

Dragon Packaging
47-48 Clywedog Road North,
Wrexham Industrial Estate
Wrexham
LL13 9XN

Proposed Commercial Extension

Flood Consequence Assessment

For: FI Real Estate

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1.0 INTRODUCTION

1.1 Background

This Flood Consequence Assessment (FCA) has been prepared for the proposed commercial development at 47-48 Clywedog Road, North, Wrexham Industrial Estate, Wrexham, LL13 9XN. This FCA has been carried out in accordance with guidance contained in Technical Advice Note 15 Development and Flood Risk (TAN15) and associated Development Advice Maps. This FCA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

It is recognised that developments which are designed without regard to flood risk may endanger lives, damage property, cause disruption to the wider community, damage the environment, be difficult to insure and require additional expense on remedial works. The development design should be such that future users will not have difficulty obtaining insurance or mortgage finance, or in selling all or part of the development, as a result of flood risk issues.

1.2 Report Structure

This FCA has the following report structure:

- Section 2 describes the location area and the existing and proposed development;
- Section 3 outlines the flood risk to the existing and proposed development;
- Section 4 assesses the overall level of flood risk from the pertinent sources;
- Section 5 outlines mitigation measures used to reduce the overall level of flood risk;
- Section 6 details the Justification Test and Acceptability Criteria; and
- Section 7 presents a summary and conclusions.

2.0 SITE LOCATION & DEVELOPMENT DESCRIPTION

2.1 Site Location

The site is located at 47-48 Clywedog Road North, Wrexham Industrial Estate, Wrexham, LL13 9XN, as shown in Figure 1. The National Grid Reference (NGR) of the site is 337255, 349699.



Figure 1 - Site Location

2.2 Existing Development

The site currently consists of existing industrial buildings and an associated service yard / parking area.

2.3 Proposed Development

The proposals are for an extension on either side of the existing commercial units (see Appendix 1). Further details with regard to the proposed development can be found in the accompanying information submitted with the planning application.

2.4 Ground Levels

Topographically, the site slopes gently from north west to south east with ground levels ranging between 37.4 metres Above Ordnance Datum (mAOD) and circa 35.1mAOD.

2.5 Catchment Hydrology

Redwitter Brook is located approximately 160m to the north of the site and the River Clywedog is located approximately 1.25km to the south of the site.

The site is located within an area of average rainfall. The 1961-1990 Standard Average Annual Rainfall (SAAR) for the site as recorded in the FEH Webservice is 692 mm per annum. The UK national average is 832mm per annum.

2.6 Geology

The British Geological Survey (BGS) Geological Map of the area indicates that the bedrock underlying the site consists of the Salop Formation - mudstone, sandstone and conglomerate. Sedimentary bedrock formed between 309.5 and 272.3 million years ago during the Carboniferous and Permian periods. The superficial deposits consist of Till, devensian - diamicton. Sedimentary superficial deposit formed between 116 and 11.8 thousand years ago during the Quaternary period.

Information from the National Soil Resource Institute¹ details the site area as being situated on slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils. The Flood Studies Report WRAP soil map classification is Type 1: i) Well drained permeable sandy or loam soils and shallower analogues over highly permeable limestone, chalk, sandstone or related drifts; ii) Earthy peat soils drained by dykes and pumps; and iii) Less permeable loamy over clayey soils on plateaux adjacent to very permeable soils in valleys.

¹ <https://www.landis.org.uk/soilscapes/>

3.0 PLANNING & FLOOD RISK

3.1 Planning Policy Wales

Planning Policy Wales (11th edition) sets out the land use planning policies of the Welsh Government. Chapter 6.6 'Recognising the Environmental Qualities of Places' outlines the Welsh Government's objectives in terms of addressing flood risk.

Paragraph 6.6.22 of Planning Policy Wales states: 'Planning authorities should adopt a precautionary approach of positive avoidance of development in areas of flooding from the sea or from rivers.' Paragraph 6.6.25 states: 'Development should reduce, and must not increase, flood risk arising from river and/or coastal flooding on and off the development site itself.'

3.2 Technical Advice Note 15 (TAN15)

Planning Policy Wales is supplemented by a series of Technical Advice Notes (TAN). Technical guidance on development and flood risk is provided by TAN15. TAN15 was introduced in 2004 by the Welsh Assembly Government. It is technical guidance related to development planning and flood risk using a sequential characterisation of risk based on the Welsh Government's Development and Flood Risk Advice Map (DAM). Its initial requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

One of the key aims of TAN15 is to ensure that flood risk is taken into account at all stages of the planning process; to avoid inappropriate development in areas at risk of flooding and to direct development away from areas of highest risk.

It advises that, where new development is exceptionally necessary in areas of higher risk, this should be safe, without increasing flood risk elsewhere, and where possible, reduce flood risk overall. A risk-based approach is adopted at all stages of the planning process, applying a source-pathway-receptor model to planning and flood risk. To demonstrate this, an FCA is required and should include:

- whether a proposed development is likely to be affected by current or future flooding from all sources;
- whether it will increase flood risk elsewhere;
- whether the measures proposed to deal with these effects and risks are appropriate; and to
- satisfy the justification test, including the acceptability of consequences.

A revised TAN15 is due to be implemented in June 2023. This will be supported by the new Flood Map for Planning, which includes climate change information to show how this will affect flood risk extents over the next century. It shows the potential extent of flooding assuming no defences are in place.

3.3 Natural Resources Wales

The Flood and Water Management Act 2010 gives Natural Resources Wales a strategic overview role for all forms of flooding and coastal erosion. They also have direct responsibility for the prevention, mitigation, and remediation of flood damage for main rivers and coastal areas. Natural Resources Wales is the statutory consultee with regard to flood risk and planning.

Natural Resources Wales Flood Risk Standing Advice and TAN15 have been consulted and reviewed during this FCA. This has confirmed the level of FCA required and that a surface water drainage

assessment is to be undertaken. Information regarding the current flood risk at the Site, local flood defences and floodwater levels has been obtained from Natural Resources Wales.

3.4 Development Advice Map

The Development Advice Map (DAM) which accompanies TAN15 shows that the site is located within Zone A which is considered to be at little or no risk of fluvial or tidal/coastal flooding (see Figure 2 and Table 1). In this case, the DAM indicates that justification test is not applicable and that there is no need to consider flood risk further. The proposed development is appropriate for this location.

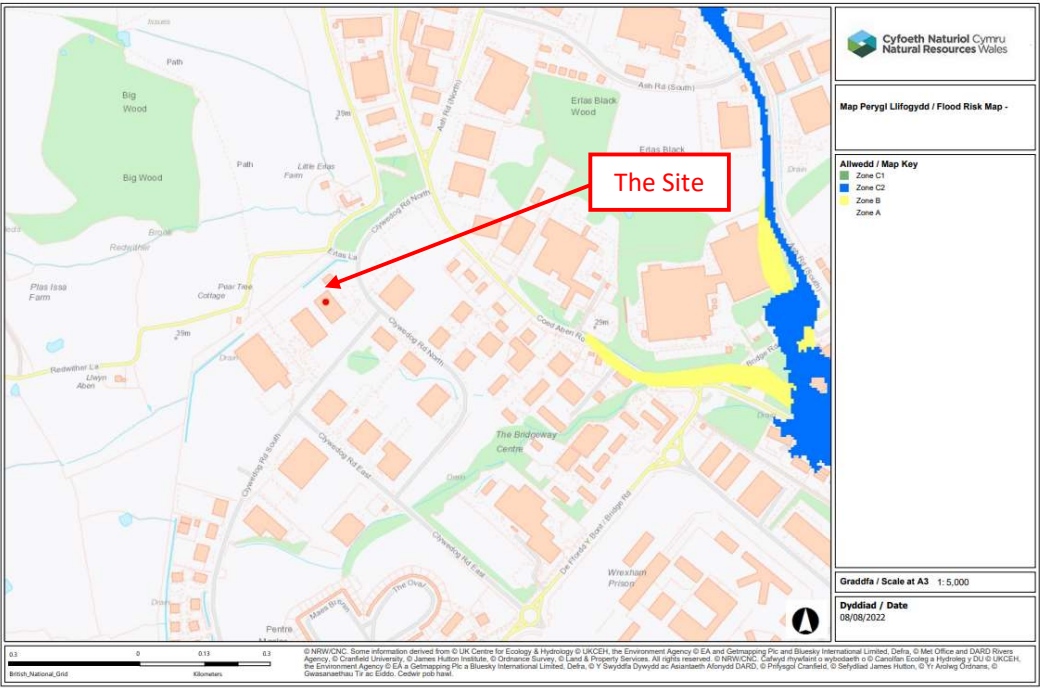


Figure 2 - DAM Zones

Table 1 - DAM Zones

Description of Zone	Zone	Use within the Precautionary Framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding.	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.
Areas known to have been flooded in the past evidenced by sedimentary deposits.	B	Used as part of a precautionary approach to indicate where site levels should be checked against the extreme (0.1%) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further.
Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river, tidal or coastal)	C	Used to indicate that flooding issues should be considered as an integral part of decision making by the application of the justification test including assessment of consequences.
Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.	C1	Used to indicate that development can take place subject to application of justification test, including acceptability of consequences.
Areas of the floodplain without significant flood defence infrastructure.	C2	Used to indicate that only less vulnerable development should be considered subject to application of the justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered.

3.5 Flood Map for Planning

The Flood Map for Planning (FMfP) has no official status for planning purposes until June 2023. Natural Resources Wales may use the FMfP data as the 'best available information' on flood risk to inform our planning advice. The Flood Map for Planning (FMfP) shows that the Site is:

- Rivers and Sea: Flood Zone 1 with less than a 1 in 1000 (0.1% %) chance of flooding from rivers and sea in a given year, including the effects of climate change (see Figure 3).
- Surface water and small watercourses: The majority of the site is located within Flood Zone 1 however there is a small section to the north east and north west that is located within Flood Zone 2 and 3 with a 1 in 1000 to 1 in 100 (0.1% to 1%) to more than 1 in 100 (1%) chance of flooding in a given year, including the effects of climate change (see Figure 4).

Table 2 provides details of the FMfP Flood Zones. The proposed development is appropriate for this location.

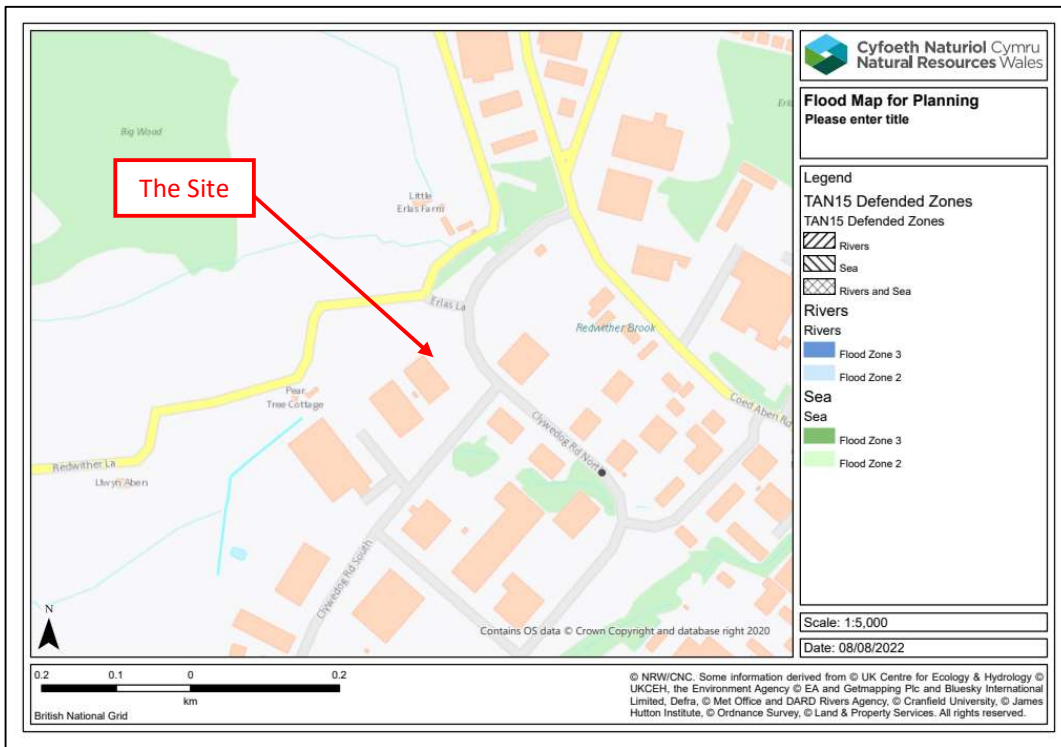


Figure 3 - Flood Map for Planning: River & Sea

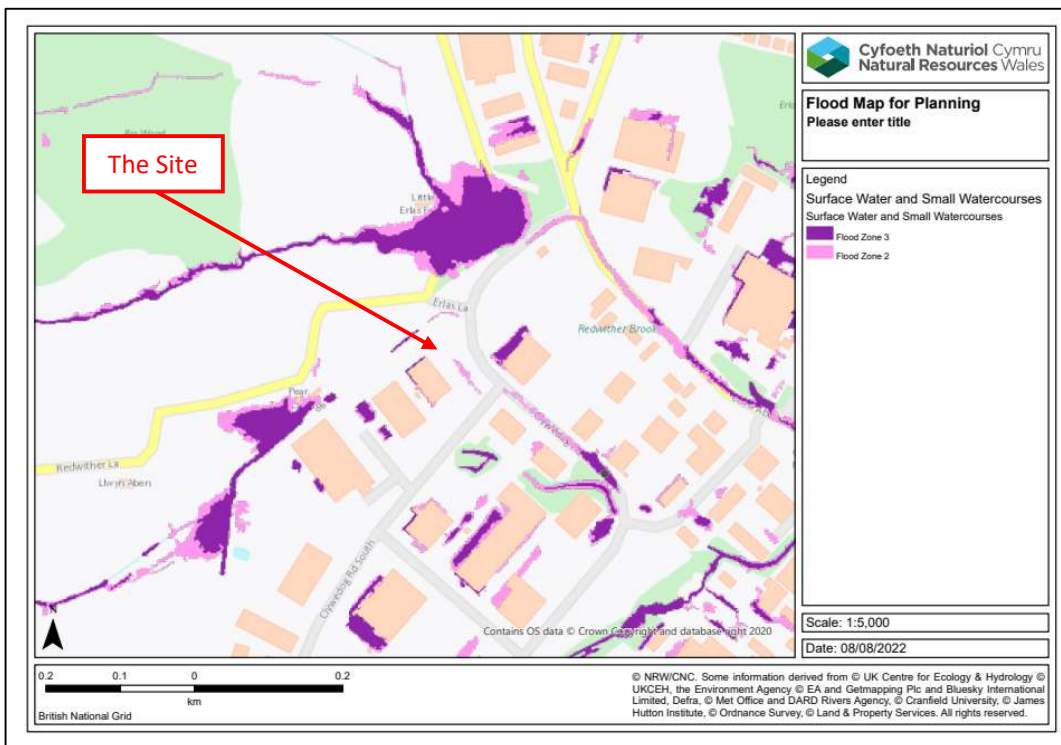


Figure 4 - Flood Map for Planning: Surface Water and Small Watercourses

Table 2 - FMfP Flood Zones

Flood Zone	Explanation
Rivers - Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Rivers - Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from rivers in a given year, including the effects of climate change.
Sea - Flood Zone 2	Areas with 0.1% to 0.5% (1 in 1000 to 1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
Sea - Flood Zone 3	Areas with more than 0.5% (1 in 200) chance of flooding from the sea in a given year, including the effects of climate change.
Surface Water and Small Watercourses - Flood Zone 2	Areas with 0.1% to 1% (1 in 1000 to 1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.
Surface Water and Small Watercourses - Flood Zone 3	Areas with more than 1% (1 in 100) chance of flooding from surface water and/or small watercourses in a given year, including the effects of climate change.

3.6 Flood Vulnerability

Table 1 describes the composition and use of the DAM Zones to control and manage development. Applying the Flood Risk Vulnerability Classification in Figure 2 of TAN15, the proposed industrial development is categorised as 'less vulnerable' development. The DAM classification therefore indicates that the site is suitable for the proposed use.

4.0 ASSESSMENT OF FLOOD RISK

4.1 Sources of Flooding

All sources of flooding have been considered, these are: fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

4.2 Climate Change

Projections of future climate change in the UK indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within TAN15 recommends that the effects of climate change are incorporated into FCA reports. Recommended precautionary sensitivity ranges for peak rainfall intensities, peak river flows and sea level rise are outlined in the following documents: CL-03-16 - Climate Change Allowances for Planning Purposes², Flood Consequence Assessments: Climate change allowances³ and Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales⁴.

The 9th January 2014 Welsh Government letter to all Chief Planning Officers (CPO) in Wales and CL-03-16 - Climate Change Allowances for Planning Purposes clarifies and refers to the Natural Resources Wales recommendations that the lifetime of development for residential development is 100 years, and for other development it is considered to be 75 years. Table 3 shows the peak river flow allowances by river catchment.

Table 3 - Peak River Flow Allowances by River Basin District

River Basin District	Allowance Category	2020s	2050s	2080s
Dee	Upper	+20%	+30%	+45%
	Central	+10%	+15%	+20%
	Lower	+5%	+5%	+5%

Projections of relative mean sea level rise for each epoch (period of time) is provided for the Welsh coastline in Table 4. These projections are consistent with the latest global predictions for sea level rise. The rate of change is projected to increase in each epoch.

Table 4 - Sea Level Allowance for Each Epoch Per Year (mm)

Period	Allowance (percentile)	Mean Sea Level Rise (m) by 2100*	Mean Sea Level Rise (m) by 2120*
Denbighshire	70 th	0.75	0.90
	95 th	0.95	1.15

* (UKCP18 baseline 1981-2000)

4.3 Historic Flooding

According to the Natural Resources Wales historic flooding dataset, this site has not historically flooded, as shown in Figure 5.

² <https://gov.wales/sites/default/files/publications/2018-11/cl0316-climate-change-allowances.pdf>

³ <https://gov.wales/sites/default/files/publications/2018-11/flood-consequence-assessments.pdf>

⁴ <https://gov.wales/sites/default/files/publications/2021-09/adapting-to-climate-change-guidance-for-flood-and-coastal-erosion-risk-management-authorities-in-wales.pdf>

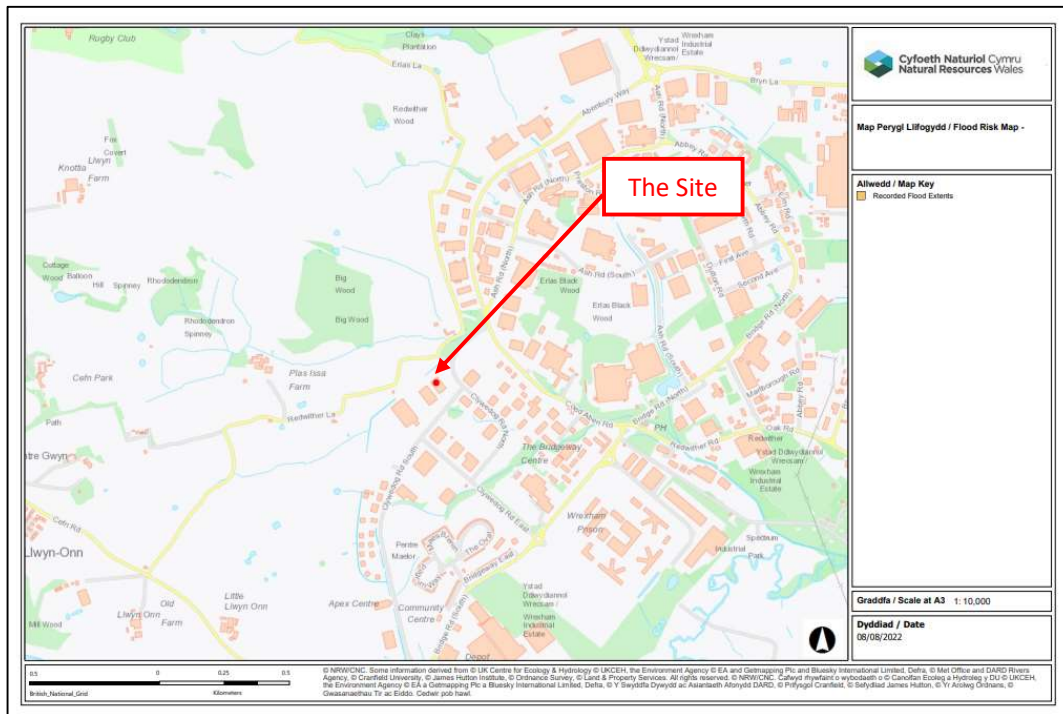


Figure 5 - Natural Resources Wales Historic Flood Map

4.4 Existing and Planned Flood Defence Measures

The site is not protected against flooding by existing flood defence measures. However, the flood risk will be mitigated by using a number of risk management measures to manage and reduce the overall flood risk at the site, these are discussed in Section 5.0.

4.5 Fluvial (river) Flooding

The site is not at risk of fluvial flooding (see Figures 3 and 6). Therefore, the risk of flooding from fluvial sources is considered to be **not significant**.

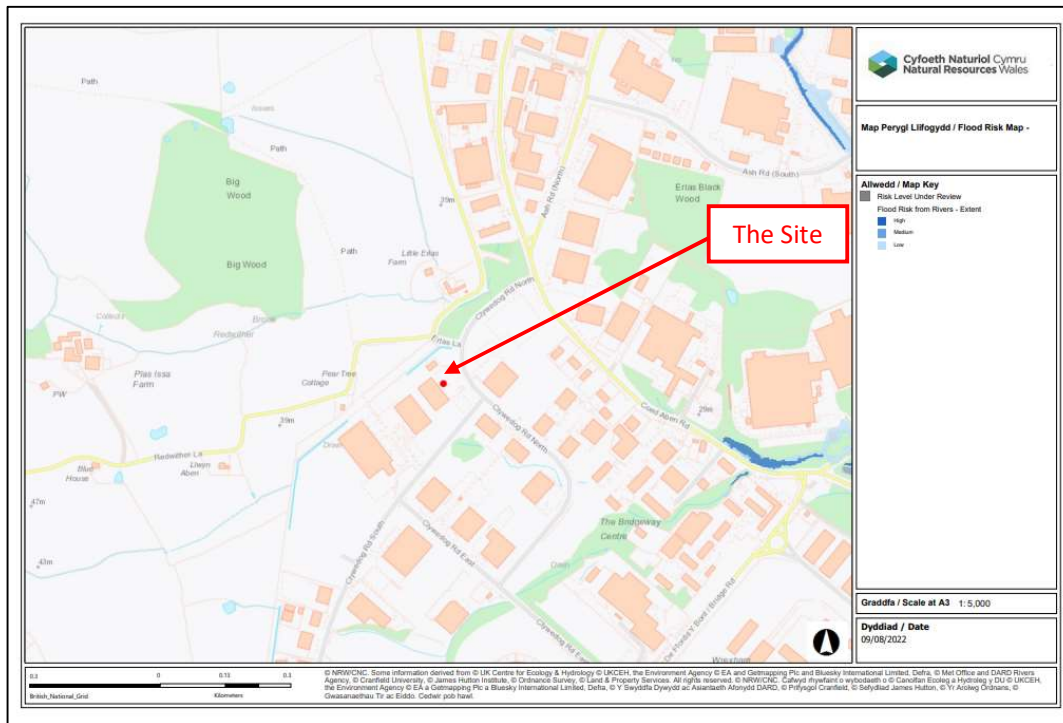


Figure 6 - Flood Risk Assessment Wales Map: Rivers

4.6 Tidal (coastal) Flooding

The site is not located within the vicinity of tidal flooding sources (see Figures 3 and 7) and the risk of tidal flooding is considered to be **not significant**.



Figure 7 - Natural Resources Wales Tidal Flood Map

4.7 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site conditions suggest a low probability of groundwater flooding as the local geology is not considered to yield significant volumes of groundwater. No below surface infrastructure and buildings are located or are proposed for the site. The risk of flooding from groundwater flooding is considered to be **not significant**.

4.8 Surface Water (pluvial) Flooding

The site is not situated near to large areas of poor permeability which may result in surface water flooding. The FMfP (see Figure 4) shows that the majority of the site is located within Flood Zone 1 however there is a small section to the north east and north west that is located within Flood Zone 2 and 3 with a 1 in 1000 to 1 in 100 (0.1% to 1%) to more than 1 in 100 (1%) chance of flooding in a given year, including the effects of climate change and is associated with low spots and discrete areas of low permeability on the site.

The resultant flooding will be less than 0.30m in depth, with velocities of less than 1m/s and a hazard rating of low to danger for some. This is confirmed within the Natural Resources Wales Surface Water flood map shown in Figure 8.

Given the scale and nature of the proposed development and the size and location of the surface water flooding sources it has been concluded that surface water flooding poses a low flood risk to the site and the risk of surface water flooding is considered to be of **low significance**.

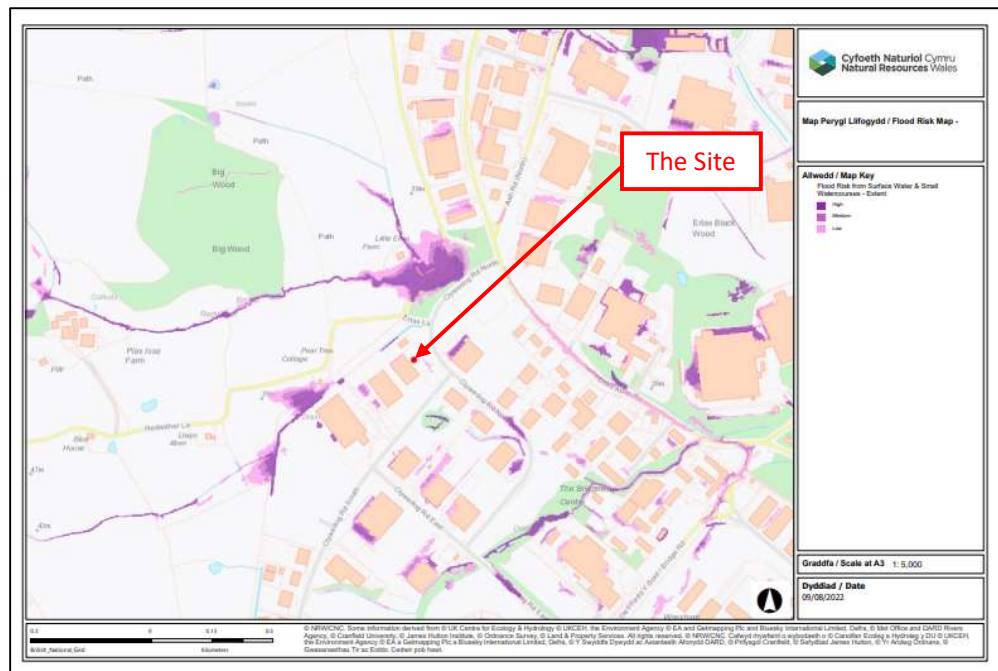


Figure 8 - Natural Resources Wales Surface Water and Small Watercourses Flood Map

4.9 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system exceeds its capacity. Sewer flooding tends to occur sporadically in both location and time such that flood flows would tend to be confined to the streets around the development.

There are existing sewers located within the vicinity of the site and these will inevitably have a limited capacity so in extreme conditions there would be surcharges, which may in turn cause flooding. Flood flows could also be generated by burst water mains, but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment.

Given the design parameters normally used for drainage design in recent times and allowing for some deterioration in the performance of the installed systems which are likely to have been in place for many years, an appropriate flood risk probability from this source could be assumed to have a return period in the order of 1 in 10 to 1 in 20 years.

The provision of an adequate level difference between the ground floors and adjacent ground level would reduce the annual probability of damage to property from this source to 1 in 100 years or less. Therefore, the risk of flooding from sewer flooding is considered to be **not significant**.

4.10 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no nearby artificial water bodies, water channels, reservoirs and artificial drainage systems that could be considered a flood risk to the Site. The Natural Resources Wales Reservoir flood map shows that the site is not at risk of reservoir flooding (see Figure 9). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

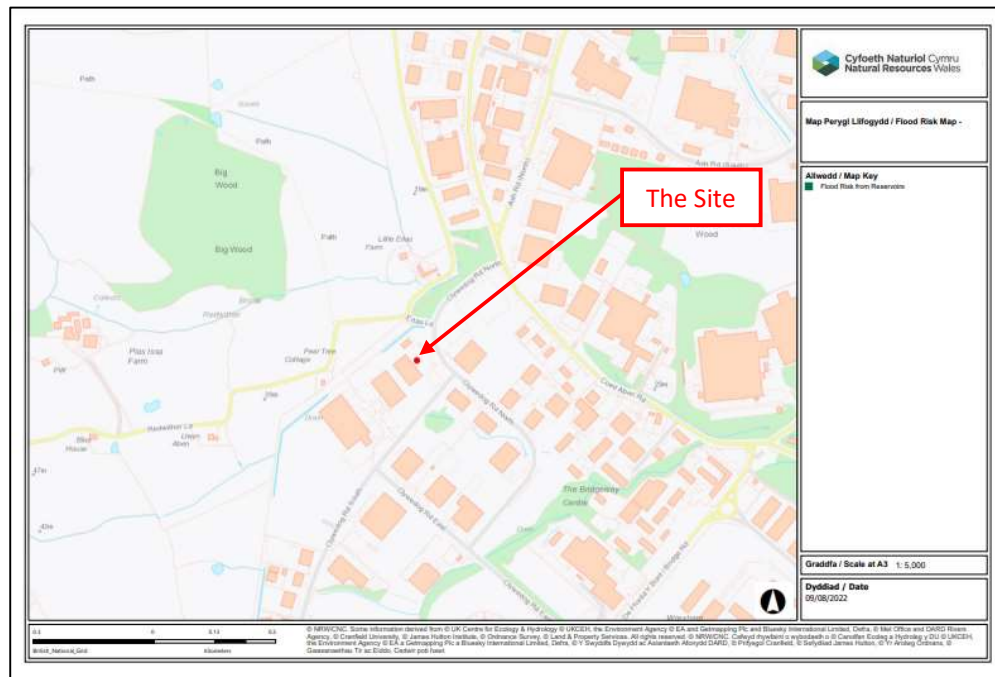


Figure 9 - Natural Resources Wales Reservoir Flood Map

4.11 Effect of the Development on Flood Risk

The site is located within Flood Zone 1 therefore, the proposed development will have no impact on flood risk and the overall direction of the movement of water will be maintained within the developed site and surrounding area. There will no net loss in flood storage capacity. The conveyance routes (flow paths) will not be blocked or obstructed. The topography of the site will not be altered; therefore, the overland flow routes will not be altered.

The proposed development would therefore not result in any impedance of flood flows or displacement of existing floodplain with the existing flood defences to be maintained and improved in the future to further ensure the development is not within an area susceptible to flood flows and floodplain in normal operation. The site proposals have been shown to be in accordance with A1.12 of TAN15.

4.12 Summary of Site Specific Flood Risk

A summary of the sources of flooding and a review of the risk posed by each source at the sites is shown in Table 5.

The site is not at risk of flooding from a major source (e.g. fluvial and/or tidal). The site has a 'low probability' of fluvial/tidal flooding as the site is located within Flood Zone 1 with less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%), including the effects of climate change. A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding sources will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time, in very extreme cases and will not have an impact on the whole of the proposed development site.

The proposed development would not result in any impedance of flood flows or displacement of existing floodplain with the existing flood defences to be maintained and improved in the future to further ensure the development is not within an area susceptible to flood flows and floodplain in normal operation. The site proposals have been shown to be in accordance with A1.12 of TAN15.

Table 5 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial Flooding	No	None Reported	None
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	Yes	Low Spots/Low Permeability	Low
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	No	None Reported	None

5.0 RISK MANAGEMENT

5.1 Introduction

In this flood zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout, form of the development and the use of flood mitigation measures. These will be used to ensure the development will be safe and there is:

- Minimal risk to life;
- Minimal disruption to people living and working in the area;
- Minimal potential damage to property;
- Minimal impact of the proposed development on flood risk generally, and;
- Minimal disruption to natural heritage.

The flooding sources will have to be mitigated on the site by using a number of techniques and mitigation strategies to manage and reduce the overall flood risk at the site.

5.2 Finished Floor Levels

The finished floor levels of the proposed extensions will be set no lower than existing ground levels. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations that it is considered impractical to raise the finished floor levels further. Therefore, a combination of resistance (proofing) and resilience measures will be included to further provide protection. This is discussed below.

5.3 Flood Resilience and Resistance

The development of the layout should always consider that the site is potentially at risk from an extreme event and as such the implementation of flood resilience and resistance methods should be assessed. Flood resistant/resilient measures will be used, including:

- Concrete floors will be used.
- All electrical wiring, switches, sockets, socket outlets, electrical, and gas meters etc. will be located a minimum of 450mm above the finished floor level.
- Cavities will be insulated with Polyisocyanurate (PIR) closed cell type insulation (e.g. Celotex).
- Sealant will be used around external doors and windows.
- All external doors and windows will be constructed from robust materials.

5.4 Access and Egress

The site and surrounding area is not located within the floodplain therefore a permanently safe and dry access can be maintained.

5.5 Residual Risk

The mitigation measures detailed above show that the flood risk can be effectively managed and therefore the consequences of flooding are acceptable. As such, the residual risk is considered to be acceptable for the lifetime of the development.

6.0 JUSTIFYING THE LOCATION OF THE DEVELOPMENT

6.1 Justification Test

The Justification Test sets out the details required to justify siting a new development in an area believed to be at risk of flooding and is defined in Section 6 of TAN15. The site is located within DAM Zone A and therefore the proposed development passes the Justification Test.

6.2 Assessment of Acceptability Criteria

The site is compliant with the indicative frequency thresholds and consequences of flooding as set out in A1.14 and A1.15 of TAN15. The consequences of flooding can be acceptably managed for the lifetime of the development. The development proposals should therefore be considered by the LPA to satisfy the Acceptability Criteria as set out in TAN15.

7.0 SUMMARY AND CONCLUSIONS

7.1 Introduction

This report presents a FCA in accordance with TAN15 for the proposed commercial development at 47-48 Clywedog Road North, Wrexham Industrial Estate, Wrexham, LL13 9XN. This FCA identifies and assesses the risks of all forms of flooding to and from the development and demonstrates how these flood risks will be managed so that the development remains safe throughout the lifetime, taking climate change into account.

7.2 Flood Risk

The site is not at risk of flooding from a major source (e.g. fluvial and/or tidal). The site has a 'low probability' of fluvial/tidal flooding as it is located within Flood Zone 1 with less than a 1 in 1000 annual probability of river or sea flooding in any year (<0.1%). A secondary flooding source has been identified which may pose a **low significant** risk to the site. This is:

- Surface Water Flooding

The flooding sources will only inundate the site to a relatively low water depth and water velocity, will only last a short period of time in very extreme cases and will not have an impact on the whole of the proposed development site.

The proposed development would not result in any impedance of flood flows or displacement of existing floodplain with the existing flood defences to be maintained and improved in the future to further ensure the development is not within an area susceptible to flood flows and floodplain in normal operation. The site proposals have been shown to be in accordance with A1.12 of TAN15.

7.3 Risk Management

The flood risk at the site will be reduced by using a number of risk management measures to manage and reduce the overall flood risk at the site. Measures will include:

Finished Floor Levels: The finished floor levels of the extensions will be set no lower than existing ground levels. It is recognised however that owing to limited headroom constraints, massing, planning policy and Building Regulations it is considered impractical to raise the finished floor levels further. Therefore, a combination of resistance (proofing) and resilience measures will be included to further provide protection. This is discussed below.

Flood Resilience and Resistance: Flood resistant/resilient measures will be used, including:

- Concrete floors will be used.
- All electrical wiring, switches, sockets, socket outlets, electrical, and gas meters etc. will be located a minimum of 450mm above the finished floor level.
- Cavities will be insulated with Polyisocyanurate (PIR) closed cell type insulation (e.g. Celotex).
- Sealant will be used around external doors and windows.
- All external doors and windows will be constructed from robust materials.

Access and Egress: The site and surrounding area is not located within the floodplain therefore a permanently safe and dry access can be maintained.

7.4 Justifying the Location of the Development

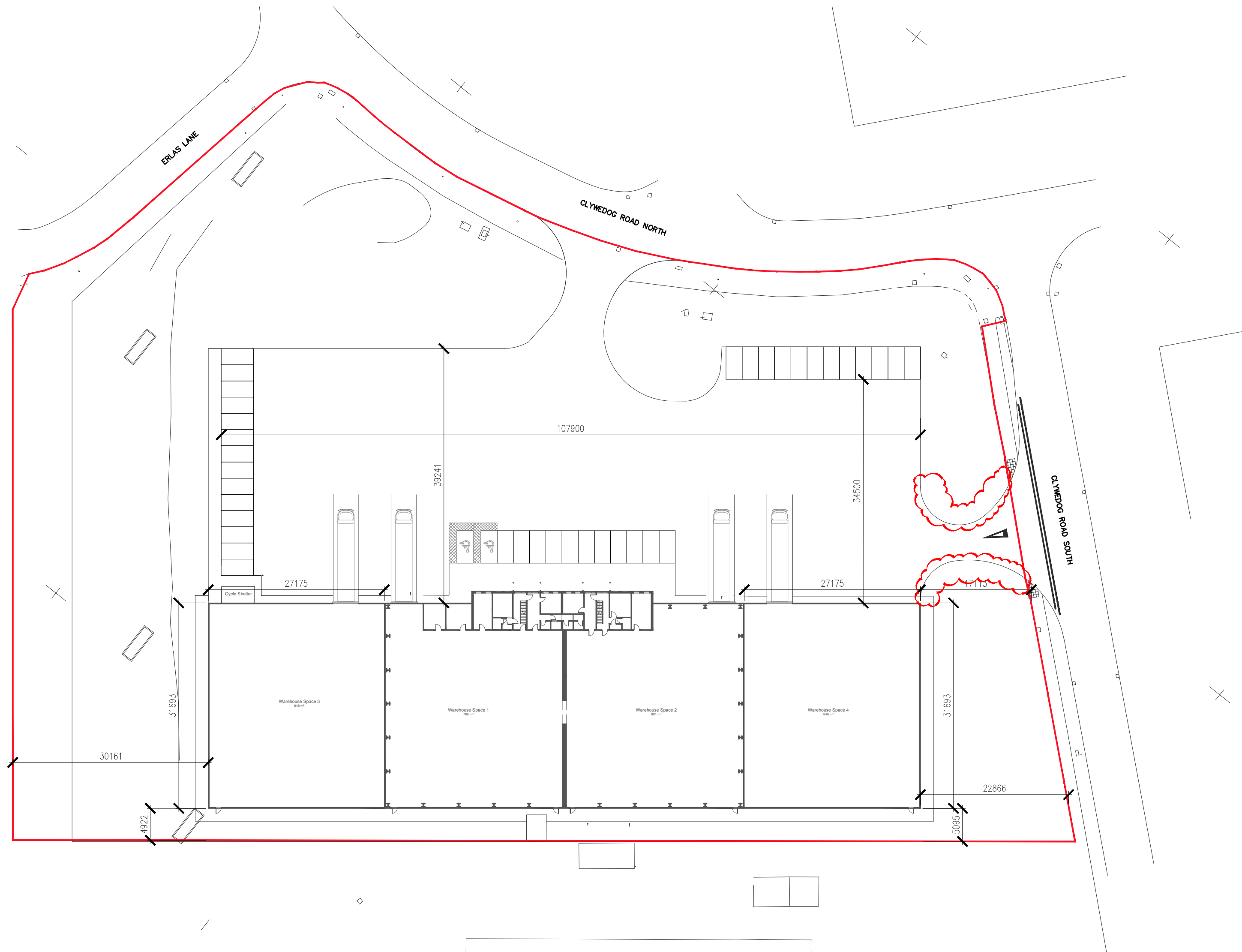
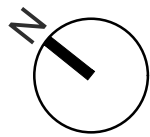
The Justification Test sets out the details required to justify siting a new development in an area believed to be at risk of flooding and is defined in Section 6 of TAN15. The site is located within DAM Zone A and therefore the proposed development passes the Justification Test.

7.5 Conclusion

In conclusion, the proposed development would be expected to remain dry in all but the most extreme conditions. Providing the recommendations made in this FCA are instigated, flood risk from all sources would be minimised, the consequences of flooding are acceptable and the development would be in accordance with the requirements of TAN15.

This FCA demonstrates that the proposed development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of TAN15. The development should not therefore be precluded on the grounds of flood risk.

APPENDIX 1 – Proposed Site Layout



Proposed Site Plan

A	Initial Issue	PJ	01.08.22
B	Updated to reflect tree constraints plan	PJ	09.08.22
C	HGV egress updated.Cycle store added	PJ	18.08.22
D	Main access updated	PJ	24.08.22
E	Dimensions added	MM	15.12..22
F	Parking & yard area amended	PJ	19.04.23
G	Parking & yard area amended	MA	28.04.23
H	New entrance footway returns removed	JT	23.04.24

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Client
F.I.Real Estate Management

Project
**Dragon Packaging
Wrexham**

Description
Proposed Site Plan

Status Information		
Scale	Drawn By	Date
1:500@A2	PJ	Jul22
Job Number	Drawing Number	Revision
1211	02-002	H

General

SHAW STEPHENS CONSULTING has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from **SHAW STEPHENS CONSULTING** and a charge may be levied against such approval.

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Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, **SHAW STEPHENS CONSULTING** reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing enough information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, several important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the sites which have not been disclosed by this investigation, and which have therefore not been considered in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.