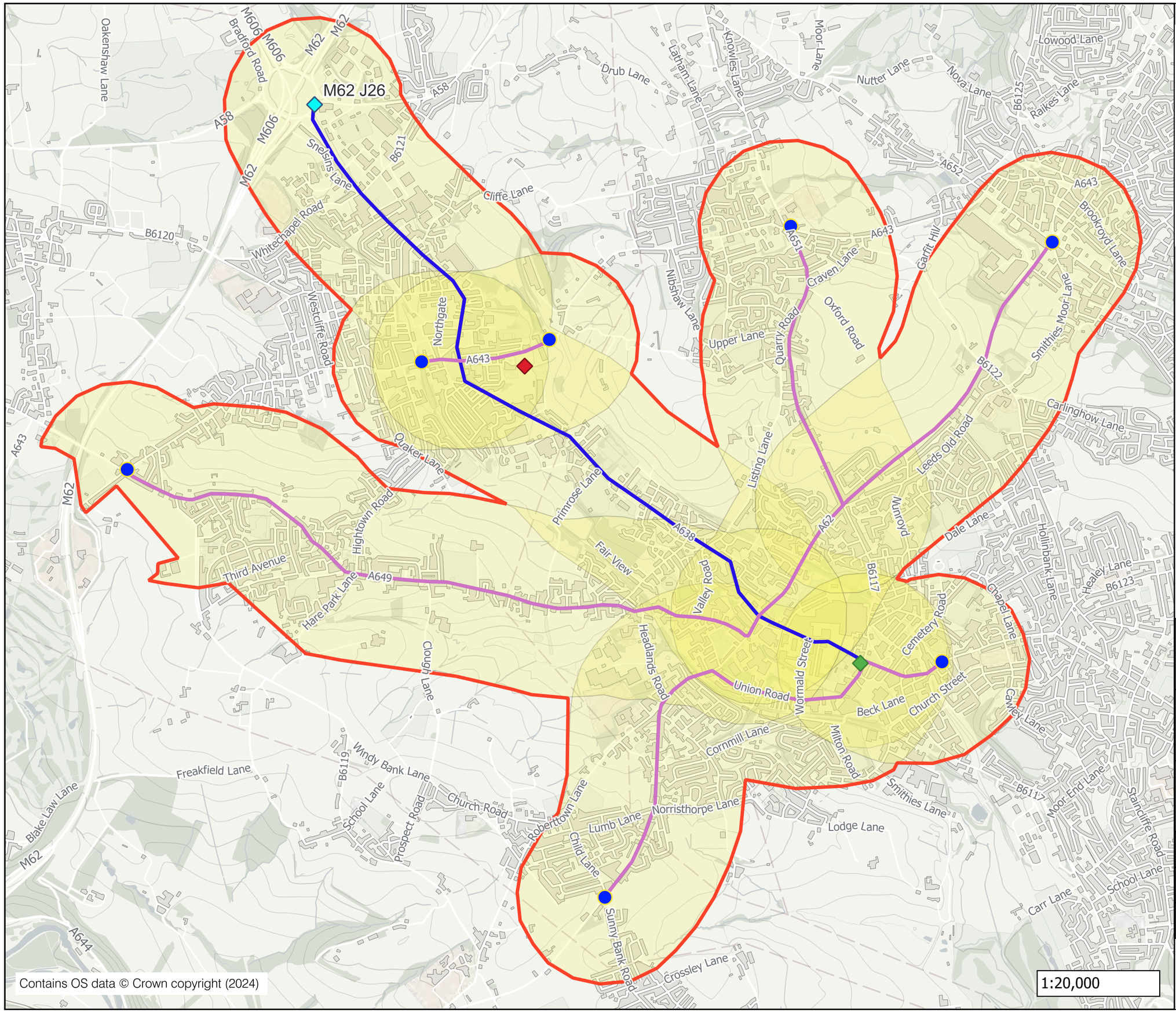
Land Off St Peg Lane, Cleckheaton, BD19 3SA

Title

EA Risk of Flooding from Reservoir Failure

Report No.	Drawing No.	Revision
182623-F02	11	-
Scale	**Date**	**Frame Size**
As Shown	26/01/2024	A3
Produced By	**Drawn By**	**Approved By**
LC	LC	RW

ASHFIELD
SOLUTIONS GROUP



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Legend

- Sequential Test Area
- Proposed Site Location
- Client's Flush Mills Site
- Motorway Junctions

A-Roads within the Sequential test area

- A638
- A-Roads Deemed suitable for transport
- 500m Buffer around A Roads
- Identified Issues

Client

Wakefield Acoustics Limited

Project

Land Off, St Peg Land, Clekheaton, BD19 3SA

Title

Sequential Test Search Area

Report No.	Drawing No.	Revision
182623-F02	SK01	A
Scale	**Date**	**Frame Size**
As Shown	08/07/2024	A3
Produced By	**Drawn By**	**Approved By**
RW	RW	JR

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Appendices

Appendix A

Site Location

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Notes:

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2. Do not scale this drawing - check all dimensions on site.

KEY

APPLICATION BOUNDARY
0.997 Ha / 2.464 acres

Rev:	Date:	Status/Amendments:	By:
P01	21.12.23	INITIAL ISSUE	AE

mosodi TECHNICAL

Manchester 0161 413 5168
Leeds 0113 323 0854

Client:
WAKEFIELD ACOUSTICS NOISE CONTROL TECHNOLOGY

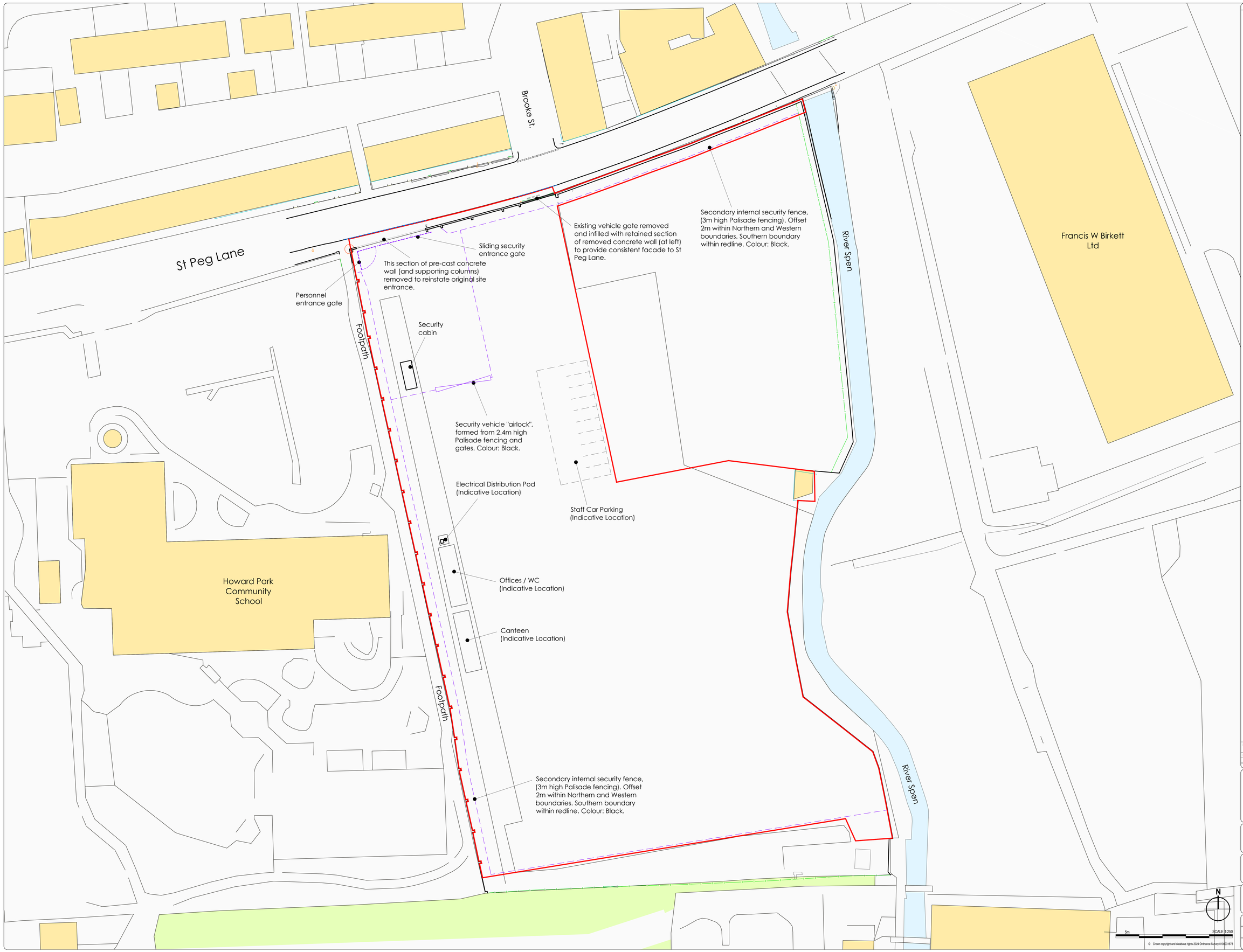
Project:
Wakefield Acoustics
St Peg Lane

Drawing Title:
Proposed Redline Overlay

Drawn By:	Checked By:	Approved By:
AE	AE	AE
Scale: 1:250	Paper Size: A0	Date Created: 20.11.23
Drawing Number: 23001-MOS-SI-XX-DR-A-0002		Drawing Revision: P01

Appendix B

Proposed Plans



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Overlaid onto selected Topographical data, drawing no: P23-0089B-MET-EXT-XX-TOP-M2-G-001, dated 07.08.23

Source:
MET Geo Environmental
Southgate House
Pontefract Road
Stourton
Leeds
LS10 1SW

KEY

APPLICATION BOUNDARY
0.946 Ha / 2.338 acres

Existing Dropped Kerb

Rev.	Date:	Status/Amendments:	By:
P03	10.06.24	Indicative locations for staff welfare, staff car park, and electrical distribution pod added	AE
P02	13.02.24	Redline amended, gate detail added	AE
P01	21.12.23	INITIAL ISSUE	AE

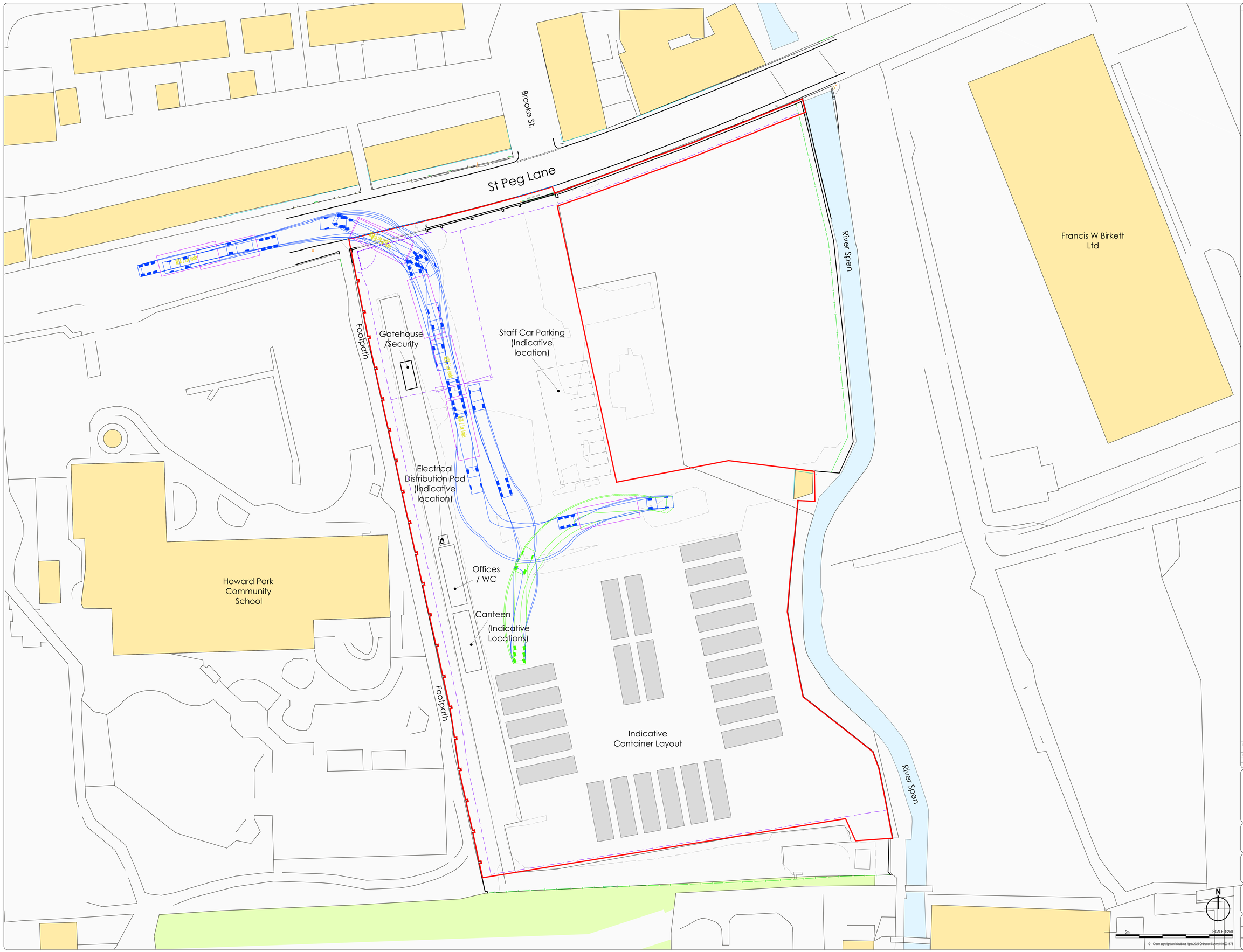
mosodi TECHNICAL
Manchester 0161 413 5168
Leeds 0113 323 0854

Client:
WAKEFIELD ACOUSTICS NOISE CONTROL TECHNOLOGY

Project:
Wakefield Acoustics
St Peg Lane

Drawing Title:
Proposed Site Plan

Drawn By:	Checked By:	Approved By:
AE	AE	AE
Scale: 1:250	Paper Size: A0	Date Created: 20.11.23
Drawing Number: 23001-MOS-SI-XX-DR-A-0004		Drawing Revision: P03



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Notes:

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Overlaid onto selected Topographical data, drawing no: P23-0089B-MET-EXT-XX-TOP-M2-G-001, dated 07.08.23

Source:
MET Geo Environmental
Southgate House
Pontefract Road
Stourton
Leeds
LS10 1SW

KEY

APPLICATION BOUNDARY
0.946 Ha / 2.338 acres

Rev.	Date:	Status/Amendments:	By:
P03	10.06.24	Location of Electrical Distribution pod amended, indicative staff parking location added	AE
P02	13.02.24	Redline amended, gate detail added	AE
P01	22.01.24	INITIAL ISSUE	AE

mosodi TECHNICAL
Manchester 0161 413 5168
Leeds 0113 323 0854

Client:
WAKEFIELDACOUSTICS NOISE CONTROL TECHNOLOGY

Project:
Wakefield Acoustics
St Peg Lane

Drawing Title:
Proposed Site Plan
(Indicative Container Layout)

Drawn By:	Checked By:	Approved By:
AE	AE	AE
Scale: 1:250	Paper Size: A0	Date Created: 21.12.23
Drawing Number: 23001-MOS-SI-XX-DR-A-0007		Drawing Revision: P03

Appendix C

Topographic Survey

Notes

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Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on S2

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Layout Key

(1)

(2)

Station Listing

Station	Easting	Northing	Level
S1	419411.948	425267.166	72.128
S2	419516.501	425302.046	71.909
S5	419474.275	425169.375	70.869
S2A	419449.227	425286.116	71.850
S2B	419493.408	425230.365	70.599

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

Met® GEO ENVIRONMENTAL
Southgate House
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Stourton
Leeds
West Yorkshire
LS10 1SW
T: +44 [0] 1132 008 900
F: +44 [0] 1132 008 901
E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
JONES HARGREAVES (UK) LIMITED

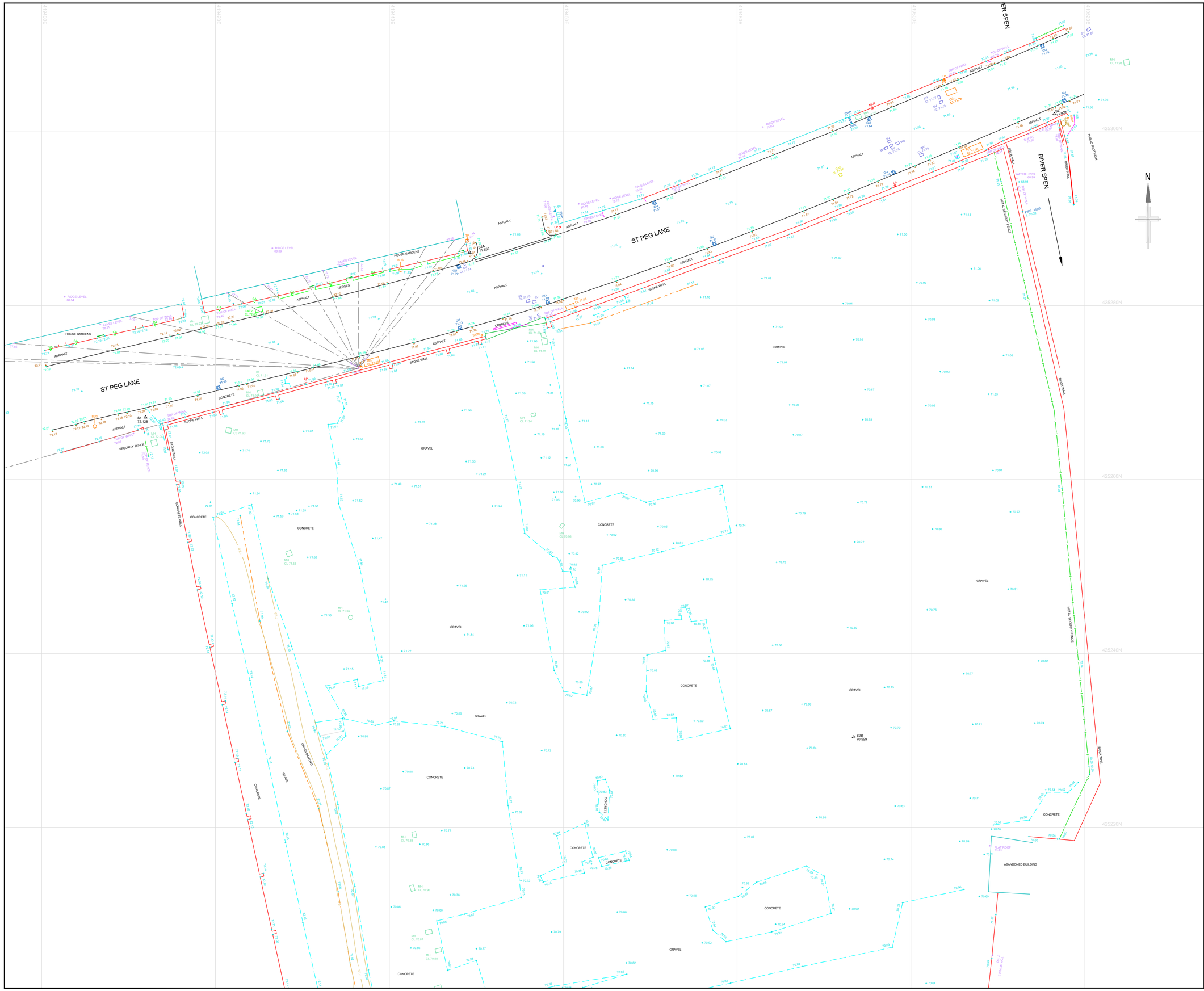
Site
ST PEG LANE
CLECKHEATEN, BD19 3SA

Title
TOPOGRAPHICAL SURVEY

Surveyed	TW,EB	Drawn	T,EB
Check	DA	Date	07/08/2023
Scale 1:200	Job No P23-00898	Sheet Size A1	Rev 01

DWG Ref.

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P23-00898	MET	EXT	XX	TOP	M3	G	002



Notes

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Grid : OS National Grid.
Using the OS GPS Network and applying OSTN15 transformation and then removing the scale factor for true distances with a one-step transformation centred on S2

Datum : OS Level Datum.
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections.

Layout Key

(1)

(2)

Station Listing

Station	Easting	Northing	Level
S1	419411.948	425267.166	72.128
S2	419516.501	425302.046	71.909
S5	419474.275	425169.375	70.869
S2A	419449.227	425286.116	71.850
S2B	419493.408	425230.365	70.599

KEY

AIR VALVE	AV	JUNCTION BOX	JB
BENCH MARK	BM	KERB OUTLET	KO
BIN	BIN	LAMP POST	LP
BOLLARD	BOL	MANHOLE (CIRCULAR)	MH
BORE HOLE	BH	MANHOLE (RECTANGULAR)	MH
BRITISH TELECOM COVER	BT	MANHOLE (TRIANGULAR)	MH
BUS STOP	BUS	MARKER POST	MKR
CABLE TV COVER	CATV	GULLY	GU
CABLE TV SUPPLY	CA	RODDING EYE	RE
COLUMN	COL	SIGN POST	SIGN
DROPPED KERB	DK	TELECOM COVER	TEL
EARTHING POINT	ER	TELEGRAPH POLE	TP
ELECTRICITY COVER	ELEC	THRESHOLD LEVEL	THL
ELECTRICITY POLE	EP	TRAFFIC LIGHT	TL
FIRE HYDRANT	FH	TRIAL PIT	PIT
GAS VALVE	GAS	WASH OUT	WO
GATE		WATER METER	WM
INSPECTION COVER (CIRCULAR)	IC	WATER STOP COCK	SC
INSPECTION COVER (RECTANGULAR)	IC	WATER STOP VALVE	SV
COVER LEVEL	CL	CHAMBER BASE LEVEL	Ch.L
INVERT LEVEL	IL	WATER SURFACE LEVEL	WL
UNABLE TO RAISE	UTR	UNABLE TO MEASURE	UTM
GIRTH OF TREE TRUNK	G	DIAMETER OF TREE TRUNK	D
HEIGHT TO TOP OF TREE CANOPY	H	MULTI BOLE TREE	MB

Rev	Date	Drawn	Description	Check
-	--/--/----	--	--	--

Met® GEO ENVIRONMENTAL
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F: +44 [0] 1132 008 901
E: admin@metgeoenvironmental.com
W: www.metgeoenvironmental.com

Client
JONES HARGREAVES (UK) LIMITED

Site
ST PEG LANE
CLECKHEATEN, BD19 3SA

Title
TOPOGRAPHICAL SURVEY

Surveyed	TW,EB	Drawn	T,EB
Check	DA	Date	07/08/2023
Scale 1:200	Job No P23-00898	Sheet Size A1	Rev 01

DWG Ref

Project Number	Origin	Zone	Level	Desc	Type	Role	Sheet
P23-00898	MET	EXT	XX	TOP	M3	G	001

Appendix D

Drainage Plans

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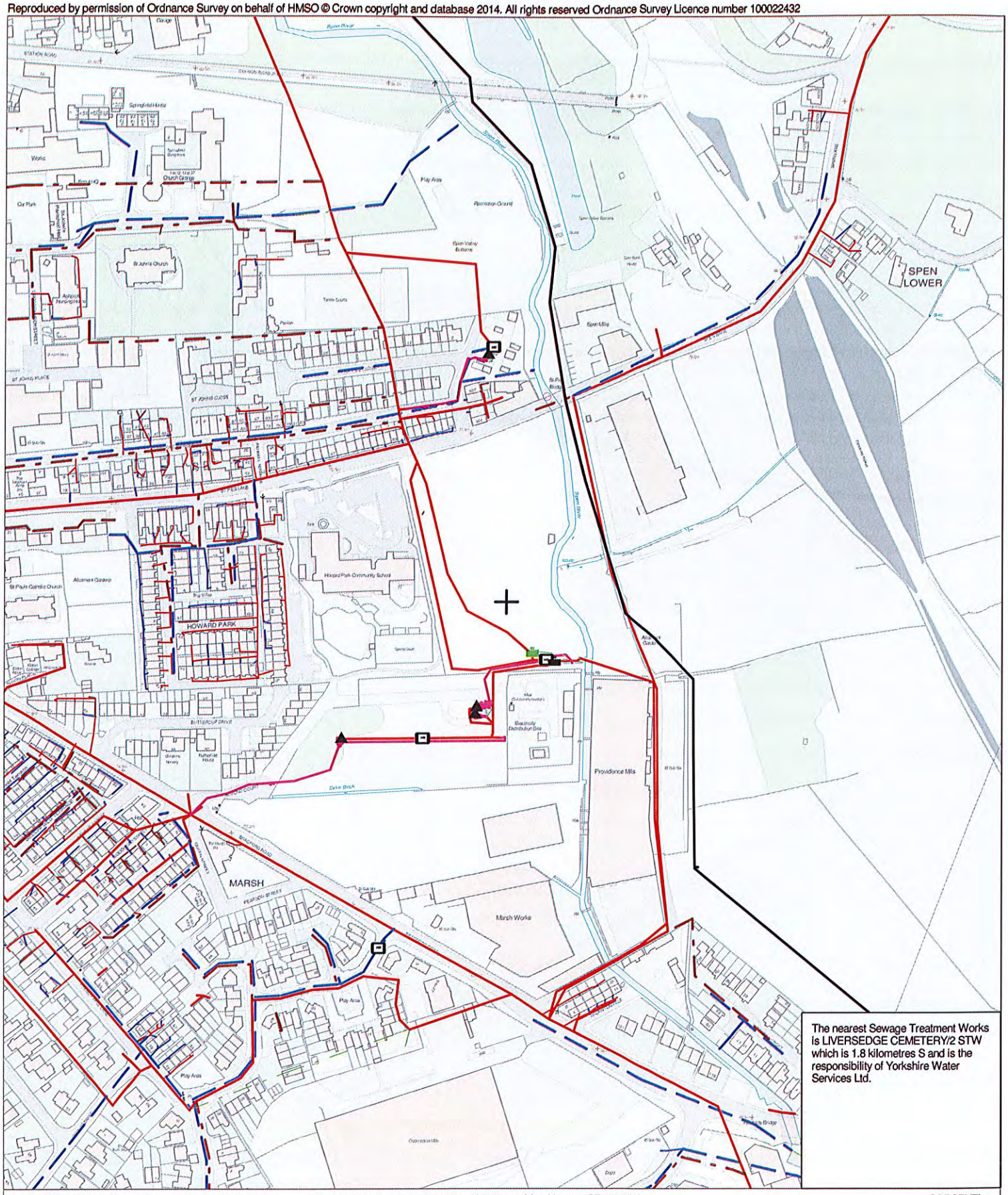
SPEN LOWER
HOWARD PARK
MARSH
Providence Mills
Marsh Works
Spen Mills
Spen River
Howard Park Community School
St Johns Church
Play Area
Recreation Ground
Tennis Courts
Allotment Gardens
Electricity Distribution Site
Dyke Beck
Bradford Road
Pearson Street
Buttercup Drive
St Johns Place
St Johns Close
Station Road
Spen Valley Estate
Spen Bridge
Spen Bridge Road
Spen Lane
Providence Bridge
Garage
Car Park
Works
Scouts
Church Grange
Springfield House
Spen Valley Estate Office
Spen Mill House
St Paul's Catholic Church
Nursery
Nursery School
Pavilion
Sports Court
Fire Station
Depot
Cricket Ground
Cricket Pitch
Footbridge
Weir
Flood Gate
Sluice
Pond
Tank
Tanks
Reservoir
Sewage Works
Pumping Station
Electricity Substation
Gas Governor
Gas Tank
Gas Holder
Telephone Kiosk
Post Box
Bus Stop
Bus Shelter
Lamp Post
Tree
Hedge
Fence
Wall
Gate
Footway
Footpath
Cycle Track
Road
Kerb
Manhole
Inspection Chamber
Valve
Hydrant
Air Valve
Sewer Vent
Sewer Pipe
Water Pipe
Gas Pipe
Electric Cable
Telecom Cable
Boundary
Property Boundary
Site Boundary
Building
Residential Building
Industrial Building
Public Building
Ruins
Open Space
Woodland
Scrub
Grass
Hard Standing
Car Park
Playing Field
Allotment
Cemetery
Churchyard
Golf Course
Water Feature
Lake
Pond
Reservoir
Tank
River
Stream
Canal
Weir
Sluice
Flood Gate
Footbridge
Bridge
Culvert
Tunnel
Railway
Railway Station
Railway Line
Level Crossing
Signal Box
Signal
Point
Buffer Stop
Platform
Track
Road Bridge
Road Junction
Roundabout
Traffic Island
Pedestrian Crossing
Zebra Crossing
Pelican Crossing
Toucan Crossing
Puffin Crossing
Traffic Light
Street Light
Lamp Post
Bollard
Post Box
Telephone Kiosk
Bus Stop
Bus Shelter
Bus Station
Taxi Rank
Car Park
Multi-Storey Car Park
Garage
Petrol Station
Petrol Pump
Petrol Tank
Gas Tank
Gas Holder
Gas Governor
Gas Pipe
Water Pipe
Sewer Pipe
Sewer Vent
Manhole
Inspection Chamber
Valve
Hydrant
Air Valve

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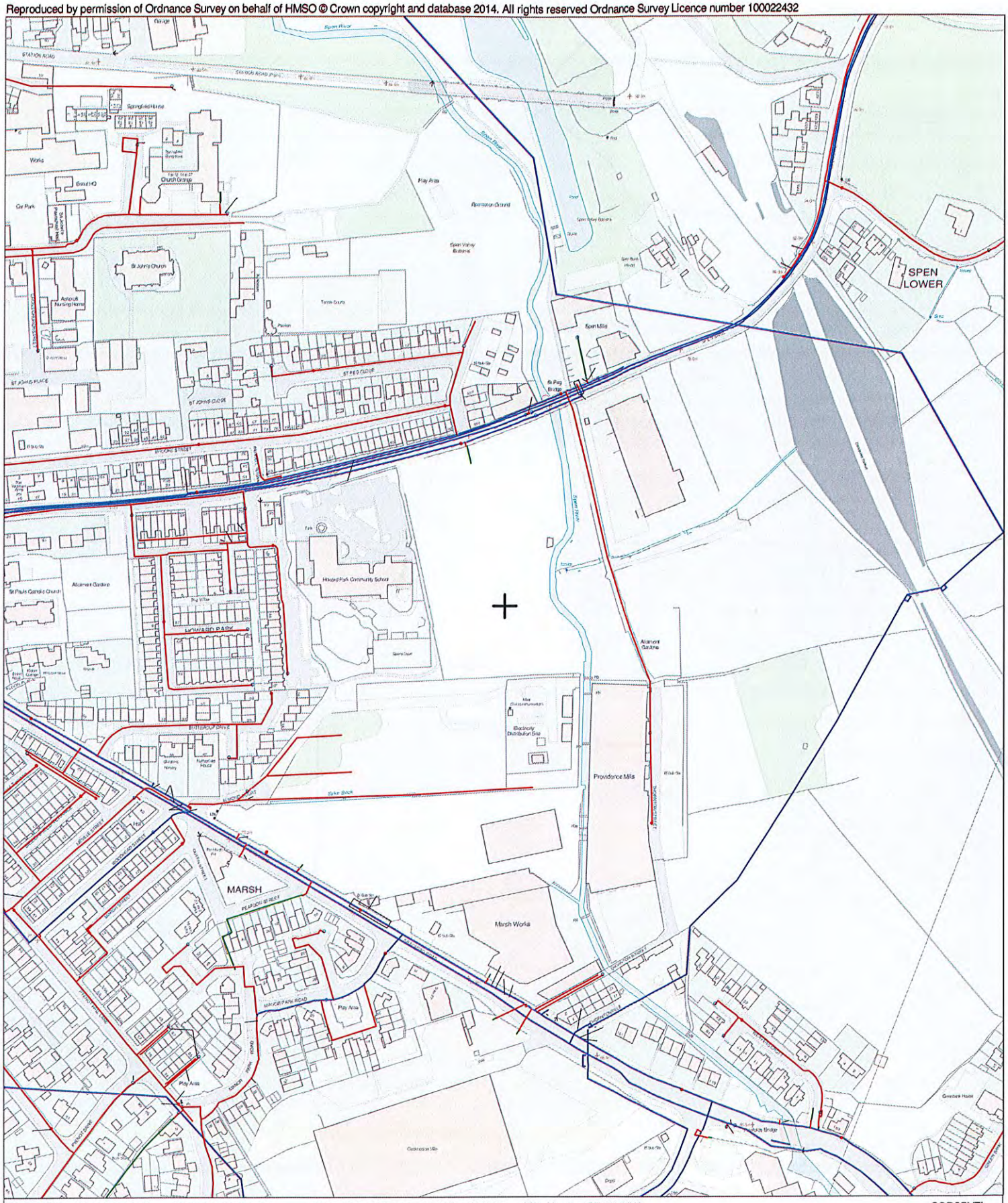

Public Clean Water Network 09/07/2019 14:25:17 OS Grid Coordinates: 419157 : 424797 Map Name : SE1924NW SORSBYFI

COMMERCIALDW
DRAINAGE AND WATER ENQUIRY

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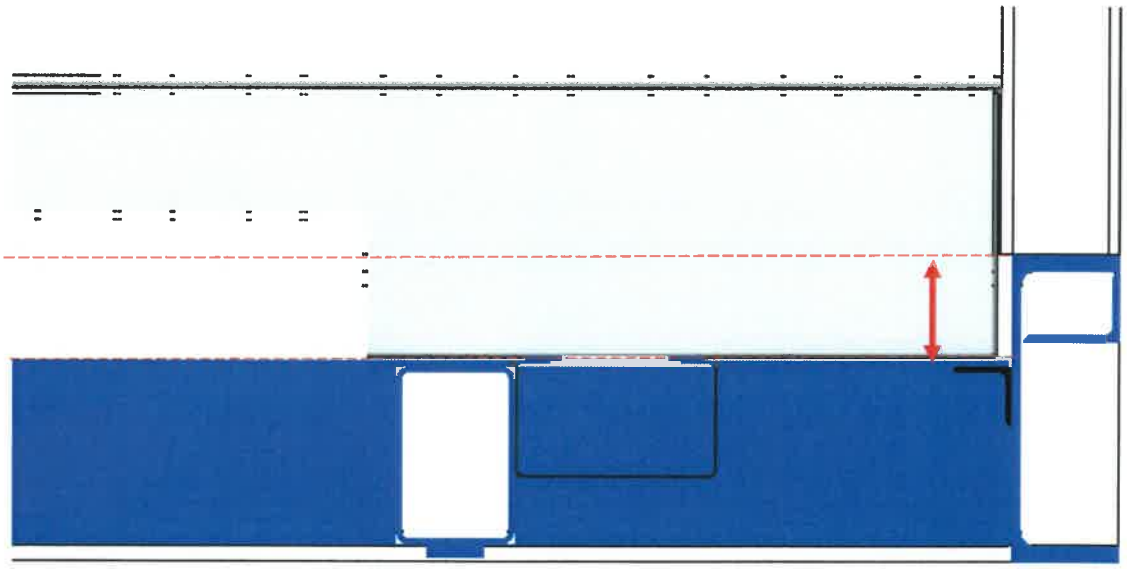
Appendix E

Buoyancy Calculations

Enclosure Buoyancy Calculations

All values presented here are taken from a recent Wakefield project (C29289) as an example of standard practices. While dimensions will vary from project to project, this represents the standard design principles present in most projects.
Due to the design of the standard Wakefield Genset Enclosure Units, it is assumed that the base, while bunded for internal liquid retention, is not watertight when accounting for rising water entering through the under sheets. This therefore means, that in the event of a flood, the under-base would fill with water, preventing it from contributing to the unit's buoyancy. This would mean that in a flood the only displaced water would be caused by the internal liquid bund:



As the purpose of the Genset Enclosure is to house various types of diesel generator, designs as standard allow for airflow through the unit. This means that both ends of the Enclosure are open until delivered to site, where often an attenuator is married to the end, or it is fed into some form of stack. Therefore, as water could enter through the two ends, this limits the area of buoyancy to the internal bunded area.
However, to confirm there are no concerns with the units being lifted by flood waters, we will assume a worst-case scenario for our calculations, therefore we will calculate buoyancy as if the entire base and internal bund are contributing to water displacement, which, in reality, will not occur.

We will therefore calculate the buoyancy force generated by the genset assuming that the under-base and bunded internal base are contributing to liquid displacement where the liquid is assumed to be rainwater.

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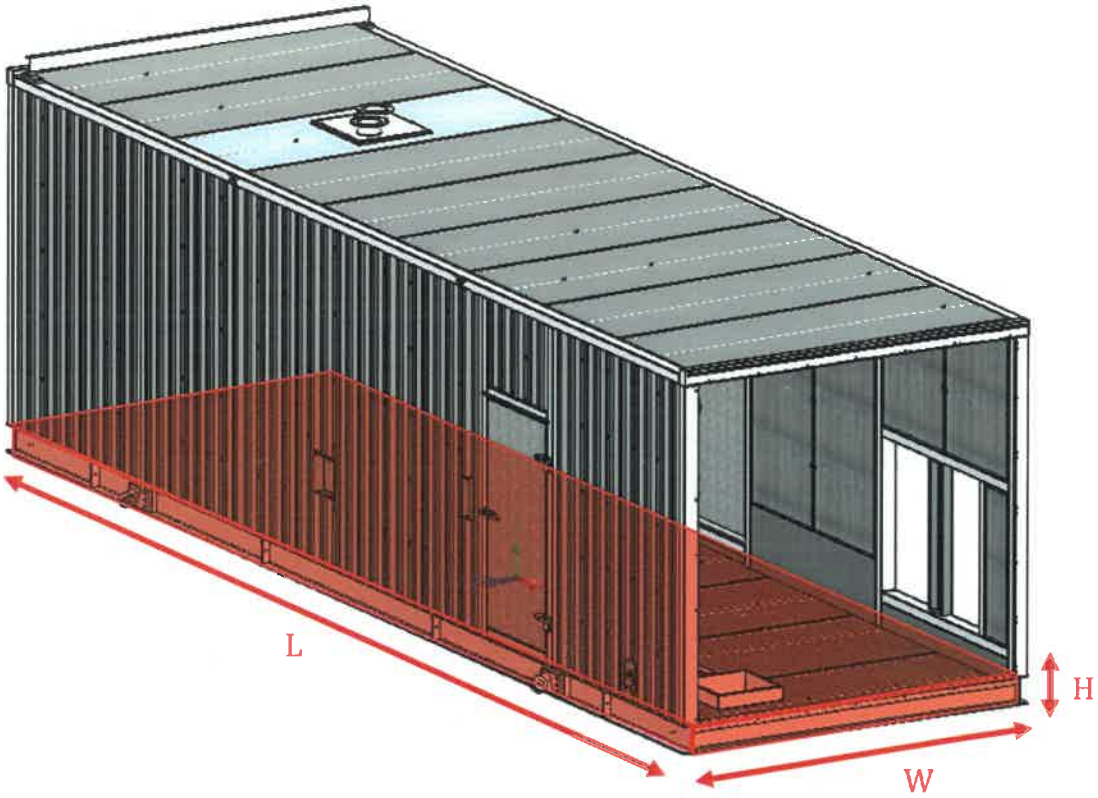

Buoyancy Calculation

$Fb = \rho V g$

Where Fb = Buoyancy Force
ρ = Density of water (assumed to be 997Kg/m^3)
V = Volume of displaced liquid
g = Gravitational Acceleration (assumed to be 9.8m/s^2)

V= L x W x H = 11.736m x 3.336m x 0.26m = 10.18m^3
∴ Fb = (997Kg/m^3) x (10.18m^3) x (9.8m/s^2)
= 99,465N

Mass of **Unloaded** Enclosure = 25,520Kg
∴ Weight of Enclosure = 250,096N

Conclusion

It can be concluded that even in the worst-case scenario, the buoyancy force generated by the Enclosure is not enough to overcome its unloaded weight and would therefore be unable to float.

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Appendix F

LLFA Email

Ryan Williams

From: Paul Farndale
Sent: 09 September 2024 14:25
To: Ryan Williams; Nina Sayers
Cc: Joel Read
Subject: RE: Peg Lane Meeting

Follow Up Flag: Follow up
Flag Status: Flagged

Hello Nina,

Please see below some conclusions from a meeting regarding 2024/90792 St Peg Lan, Cleckheaton. As there is no change is drainage, we concur with the statement below.

I understand they are waiting for a response from the Environment Agency but none has been provided recently. If you wish to discuss the site, please book me in for a short meeting.

Kind regards,

Paul Farndale
Team Leader (Acting)
Flood Management & Drainage (LLFA)
Kirklees Council

From: Ryan Williams
Sent: Friday, August 30, 2024 2:34 PM
To: Paul Farndale
Cc: Joel Read
Subject: Peg Lane Meeting

CAUTION: External email. Do not click links or open attachments unless you recognize the sender and know the content is safe.

Dear Paul,

Thank you again for meeting with myself and Joel earlier today. It was helpful to discuss the current situation in detail. I'd appreciate it if you could confirm the following key points from our conversation:

- As there is no 'built' development proposed at the site or any changes to ground surfacing, you are satisfied that there is no increase in flooding, and that no changes are required regarding drainage/attenuation/discharge rates.
- The Genset Enclosures (containers) will discharge water onto the ground, which will be managed by the existing drainage at the site.

- Implementing a Flood Warning and Evacuation Plan would help address the EA's concerns regarding any residual scenario of flood water emerging from the river walls on site and outline what to do on site based on different severity flood alert/warning codes.

If you could kindly confirm or provide any additional thoughts, that would be greatly appreciated.

Kind Regards,
Ryan

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Flood Risk Consultant

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