

██████████ SAMLESBURY

██████████ ██████████ ██████████ BUILDING

FLOOD RISK ASSESMENT

REVISION P01

Prepared for

██████████ ██████████

SEPT 2024

Project 7272

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Document Revision Record

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DUTY OF CARE

This report was prepared on behalf of the client, ██████████ ██████████, in response to a specific brief. No reliance is to be placed on the content of this report for any use other than that for which it was prepared. This report has been prepared in the light of Legislation and best practice current at the time of writing.

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FLOOD RISK ASSESSMENT

1.0 INTRODUCTION

1.1 Project Background

TRP Consulting was commissioned by Wilson Mason on behalf of [REDACTED] Ltd to prepare a flood risk assessment for the proposed construction of a new Industrial unit comprising [REDACTED] Building ([REDACTED]) on land at Samlesbury Airfield site in Balderstone, Lancashire. The proposed development site covers an area of approximately 0.199 hectares.

The site is currently 100% impermeable hardstanding and comprises car parking for the existing warehouses/ units surrounding. For context the existing site and surrounding conditions are shown within the extracted google earth image below, site boundary in yellow:



1.2 Report and Objectives

The purpose of this report is to assess the risk of flooding to the site from fluvial, tidal, pluvial (overland) surface water and ground water sources as well as from reservoirs, canals and adjacent sewers.

This report will consider flood risk, flooding consequences (as appropriate), mitigation measures and satisfy legislative requirements under The National Planning Policy Framework (NPPF) December 2023. The assessment has been undertaken in accordance with Ciria C624, 'Development and Flood Risk – Guidance for the Construction Industry' (2004) and DEFRA's Flood

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Risk Assessment Guidance for New Development, Phase 2, R & D Technical Report FD2320/ TR2 (2005).

This flood risk assessment is based on information provided by ■■■■■ ■■■■■, Wilson Mason, the Environment Agency and other information available in the public domain.

Surface water must discharge from the site in the most sustainable manor and drainage proposals should adhere to the SUDs hierarchy.

1.3 Consultation

The Environment Agency website has been consulted during the preparation of this report. Advice provided by the Environment Agency for developments in the vicinity of the site has also been considered.

The Zone 1 proposed ■■■■■ ■■■■■ building is to be constructed to the north east of building ■■■■■ within the ■■■■■ complex at Samlesbury Aerodrome. Environment Agency Flood Mapping indicates that the site is in Flood Zone 1 (low probability of flooding). Flood Zone 1 land has been assessed as having 0.1% (1 in 1000 year) chance of flooding from rivers or the sea in any given year.

General Environment Agency Advice

Environment Agency standing advice for developments in Flood Zone 1 indicates that the Environment Agency need only be consulted if a development is located within 20m of a main river or where 'other than minor development' is to be in areas with critical drainage problems.

A flood risk assessment will not generally be required for a development under 1 hectare in Flood Zone 1 unless it could be affected by sources of flooding other than rivers and the sea, for example surface water drains. For developments greater than 1 hectare in Flood Zone 1, the FRA should be focused on the management of surface water run-off. Proposals for surface water management should seek to maintain, or where practicable reduce, the rate of run-off from the site taking into account the potential for climate change.

EA guidance on flood risk recommends that surface water runoff should be controlled as near to its source as possible through a sustainable drainage approach to surface water management (SUDS), including the use of soakaways, infiltration trenches, permeable pavements and grassed swales to reduce flood risk by attenuating the rate and quantity of surface water runoff from the site.

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2.0 THE SITE

2.1 Site Location and Description

The [REDACTED] site at Samlesbury, a former World War 2 airfield, is located in Balderston, Blackburn BB2 7LF and is centred on Ordnance Survey grid co-ordinates 362700, 431180. It is located between Myerscough Smithy Road (A59) to the north and Preston New Road (A677) to the south. The area of Mellor Brook lies just over 1km to the east, Turner Green lies approximately 1.5km to the west and Samlesbury town centre is located almost 4km to the west.

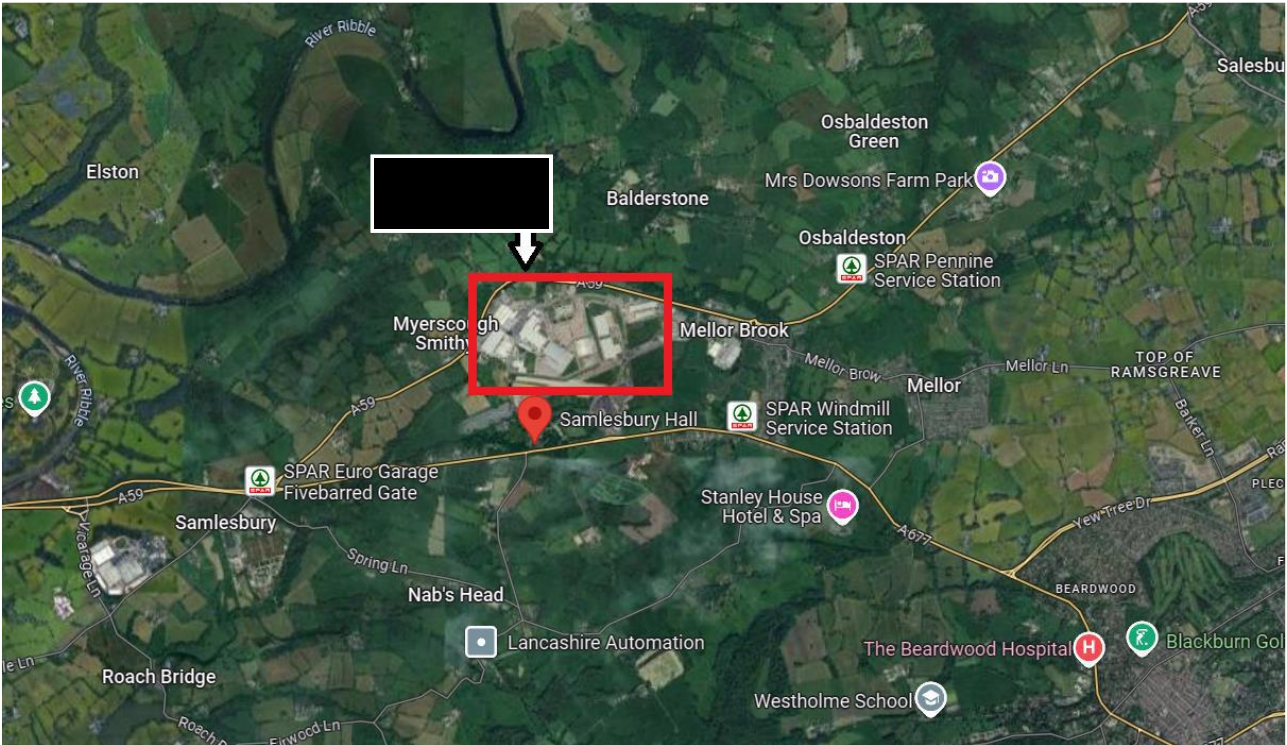


Figure 2.1: Site location

The Samlesbury site was undeveloped open farmland prior to World War 2 when it was developed as an airfield. Following the war, the former airfield was subsequently developed for aircraft component manufacture and assembly.

The [REDACTED] facility is now occupied by several manufacturing, office and storage buildings, site roads, disused runways and grassed areas. The surrounding rural area comprises agricultural land and associated farm buildings.

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3.0 NATIONAL POLICY

3.1 National planning policy framework

The National Planning Policy Framework (NPPF) clearly identifies flood risk as a specific material consideration in the Planning Process and in the allocation and release of sites for development or re-development.

NPPF seeks to further strengthen the co-ordination between land use planning and development planning and the operational delivery of flood and coastal defence strategy. NPPF encourages local planning authorities to use their existing powers to guide, regulate and control development in relation to flooding and flood risk. The framework expects local authorities to adopt a risk-based approach at all levels of planning, through the application of the Sequential Test detailed in Table 1 and 2, of the Technical Guidance to NPPF document, a copy of which is attached in Appendix A.

The aim of the sequential test is to steer new development to areas with the lowest probability of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower probability of flooding. The Strategic Flood Risk Assessment (SFRA) will provide the basis for applying this test. A sequential approach should be used in areas known to be at risk from any form of flooding.

The Water Resources Act 1991 [Section 105] also requires the Environment Agency to exercise a general supervision over all flood defence matters, including flood plains and wash lands which accommodate waters during periods of flood. In discharging their functions, the Agency from time to time carries out comprehensive surveys and flood studies, largely of 'main rivers' within its jurisdiction.

A Section 105 Study involves the Agency topographically surveying the subject watercourse (or parts of it) and obtaining details of the flow mechanics within the watercourse. This data then enables them to generate a comprehensive hydraulic computer model for the watercourse.

From this hydraulic model the EA can define the approximate extent of fluvial flood-plain associated with the 1 in 100-year (1% annual probability) flooding event or the extent of tidal floodplain associated with the 1 in 200-year (0.5% annual probability) flooding event.

The extents of the modelled floodplain are then provided to Local Planning Authorities, to enable them to make more informed decisions when considering proposed development in flood susceptible areas. If development is proposed in a flood susceptible area, or in an area where there is a history of flooding, the EA, as a statutory consultee in the Planning Process, will generally recommend that the risk of flooding be formally assessed, in accordance with the NPPF, and that a Flood Risk Assessment report be produced to support the Planning Application.

The broader modelled flood extents are also indicated on the EA's Flood Zone Maps, available through their website.

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4.0 LOCAL POLICY

4.1 Strategic flood risk assessment (SFRA)

Local planning authorities are required to produce local development frameworks, which are a portfolio of local development documents [LDDs] that collectively deliver the spatial planning strategy for the authority area. The LDD's undergo a sustainability appraisal which assists planning authorities in ensuring their policies fulfil the principles of sustainability.

Strategic Flood Risk Assessments [SFRA] are one of the documents to be used as the evidence base for planning decisions and are a component of the Sustainability Appraisal process. Therefore, SFRA's should be used in the review or production of LDD's.

To assist Local Planning Authorities in their strategic land-use planning, SFRA's should present enough information to enable Local Authorities to apply the Sequential Test to their proposed development sites:

“Decision makers should use the SFRA to inform their knowledge of flooding, refine the information on the Flood Map and determine the variations in flood risk from all sources of flooding across and from their area. These should form the basis for preparing appropriate policies for flood risk management for these areas.”

In February 2021 in collaboration with Preston City council, South Ribble borough council and Chorley borough council JBA consulting produced a produced a level 1 Strategic Flood Risk Assessment.

The SFRA along with the EA flood risk maps indicate that the proposed development site lies within Flood Zone 1 (less than 1 in 1000 probability of flooding from river or sea) and therefore is unlikely to be at risk of fluvial flooding.

The SFRA has been developed with the assistance of the Environment Agency, United Utilities and key landowners to provide a robust assessment of current and future levels of flood risk, ensuring that future development takes full account of flood risk and sustainability at the outset.

In the application of the sequential test the strategic flood risk assessment has identified flood risk zones within the boroughs (1, 2 and 3) and has assessed the potential of the various possible development sites which have been identified by the councils. This has created a hierarchy of preferred development sites in line with the sequential approach required by the NPPF.

A copy of the SFRA is available from Lancashire's central local plan website.

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5.0. FINDINGS OF A FLOOD RISK ASSESSMENT

5.1. Climate change

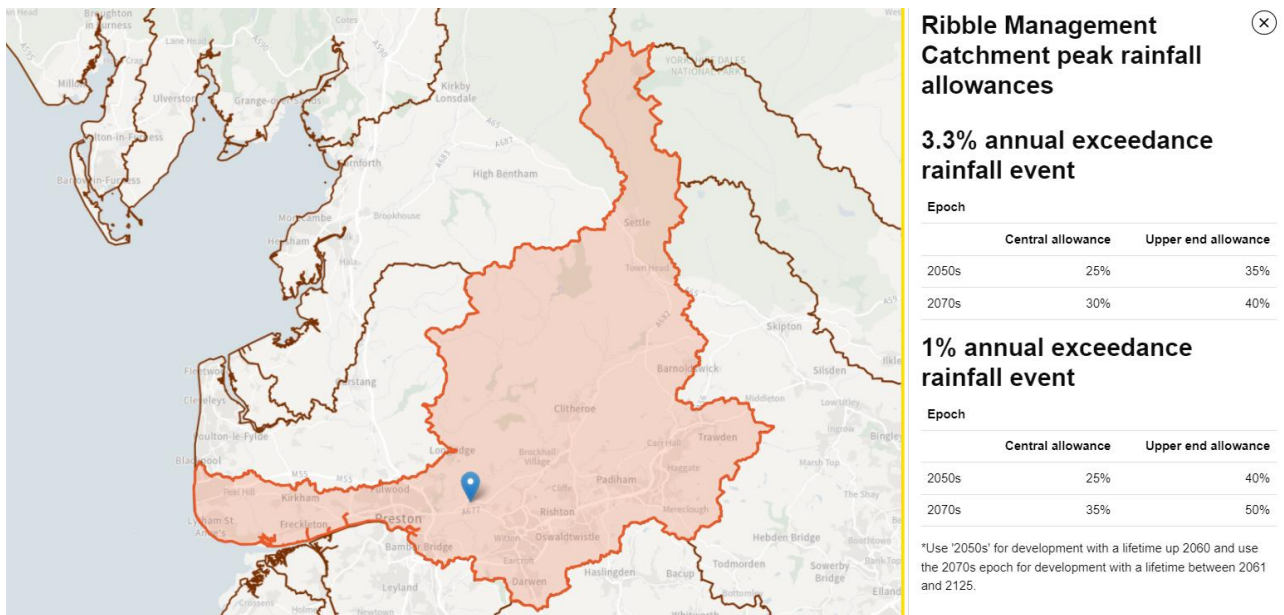
Climate change requires careful consideration in all aspects of development, and it is crucial to analyse the potential impact of climate change on proposed developments. One significant aspect to consider is the increase in rainfall events. With climate change, there is a growing trend of more intense and frequent rainfall, leading to an increased risk of flooding.

Incorporating climate change allowances into the development proposals will mitigate flood risk and ensure the long-term sustainability and resilience of the development. By implementing measures such as effective drainage systems, green infrastructure, and flood-resistant construction techniques, developments can better withstand the potential impacts of climate change, safeguarding residents and properties.

Taking proactive steps within development proposals will not only protect the investment in the development but also contribute to a more sustainable and climate-resilient future.

An increase to peak rainfall allowances should be accommodated in drainage proposals and the Environment Agency/DEFRA website provides online mapping services indicating central and upper end allowances for climate change in specific management catchments. The development lifetime (100 years) means a requirement to assess the upper end allowance should be considered.

The Ribble management catchment (extracted below) indicates (worse case) an additional, upper end, allowance for the 1 in 100-year (1% annual exceedance rainfall) event is 50% so this should be considered within the development’s drainage calculations.



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5.2. Existing Run Off Rate

The total area of the development site is 0.199 hectares and is 100% impermeable car park / hardstanding.

The existing runoff rate from the site has been calculated in two ways. Firstly, as an initial design estimate, as noted in the SUDs manual CIRIA Report C753 table 24.1, which indicates a summary of runoff estimation methods for calculating runoff rates and runoff volumes.

The peak brownfield runoff rate has been calculated using The Wallingford procedure, modified rational method.

TABLE 24.1 Summary of runoff estimation methods

Runoff estimation method	Reference	Greenfield site		Developed site		Section ref
		Peak runoff rate	Runoff volume	Peak runoff rate	Runoff volume	
FEH ReFH2	Kjeldsen (2007)	✓	✓	✓	✓	24.3.1
FEH statistical method	Kjeldsen <i>et al</i> (2008)	✓				24.3.1
IH124	Marshall and Bayliss (1994)	✓ ²				24.3.2
FSSR16	NERC (1985)		✓ ²			24.4
Modified rational method	HR Wallingford (1981)			✓		24.6.2
Wallingford – Fixed	HR Wallingford (1981)			4	4	24.6.3
Wallingford – Variable	Packman (1990), Osborne (2009)			✓	✓	24.6.3
UKWIR	UKWIR (2014)			✓	✓	24.6.3

Notes

- The Environment Agency (through the joint EA/Defra/NRW/Welsh Government FCERM research and development programme) is currently undertaking research that will improve small catchment and plot-scale flood and hydrograph estimation. The intention is for the research and new methods to be available to practitioners in 2017. Some interim outputs are already available (Faulkner *et al*, 2012).
The research is investigating three approaches:
 - a full hydrological analysis method for watercourses (using FEH software and catchment descriptors)
 - a rapid assessment method for watercourses (using FEH catchment descriptors)
 - a specific plot-scale method with a free-to-access tool and input characteristic data
 SuDS practitioners undertaking hydrological analysis from 2017 onwards should check for the latest guidance and recommendations on the Environment Agency R&D web pages or the FEH development pages (hosted on the CEH website).
- FEH methods are preferred.
- Simple method, relevant for initial design estimates and very simple sites.
- No longer recommended, but included here as it is still used in current modelling software packages.

The modified rational method equation is outlined in equation 24.5 of the SUDs manual.

In brief:

$$DR = 2.78 \times A \times I$$

where:

DR = Discharge rate (litres per second)

A = Area (Hectares)

I = Rainfall Intensity (mm/hr)

Average rainfall intensity assumed at 50mm/hr. So existing run off = 2.78 x 0.199 x 50 = 27.66 litres per second.

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Secondly and for a more detailed comparison against the above initial estimate, in accordance with section 24.5 of SUDs manual CIRIA Report C753 the hydraulic characteristics of the existing site have been modelled in micro drainage software.

24.5 PREVIOUSLY DEVELOPED SITES: PEAK RUNOFF RATE AND RUNOFF VOLUME ESTIMATION

Where a site has been previously developed, there may be agreement that discharge limits can correspond to rates that exist for the current state of the site (or a proportion of those rates). The preferred position should be to aspire to meet greenfield runoff rates and volumes, and any relaxation of this should be subject to an assessment of the current and future capacity of the receiving sewer or watercourse and agreement with the environmental regulator, drainage approving body and/or relevant sewerage company. In many cases, runoff volume may be as important as flow rate in terms of protecting receiving water body flood risk. Local policies, specifically strategic Flood Risk Assessments should be checked with respect to runoff control requirements for previously developed sites.

Runoff characteristics for a previously developed site can be estimated in a number of ways:

1 Any land that has been previously developed is likely to have had a system in place to drain surface water runoff from the site. This drainage system may or may not have included storage and flow control systems. Where any drainage system is still operational, peak flow rates at the outfall for the relevant return periods (usually 1:1 year, 1:30 year and 1:100 year) can be demonstrated by producing a simulation model that includes an accurate representation of the drainage system and site area contributions – thus allowing derivation of an appropriate head–discharge relationship at the outfall.

It is recognised that existing drainage systems will probably be overwhelmed for the 1:30 and 1:100 year events and therefore the actual rate of discharge from the site in such scenarios is likely to be increased by overland flow contributions or surcharging. However, these effects should not be accounted for, and the discharge limit should be based solely on the flow rate from the piped system (thus providing a conservative estimate).

The existing drainage infrastructure for the car park area where the proposed unit will be sited is described below and the outputs from the micro drainage model are shown in appendix B2.

The existing peak runoff rate for the 1 in 2-year storm is shown to be 26.9 litres per second.

5.3. Existing drainage

The below extract shows the surface water provision for the existing car park area of the site where the new unit is proposed.

The car park area is served by gullies and ACO channels which collect surface water and direct flows to the northern boundary into a 150mm drain.

This in turn connects to a 400mm diameter sewer on the western extents, heading south then west away from the site. Some connections are present directly to the larger sewer to the west.

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5.5. Flood risk – Fluvial

The nearest surface water feature is Huntley Brook (flowing North to South) located approximately 230m west of the site. A second watercourse, Mellor Brook is located approximately 800m north of the site and flows westwards.

Environment Agency Flood Mapping indicates that the site is located within EA Flood Zone 1. EA Flood Zone 1 land has been assessed as having a minimal 0.1% (1 in 1000 year) chance of flooding from rivers or the sea in any given year. The flood map shows that the development area is not within the flood plains of the watercourses in the vicinity and the likelihood of flooding from the any watercourse is low. The flood map is included in Appendix C.

The risk of flooding from fluvial or tidal flooding is low.

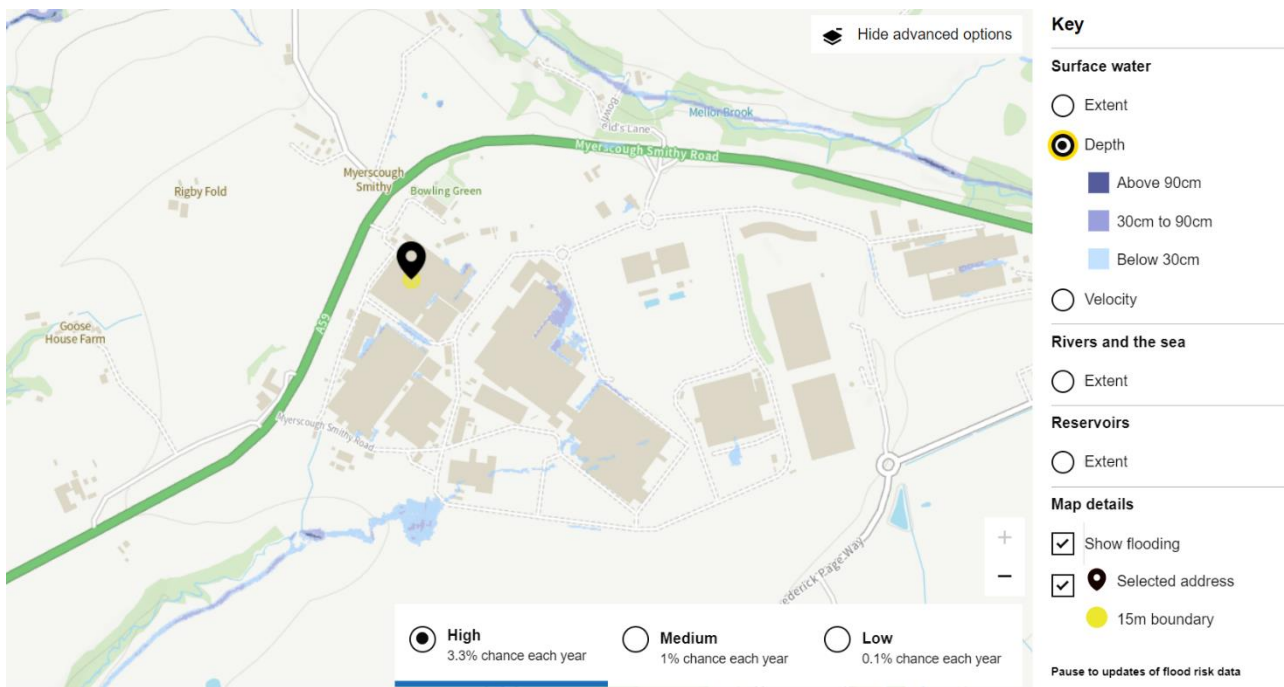
FLOOD RISK ASSESSMENT

5.6. Flood risk – Surface water

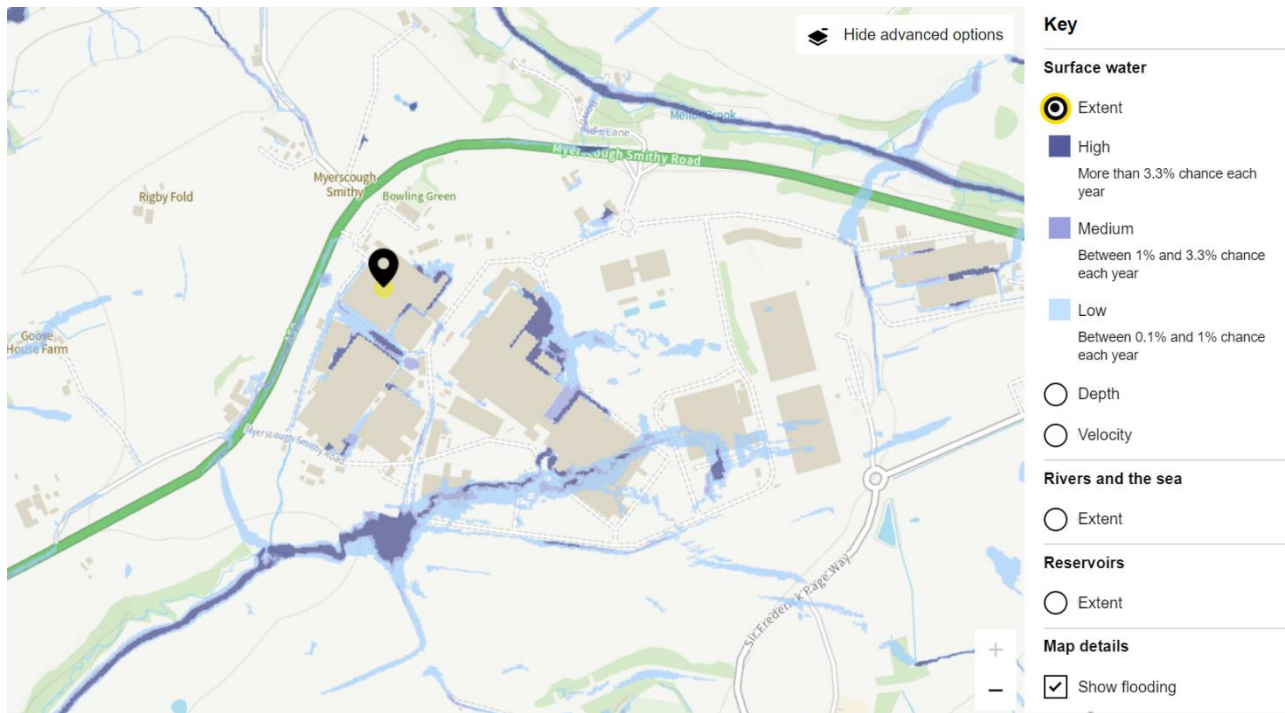
Surface water flooding may occur when intense rainfall causes the ground to be saturated and its capacity is exceeded. Excess surface water flows don't appear to affect the development area itself, but some flooding is shown adjacent to the existing building to the west.

Surface water flows from the site are believed to drain naturally to the low point in the west of the car park adjacent to the existing building by overland flow. Surface water flood mapping below shows the location, depth and extent of flooding from this source.

The development of the site and introduction of the unit will mitigate flooding from overland surface water. Flows previously travelling across the car park and ponding adjacent to the existing building will be intercepted by the new building and appropriate positive drainage/ reconfigured gullies and drainage channels will channel this away, reducing the amount of flooding here. Finished floor levels should be set a minimum of 150mm above surrounding ground levels to minimise the risk of flooding from this source.



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5.7. Flood risk – Reservoirs

Examination of public records and maps has not revealed the presence of reservoirs or ponds in the close vicinity of the site or known records of flooding from artificial sources at the site.

Therefore, these are an unlikely source of flooding.

5.8. Flood risk – Ground water

Groundwater flooding is caused by the emergence of water from beneath the ground. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises.

Results from the Phase 1 and Phase 2 Ground investigations carried out on the site in January 2019 and February 2019 respectively, indicate that the site is underlain by topsoil and made ground extending to depth up to 4.00m below ground level. The made ground generally comprised of firm/stiff clay. Underlying the clay deposits is a strata of glacial till type material to a maximum depth of 20.00m below ground level.

No groundwater was encountered during the site investigation.

Information obtained from the British Geological Survey (BGS) map confirm the superficial geology of the site as comprising of Till described as *“Devensian - Diamicton. Superficial Deposits formed between 116 and 11.8 thousand years ago during the Quaternary period”*

The bedrock is described as *“Silsden Formation - Mudstone. Sedimentary bedrock formed between 328 and 324 million years ago during the Carboniferous period”*

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Given the above characteristics of the soil and groundwater not encountered at depth up to 20.00m below ground level, Groundwater flooding is not considered to represent a significant risk to the site.

5.9. Flood risk - Adjacent sewers

There are no reported problems of flooding from sewers in the vicinity of the site.

The existing site is served by separate drainage networks for foul and surface water. The only risk of flooding from this source would be failure or surcharge during periods of high flow.

Assuming the existing sewers have sufficient capacity for the catchments they are serving, and they are regularly maintained and inspected the risk of flooding from sewers is low.

5.10. Flood risk – Proposed sewers

Proposed drainage infrastructure will be designed to ensure that rainwater drains off site at a restricted rate and storage will hold all volumes up to and including the 1 in 100 year + climate change storm events. This will minimise the risk of flooding from proposed surface water sources.

5.11. Residual risks

The table below outlines the initial qualitative assessment of risk posed by each potential source of flooding, the mechanisms for flooding and the likely consequences. The Table also includes a review of possible mitigation measures and what effect, if any, the mitigation measures are likely to have on the residual risk posed by each potential flood source. Categories of risk have been qualitatively defined as:

- High Risk: Flooding is likely to result in significant damage to property and pose a significant risk to life.
- Medium Risk: Flooding is likely to result in possible minor damage to property, but flood progress would allow adequate time for residents to be warned and safely evacuated to higher ground or appropriate places of safety.
- Low' Risk: Flooding is unlikely to result in any damage to property and pose little or no risk to life.

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Source	Flood Mechanism & Consequences	Assessment of Risk	Recommended Mitigation Measures	Residual Risk
Fluvial flooding	Risk of fluvial flooding at the site from adjacent Watercourses, Drains and other Water Bodies.	Very Low	<ul style="list-style-type: none"> Fluvial flooding of the site is not expected during the 1 in 100-year event + climate change. 	Very Low
Pluvial flooding	Risk of flooding from overland flows in extreme events. Ponding of surface water due to ground being saturated and capacity being exceeded.	Low	<ul style="list-style-type: none"> FFLs to be set 150mm above surrounding levels. Addition of positive drainage solution to unit roof. 	Very Low
Surcharging of artificial drainage systems	<p>Drainage systems operating above design capacity, resulting in:</p> <ul style="list-style-type: none"> surcharging of manholes / drainage systems. over-land flow through development. ponding in low-lying areas of site. no over-land flow route for flood waters accumulating in low-lying areas. 	Low	<ul style="list-style-type: none"> Appropriate design of SW drainage system to provide sufficient storage. Provision of overland flood flow routes through proposed development. 	Low
Infrastructure failure	<p>Water main burst resulting in:</p> <ul style="list-style-type: none"> Possible over-land flows through / adjacent to the site and possible inundation of property. Possible ponding in low-lying areas. 	Low	<ul style="list-style-type: none"> Safe access/egress available to adjacent highway. Flood flow route through development. 	Low

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6.0 SuDS EVALUATION

6.1 Introduction

Development of the site will result in an increase of impermeable areas and therefore a corresponding increase in run-off volumes. The use of SUDs techniques to discharge the additional surface water will be evaluated in this section of the report.

The storm water drainage system for the proposed development will be designed in accordance with the DCG, which requires that any surface water drainage system, should not surcharge during the 1 in 2-year storm event, and should not flood during a 1 in 30-year storm event (i.e., all run-off contained wholly within the sewerage system during the 1 in 30-year event).

Whilst the DCG requires there be no surface flooding during the 1 in 30-year storm event. It is generally accepted that a degree of surface flooding can be permitted during extreme storm events i.e., 1 in 100 year + climate change. This will be subject to specific areas being designated as flood susceptible and subject to flooding of these areas posing little or no risk to human life and damage to property. Examples of surface areas which might be permitted to flood in such events are:

- Agricultural land
- Recreational land (playing fields etc.)
- Landscaped areas
- Highways
- Car parks
- Other non-inhabited, designated areas

In all cases where surface flooding might be permitted or designed into a scheme, due diligence needs to be given to the NPPF and the need to make potential users of such areas aware of their functionality and purpose, and the requirement to maintain safe egress and access at all times.

6.2 Evaluation

The Building Regulations Approved Document H (2002) outlines a hierarchy of potential methods of disposing surface water from a site:

- A soakaway: or where that is not practicable.
- A watercourse or river; or where that is not practicable,
- A sewer.

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The viability of each has been assessed below:

Soakaway: Regarding the consideration of infiltration methods for the disposal of surface water, soakaway testing has not been undertaken however at this stage soakaways aren't anticipated to be a viable solution for surface water disposal.

It is anticipated, based on the location of the proposed unit and limited space available for a soakaway that infiltration will not be viable. BRE365 states that "*Soakaways should not normally be constructed closer than 5 m to building foundations.*"

Watercourse's waterbodies: The existing sites surface water network connects to existing Mellor Brook and Huntley brook to the north and north west of the site.

Sewers: Sewers are present throughout the site. Proposals should be to connect to the aforementioned watercourses via the existing drainage provision.

7.0 CONCLUSIONS

- TRP have prepared a Flood risk assessment for the construction of an industrial unit ■■■■■ ■■■■■ Building (■■■■■).
- The site is located on land at Samlesbury Airfield site in Balderstone, Lancashire.
- The site area is 0.199 hectares, is irregular in shape and is brownfield land.
- There are existing sewers within and surrounding the site.
- TRP have been instructed to formally assess the risk of flooding through a flood risk assessment.
- The site lies within Flood Zone 1 and is therefore unlikely to be affected by fluvial flooding.
- The development of the site will not result in an increase in impermeable area so a betterment on existing flow rate is proposed.
- Surface water flows will be restricted to 18.83 litres per second.
- Surface water volumes will be stored within the site.
- Climate change has been factored into the drainage calculations.
- Construction of the proposed development will not increase flood risk on or off the site.
- No mitigation measures are considered necessary to mitigate the risk from infrastructure failure.
- Development of the site will not increase the flood risk to any other property.
- Based on the information provided to TRP in support of this flood risk assessment, the development of the site would be considered sustainable in terms of flood risk, subject to the various recommendations in line with National and Local Planning Policy.

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APPENDIX A

A1 Environment Agency Flood Map

A2 Extract from chapter 14 of NPPF December 2023



FLOOD RISK ASSESSMENT

A1 Environment Agency Flood Map



FLOOD RISK ASSESSMENT

A2 Extract from chapter 14 of NPPF December 2023



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APPENDIX B

B1 Existing Site – Pre -Development Site Drainage Drawing SAM-000-SITE-DR-018

APPENDIX B

B2 Existing Site – Pre -Development Surface Water Drainage Calculations