

LLOYD MASTERPLAN, BRIDGE ROAD SOUTH, WREXHAM

FLOOD CONSEQUENCES ASSESSMENT

Job Number: FCA 23 1007

Date: February 2023

Client: Shape Consulting Engineers Ltd



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LK Consult			
Document Verification			
Site Address	Wrexham Industrial Estate, Bridge Road South, Wrexham, LL13 9SQ		
Report Title	Flood Consequences Assessment		
Job Number	FCA 23 1007	Document Ref.	FCA 23 1007 - R0
Date Issued	February 2023	Report Version	R0
Prepared By	Jenna Lowe – Flood Risk Engineer	Reviewed By	Mark Jones – Associate

Revision Record			
Revision No.	Date	Nature of Revision	Approved By

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EXECUTIVE SUMMARY

Scope and Background

This Flood Consequences Assessment has been undertaken by LK Consult Ltd (LKC) to support a planning application for an extension of an area of Ystad Ddiwyd annol Wrecsam (the Wrexham Industrial Estate), Bridge Road South, Wrexham. The development comprises the extension of existing warehouse units.

LKC has prepared this FCA in line with the Planning Policy Wales (PPW) and Technical Guidance where appropriate.

In considering the proposals the following key principles have therefore been applied:

- Identification of flood risks.
- Protection of users of the new development.
- No increased flood risk to third parties.

Development proposals in areas defined as being of medium to high flood hazard should only be considered where:

- New development can be justified in that location, even though it is likely to be at risk from flooding; and
- The development proposal would not result in the intensification of existing development which may itself be at risk; and
- New development would not increase the potential adverse impacts of a flood event.

Consultations

Natural Resources Wales (NRW) have been consulted to inform the preparation of this report. They have provided a more detailed flood map, but no modelled data was available.

Wrexham County Borough Council (LLFA) and Hafren Dyfrdwy (Water Company) were also consulted concerning flood risk.

All relevant consultees have confirmed that there is a Negligible to Low risk of flooding to these proposals from all sources.

Flood Consequences

NRW flood maps indicate that the site is potentially vulnerable to fluvial flooding and is outside of the tidal flooding zone.

The proposed development area lies within Zone A which covers the majority of the industrial estate site. There are areas to the south of the site and western area that are in Flood Zones C2 (without significant flood defences) according to Development Advice Maps (DAM) contained within Technical Advice Note 15.

There is an area within Zone B towards the southeast (areas known to have flooded previously) and C2 towards the southwest of the site according to Development and Flood Risk Maps (July 2004). The site is not in an area served by flood defences.

The proposed extensions are shown to be in Zone A (Fluvial Flood Zone 1).

There is an area of Low Risk of Pluvial and Surface Water flooding adjacent to the existing buildings to be extended.

Mitigation

Design

Floor levels of the building to be extended should be no lower than the existing but set as high as possible above the flood level giving regard to necessary access for the less-able.

The development will not result in a reduction in flood plain storage compared to the existing situation.

Access

The northernmost access to the existing site is elevated above potential flood levels and will always provide safe access to and from the site from Bridge Road South. The southernmost access may be subject in extreme fluvial flooding events, so an emergency evacuation plan may be required to be considered if not already in place. The need should be discussed with the LPA.

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) were commissioned by Shape Consulting Engineers Ltd to carry out a Flood Consequences Assessment (FCA) for Wrexham Industrial Estate, Wrexham. The report was undertaken in support of a future planning application to extend the site. The site will continue to be used for light industrial use.

The report will address the vulnerability to flooding from all possible sources. The issues of actual flood risk are discussed in Section 4.

This report has been prepared in accordance with the guidance set out in Technical Advice Note 15 (TAN 15) Appendix 1¹. This report summarises the assessment of the risks arising from all potential sources of flooding. The level of detail entered into in any flood consequences assessment is dependent upon the scale and potential impact of the proposed development, and the vulnerability classification of the proposed land-use.

The Planning Policy Wales (PPW) documentation considers the flood risk consequences, whether inland or from the sea, is a material consideration in land use planning. All development on land within the flood plain of a watercourse, or drained via a culvert, or on low lying land adjacent to tidal waters, is at some risk of flooding, and whilst flood risk can be reduced by using mitigation measures, it can never be completely eliminated.

The provisions of CL-03-16-Climate Change for Planning Purposes should be considered for any development. The proposals are for a Less Vulnerable use as the industrial units will not be occupied.

¹ Planning Policy Wales Technical Advice Note 15: Development and Flood Risk (TAN15) – July 2004.

1.2 Site Details

A summary of the general site details is presented in Table 1-1. Plans, Drawings and Figures are provided in Appendix A. Figure 1 indicates the site location and boundary. Figure 2 indicates the proposed development.

Site Details	
Location	Wrexham Industrial Estate, Bridge Road S, Wrexham, LL13 9SQ. Centred at approximate National Grid Reference 337460E, 348635N.
Area	Approximately 14.5 Ha.
Topography	38.66 metres above ordnance datum (AOD) in the north of the site and 30.98m AOD in the southwest. The site is sloping down from the north towards the southwest.
Current Land Use	<u>Site</u> Site comprises an industrial estate made up of various warehouse units used for packing and transports services bounded by metal fencing. <u>Surrounding Area/ Boundary Treatment</u> North: Grassland and established trees. East: Grassland and the River Clywedog beyond. South: Established trees, hedgerows, and the River Clywedog. West: Bridge Road S and grassland beyond.
Proposed Development	Extension of existing industrial warehouses in southeast. Access will be from Bridge Road South.

Table 1-1: Summary of site details.

1.3 TAN 15 Requirements for Less Vulnerable Developments

Classification C2 is used to indicate that only less vulnerable development should be considered subject to application of a justification test, including acceptability of consequences.

Justification for the location of the development

The existing industrial estate is located within the client's lease / ownership area.

The site meets the definition of previously developed land.

The Consequences of flooding are minimal:

- 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.

Why the site should be developed in this area:

- The proposal brings greater investment and employment to the Wrexham area.

This FCA demonstrates the above.

Consequences

The developer must ensure that future operators and users of the development are aware of the flooding risks and consequences. Escape/evacuation routes are to be shown by the operator/developer to be operational under all conditions. Flood emergency plans and procedures produced by the developer must be in place. Use should be made of all available flood warning services. Escape / evacuation routes are to be shown by the developer to be operational under all conditions. Flood emergency plans and procedures produced by the developer must be in place. The flood risks are discussed within Section 4 of this report.

2 Site Setting

2.1 Vulnerability

As an initial phase in identifying whether a site is potentially at risk of flooding, LKC has consulted the Natural Resources Wales (NRW) website Flood Zone Mapping. This mapping is (often) based on coarse scale modelling and provides only an initial indication of the flood risk to a site. The Natural Resources Wales Flood Zone maps were developed using a very coarse Digital Elevation Map (DEM). Flood levels are not available for the J-flow model.

The PPW development and flood risk guidance defines the Flood Zones as:

- Flood Zone A – Considered to be at little or no risk of fluvial or tidal/coastal flooding.
- Flood Zone B – Areas known to have been flooded in the past evidenced by sedimentary deposits.
- Flood Zone C – Based on Environment Agency extreme flood outline, equal to or greater than 0.1% (river tidal or coastal).
- Flood Zone C1 – Areas of the floodplain which are developed and served by significant infrastructure, including flood defences.
- Flood Zone C2 – Areas of the floodplain without significant flood defence infrastructure.

The majority of the industrial estate lies within Zone A and the site partially lies within Zone B towards the south eastern corner and Zone C2 towards the south western corner of the Development Advice Maps (DAM) contained within Technical Advice Note 15 Development and Flood Risk (July 2004).

The Wrexham Industrial Estate is partially within Flood Zones B and C2, so under current regulations a Flood Consequences Assessment will be necessary to accompany the Planning Application.

The proposed development is for general light industrial use, and this is classified within the 'Less Vulnerable' development category in the TAN15 (Figure 2).

2.2 Flood Risk Avoidance

The proposed development is relating to the extension of warehouse units, these proposed works are within Zone A. Other works include extending loading bay canopies one of which is adjacent to a building shown in Zone C2. The building will remain as a Less Vulnerable use.

Notwithstanding the above, the principles outlined in the flood risk avoidance guidance should be applied for the development, for example, dwellings situated on a high part of the site when there is a risk of local surface water flooding. The issues of actual flood risk are discussed below. The issues of safety and reduction in flood risk to others required are also addressed in this document.

The Local Planning Authority (LPA) will make the final decision with regard to any planning application.

2.3 Environmental Setting

Summary of the Environmental Setting			
Geology	Superficial		Till, Devensian (Diamicton) majority of site. River Terrace Deposits (Sand and Gravel) in SW corner.
	Bedrock		Salop Formation (Mudstone, Sandstone and Conglomerate).
	BGS Boreholes		BH Ref: SJ34NE73:15m W: Fill to 0.50m, brown silty Clay with pebbles to 1.50m, loose to medium dense brown clayey Gravel to 3.00m, brown silty Clay to 4.50m and brown silty Sand to 5.00m. (Water struck at 1.70mbgl). BH Ref: SJ34NE69: 320m N: Fill to 1.00m, brown with streaks of grey Clay to 4.50m, brown Silt to 9.50m. (Wate struck at 3.50mbgl).
	DEFRA Soilscape Mapping		Type 18 – Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.
Hydrogeology	Aquifer Designation	Superficial	Secondary (undifferentiated).
		Bedrock	Secondary A Aquifer. Not located within a Source Protection Zone.
Hydrology	All adjacent and internal surface water		The River Clywedog is adjacent to the south of the site. There is a partially culverted watercourse flowing approximately 75m west of the site.
	Flooding		Majority of the site lies within Flood Zone A. A section of the site towards the south eastern corner lies within Flood Zone B and a section towards the southwestern corner lies within Flood Zone C2.
Site History			Historical mapping indicates that the site consisted of pastureland from 1879 until 1948. From 1949 the Wrexham Trading Estate was present and had been extended by the latest mapping in 1964. The River Clywedog flows to the south of the site.

Table 2-1: Summary of the Environmental Setting.

2.4 Site Reconnaissance

A site reconnaissance was carried out in February 2023 and further photographs are provided below.

Relevant features identified on site are summarised below:

-  The site is currently occupied by several warehouses associated with F Lloyd Penley Ltd, a warehousing and transport company.
-  The site is divided into two levels: the upper and lower levels.
-  The upper level comprises the main office buildings, car park, and warehouses.
-  The lower levels comprise warehouse units.
-  The site is accessed via a gated entrance to the main car park off Bridge Road South to the northwest of site.
-  An approximate 7m height difference noted between the upper level and lower level.
-  A slope is present in the south east of the site, between the upper and lower level (sloping from northeast to southwest at 23 degrees).
-  Anecdotal evidence of a below ground tank in the soft landscaping area to the southeast of site. Manhole covers noted during reconnaissance.

The surrounding area comprises:

- North: Bridge Road South and residential properties beyond.
- East: Vacant land and prison beyond.
- South: Commercial / industrial units.

Relevant photographs are provided in Plate 2-1.

	
Photograph 1: View of steep slope in SE of the site.	Photograph 2: View of some warehouses and loading area within the site.
	
Photograph 3: Stockpile present in SE of the site.	Photograph 4: Further view of the steep slope in SE of the site.

Plate 2-1: Site photographs.

Hand dug pits were carried out in 8no. locations and are summarised in Plate 3-1.

HD101	HD102	HD103
GL-0.3m Made Ground (slightly gravelly sandy silty clay with frequent rootlets, occasional ash, brick fragments) 0.3-0.75m Stiff light brown slightly gravelly clay (probable reworked).	GL-0.35m Made Ground (slightly gravelly sandy silty clay with frequent rootlets, occasional ash, brick fragments) 0.3-0.5m Stiff light brown slightly gravelly clay (probable reworked).	GL-0.15m Made Ground (slightly gravelly sandy silty clay with frequent rootlets, occasional ash, brick fragments) 0.15-0.5m Made Ground (firm brown gravelly slightly sandy silty clay with occasional brick and concrete fragments)
HD104	HD105	HD106
0.0-0.4m Made Ground (firm brown gravelly slightly sandy silty clay with occasional brick (whole and fragments) and concrete fragments, rare ash) Refusal on cobbles.	0-0.25 Made Ground (dark greyish brown gravelly silty sand with frequent brick, occasional ash, rare clinker, plastic and concrete). Refusal on dense gravel MOT layer.	0-0.28 Made Ground (dark greyish brown gravelly silty sand with frequent brick, occasional ash, rare clinker, plastic and concrete). Refusal on dense gravel MOT layer.
HD107	HD108	
GL-0.2m Made Ground (slightly gravelly sandy silty clay with rare ash and brick fragments) 0.2-0.5m Stiff light brown slightly gravelly clay (probable reworked).	GL-0.2m Made Ground (slightly gravelly sandy silty clay with rare plastic and brick fragments) 0.2-0.45m Stiff light brown slightly gravelly clay (probable reworked).	

Plate 3-1: Hand Dug Pit Logs.

2.5 Site and Access Levels

A topographic survey of the site was not provided, therefore opensource LiDAR levels have been extracted to OS GPS datum, and information is included on the drawings in Appendix B. The site elevation ranges from 38.66m AOD in the north and 30.98m AOD in the southwest. The existing access adjacent to the building is approximately 31.86m AOD.

3 Consultation

Information from consultees (Natural Resources Wales (NRW), Wrexham County Borough Council – LLFA and Hafren Dyfrdwy – Water Company) is summarised in Table 3-1 below.

Relevant correspondence / information is provided in Appendices C (NRW) and D (others).

Source	Details	
Natural Resources Wales (NRW)	The site is shown to be partially within Flood Zones B and C2, and the majority of the site is within Flood Zone A. The site is not benefitting from flood defence infrastructure. The estate is in a Very Low Flood Risk area. The area to the west and south east has a chance of flooding between 1 in 100 (1%) and 1 in 30 (3.3%).	
	Modelled Fluvial Flood Levels (River Clywedog)	No specific data available within the vicinity of the existing buildings. A comparison of the flood extents with the LiDAR data shows the 1% flood event flood level to be at 31.92mAOD and the 0.1% to be at 31.09mAOD.
	Records of Flooding	No information available.
	Records of Flood Warning Service	The site is not located within a flood warning area. The site is located within a flood alert area.
	Surface Water Flooding	Very low risk of surface water flooding across the majority of the site. There is a low risk of pluvial surface water flooding adjacent to buildings where rainfall may get trapped if there is a drainage failure.
	Flooding from reservoirs	The southern and western boundaries of the industrial park may be at low risk of reservoir flooding.
	Groundwater Source Protection Zone	Not within Source Protection Zone.
Wrexham CB Council (LLFA)	No information received at the time of writing.	
	Possible or known incidents of highway flooding	Unaware of any current flooding problems associated with Bridge Road South.
Hafren Dyfrdwy (HD)	Sewer Flooding	An online drain flooding map provided by HD indicates that they do not have records of internal or external sewer flooding of properties in the vicinity of the site as a result of overloaded sewers.
Strategic Flood Consequences Assessment (SFCA) ²	Flood Risk Management Plan	The site has no history of flooding from any source.
Preliminary Flood Consequences Assessment (PFCA) ³	The Preliminary Flood Risk Assessment (PFCA) ³ for the area indicates that there are no records of flooding for the area which contradicts the Zone B extents at the southern boundary of the industrial estate.	

Table 3-1: Summary consultee information.

² Strategic Flood Consequences Assessment: Wrexham County Borough Council, (2016) 'Flood Risk Management Plan'.

³ Preliminary Flood Risk Assessment: Wrexham County Borough Council, (2011) 'Preliminary Assessment Report'.

4 Assessment of Flood Risk

4.1 Flood Zones

The detailed flood map provided by NRW indicates that the majority of the site is in Zone A and is partially in Zone B towards the south eastern corner and Zone C2 towards the southwestern corner as defined in TAN15 (see Appendix C). The proposed extensions are within Zone A.

The site is not located in an area benefitting from flood defence infrastructure.

It can be reasonably concluded on the evidence above that the areas of the extensions are within the extents of Fluvial Flood Zone 1 for the purpose of this assessment.

NRW did not have any modelled levels for the stretch of the River Clywedog closest to the site. Therefore, the comparison data was extracted by comparison with the flood map extents and the available topographical data provided for this site to provide the 100-year and 1000-year plus climate change levels. The existing floor level within the buildings are slightly above the flood extents levels.

4.2 Sources of Flooding

The risk of flooding from the following flood sources has been considered:

Fluvial – The development within the industrial area is within Flood Zone 1. Therefore, the consequence of Fluvial Flooding is Very Low.

Tidal – The study area is remote from the sea and tidally influenced water bodies. Therefore, the flood risk associated with this source is considered Negligible.

Pluvial (Rainfall) – The surface water flood risk maps show areas that have the potential to flood during prolonged heavy rainfall. These areas are towards the south and slope down towards the River Clywedog. These areas need consideration within the detailed design or there is the potential to have areas of standing water in areas not positively drained if overland flow routes are not considered. Therefore, the risk of flooding from surface water flooding is Low as the topography of the site is likely to shed towards the south but should be considered further during the detailed design.

Surface Water (Overland flow) – This relates to surface water entering the site. Any surface water arising from the north of the study area is likely to flow towards the watercourse due to the slope across the land and therefore pose no threat to the development. If there was a drainage failure causing overland flow, it would flow towards the south away from the existing building. Therefore, the flood risk associated with this source is considered to be Very Low.

Groundwater – The BGS has groundwater records for the study area in the form of borehole records. The records show the water table is recorded at 1.70 – 3.50mbgl. The shallow groundwater records indicate that water may enter any deep excavations or service trenches during construction and de-watering may be necessary. Therefore, the flood risk associated with this source is considered Low as the natural topography will cause any groundwater to shed towards the south of the site.

Sewers – Online guidance provided by Hafren Dyfrdwy indicates that no property within the vicinity of the site is at risk of internal flooding due to overloaded public

sewers. The highway to the west would intercept any overland flow before it enters the site. Therefore, the flood risk associated with this source is considered Very Low.

Artificial sources – According to NRW online maps, the area of the developments is not at risk from reservoir flooding. Therefore, the flood risk associated with this source is considered Very Low.

4.3 Summary of Flood Risk

Source of Flooding	Risk Assessment Level
Fluvial	Very Low
Pluvial (Rainfall)	Low
Surface Water	Very Low
Tidal	Negligible
Groundwater	Low
Sewers	Very Low
Artificial Sources	Very Low

Table 4-1: Summary of Existing Risk Level.

The industrial estate is partially within Flood Zones B and C2, and the remainder of the site is within Flood Zone A. The areas of the proposed extensions are within Flood Zone 1.

A Negligible to Low risk of flooding from all other sources has been identified for the site.

5 Mitigation Measures

5.1 Proposed Site levels and Developments Level

Current guidance recommends that an allowance for climate change and a freeboard should be applied for all new developments for the minimum ground floor levels of new developments. In this case this application is for extensions to existing warehouse units and new loading bay canopies to other buildings on the estate. The existing buildings to be refurbished should have floor levels no lower than the existing.

5.2 Safe Access

Safe and dry access is available via Bridge Road (south) to the northwest as the majority of the access road is within Flood Zone A. The southern access to the estate may be affected by an extreme event. It is recommended that the need for an emergency evacuation plan is discussed with the LPA for the southern exit.

5.3 Flood Resistance and Resilience

The extensions proposed may be subject to flooding at more extreme events than those considered. Flood resilience measures should be included into ground floor construction to aid recovery after any event. If utilised, typical measures would include solid floors, use of suitable materials and services fed from upper floors with outlets at high level. The need can be discussed and agreed with building control officers during detailed design.

5.4 Residual Risk

It is impossible to completely guard against flooding since extreme events greater than the design standard event are always possible. However, ground floor levels of the extensions should be set above proposed levels across the site and provide a nominal freeboard to allow overland flow under exceptional conditions. Overland flow routes should be considered in case of drainage failure and the extreme events.

6 Conclusions

The proposed extensions within the site are shown on the published mapping to be located within the NRW's DAM Fluvial Zone A. To the south east of the proposed works there are areas of Zone C2 and an area of Zone B to the south west as defined in TAN15. A Very Low risk of flooding from fluvial flooding has been identified from information provided by NRW for the areas of the development.

An assessment of these risks in conjunction with the development proposals have resulted in the following recommendations for the safe development of the site:

- » The recommended minimum finished floor level is no lower than the existing floor level for the buildings being extended.
- » The operators should sign up for any flood alert warning services.
- » Flood resilience measures should be incorporated into the alterations, including sealing of any low-level vents, joints in the building fabric, use of flood resistant doors on the exterior of the building and demountable barriers on low windows up to 600mm above the existing floor level.
- » Pedestrian and vehicular safe access to and from the site is achievable under all conditions via the north access road off Bridge Street South, but the southern access may be affected.
- » The need for a formal evacuation plan should be discussed with the LPA.

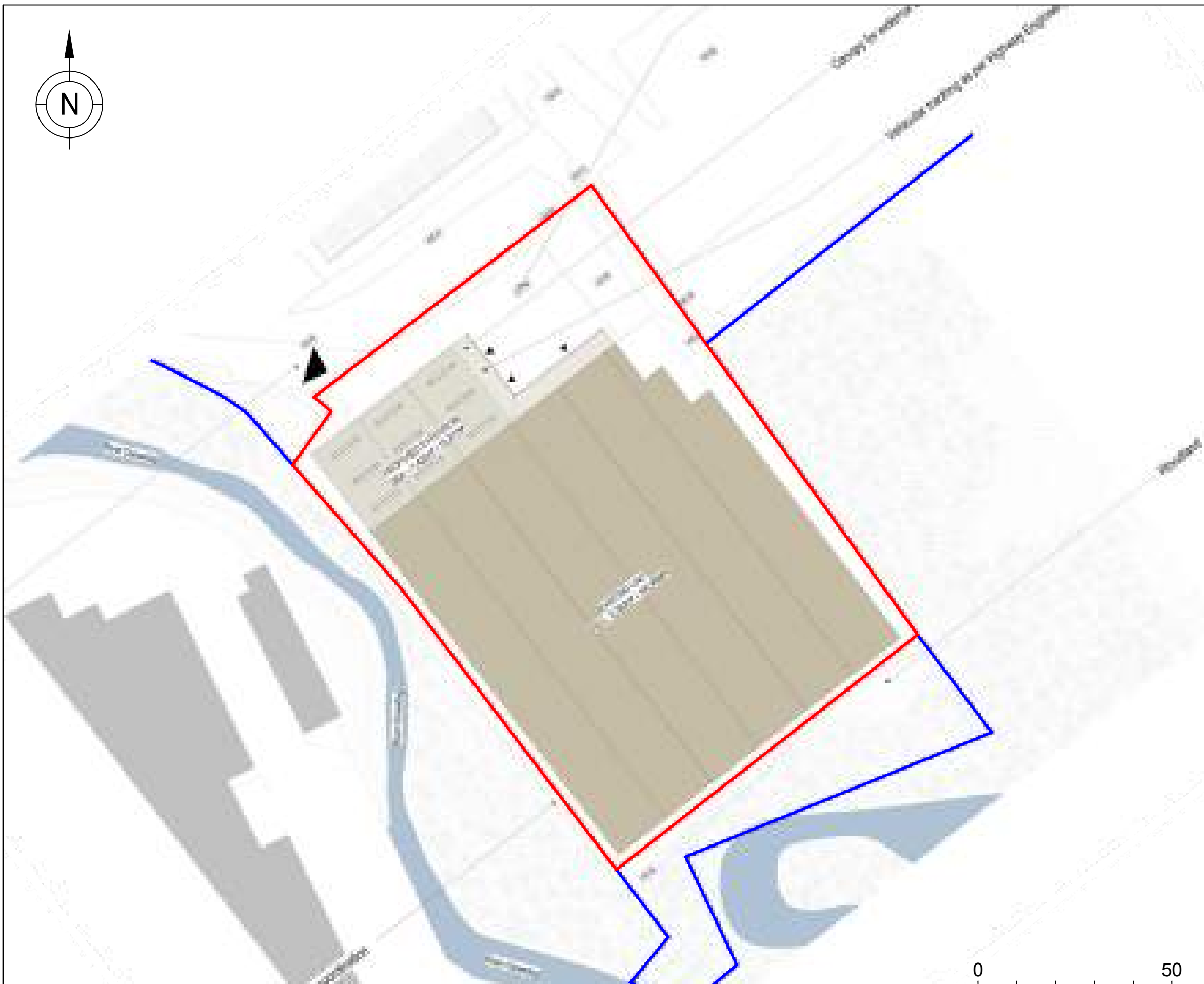
Further details on the proposed mitigation measures are provided in Section 5. All proposed measures should be agreed with the Local Authority prior to commencement of the development.

Appendix A

Figures, Plans and Drawings



Client: Shape Consulting Engineers Ltd				Title: Site Location & Boundary Plan			
Site: Lloyd Masterplan, Wrexham				Scale (see scale bar): 1:25,000 & 1:6,000 @ A4			
Job No.: FRA 23 1007	Drawn By: JL	Checked By: MJ	Drawn: Jan 2023	Figure: 1	Revision:		



KEY

-  Application Boundary
-  Site Boundary

Unit I Extension

GEA – 1,423m² / 15,317ft²

GIA – 1,121m² / 12,066ft²

-  Existing Unit
-  Proposed Extension

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:
Shape Consulting Engineering Ltd

Site:
**Lloyd Masterplan
F Lloyd Penley Ltd, Wrexham**

Title:
**Proposed Development Plan
(Unit I)**

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
FRA 23 1007	1:1000 @ A3	2a	
Drawn By: AC	Checked By: PD		
Feb 2023			

Extract from: DMWR Architects
Drawing Ref: Proposed Site Plan (Unit I Extension), No.3850-DMWR-DR-A-0100 (09/02/2023)

0 50
SCALE (Metres)



KEY

-  Application Boundary
-  Site Boundary

Unit X Extension

GEA – 4,449m² / 47,889^{ft}²

GIA – 3,889m² / 41,860^{ft}²

-  Existing Unit
-  Proposed Extension

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.



Client:
Shape Consulting Engineering Ltd

Site:
Lloyd Masterplan
F Lloyd Penley Ltd, Wrexham

Title:
Proposed Development Plan
(Unit X)

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
FRA 23 1007	1:1000 @ A3	2b	
Drawn By:	Checked By:	Drawn:	
AC	PD	Feb 2023	

Extract from: DMWR Architects
Drawing Ref: Proposed Site Plan (Unit X Extension), No.3850-DMWR-DR-A-0100 (09/02/2023)

0 50
SCALE (Metres)

Appendix B

Site Information



LiDAR Levels Key (m AOD)

- A = 30.99
- B = 30.62
- C = 30.71
- D = 32.42
- E = 34.56
- F = 37.13
- G = 39.60
- H = 39.56
- I = 38.85
- J = 31.74
- K = 31.20
- L = 38.20
- M = 39.35
- N = 39.32
- O = 36.39
- P = 37.22
- Q = 35.60
- R = 33.90

Geology 1:50,000 Maps Legends

Artificial Ground and Landslip

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	MGR	Made Ground (Undivided)	Artificial Deposit	Not Supplied - Holocene
	LSGR	Landsaped Ground (Undivided)	Artificially Modified Ground	Not Supplied - Holocene

Superficial Geology

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	ALV	Alluvium	Clay, Silt, Sand and Gravel	Not Supplied - Holocene
	TILLD	Till, Devensian	Diamicton	Not Supplied - Devensian
	GLLDD	Glaciolacustrine Deposits, Devensian	Clay and Silt	Not Supplied - Devensian
	GFSDD	Glaciofluvial Sheet Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	GFDUD	Glaciofluvial Deposits, Devensian	Sand and Gravel	Not Supplied - Devensian
	RTDU	River Terrace Deposits (Undifferentiated)	Sand and Gravel	Not Supplied - Quaternary
	RTD3	River Terrace Deposits, 3	Sand and Gravel	Not Supplied - Quaternary
	RTD2	River Terrace Deposits, 2	Sand and Gravel	Not Supplied - Quaternary
	RTD1	River Terrace Deposits, 1	Sand and Gravel	Not Supplied - Quaternary

Bedrock and Faults

Map Colour	Lex Code	Rock Name	Rock Type	Min and Max Age
	KNSF	Kinnerton Sandstone Formation	Sandstone	Not Supplied - Early Triassic
	SAL	Salop Formation	Mudstone, Sandstone and Conglomerate	Not Supplied - Westphalian
		Faults		



Geology 1:50,000 Maps

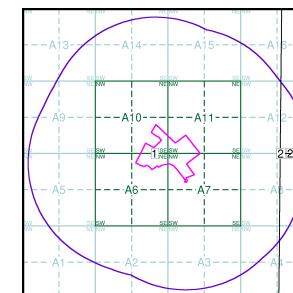
This report contains geological map extracts taken from the BGS Digital Geological map of Great Britain at 1:50,000 scale and is designed for users carrying out preliminary site assessments who require geological maps for the area around the site. This mapping may be more up to date than previously published paper maps.

The various geological layers - artificial and landslip deposits, superficial geology and solid (bedrock) geology are displayed in separate maps, but superimposed on the final 'Combined Surface Geology' map. All map legends feature on this page. Not all layers have complete nationwide coverage, so availability of data for relevant map sheets is indicated below.

Geology 1:50,000 Maps Coverage

Map ID:	1	Map ID:	2
Map Sheet No:	121	Map Sheet No:	122
Map Name:	Wrexham	Map Name:	Nantwich
Map Date:	1993	Map Date:	1967
Bedrock Geology:	Available	Bedrock Geology:	Available
Superficial Geology:	Available	Superficial Geology:	Available
Artificial Geology:	Available	Artificial Geology:	Not Available
Faults:	Not Supplied	Faults:	Not Supplied
Landslip:	Available	Landslip:	Available
Rock Segments:	Not Supplied	Rock Segments:	Not Supplied

Geology 1:50,000 Maps - Slice A



Order Details:

Order Number: 306407436_1_1
 Customer Reference: LKC 23 1018
 National Grid Reference: 337480, 348590
 Slice: A
 Site Area (Ha): 13.79
 Search Buffer (m): 1000

Site Details:

Land Adjacent To f Lloyd Penley Ltd, Bridge Road South, Wrexham Industrial Estate, Wrexham, LL13 9SQ

Landmark
 INFORMATION GROUP

Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk



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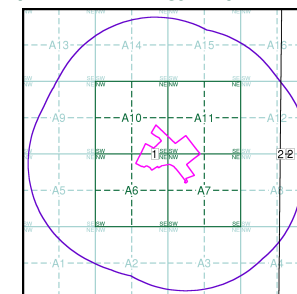
Superficial Geology

Superficial Deposits are the youngest geological deposits formed during the most recent period of geological time, the Quaternary, which extends back about 1.8 million years from the present.

They rest on older deposits or rocks referred to as Bedrock. This dataset contains Superficial deposits that are of natural origin and 'in place'. Other superficial strata may be held in the Mass Movement dataset where they have been moved, or in the Artificial Ground dataset where they are of man-made origin.

Most of these Superficial deposits are unconsolidated sediments such as gravel, sand, silt and clay, and onshore they form relatively thin, often discontinuous patches or larger spreads.

Superficial Geology Map - Slice A



Order Details:

Order Number: 306407436_1_1
 Customer Reference: LKC 23 1018
 National Grid Reference: 337480, 348590
 Slice: A
 Site Area (Ha): 13.79
 Search Buffer (m): 1000

Site Details:

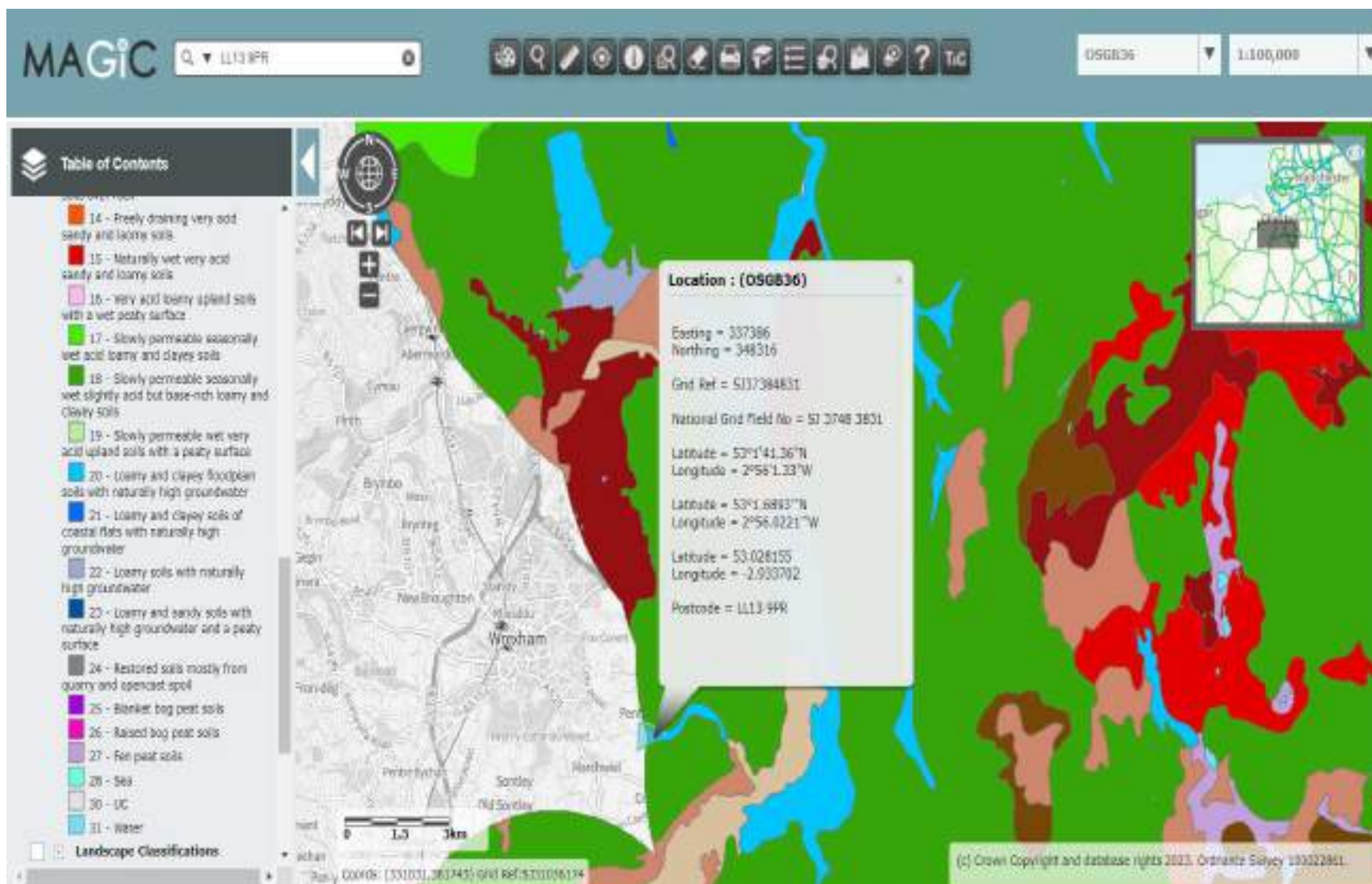
Land Adjacent To f Lloyd Penley Ltd, Bridge Road South, Wrexham Industrial Estate, Wrexham, LL13 9SQ



Tel: 0844 844 9952
 Fax: 0844 844 9951
 Web: www.envirocheck.co.uk

v15.0 27-Jan-2023

Page 3 of 5



Defra Soilscape Mapping - (c) Crown Copyright and database rights 2022. Ordnance Survey 100022861

PROJECT : PROPOSED SEWERLINE
 LOCATION : WREXHAM INDUSTRIAL ESTATE
 GROUND LEVEL :
 TYPE OF BORING : Shell & Auger
 SCALE OF LOG : 1:50

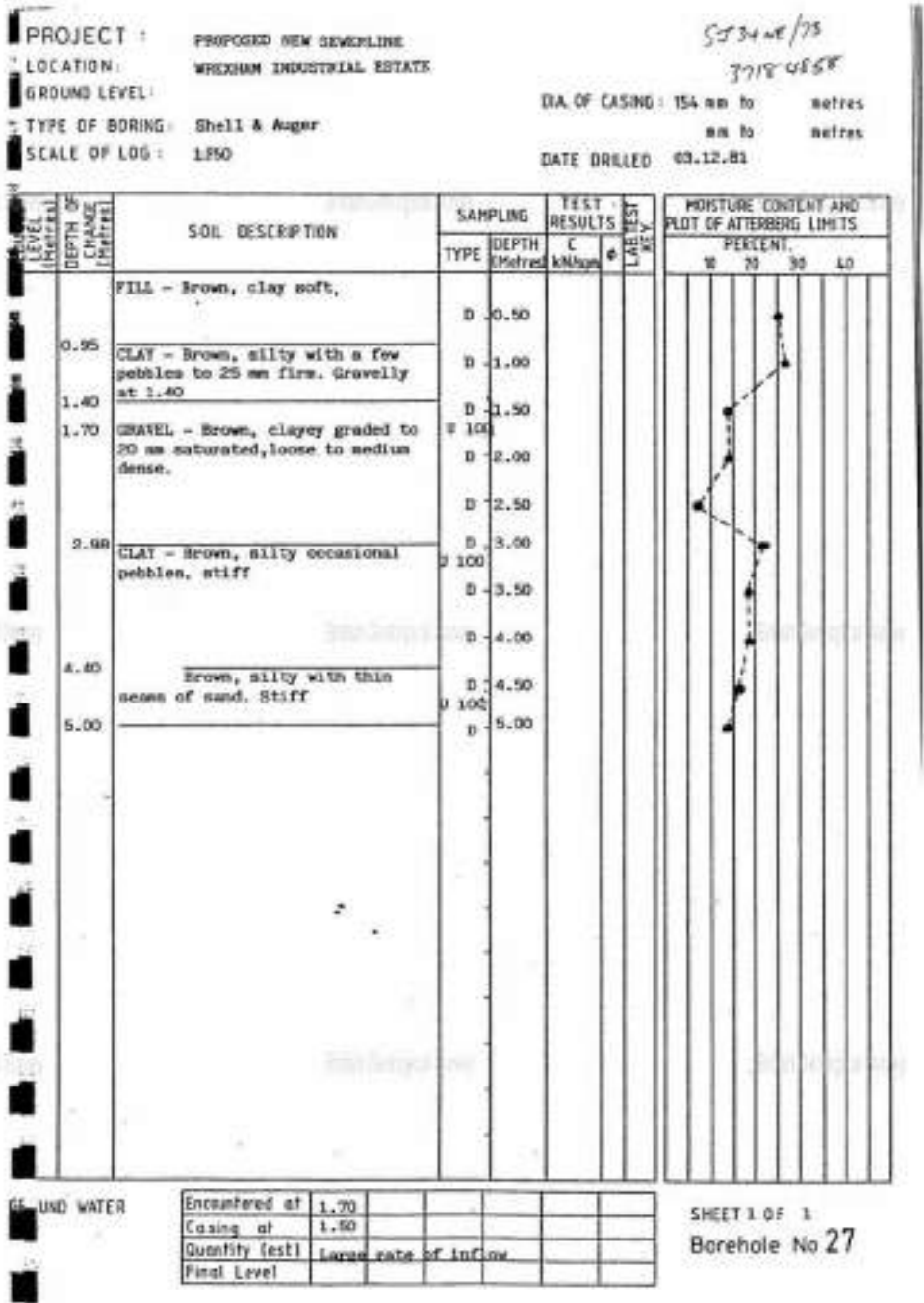
ST 34 NE / 69
 3714 4706
 DIA. OF CASING : 154 mm to metres
 mm to metres
 DATE DRILLED 03.12.81 - 5.00 m
 04.12.81

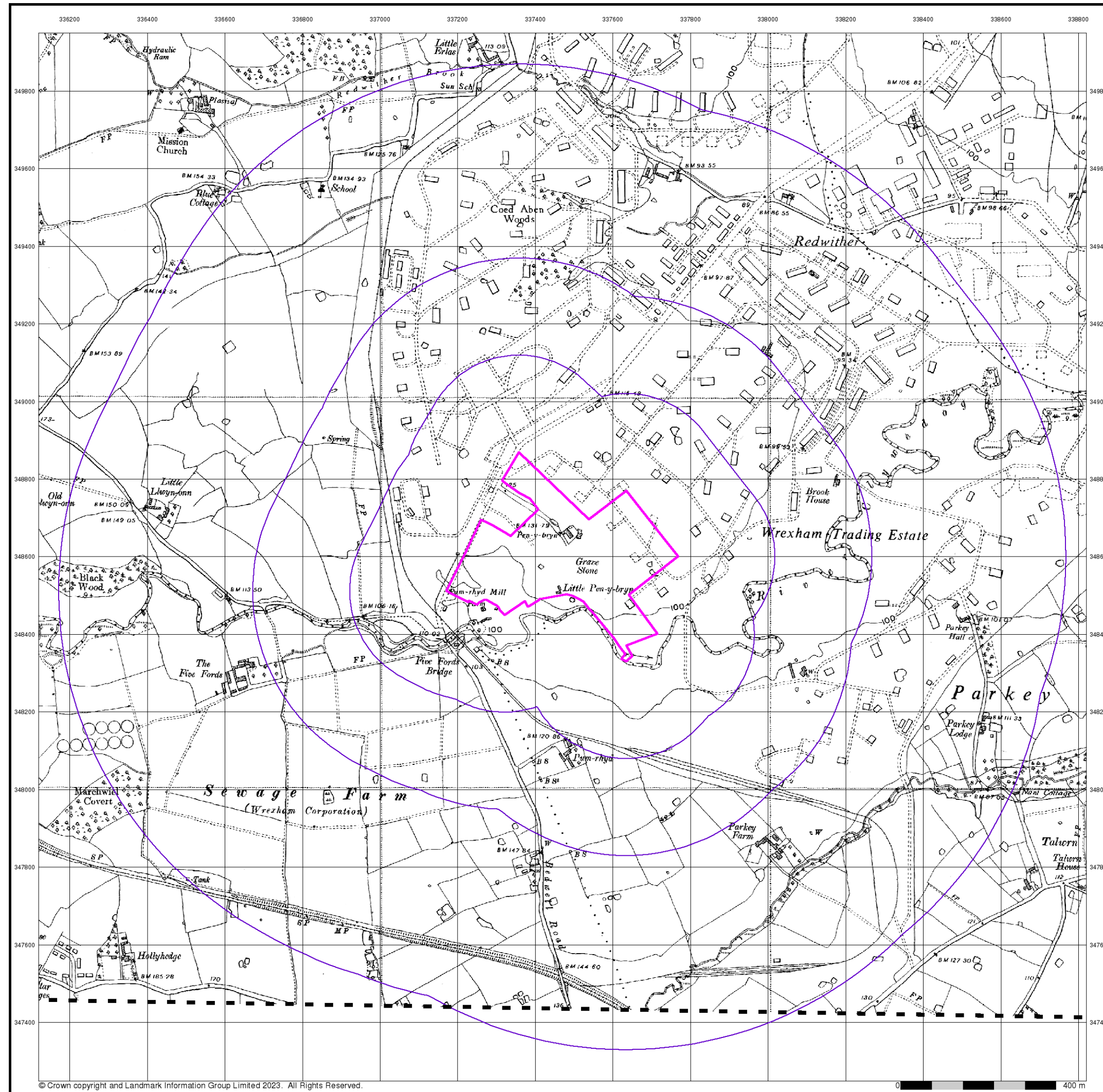
SOIL LEVEL (Metres)	DEPTH OF CHANGE (Metres)	SOIL DESCRIPTION	SAMPLING		TEST RESULTS		LAB TEST KEY	MOISTURE CONTENT AND PLOT OF ATTERBERG LIMITS			
			TYPE	DEPTH (Metres)	C kN/sqm	ϕ		PERCENT.			
								10	20	30	40
	0.75	FILL - Brown clay with traces of tree roots	D	0.50							
		CLAY - Brown with streaks of grey silt and occasional pebbles to 10 mm. Firm to stiff	D	1.00							
			D	1.50							
			U 100	2.00							
			D	2.50							
			D	3.00							
			U 100	3.50							
			D	4.00							
	4.50	SILT - Brown with some fine grained sand, saturated, soft	D	4.50							
			D	5.00							
			D	5.50							
		('in running condition')	D	6.00							
			D	6.50							
			N 1	7.00							
			D	7.50							
			N 1	8.00							
			D	8.50							
			D	9.00							
	9.50		N 4	9.50							

GROUND WATER

Encountered at	3.50			4.20		
Casing at						
Quantity (est)	Trace			Moderate rate of inflow		
Final Level						

SHEET 10 F 1
 Borehole No 23.





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0 400 m

LK GROUP

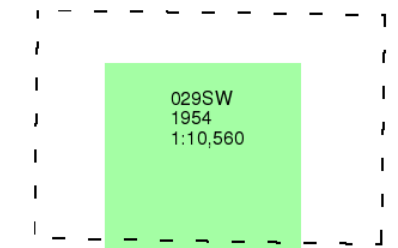
Denbighshire

Published 1954

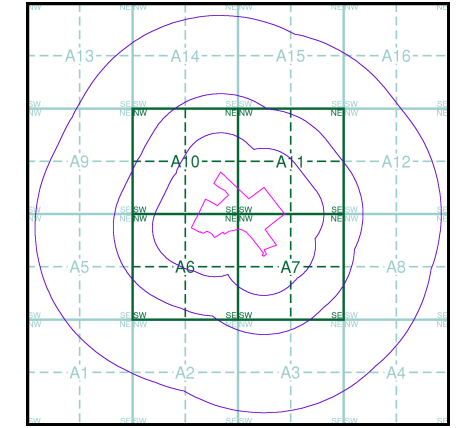
Source map scale - 1:10,560

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

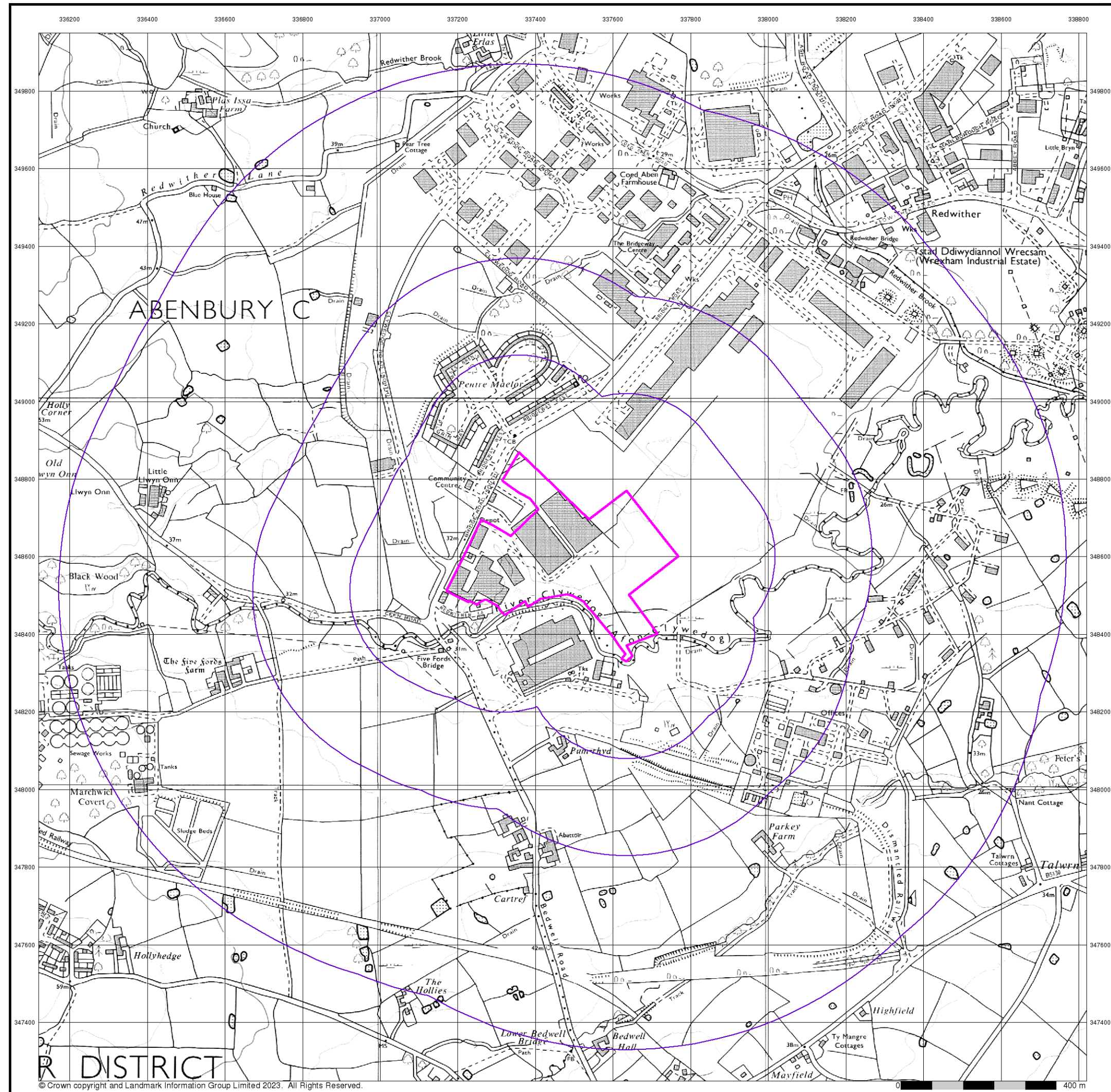
Order Number: 306407436_1_1
Customer Ref: LKC 23 1018
National Grid Reference: 337480, 348590
Slice: A
Site Area (Ha): 13.79
Search Buffer (m): 1000

Site Details

Land Adjacent To f Lloyd Penley Ltd, Bridge Road South, Wrexham Industrial Estate, Wrexham, LL13 9SQ



Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



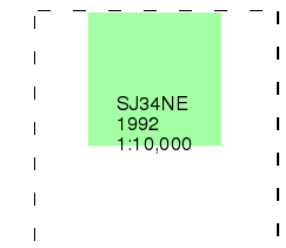
Ordnance Survey Plan

Published 1992

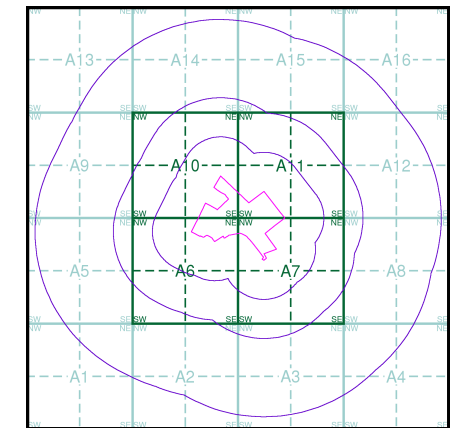
Source map scale - 1:10,000

The historical maps shown were reproduced from maps predominantly held at the scale adopted for England, Wales and Scotland in the 1840's. In 1854 the 1:2,500 scale was adopted for mapping urban areas; these maps were used to update the 1:10,560 maps. The published date given therefore is often some years later than the surveyed date. Before 1938, all OS maps were based on the Cassini Projection, with independent surveys of a single county or group of counties, giving rise to significant inaccuracies in outlying areas. In the late 1940's, a Provisional Edition was produced, which updated the 1:10,560 mapping from a number of sources. The maps appear unfinished - with all military camps and other strategic sites removed. These maps were initially overprinted with the National Grid. In 1970, the first 1:10,000 maps were produced using the Transverse Mercator Projection. The revision process continued until recently, with new editions appearing every 10 years or so for urban areas.

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

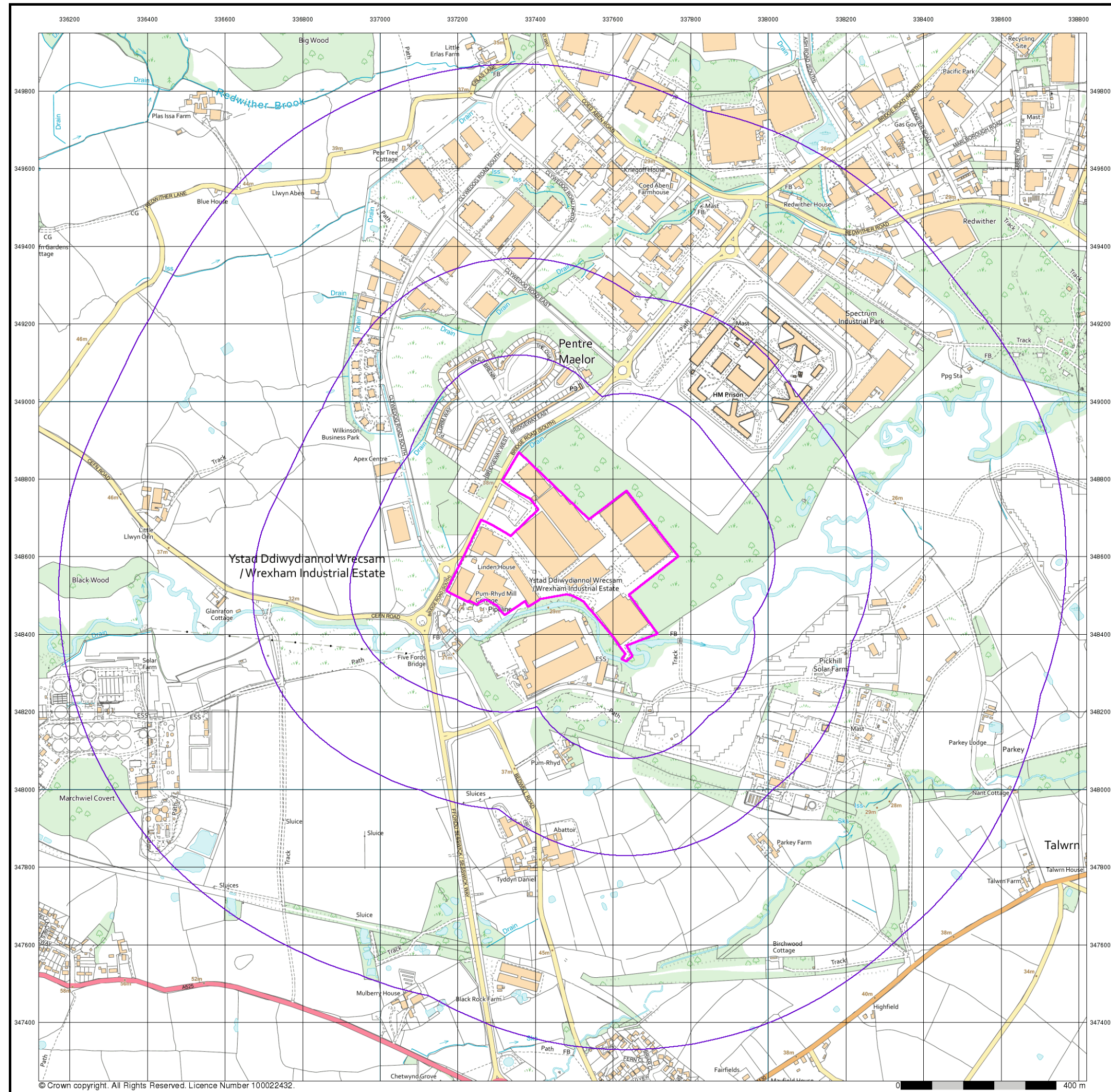
Order Number: 306407436_1_1
Customer Ref: LKC 23 1018
National Grid Reference: 337480, 348590
Slice: A
Site Area (Ha): 13.79
Search Buffer (m): 1000

Site Details

Land Adjacent To f Lloyd Penley Ltd, Bridge Road South, Wrexham Industrial Estate, Wrexham, LL13 9SQ

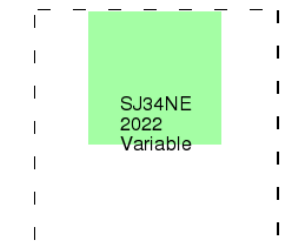


Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk

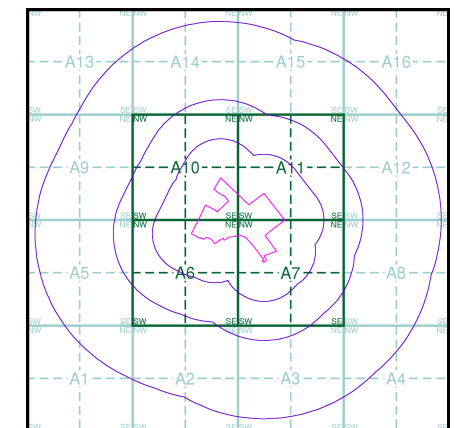


VectorMap Local (Raster) is Ordnance Survey's highest detailed 'backdrop' mapping product. These maps are produced from OS's VectorMap Local, a simple vector dataset at a nominal scale of 1:10,000, covering the whole of Great Britain, that has been designed for creating graphical mapping. OS VectorMap Local is derived from large-scale information surveyed at 1:1250 scale (covering major towns and cities), 1:2500 scale (smaller towns, villages and developed rural areas), and 1:10 000 scale (mountain, moorland and river estuary areas).

Map Name(s) and Date(s)



Historical Map - Slice A



Order Details

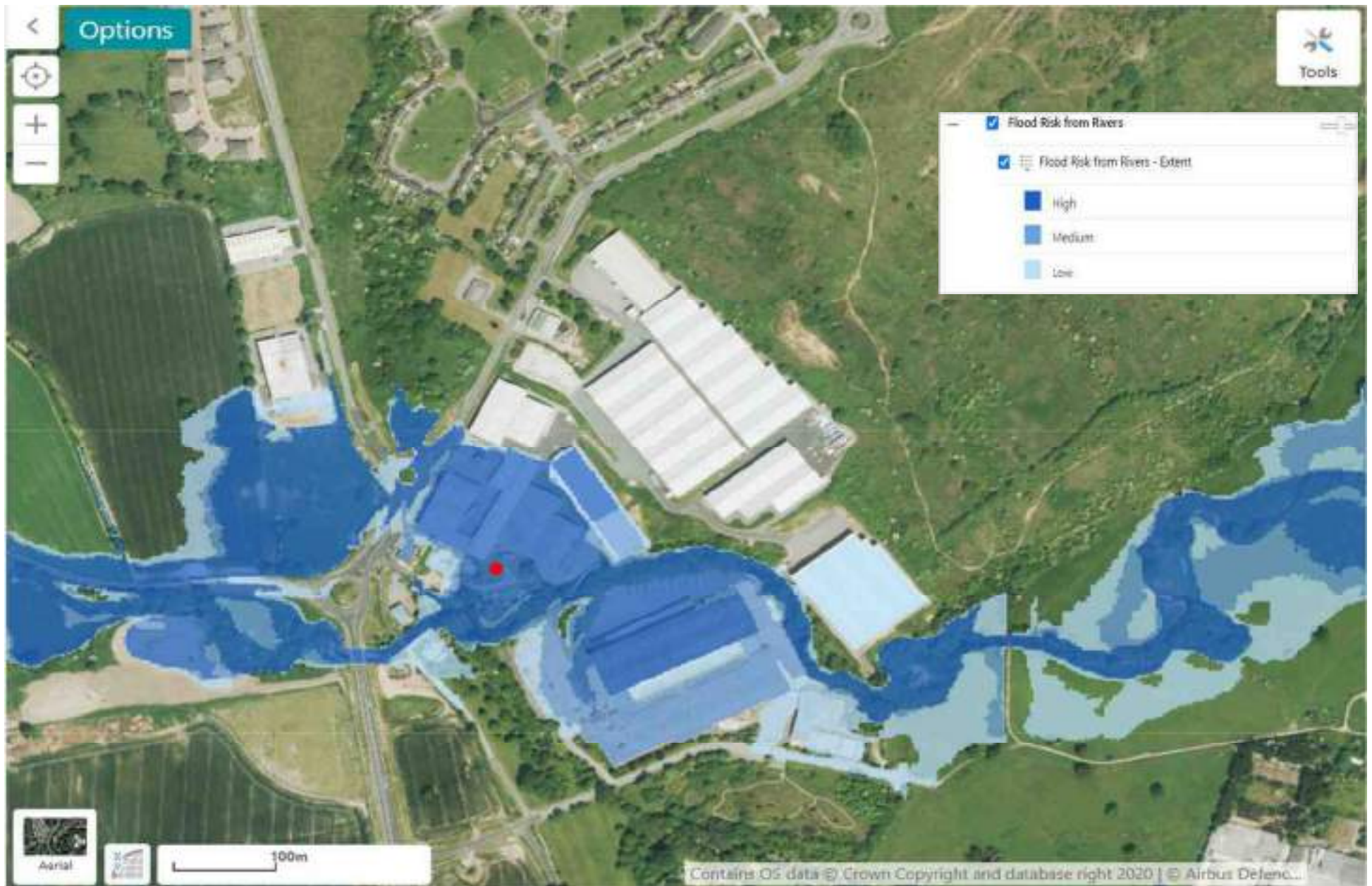
Order Number: 306407436_1_1
Customer Ref: LKC 23 1018
National Grid Reference: 337480, 348590
Slice: A
Site Area (Ha): 13.79
Search Buffer (m): 1000

Site Details

Land Adjacent To f Lloyd Penley Ltd, Bridge Road South,
Wrexham Industrial Estate, Wrexham, LL13 9SQ

Appendix C

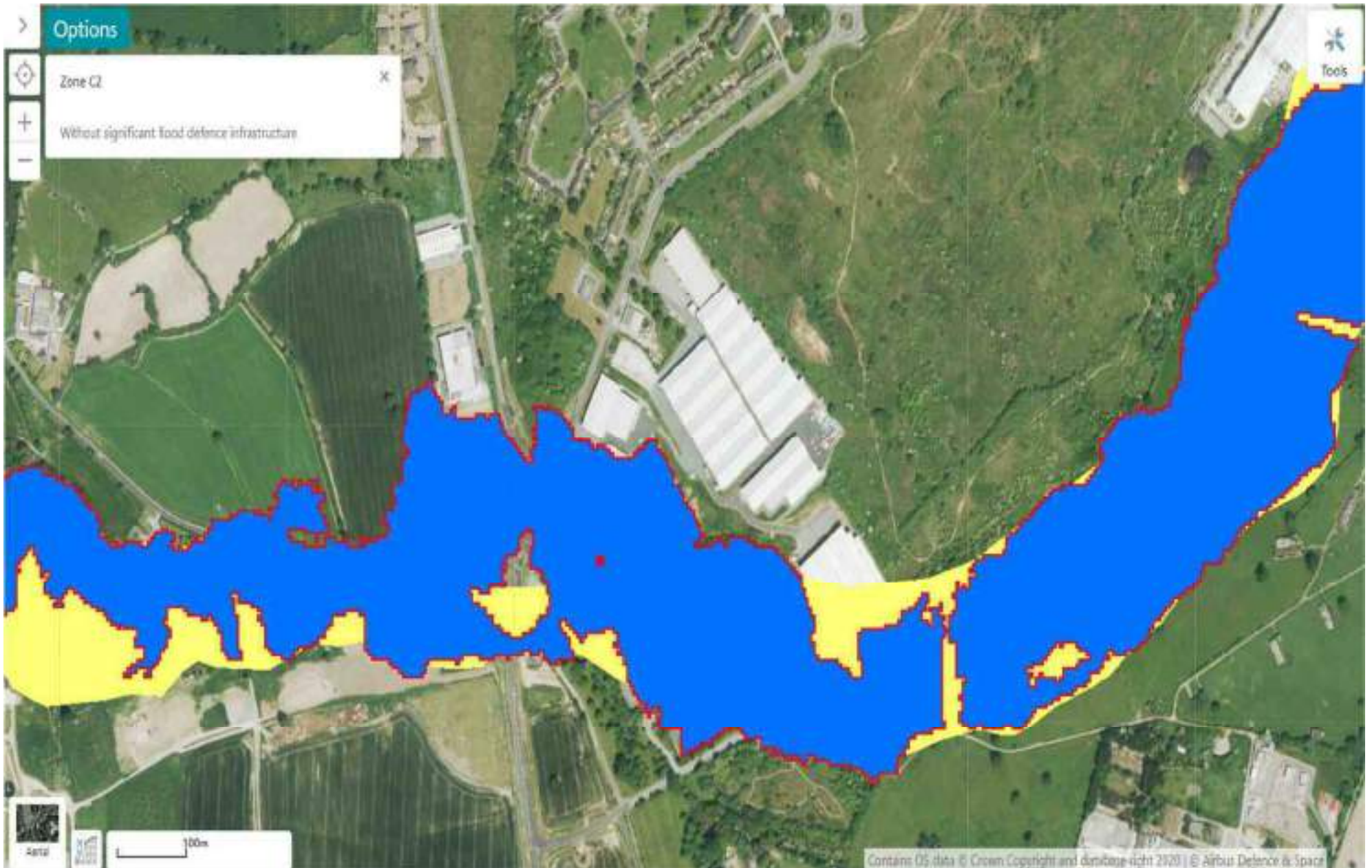
Natural Resources Wales



Flood Risk from Rivers – crown Copywrite and database right 2023



Flood Risk from Surface Water & Small Watercourses – crown Copywrite and database right 2023



Development Advice Map – crown Copywrite and database right 2023

Jenna Lowe

From: Jenna Lowe
Sent: 20 January 2023 12:00
To: Data Distribution
Subject: FCR QUERY - FRA 23 1007 - Llyod Masterplan, Wrexham
Attachments: 3850-DMWR-A-DR-SK12A - Indicative Site Layout.pdf

Dear Sir/Madam,

LK Consult Ltd. has been commissioned to undertake a Flood Consequences Report (FCR), for a site located at Wrexham Industrial Estate, Bridge Road South, Wrexham. Nearest Postcode LL13 9PR, centred at approximate National Grid Reference 337262E, 348540N.

The area of interest appears to be within an area at High Risk from fluvial flooding.

BGS data indicates that the site is within an area underlain by Till, Devensian - Diamicton superficial deposits and Salop Formation - Mudstone, sandstone and conglomerate bedrock.

The site location is attached to this email.

To complete the FCR, we would be grateful if you could supply us with the following, if available, for the vicinity of the site:

- The modelled 1% and 0.1% annual probability fluvial flood level, the 1% annual probability plus climate change flood level and any lower order flood levels, in particular the modelled 5% fluvial flood level if relevant for functional floodplain, (with confirmation of the reference datum used for the levels – i.e. Local OSBM or OSGPS) if available.
- Details of any flood defences in the immediate area, including their extent, crest levels (and datum), assumed level of standard, construction, and maintenance regime, as well as any other structures which may influence the local hydraulics.
- Proposed defence levels and timescale for implementation.
- Results of any breach analyses for defences in the area which may be relevant.
- Records of any historic flood events and potential sources of flooding from rivers, land drainage, groundwater, foul and surface water sewers on site and in the area.
- Any restrictions to infiltration and discharge to the watercourse.
- A copy of your detailed flood zone map and the modelled flood extent plans for the area.

If you have any queries, please do not hesitate to get in touch.

We are, of course, happy to pay your reasonable charge for this service. Please let me know by return what information is available, what the charge will be, and we will pay the relevant fees by debit card as soon as possible.

Any advice or recommendations you may have regarding the potential discharges from the development of this site would also be appreciated.

We will be in contact with all other relevant authorities to get a more complete understanding of the issues in the area.

Regards

Jenna Lowe

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 09 February 2023 10:47
To: Jenna Lowe
Subject: ATI 24656a - FCR QUERY - FRA 23 1007 - Llyod Masterplan, Wrexham

Hello Jenna

Unfortunately we have no detailed flood models available for this area.

Please note that our Planning Team and Development & Flood Risk Team will provide comments as part of the pre-application or formal application process – refer to final sentence below.

Discharge to watercourse will be considered by Wrexham County Borough Council as the Risk Management Authority with regards to surface water control from any development as part of their SuDS approval body remit.

The Clywedog is designated as main river so any structures (headwall as opposed to quantity/quality) may require a Flood Risk Activity Permit as explained at [Natural Resources Wales / Flood risk activity permits](#)

Please also refer to the standard caveats below.

Self Service Open Data:

You can now make the most of open data provided **free online:**

- Please see the [Flooding](#) pages on the NRW website for the NRW Flood Risk Map Viewer and the Development Advice Map/Flood Map for Planning. You will find many spatial risk layers including the Flood Risk Assessment Wales (FRAW) maps, reservoir hazard data, Recorded Flood Extents, flood defences and more.
- [DataMapWales](#) and [Lle](#): Spatial data is free to download, view and use within your own GIS system. The flood datasets include: Flood Risk Assessment Wales (FRAW) Maps, Flood Map for Planning (FMfP), Recorded Flood Extents, Flood Defences, Areas Benefitting from Flood Defences, FMfP TAN 15 Defences Zones and LIDAR data.
- Please note that you can find a GIS layer of our flood models in the Flood Map for Planning viewer. This is not an exhaustive list but does give a good idea as to the most relevant models for an area. This can be accessed via the following link: <https://flood-map-for-planning.naturalresources.wales/>. Select the 'Detailed Map' tab and the layer in question is called 'NRW Local Model Manager'.

Please Note the Following:

- Extreme Sea Level Information around the Welsh coastline is available from: [Coastal Design Sea Levels - Coastal Flood Boundary Gauge Data \(2018\)](#)

- All information supplied will need to be verified by the recipient **PRIOR** to using in a Flood Consequences Assessment (FCA). We would expect to see a review of hydrology, in-channel survey, floodplain topography etc. to demonstrate the data is suitable for the purposes of producing an FCA. Please see our website for further information on [Modelling for Flood Consequence Assessments](#) and [Developing hydraulic models for flood risk](#).
- Climate change allowances will need to be applied carefully to ensure compliance with [Welsh Government climate change allowances and flood consequence assessments](#).
- For Coastal and Estuarine sites NRW will require assessment of wave overtopping. It is up to the developer to justify why an assessment *isn't* required.
- Shoreline Management Plan (SMP) information is available on our website via our [Flood Risk Viewer Map](#) and also on Welsh Government's [DataMapWales Portal](#). You may need to consider the policy implications of the SMP when assessing the suitability and sustainability of new development on your site of interest. For proposed development sites in Gwynedd & Anglesey a Local Development Plan Policy (POLICY ARNA 1: Coastal Change Management) sets out how the Local Planning Authority will consider new development proposals within a Coastal Change Management Area. We recommend that you contact the relevant Planning Authority for further information and guidance in relation to this.
- **Pre-application Advice:** As part of our advice service to developers, NRW offer a free initial opinion on your proposal. However, in cases where you would like to access any extra advice that falls outside of our statutory duties, we can only offer this as part of our Discretionary Planning Advice Service (DPA Service). For more information regarding free service and our discretionary planning can be found in the following links: [Welsh Version](#) / [English version](#).

Your request for our free or charged discretionary advice service needs to be accompanied by the relevant 'Request Form' which is available to download from our website. You will then need to send the form to northplanning@cyfoethnaturiolcymru.gov.uk who will coordinate our response.

Regards

Kathy Banner

Cymorth Technegol Cyswllt Cyfoeth/Customer Hub Technical Support
Cwsmer, Cyfarthrebu a Masnach/Customer, Communications and Commercial Directorate
Cyfoeth Naturiol Cymru/Natural Resources Wales
Llys Afon, Hwlfordd/River Court, Haverfordwest
Work: 02922 783727
Mobile: 07817 883574
Dysgwr Cymraeg

Dw i'n gweithio Dydd Mawrth - Dydd Iau
I work Tuesday – Thursday

www.cyfoethnaturiol.cymru / www.naturalresources.wales

Yn falch o arwain y ffordd at ddyfodol gwell i Gymru trwy reoli'r amgylchedd ac adnoddau naturiol yn gynaliadwy.

Proud to be leading the way to a better future for Wales by managing the environment and natural resources sustainably.

Croesewir gohebiaeth yn Gymraeg a byddwn yn ymateb yn Gymraeg, heb i hynny arwain at oedi.

Correspondence in Welsh is welcomed, and we will respond in Welsh without it leading to a delay.



From: Jenna Lowe <j.lowe@thelkgroup.com>
Sent: 20 January 2023 12:00
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: FCR QUERY - FRA 23 1007 - Llyod Masterplan, Wrexham

Dear Sir/Madam,

LK Consult Ltd. has been commissioned to undertake a Flood Consequences Report (FCR), for a site located at Wrexham Industrial Estate, Bridge Road South, Wrexham. Nearest Postcode LL13 9PR, centred at approximate National Grid Reference 337262E, 348540N.

The area of interest appears to be within an area at High Risk from fluvial flooding.

BGS data indicates that the site is within an area underlain by Till, Devensian - Diamicton superficial deposits and Salop Formation - Mudstone, sandstone and conglomerate bedrock.

The site location is attached to this email.

To complete the FCR, we would be grateful if you could supply us with the following, if available, for the vicinity of the site:

- The modelled 1% and 0.1% annual probability fluvial flood level, the 1% annual probability plus climate change flood level and any lower order flood levels, in particular the modelled 5% fluvial flood level if relevant for functional floodplain, (with confirmation of the reference datum used for the levels – i.e. Local OSBM or OSGPS) if available.
- Details of any flood defences in the immediate area, including their extent, crest levels (and datum), assumed level of standard, construction, and maintenance regime, as well as any other structures which may influence the local hydraulics.
- Proposed defence levels and timescale for implementation.
- Results of any breach analyses for defences in the area which may be relevant.
- Records of any historic flood events and potential sources of flooding from rivers, land drainage, groundwater, foul and surface water sewers on site and in the area.
- Any restrictions to infiltration and discharge to the watercourse.
- A copy of your detailed flood zone map and the modelled flood extent plans for the area.

If you have any queries, please do not hesitate to get in touch.

We are, of course, happy to pay your reasonable charge for this service. Please let me know by return what information is available, what the charge will be, and we will pay the relevant fees by debit card as soon as possible.

Any advice or recommendations you may have regarding the potential discharges from the development of this site would also be appreciated.

We will be in contact with all other relevant authorities to get a more complete understanding of the issues in the area.

Regards
Jenna



Jenna Lowe MSc, BSc. (Hons)
Flood Risk Engineer
0161 763 7200 | 07467 957756
Manchester | London | Swindon | Liverpool | Glasgow
www.thelkgroup.com

I N C R E A S I N G L A N D V A L U E

Appendix D

Consultee Correspondence

Jenna Lowe

From: Jenna Lowe
Sent: 26 January 2023 11:28
To: waterregulations@hafrendyfrdwy.co.uk
Subject: FCA QUERY - FRA 23 1007 - Llyod Masterplan, Wrexham
Attachments: 3850-DMWR-A-DR-SK12A - Indicative Site Layout.pdf

Dear Sir/Madam,

Please would you be able to pass this email on to the correct department please.

LK Consult Ltd. has been commissioned to undertake a Flood Consequences Report (FCR), for a site located at Wrexham Industrial Estate, Bridge Road South, Wrexham. Nearest Postcode LL13 9PR, centred at approximate National Grid Reference 337262E, 348540N.

The area of interest appears to be within an area at High Risk from fluvial flooding.

BGS data indicates that the site is within an area underlain by Till, Devensian - Diamicton superficial deposits and Salop Formation - Mudstone, sandstone and conglomerate bedrock.

The site location is attached to this email.

To complete the FCR, we would be grateful if you could supply us with the following, if available, for the vicinity of the site:

- Records of any historic flood events and potential sources of flooding from foul and surface water sewers on site and in the area.

If you have any queries, please do not hesitate to get in touch.

We are, of course, happy to pay your reasonable charge for this service. Please let me know by return what information is available, what the charge will be, and we will pay the relevant fees by debit card as soon as possible.

Any advice or recommendations you may have regarding the potential discharges from the development of this site would also be appreciated.

We will be in contact with all other relevant authorities to get a more complete understanding of the issues in the area.

Regards
Jenna

Jenna Lowe

From: Jenna Lowe
Sent: 20 January 2023 11:57
To: contact-us@wrexham.gov.uk
Subject: FCR QUERY - FRA 23 1007 - Llyod Masterplan, Wrexham
Attachments: 3850-DMWR-A-DR-SK12A - Indicative Site Layout.pdf

Dear Sir/Madam,

Apologies, please discard of the information requested in the previous email.

LK Consult Ltd. has been commissioned to undertake a Flood Consequences Report (FCR), for a site located at Wrexham Industrial Estate, Bridge Road South, Wrexham. Nearest Postcode LL13 9PR, centred at approximate National Grid Reference 337262E, 348540N.

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The site location is attached to this email.

To complete the FCR, we would be grateful if you could supply us with the following, if available, for the vicinity of the site:

- Details of any flood defences in the immediate area, including their extent, crest levels (and datum), assumed level of standard, construction and maintenance regime, as well as any other structures which may influence the local hydraulics.
- Records of any historic flood events and potential sources of flooding from rivers, land drainage, groundwater, foul and surface water sewers on site and in the area.
- Any restrictions applied to ordinary watercourses and sewers in the area.
- Highway drainage restrictions and records.
- Indications if the site is within the Critical Drainage Area.
- Policies that may relate to Sustainable Drainage Systems (SuDS).

If you have any queries, please do not hesitate to get in touch.

We are, of course, happy to pay your reasonable charge for this service. Please let me know by return what information is available, what the charge will be, and we will pay the relevant fees by debit card as soon as possible.

Any advice or recommendations you may have regarding the potential discharges from the development of this site would also be appreciated.

We will be in contact with all other relevant authorities to get a more complete understanding of the issues in the area.

Regards
Jenna

Based across the UK with
offices in Manchester,
London, Liverpool and Glasgow.

Manchester (Head Office)

Unit 29,
Eton Business Park
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t: 0161 763 7200
e: info@thelkgroup.com

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e: info@thelkgroup.com

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t: 0151 235 8716
e: info@thelkgroup.com

Swindon

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Bowman Court
Whitehill Lane
Royal Wootton Bassett
Swindon
SN4 7DB

t: 01793 987 390
e: info@thelkgroup.com



- Geotechnical
- Contaminated Land
- Flood Risk and Drainage
- Asbestos
- Invasive Species
- Land Remediation
- Project Management
- Land Drilling