coopers

chartered consulting engineers

Our ref: 8211_FCA

Flood Consequences Assessment

for

Quarry Farm, Oakenholt,

Flintshire

For : Castle Green Homes Ltd
Unit 20, St Asaph Business Park
St Asaph
Denbighshire
LL17 0LJ

2nd July 2025

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Document Verification

Project Title	Quarry Farm, Oakenholt, Flintshire
Project Number	8211
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This document is not to be used for contractual or engineering purposes unless the document verification sheet is signed where indicated by the approver of the document.	

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Document Revision

Report Reference	Date	Description	Prepared	Checked and Approved
8211_FCA	02/07/2025	Flood Consequences Assessment	A Jones	P R Sykes

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1.0 Introduction

Coopers (Chester) Ltd, (Coopers) have been appointed by Castle Green Homes Ltd to assess the risk of flooding for Quarry Farm, Oakenholt, Flintshire. Castle Green Homes Ltd are proposing a new housing development, comprising of approximately 110 No. dwellings.

Castle Green Homes Ltd are planning the construction of a mixture of semi-detached and detached residential properties with associated access road, parking, vehicular access and landscaping subject to conditions. It is understood the site does not currently benefit from any planning decision.

This flood consequences assessment (FCA) evaluates the proposals regarding to flood risk, identifying and appraising potential flood risk both to and from the whole site. Coopers have carried out the following:

i. Assessment of the development potential of the site in line with the Welsh Government's Technical Advice Note 15: Development and Flood Risk (TAN15) and;
ii. An assessment of surface water runoff and drainage strategy

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100m^2. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

2.0 Site Characteristics

2.1 Site Location

The site is a parcel of agricultural land in Oakenholt. The site is situated to the south of the A548 (Chester Road), accessed off Leadbrook Drive at approximate grid reference SJ258716.

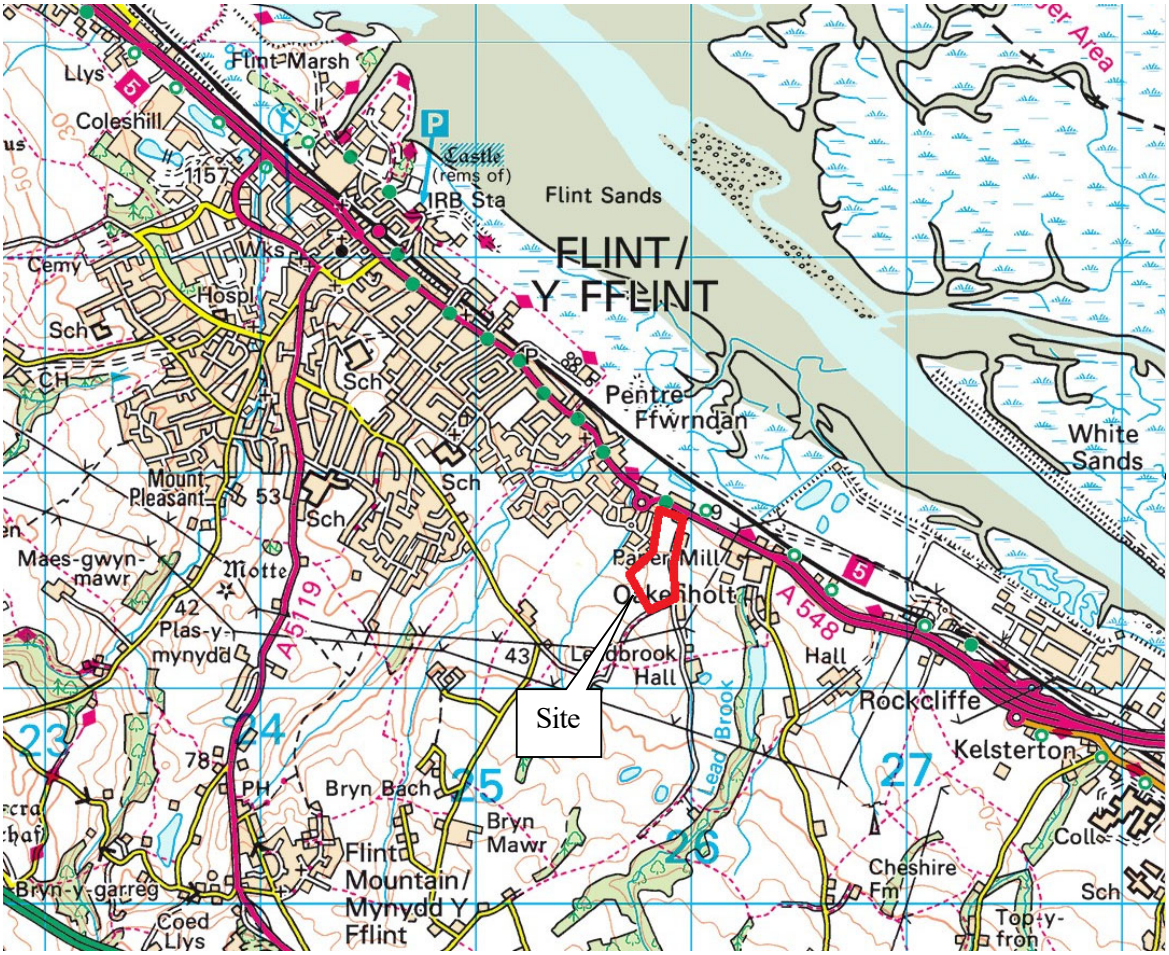


Figure 1 – Site Location

2.2 Site Description

The site covers an area of approximately 4.87 Hectares of land located approximately 1.5km southeast of Flint Town Centre. The surrounding area is primarily a mixture of residential, and agricultural land with Chester Road located to the north and Leadbrook Drive to the east, and an un-named watercourse along the southwest boundary.

The topography of the site varies with a high point splitting the site into a northern and southern portion. The northern portion falls towards Chester Road to the north at a gradient of approximately 1:20, whilst the southern portion falls towards the west at a gradient of approximately 1:16 towards the watercourse.

3.0 Sources of Flood Risk Information

3.1 The Welsh Government Development Advice Map

The Welsh Government Development Advice Map shows the site is located within Flood Zone A – an area considered to be at little or no risk of fluvial or tidal flooding, with a less than 1 in 1000 (0.1%) annual probability of flooding in any given year.

The proposed residential development is considered to be a 'highly vulnerable' development in accordance with Figure 2 of the Welsh Governments Technical Advice Note 15. Highly vulnerable development is considered to be appropriate within Flood Zone A.

3.2 Natural Resources Wales

The NRW Flood Map shows the site is located within Flood Zone 1 – an area considered to have the lowest probability of fluvial flooding. It is assessed as having a less than 0.1% annual probability of flooding in any given year. See Figures 2 and 3 below.

Figure 2 – Natural Resources Wales Flood Map for Planning (Sea)

Figure 3 – Natural Resources Wales Flood Map for Planning (River)

The Natural Resources Wales long term flood risk maps do not indicate any flood risk from surface water. See Figure 4 below.

Figure 4 – Natural Resources Wales Surface Water Flooding Map

The Natural Resources Wales long term flood risk maps do not indicate any flood risk from Development Advice Maps (DAM). See Figure 5 below.

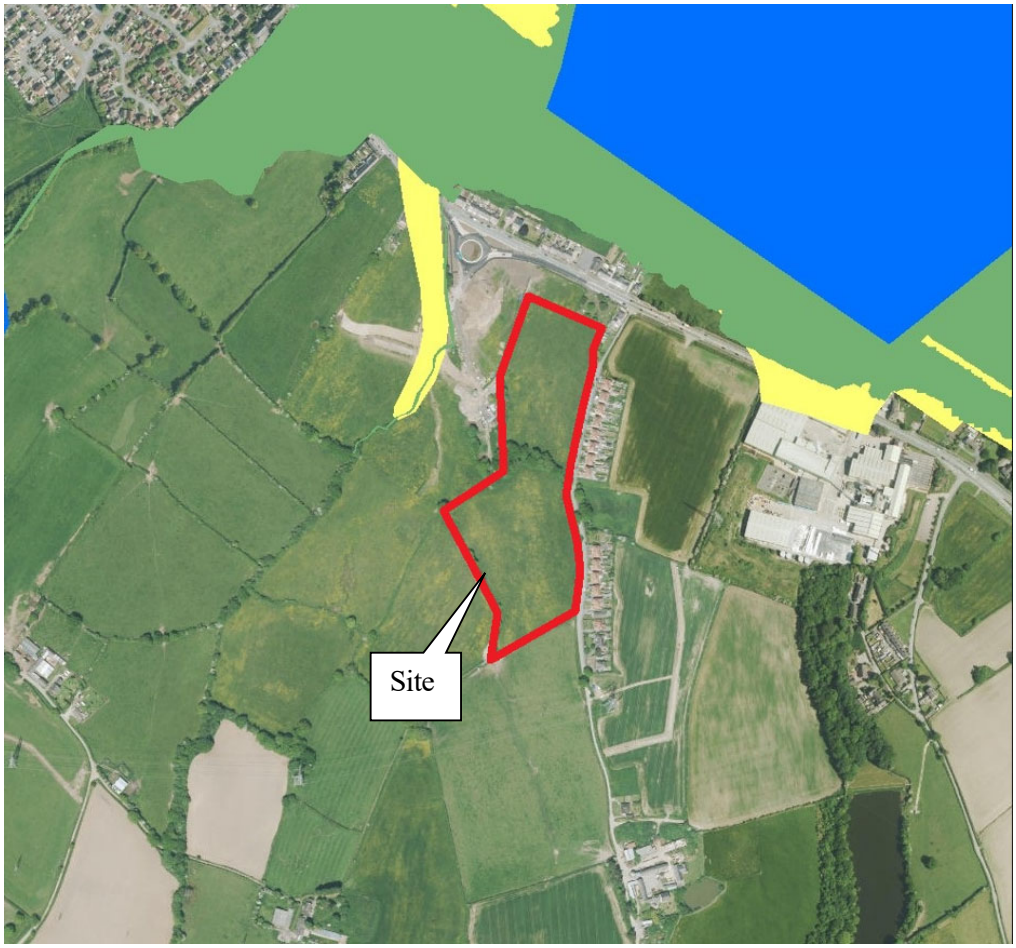


Figure 5 – Natural Resources Wales Development Advice Flooding (DAM) Map

It should be noted that flooding can occur at any time and in any place from sources such as rising groundwater levels, burst water mains, blocked road drains, run-off from hillsides, sewer overflows, etc.

3.3 Flintshire County Council LLFA

We have contacted Flintshire County Council for confirmation of any known historical flooding within the vicinity of the site. They have responded to confirm they are not aware of any flood incidents.

Refer to Appendix 4 for all correspondence.

4.0 Sources of Flood Risk

4.1 Fluvial

Extreme fluvial flood events have the potential to cause rapid inundation of the site whilst posing a threat to welfare and users. As outlined in Section 3.2; the site is within Flood Zone 1 and is therefore not at risk from extreme fluvial or tidal flooding. Therefore, the risk from extreme fluvial flooding to the site is considered to be low.

4.2 Infrastructure Failure (Existing and Proposed)

The failure of infrastructure such as culverts or bridges could increase the risk of flooding at the site. The risk of flooding is considered as very low.

4.3 Overland Flow

Overland flow occurs when the infiltration capacity of the ground is exceeded in a storm event. This can result in water travelling as a sheet flow overland or excess water being conveyed from one location to another via local road networks. The site currently drains in 2 directions with the northern portion falling towards Chester Road and the southern portion falling towards the watercourse. Overland flow is not considered a significant risk as flows from the site will be significantly reduced post development with the incorporation of positive drainage and an internal road network.

4.4 Sewer Flooding

If the capacity of the sewers is exceeded in an extreme event, or a blockage occurs, surcharging of the network can result in surface flooding. Welsh Water sewer plans which are included in Appendix 1, indicate sewers to the north and west of the development, but as the site is at a higher elevation sewer flooding is not considered a significant risk.

We are proposing to discharge all foul flows into the 225mm Diameter combined sewer to the west of the site subject to Welsh Water approval.

Welsh Water may have confirmed they have no records or any known flooding within the vicinity of the site. Refer to Appendix 4 for correspondence.

The overall risk from sewer flooding is considered as low.

4.5 Groundwater Flooding

Groundwater flooding occurs as a result of water rising up from the underlying superficial deposits, bedrock or from springs.

The site trial pits undertaken for the infiltration tests were at depths of between 1.4 – 2.3m and encountered no groundwater during excavation. Additionally, the Envirocheck Flood Report presented in Appendix 2 indicated there is negligible risk of ground water flooding within the site boundary other than a small area located in the southwest corner of the site which is identified as being a moderate risk. This should be investigated further during the intrusive site investigation.

The overall risk from groundwater flooding is considered as low.

4.6 Coastal Flooding

The development site is located approximately 1.0km south of the Dee Estuary. No flooding is shown to the south of Chester Road which is at an elevation of approximately 8.8m AOD. However, the lowest site elevation is approximately 11.5m AOD and is therefore not at risk from tidal inundation.

Refer to Figure 2 – NRW Flood Map for Planning (Sea).

4.7 Reservoirs

The site is not located in proximity of any reservoirs. Additionally, the NRW maps indicate the site is not at risk of flooding from reservoirs. See Figure 6 below.

Figure 6 – Natural Resources Wales Reservoir Flooding Map

5.0 Surface Water Drainage

5.1 General

The design for a surface water drainage system for the proposed development will be guided by the principles set out in the Welsh Government's 'Recommended non-statutory standards for sustainable drainage (SuDS) in Wales – designing, constructing, operating and maintaining surface water drainage systems' (2017)

The SuDS Standards Wales sets out the following hierarchy for surface water runoff destination:

Priority Level 1: Surface water runoff is collected for use;
Priority Level 2: Surface water runoff is infiltrated to ground;
Priority Level 3: Surface water runoff is discharged to a surface water body;
Priority Level 4: Surface water runoff is discharged to a surface water sewer, highway drain, or another drainage system;
Priority Level 5: Surface water runoff is discharged to a combined sewer.

Note that Priority Level 1 is the preferred (highest priority) and that 4 and 5 should only be used in exceptional circumstances.

5.2 Existing Surface Water Drainage

The site does not benefit from any existing drainage and will rely on infiltration and surface water run-off to dispose of surface water flows. The flows will follow topography with the northern portion of the site draining towards Chester Road and the southern end of the site draining towards the watercourse along the southwest boundary of the site. We are not aware of any existing land drainage within the site to assist with drainage.

5.3 Existing Site Runoff

The greenfield run-off rates for the site have been calculated using the HR Wallingford Greenfield runoff rate estimation tool. Calculations below are based on a 3.23Ha developable site area.

1-year	= 14.7 l/s
100-year	= 36.3 l/s
QBAR	**= 16.7 l/s**

Refer to Appendix 5 for surface water greenfield run-off calculations based on a 1 Hectare site area.

5.4 Proposed Surface Water Drainage and Runoff Rates

Priority Level 1

Whilst rainwater harvesting has been considered for the proposed development it should be noted that any device enabling water re-use cannot be taken into account when sizing attenuation as the storage facility may be full when a storm event occurs. Therefore, an overflow to an infiltration device (where ground conditions allow) or to a watercourse / sewer will be required.

Castle Green Homes Ltd are not proposing to incorporate rainwater harvesting within the development; however, they are proposing to install a water butt to each dwelling which will allow for water collection for garden re-use.

Priority Level 2

Site investigation has determined the site is not suitable for infiltration techniques to dispose of surface water flows from the site due to the cohesive underlying strata.

Refer to Appendix 3 infiltration test results.

Priority Level 3

Pentre Brook is located approximately 400m west of the site and Lead Brook is located approximately 400m east of the site. Both watercourses pass under Chester Road before discharging to the River Dee estuary which is located approximately 1.0km to the north of the site.

There is an ordinary watercourse flowing along the southwest boundary of the site. This watercourse continues to flow through the residential development (Anwyl Homes Croes Atti development) to the west of the site via culverts and open watercourses which discharges into a watercourse network to the north of Chester Road. This flows into the Pentre Brook and ultimately outfalls to the River Dee estuary.

A review of levels has determined the southern portion of the site can drain to the watercourse, but the northern portion cannot drain via gravity due to topography, so an alternate outfall will need to be explored.

Priority Level 4

A recent CCTV drainage survey has confirmed a highway drain within Leadbrook Drive to the east of the site and also highway drainage networks within Chester Road to the north of the development. Refer to Appendix 1 for the drainage survey plan.

There is a network of surface water sewers recorded on the Welsh Water sewer maps within the residential development to the west of the site. A review of site levels confirms a gravity connection into these sewers to drain the northern portion of the site is achievable. Following discussions with Welsh Water we are proposing to discharge the northern portion of site into the surface water sewers network at a restricted flow rate of 5l/s, with the remainder of the site draining to the watercourse. This will help reduce excessive sewer depths at the site highpoint. Refer to Appendix 1 for the Welsh Water sewer records and Appendix 4 for Welsh Water correspondence.

Priority Level 5

The Welsh Water sewer maps indicate the presence of a 150mm Diameter combined sewer in Chester Road to the north of the development. Refer to Appendix 1 for Welsh Water sewer map.

5.5 SuDS Approval Bodies

Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 No. properties or the construction area is more than 100m^2. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Every SuDS application should go to every attempt to satisfy the Principles and Standards of the legislation. When vetting an application, the SAB officer will look at the clear red line boundary area of the site when considering space for SuDS and water management features and not the space that's left on the proposed site layout.

The principles are as follows:

SuDS schemes should aim to:

1. *manage water on or close to the surface and as close to the source of the runoff as possible;*
2. *treat rainfall as a valuable natural resource;*
3. *ensure pollution is prevented at source, rather than relying on the drainage system to treat or intercept it;*
4. *manage rainfall to help protect people from increased flood risk, and the environment from morphological and associated ecological damage resulting from changes in flow rates, patterns and sediment movement caused by the development;*
5. *take account of likely future pressures on flood risk, the environment and water resources such as climate change and urban creep;*
6. *use the SuDS Management Train, using drainage components in series across a site to achieve a robust surface water management system (rather than using a single "end of pipe" feature, such as a pond, to serve the whole development);*
7. *maximise the delivery of benefits for amenity and biodiversity;*
8. *seek to make the best use of available land through multifunctional usage of public spaces and the public realm;*
9. *perform safely, reliably and effectively over the design life of the development taking into account the need for reasonable levels of maintenance;*
10. *avoid the need for pumping where possible; and*
11. *be affordable, taking into account both construction and long-term maintenance costs and the additional environmental and social benefits afforded by the system.*

Applicants seeking SAB Approval must demonstrate how they have complied with these principles or provide justification for any departure.

An indicative surface water strategy is presented in Appendix 1. We are proposing to drain the southern portion of the site into the watercourse via 2 new outfalls and the northern portion of the site into the surface water public sewer network in Ffordd Pedrog to the west of the site. Flows will be restricted to greenfield QBAR rate and attenuation will be provided within a network of oversized on-line pipes, buried cellular tanks and a dry SUDS basin.

Incorporation of additional source control SuDS components such as water butts, permeable paving and bio retention (tree pits and rain gardens) will need to be considered further at detailed design stage to meet the 5mm interception design criteria.

Flood Defence Consent will be required from Flintshire LLFA for the surface water outfalls into the watercourse. Flintshire Highways will need to approve the connection into existing highway drain for the northern portion of the site. Early discussions are advised to ensure that the proposed points of connection and flow rates are acceptable to the approving authority.

5.6 Foul Drainage

We are proposing to discharge all foul flows into the existing 225mm Diameter foul public sewer in Ffordd Pedrog to the west of the site. This sewer has been constructed to accommodate flows from the Anwy Homes Croes Atti development, but as it's a 225mm Diameter capacity for additional flows should not be an issue. This will need to be discussed with Welsh Water to confirm this is an acceptable point of connection.

Topography and proposed site levels design will allow for a gravity network to serve the entire development without any need for a pumping station. Refer to the indicative drainage strategy presented in Appendix 1 for proposed foul routes and sewer levels.

6.0 Conclusions and Recommendations

The site is located in Flood Zone 1 and has been shown to be at low risk of flooding from sea, rivers, surface water, groundwater, sewers and climate change. Therefore, mitigation measures are not considered necessary for any future development at the site.

All potential sources of flooding have been considered as part of this report. There are no known records of historical flooding at the site.

The infiltration tests undertaken have determined that the underlying soils have poor infiltration characteristics. Therefore, surface water run-off from highways, roof and private drives will discharge into the ordinary watercourse.

The development will increase the impermeable area of the site. This results in an increase in surface water runoff rates and volumes. In order to ensure the increase in runoff will not have an impact elsewhere all flows will discharge via gravity to the watercourse and highway drain at greenfield QBAR flow rates.

All surface water run-off from highways, roof and private drives will be collected into gravity piped networks and discharged into networks of oversized pipes and SuDS attenuation features.

Additional on-site source control components such as permeable paving and bioretention components (tree pits and rain gardens) should be considered further at detailed design stage.

All foul sewers should be designed in accordance with Sewers for Adoption 7th Edition / Welsh Ministers Standards and will be subject to S104 Agreement.

A SuDS Maintenance and Management Plan should be produced to outline the activity and frequency of inspections and maintenance works required on any SuDS components subject to SAB Approval / Adoption.

This Flood Consequences Assessment should be submitted to the Local Planning Authority in support of the planning application.

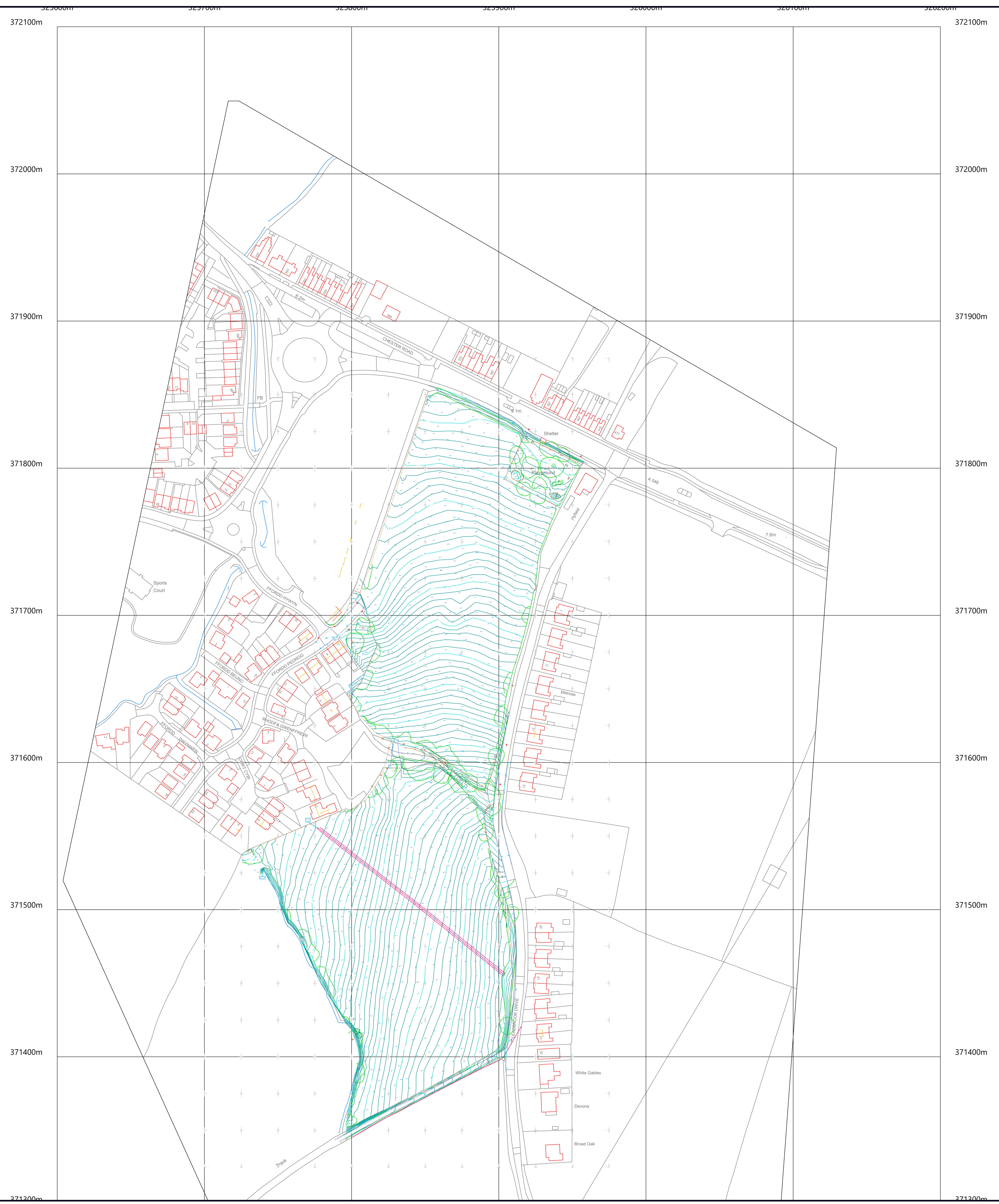
Since January 7th, 2019, all new developments will require sustainable drainage for surface water if there are at least 2 properties or the construction area is more than 100m^2. The surface water drainage systems must be designed and built to meet Welsh Government standards for sustainable drainage.

These systems must be approved by the local authority acting in its SuDS Approving Body (SAB) role before construction work begins. The SAB will have a duty to adopt compliant systems.

Appendix 1

Reference Drawings

Drawing No.	Revision	Title
B555-00	-	Topographical Survey (Carl Williams Land Surveys Ltd)
-	-	Existing Drainage Survey
-	-	Welsh Water Sewer Map
8211 – SK01	G	Engineering Layout



Survey Site Control:

Coordinates & Levels to Ordnance Survey Datum OSGB36NG via OSTN15 & OSGM15

Station	Easting	Northing	Level
1	325807.248	371702.691	14.039
2	325803.765	371708.414	13.893
3	325788.476	371692.433	14.788
4	325777.460	371684.593	15.163
70	325900.950	371585.084	22.742
71	325905.212	371611.929	20.433
80	325920.441	371826.444	8.850
81	325955.764	371808.156	8.961

Building Roof Ridge Line

Manhole Cover - Drainage

Inspection Chamber Cover - Comms, Elec etc

Road Gulley

Stop Valve - Water

Wash Out Valve - Water

Fire Hydrant - Water

Tree Canopy & Stem Diameter

Overhead Cables & Electric Poles

Signpost

Lamp Post Street Lighting

Survey Notes:

Where possible all trees, their stems, canopies and heights have been surveyed in accordance with BS5837 (2012) Sect 4.2 Topographical Survey

Revision	Date	Description

Carl Williams Land Surveys Ltd
The Studio
15 Millfield
Neston
Cheshire
CH64 3TF
www.cwlandsurveys.com e:info@cwlandsurveys.com

Client
Castle Green Homes

Project
Oakenholt
Topographic Survey (2d)

Scale 1:1000	Surveyed By CW & VW	Date 21.08.23 - 28.08.23
Drawing No.	Checked By CW	Date 28.08.23
B555-00	Drawn By CW	Date 29.08.23

ASSUMED BLIND CONNECTION OUTO SECTION OF WATERCOURSE CROSSING CHESTER ROAD

225 Ø

8.2m

NETWORK HIGHLY SILTED + HOLDING WATER

CHESTER ROAD

HEAD OF RUN

9.1m

NM FILLED WITH DEBRIS + FOOTBALLS WASHED DOWNSTREAM FROM OPEN WATERCOURSE

FB

Shelter

Playground

Animal Sanctuary

Drain

UNABLE TO CAMERA SURVEY MAJORITY OF SEWERS ON NORTH SIDE OF CHESTER ROAD DUE TO SILT + HOLDING WATER

300 Ø

A 548

Hyfield

7.6m

UNABLE TO SURVEY BEYOND THIS POINT

MP 9.25

Track

7.9m

WB

El Sub Sta

Pipeline

CATCH PIT MH 0.9m TO OUTLET INVERT 290mm SUMP

CATCH PIT MH 1.21m TO OUTLET INVERT 290mm SUMP

BURIED MH IN VERGE

HIGHWAY DRAIN ASSUMED TO CARRY ON UP LEADBROOK DRIVE

Melrose

FFORDD HYWYN

2.110m TO INVERT

2.210m TO INVERT

3.810m TO INVERT

3.020m TO INVERT

FFORDD BEUNO

FFORDD PEDROG

RHODFA GWENFFREWI

CWRT CYBI

Dŵr Cymru
Welsh Water

Quarry Farm Chester Road Oakenholt
Flintshire CH6 5WD

N
W E
S

LEGEND(Representative of most common features)

Waste network:

Foul chamber		Outfall	
Surface water chamber		Lamphole	LH
Combined chamber		Storm Overflow	
Combined sewer overflow		Rising main	
Special purpose chamber		Gravity sewer	
Treatment works		Private sewer	
Pumping station		Private sewer subject to Sect. 104 adoption agreement	S 104
		Private Sewer Transfer	
		Lateral Drain	
		Inspection Chamber	

NB: Sewer symbol colour indicates the type.
RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases, pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF) . It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Map Ref:	325850,371720
Map scale:	1:1000
Printed by:	Zara Howells
Printed on:	23 Aug 2023

DO NOT SCALE

NORTH

STORM Network 1

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Upstream Manhole Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Number	Downstream Manhole Invert	Downstream Manhole Cover
1.000	300	30	Circular	14.687	S101	25.37	26.87	S102	24.89	26.69
1.001	300	25	Circular	18.580	S102	24.89	26.69	S103	24.13	25.93
1.002	300	10	Circular	10.899	S103	24.13	25.93	S104	23.02	25.36
1.003	750	400	Circular	11.331	S104	21.52	25.36	S105	21.49	24.80
1.004	1050	400	Circular	20.928	S105	21.19	24.80	S107	21.14	23.97
1.005	1050	400	Circular	17.769	S107	21.14	23.97	S108	21.09	23.15
1.006	300	150	Circular	14.821	S108	21.09	23.15	S109	21.00	
2.000	1050	400	Circular	15.620	S106	21.18	23.50	S107	21.14	23.97

STORM Network 2

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Upstream Manhole Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Number	Downstream Manhole Invert	Downstream Manhole Cover
1.000	450	26	Circular	15.866	S201	24.58	26.93	S202	23.97	26.72
1.001	450	25	Circular	22.904	S202	23.97	26.72	S203	23.07	25.71
1.002	1350	400	Circular	14.848	S203	20.67	25.71	S204	20.63	24.96
1.003	1350	400	Circular	17.126	S204	20.63	24.96	S205	20.59	23.99
1.004	300	18	Circular	14.380	S205	20.59	23.99	S206	19.77	23.05
1.005	1500	400	Circular	25.024	S206	17.07	23.05	S207	17.01	21.40
1.006	1500	400	Circular	69.535	S207	17.01	21.40	S215	16.84	19.33
1.007	300	240	Circular	16.062	S215	16.84	19.33	S216	16.80	
2.000	450	26	Circular	21.463	S208	22.37	25.52	S209	21.53	24.45
2.001	1350	400	Circular	25.269	S209	18.83	24.45	S210	18.77	23.20
2.002	1500	400	Circular	28.450	S210	18.62	23.20	S211	18.55	22.69
2.003	1500	400	Circular	12.002	S211	18.55	22.69	S212	18.52	22.22
2.004	1500	400	Circular	12.399	S212	18.52	22.22	S213	18.49	21.61
2.005	300	57	Circular	22.186	S213	18.49	21.61	S214	18.09	20.50
2.006	1500	400	Circular	23.099	S214	16.89	20.50	S215	16.84	19.33

STORM Network 3

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Upstream Manhole Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Number	Downstream Manhole Invert	Downstream Manhole Cover
1.000	900	400	Circular	33.033	S301	16.78	21.78	S302	16.70	20.13
1.001	900	400	Circular	25.668	S302	16.70	20.13	S306	16.63	18.84
1.002	300	16	Circular	27.490	S306	16.63	18.84	S307	14.95	17.48
1.003	450	35	Circular	31.326	S307	14.80	17.48	S308	13.91	15.87
1.004	750	400	Circular	12.690	S308	12.26	15.87	S309	12.22	15.18
1.005	750	400	Circular	14.051	S309	12.22	15.18	S310	12.19	14.38
1.006	750	400	Circular	11.508	S310	12.19	14.38	S311	12.16	13.94
1.007	225	171	Circular	20.315	S311	12.16	13.94	S312	12.04	13.82
2.000	900	400	Circular	13.670	S303	16.76	19.66	S304	16.73	19.44
2.001	900	400	Circular	14.984	S304	16.73	19.44	S305	16.69	19.19
2.002	900	400	Circular	24.511	S305	16.69	19.19	S306	16.63	18.84

FOUL Network 4

Pipe Code	Diameter (mm)	Gradient (1:)	Pipe Type	Pipe Length	Upstream Manhole Number	Upstream Manhole Invert	Upstream Manhole Cover	Downstream Manhole Number	Downstream Manhole Invert	Downstream Manhole Cover
1.000	150	20	Circular	14.560	F1	23.20	24.55	F2	22.46	23.88
1.001	150	26	Circular	62.018	F2	22.46	23.88	F4	20.12	21.47
1.002	150	33	Circular	64.538	F4	20.12	21.47	F5	18.13	19.48
1.003	150	150	Circular	24.071	F5	18.13	19.48	F6	17.97	20.69
1.004	150	150	Circular	22.304	F6	17.97	20.69	F7	17.82	21.81
1.005	150	150	Circular	16.269	F7	17.82	21.81	F8	17.71	22.54
1.006	150	150	Circular	31.617	F8	17.71	22.54	F14	17.50	23.32
1.007	150	150	Circular	15.311	F14	17.50	23.32	F15	17.40	22.58
1.008	150	150	Circular	23.054	F15	17.40	22.58	F16	17.25	21.42
1.009	150	150	Circular	23.322	F16	17.25	21.42	F17	17.09	20.26
1.010	150	28	Circular	25.821	F17	17.09	20.26	F19	16.19	18.98
1.011	150	150	Circular	28.533	F19	16.19	18.98	F20	16.01	17.65
1.012	150	24	Circular	37.723	F20	16.01	17.65	F21	14.41	15.76
1.013	150	21	Circular	9.192	F21	14.41	15.76	F22	13.98	15.33
1.014	150	22	Circular	7.540	F22	13.98	15.33	F23	13.63	14.98
1.015	150	22	Circular	8.923	F23	13.63	14.98	F24	13.21	14.56
1.016	150	25	Circular	11.304	F24	13.21	14.56	F25	12.76	14.11
1.017	150	43	Circular	12.548	F25	12.76	14.11	F26	12.47	13.87
1.018	150	54	Circular	12.989	F26	12.47	13.87	F27	12.23	14.88
1.019	150	52	Circular	19.908	F27	12.23	14.88	F28	11.85	14.88
2.000	150	15	Circular	26.675	F3	21.90	23.25	F4	20.12	21.47
3.000	150	80	Circular	22.437	F9	25.67	27.02	F10	25.39	26.99
3.001	150	150	Circular	24.997	F10	25.39	26.99	F11	25.23	26.64
3.002	150	18	Circular	44.691	F11	25.23	26.64	F12	22.77	24.72
3.003	150	10	Circular	11.653	F12	22.77	24.72	F13	21.57	24.12
3.004	150	7	Circular	15.923	F13	21.57	24.12	F14	19.15	23.32
4.000	150	15	Circular	26.551	F18	17.96	19.31	F19	16.19	18.98

S311
(2.4 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0094-5000-1800-5000
Restricted to:
5.00 l/s @ 1.80m design head
Orifice size = 94mm

Outfall to existing surface water sewer subject to WW approval

Outfall to existing Foul water sewer subject to WW approval

EX SW MH CL 14.25 IL 12.04

EX SW MH CL 15.01 IL 11.21

EX FW MH 225Ø CL 14.88 IL 11.86

EX SW MH CL 14.48 IL 12.27

Cellular Crate 4 (S305)
Crate Base = 16.800
Area = 60sq.m
Storage Volume = 72cu.m.
Crate Depth = 1200mm (3 row)

S306
(2.1 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0070-3000-2000-3000
Restricted to:
3.00 l/s @ 2.00m design head
Orifice size = 70mm

EX MH 225Ø CL 14.15 IL 12.94

EX MH 225Ø CL 13.80 IL 12.90

Cover levels to be confirmed by client at detailed design

Buried MH in verge

S213
(2.4 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0083-5000-3000-5000
Restricted to:
5.00 l/s @ 3.00m design head
Orifice size = 83mm

Outfall to watercourse subject to LLFA approval

S215
(2.4 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0112-8200-2500-8200
Restricted to:
8.20 l/s @ 2.50m design head
Orifice size = 112mm

S205
(2.4 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0091-6000-3000-6000
Restricted to:
6.00 l/s @ 3.00m design head
Orifice size = 91mm

Cellular Crate 2 (S207)
Crate Base = 17.900
Area = 50sq.m
Storage Volume = 80cu.m.
Crate Depth = 1600mm (4 row)

Outfall to watercourse subject to LLFA approval

S108
(2.4 Dia flow control manhole)
Hydrobrake Optimum
Flow Regulator
MD-SHE-0080-3500-1600-3500
Restricted to:
3.50 l/s @ 1.60m design head
Orifice size = 80mm

Cellular Crate 1 (S106)
(NRV Needed)
Crate Base = 21.250
Area = 72sq.m
Storage Volume = 115.2cu.m.
Crate Depth = 1600mm (4 row)

Shelter
Playground
Animal Sanctuary
A 548
Hyfield
LLYS CADFAN
FFORDD HYWYN
FFORDD BEUNO
FFORDD PEDROG
RHODFA GWENFFREWI
CWRT CYBI
LEADBROOK DRIVE
Melrose
White Gables
Devona
Broad Oak

0 5 10 15 20 25 30 35 40 45 50
SCALEBAR (m)

Notes

1. Setting out shall be undertaken using only the information given. Distances should not be scaled from this drawing.
2. All adoptable drainage shall be constructed in accordance with 'Sewers for Adoption' 7th Edition, Welsh Ministers Standards and Welsh Water Details and Guidelines.
3. The minimum gravity pipe diameter under adoptable highways shall be 150mm
4. It is the responsibility of the Contractor to verify all information given with regards to existing services and drainage connections etc. prior to commencing the works. The rates shall include for hand dig around services where necessary. The Contractor shall adhere to the CDM Regulations at all times
8. All materials to bear the relevant B.S. Kitemark and comply fully with the specifications. All concrete & concrete products must use Sulphate resistant cement to withstand Class 3 condition (unless the site investigation report proves that sulphate attack from soils and groundwater will not occur).
9. All opening notices etc. as required under Highways Acts etc. are to be obtained prior to commencement of works. All works are to be inspected by L.A., NHBC or the Network Operator as applicable.
10. Where structured wall UPVC pipes (or similar approved) are used in adoptable drainage they shall be handled and laid in accordance with the manufacturers instructions and will be subject to post installation deformation testing prior to adoption.
A Class S Bed and Surround must be used for structured wall pipes
10. Trench backfill in highways to within 1m of highway shall, as directed by the Highway Authority be a suitable granular material all in accordance with Sewers for Adoption.
12. Slab levels shall not be varied without reference to the Engineer for guidance.
13. Pipes have not been designed to accommodate construction traffic loading. The contractor is responsible for providing adequate protection to the pipes during construction.
14. All manhole covers and frames shall comply with BS EN124. All adoptable manholes and chambers shall comply with Sewers for Adoption 7th Edition. Covers in roads to be grade D400 and be 150mm deep. Manhole covers in car parking areas and drives to be grade B125 and covers in landscaping areas to be grade A15. All to be sized in accordance with Building Regulations Part H, Tables 11 & 12. "In-fill" type covers should not be used. Where a cover is located in an area of block paving, the bottom of the frame should be 150mm deep.

Legend

Site Boundary

Existing

Existing Foul Water Sewer
Existing Surface Water Sewer
Existing Highway Drain

Proposed

Adoptable Surface Water Sewer
Adoptable Foul Sewer
Flow Control Manhole
Plot Slab Level
Sewer Easement
Brick Retaining Wall
Underbuild
Steps in Slab
Concrete Post & Gravel Board
Cellular Storage Crates
Rain Garden
Surface Water Filter Drain
Depth of fill (Existing levels to proposed)

STRATEGY

Rev.	Date	Revision	By	Appd.
G	01.07.25	Updated to suit revised layout	PW	AJ
F	26.03.25	Updated to suit revised layout	PW	AJ
E	17.02.25	Updated to suit revised layout	PW	AJ
D	01.05.24	Updated to suit revised layout	PW	AJ
C	23.01.24	Location of crates updated	PW	AJ
B	19.01.24	Surface Water drainage design updated to suit revised outfall	PW	AJ
A	31.10.23	Surface Water drainage design updated	PW	AJ

coopers
chartered consulting engineers
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU
Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

Client: Castle Green

Project: QUARRY FARM, OAKENHOLT, FLINT.

Title: Drainage Strategy

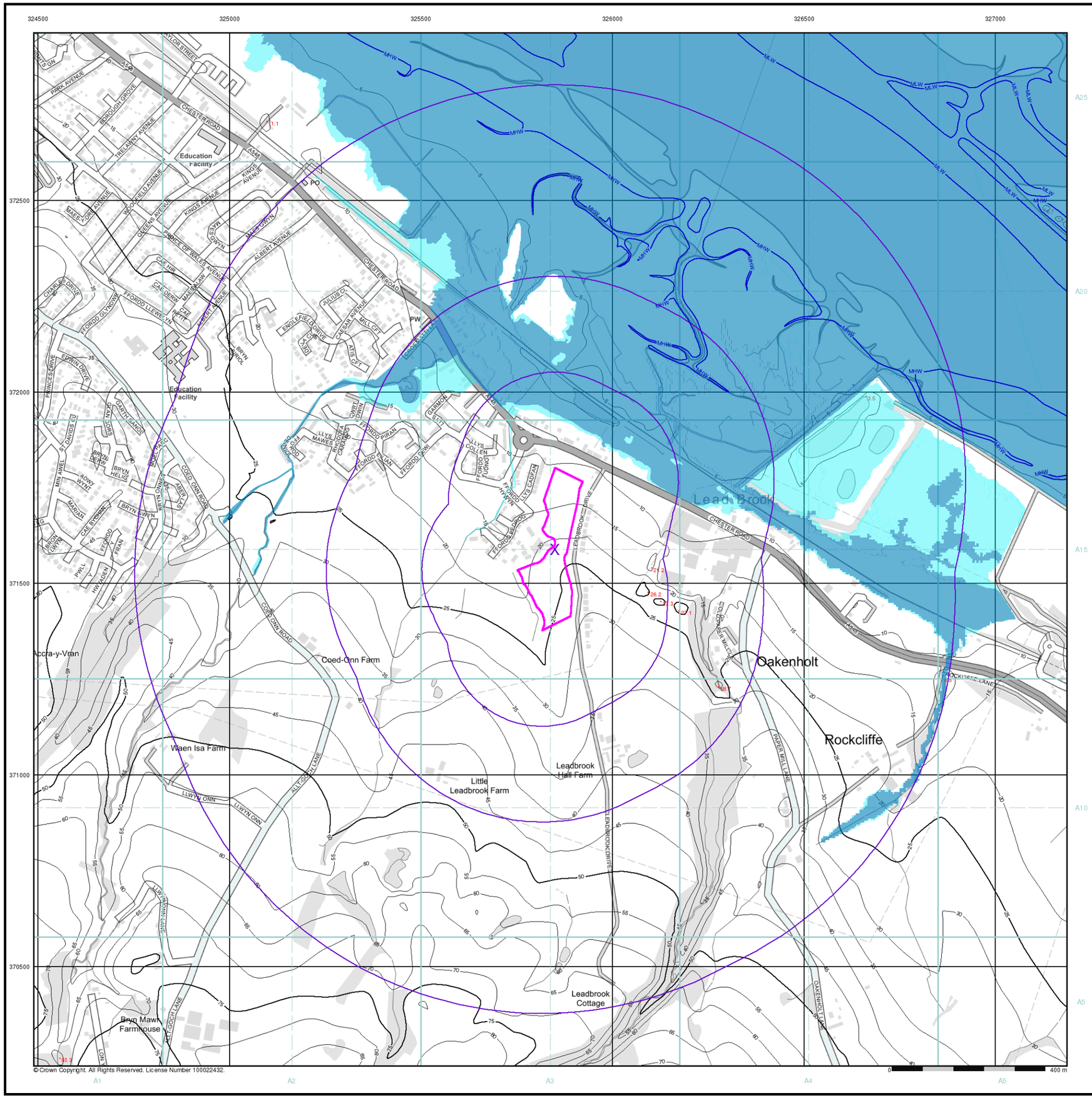
DRAWING NUMBER: 8211 / SK01

SCALE at A0 1:500
DATE 20.09.23
DRAWN PW
CHECKED AJ
REVISION G

Appendix 2

Envirocheck Flood Screening Report

Order Number: 312162444_1_1



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EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

Standard Contour 105 100 95

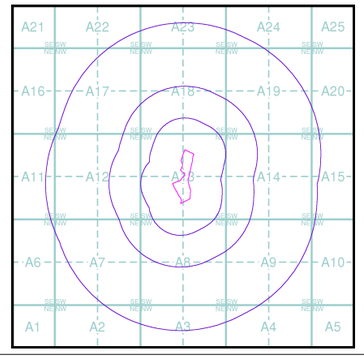
Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

EA/NRW Flood Data Map - Slice A



Order Details

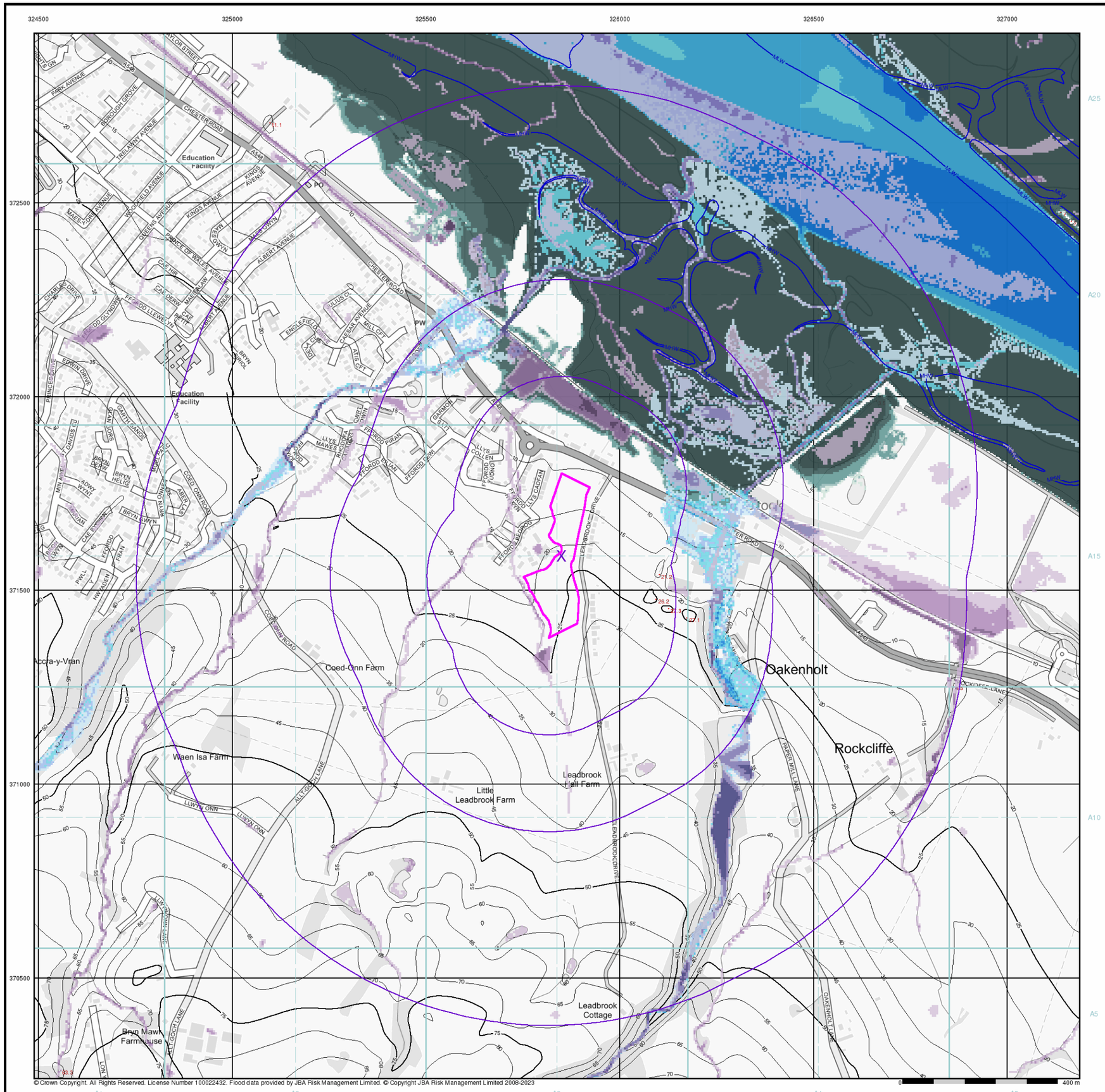
Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

Landmark® INFORMATION GROUP

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



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LANDMARK INFORMATION GROUP®

JBA 75 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

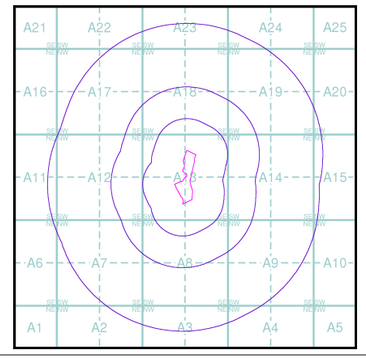
Contours (height in metres)

Standard Contour 105 100 95 — MLW Mean Low Water

Master Contour — MHW Mean High Water

Spot Height 157.8

JBA 75 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

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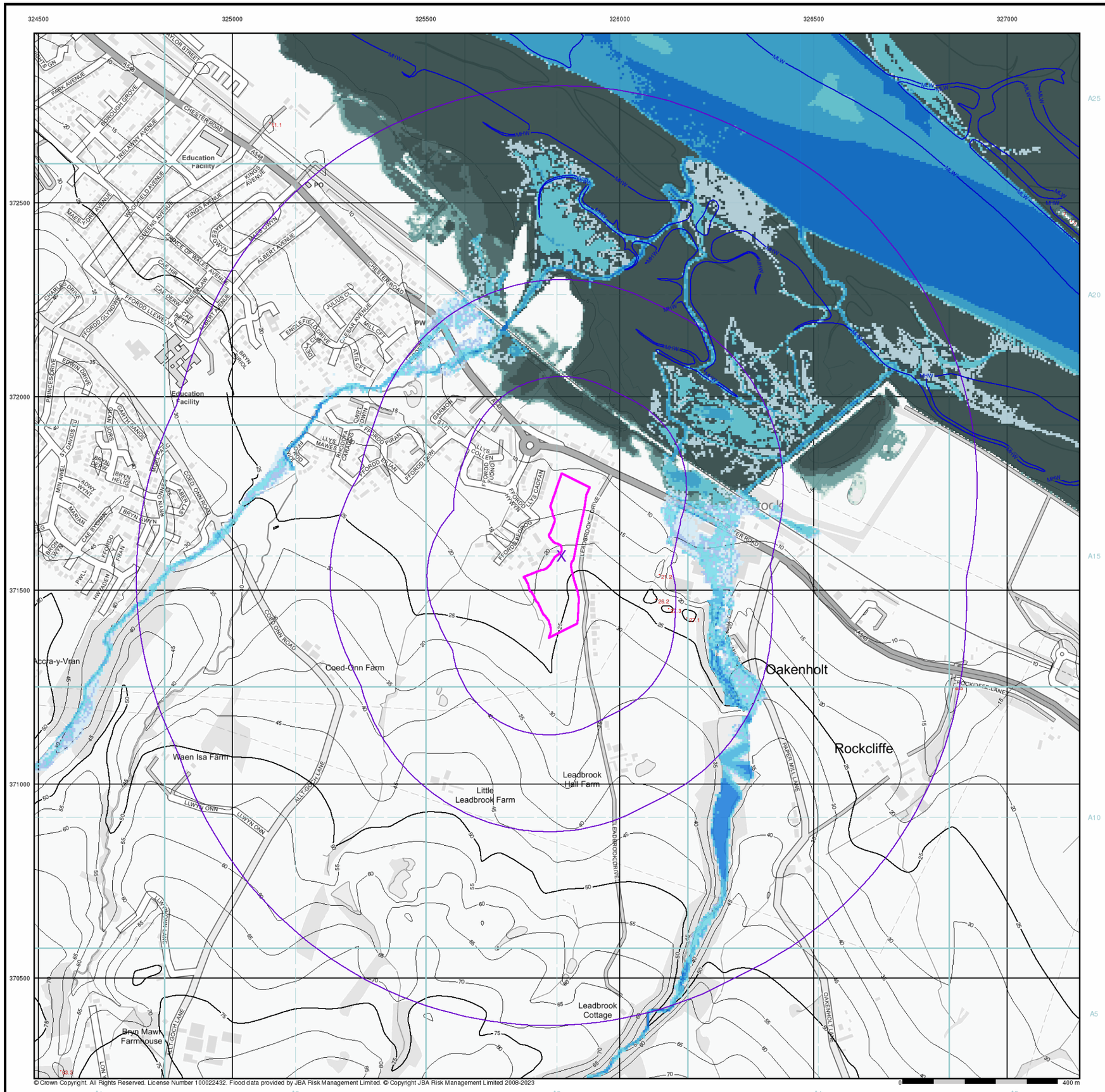

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JBA 100 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Fluvial Depth	Coastal Depth
0.01m - 0.05m	0.01m - 0.05m
0.05m - 0.1m	0.05m - 0.1m
0.1m - 0.3m	0.1m - 0.3m
0.3m - 1m	0.3m - 1m
>1m	>1m

Contours (height in metres)

Standard Contour 105

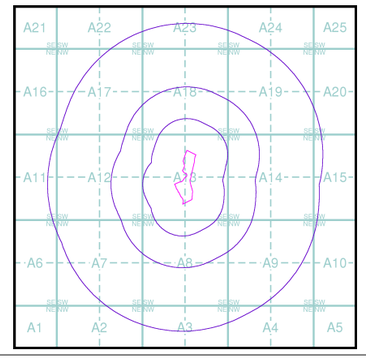
Master Contour 100 95

Spot Height 167.8

MLW Mean Low Water

MHW Mean High Water

JBA 100 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

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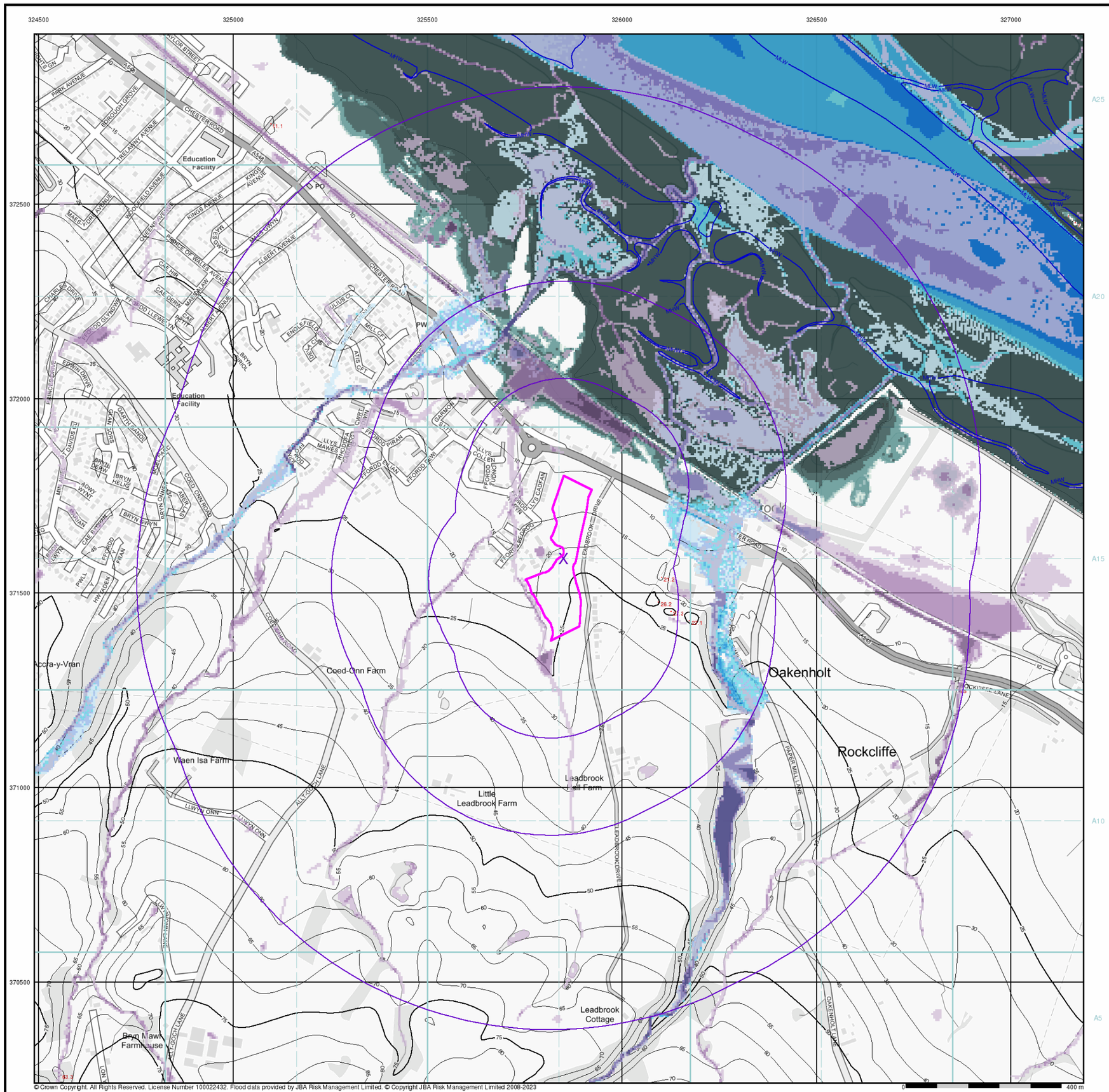

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LANDMARK INFORMATION GROUP®

JBA 200 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

Standard Contour — 105 — 100 — 95

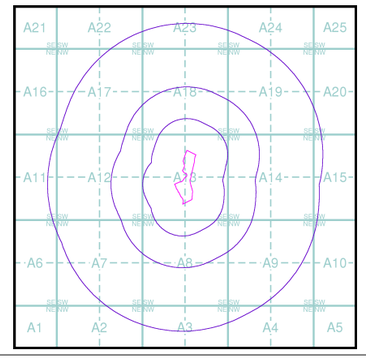
Master Contour

Spot Height 157.8

MLW Mean Low Water

MHW Mean High Water

JBA 200 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

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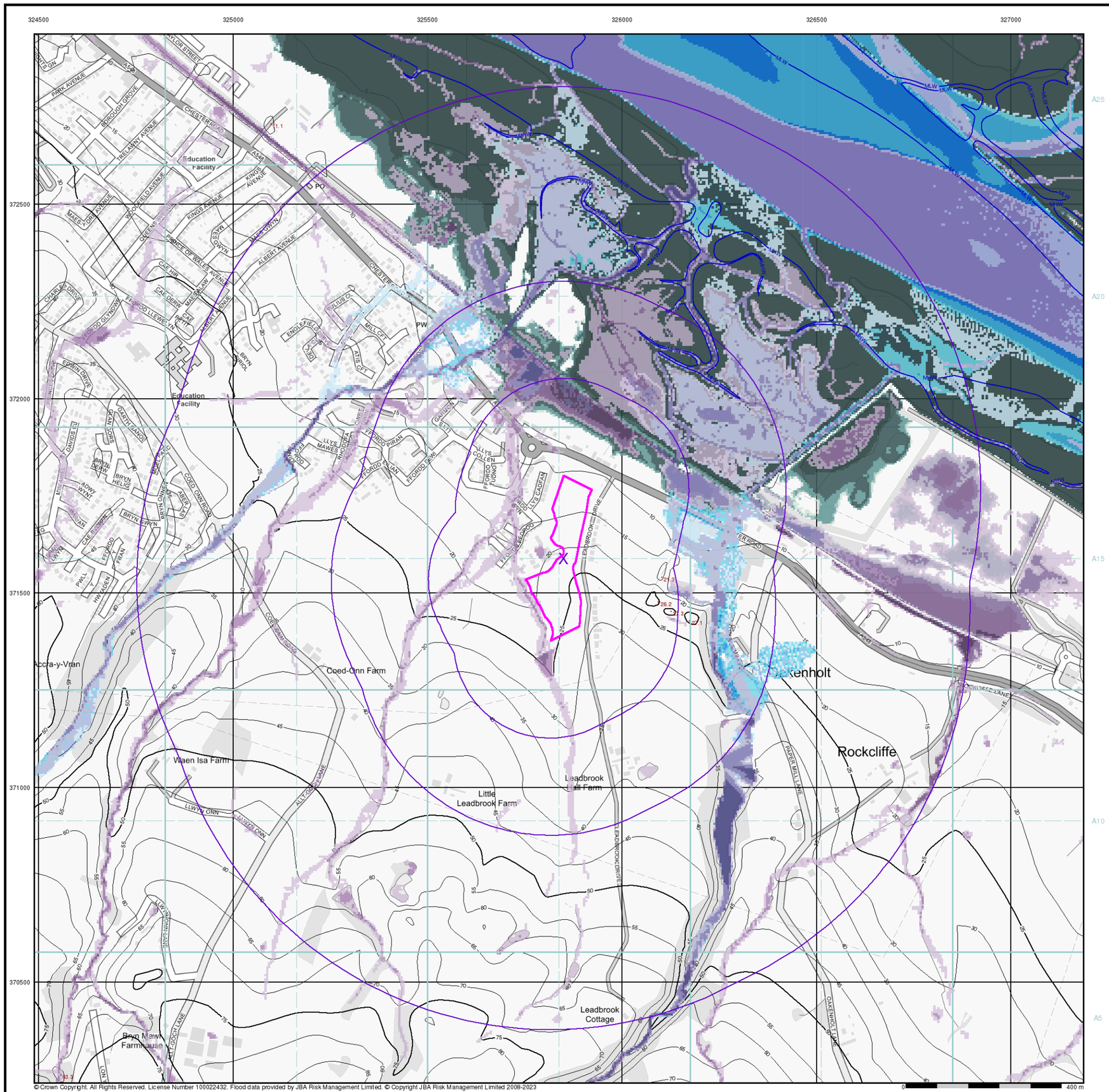

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LANDMARK INFORMATION GROUP®

JBA 1000 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0.1m	0.01m - 0.05m	0.01m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

Standard Contour — 105 — 100 — 95

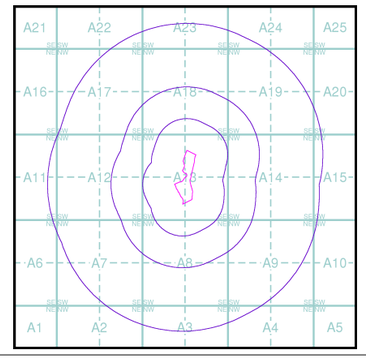
Master Contour

Spot Height — 157.8

MLW Mean Low Water

MHW Mean High Water

JBA 1000 Year Return Flood Map (Undefended) - Slice A



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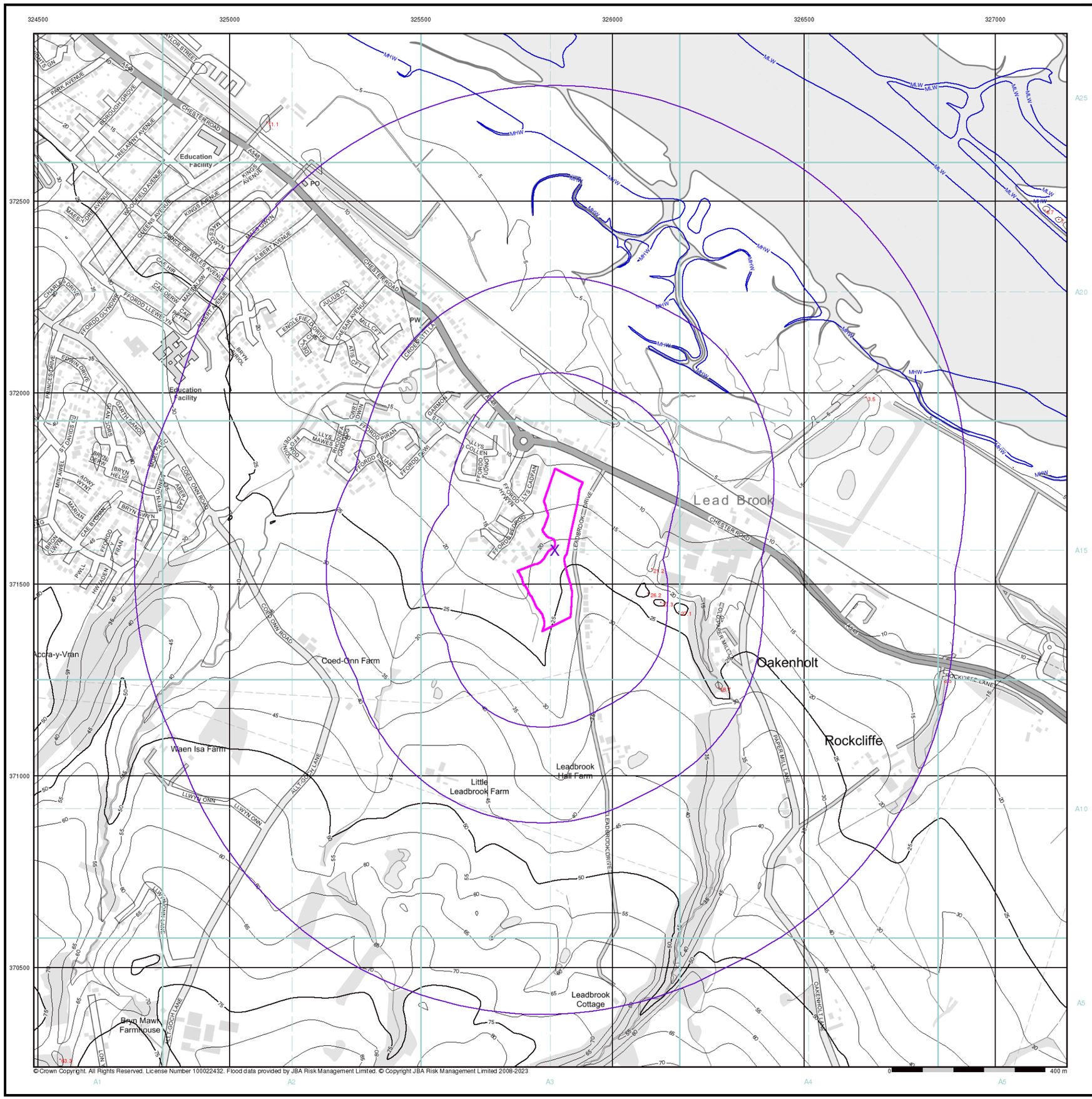

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JBA Canal Failure Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

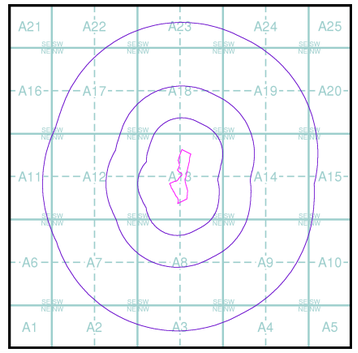
Flood Data

- Canal Failure
- Coverage

Contours (height in metres)

- Standard Contour
- Master Contour
- Spot Height *167.8
- MLW Mean Low Water
- MHW Mean High Water

JBA Canal Failure Flood Map - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

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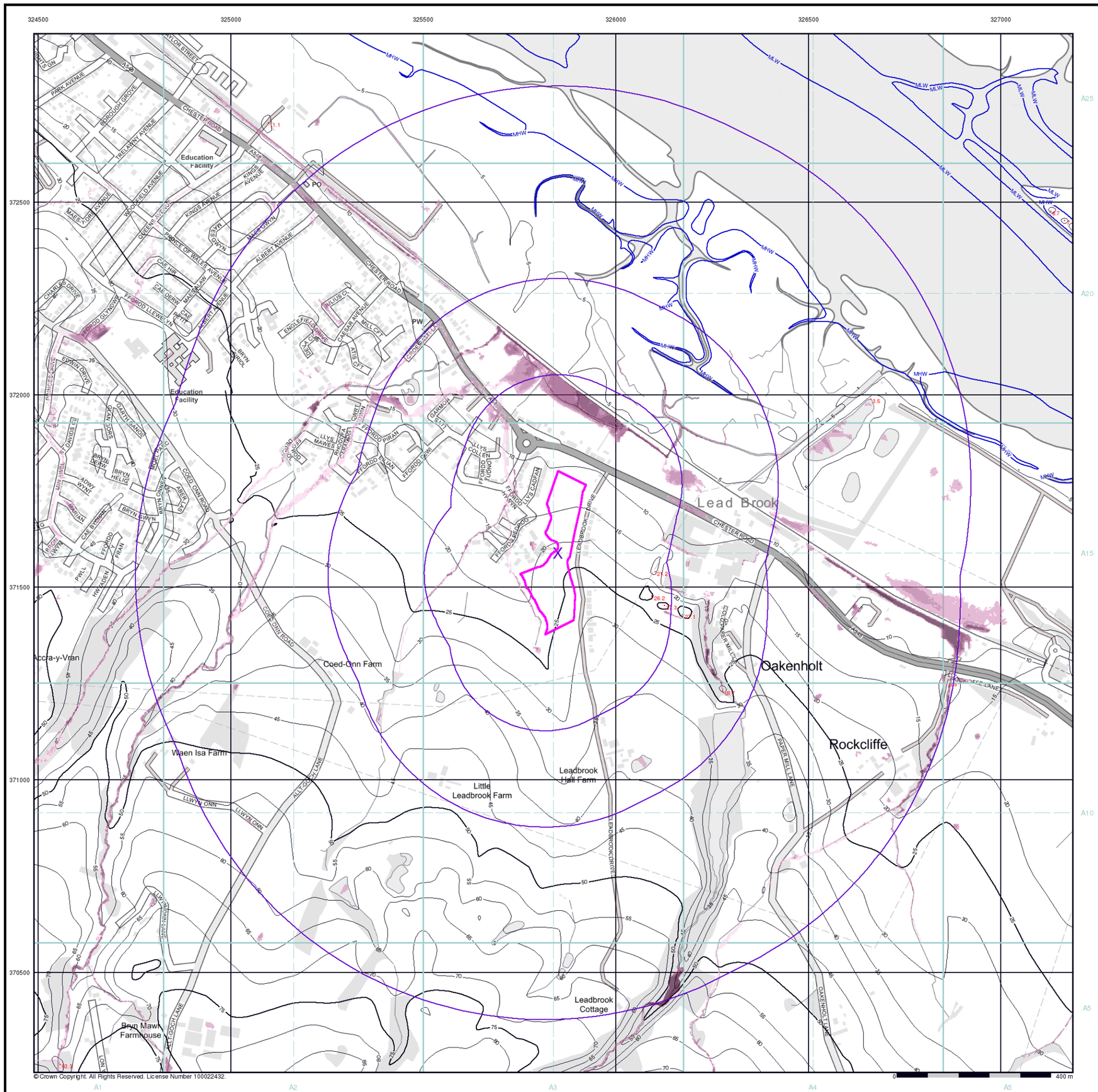

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour | Master Contour | Spot Height 167.8

MLW Mean Low Water

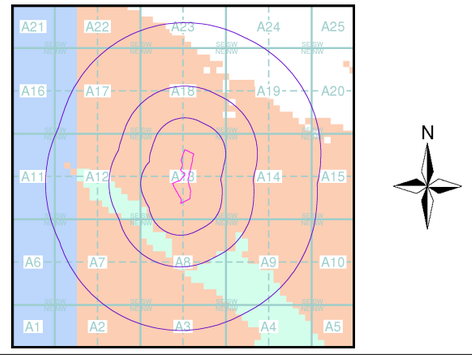
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

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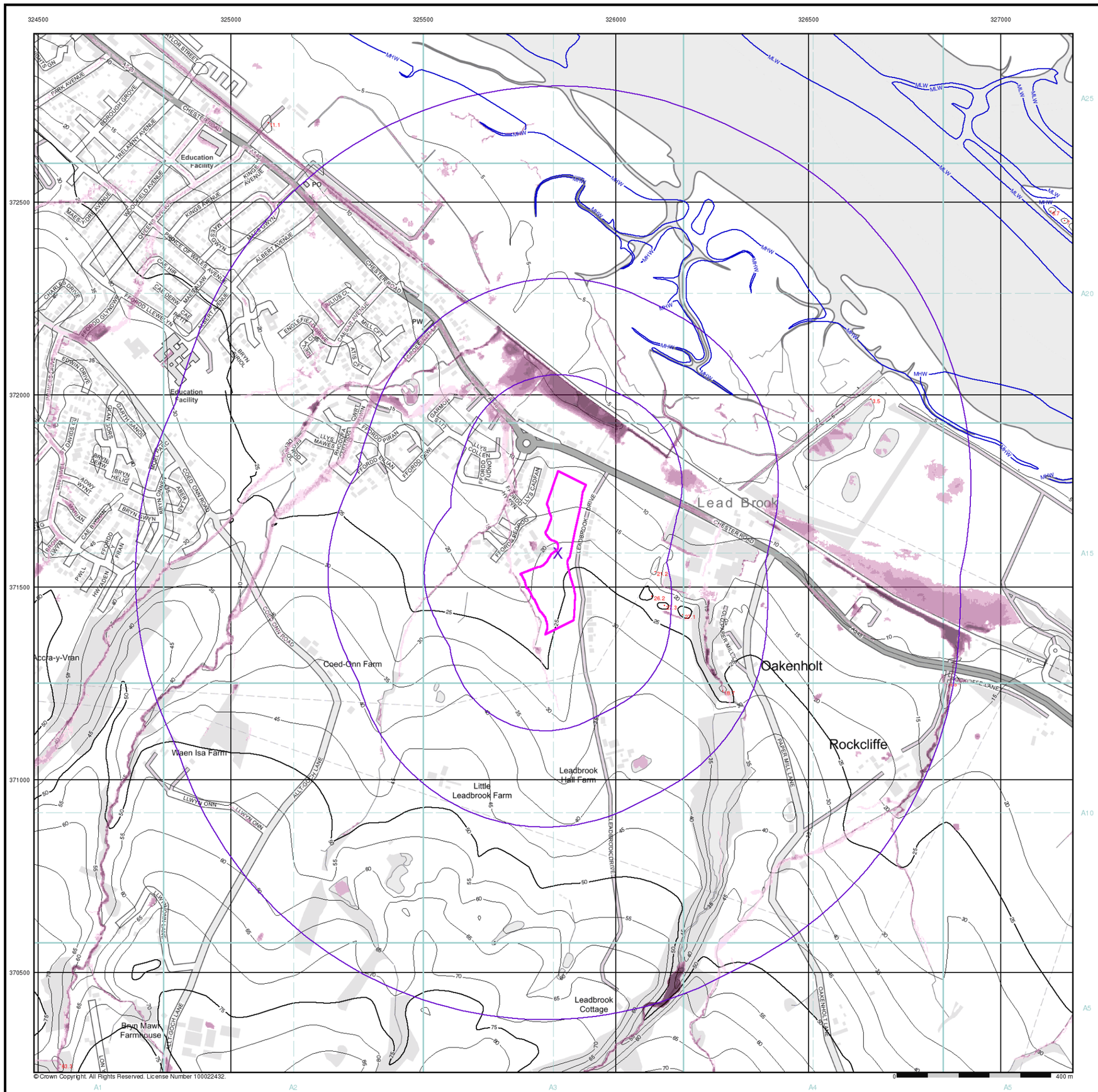


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Depth Map

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour | Master Contour | Spot Height 167.8

MLW Mean Low Water

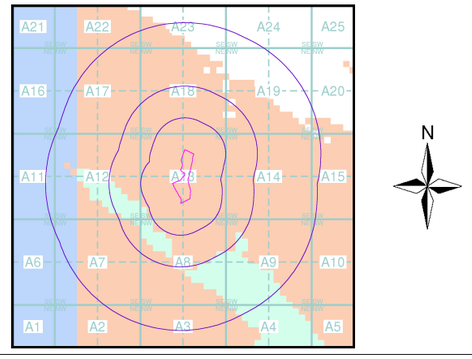
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

Landmark INFORMATION GROUP

Tel: 0844 844 9952
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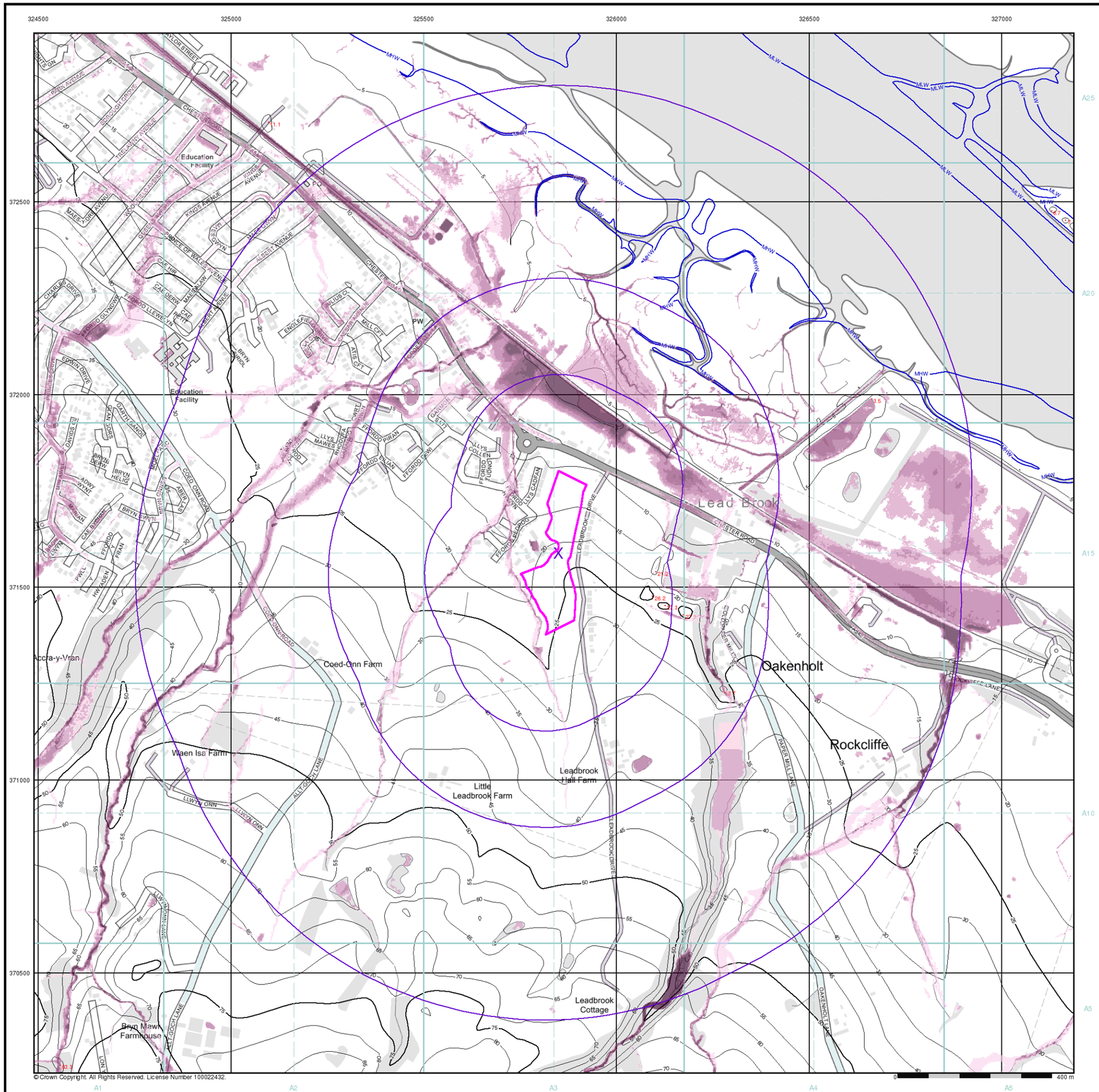

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 1000 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

Standard Contour | Master Contour | Spot Height 167.8

MLW Mean Low Water

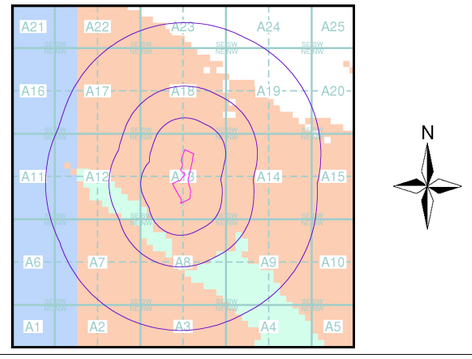
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

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National Grid Reference:	325850, 371590
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Site Details

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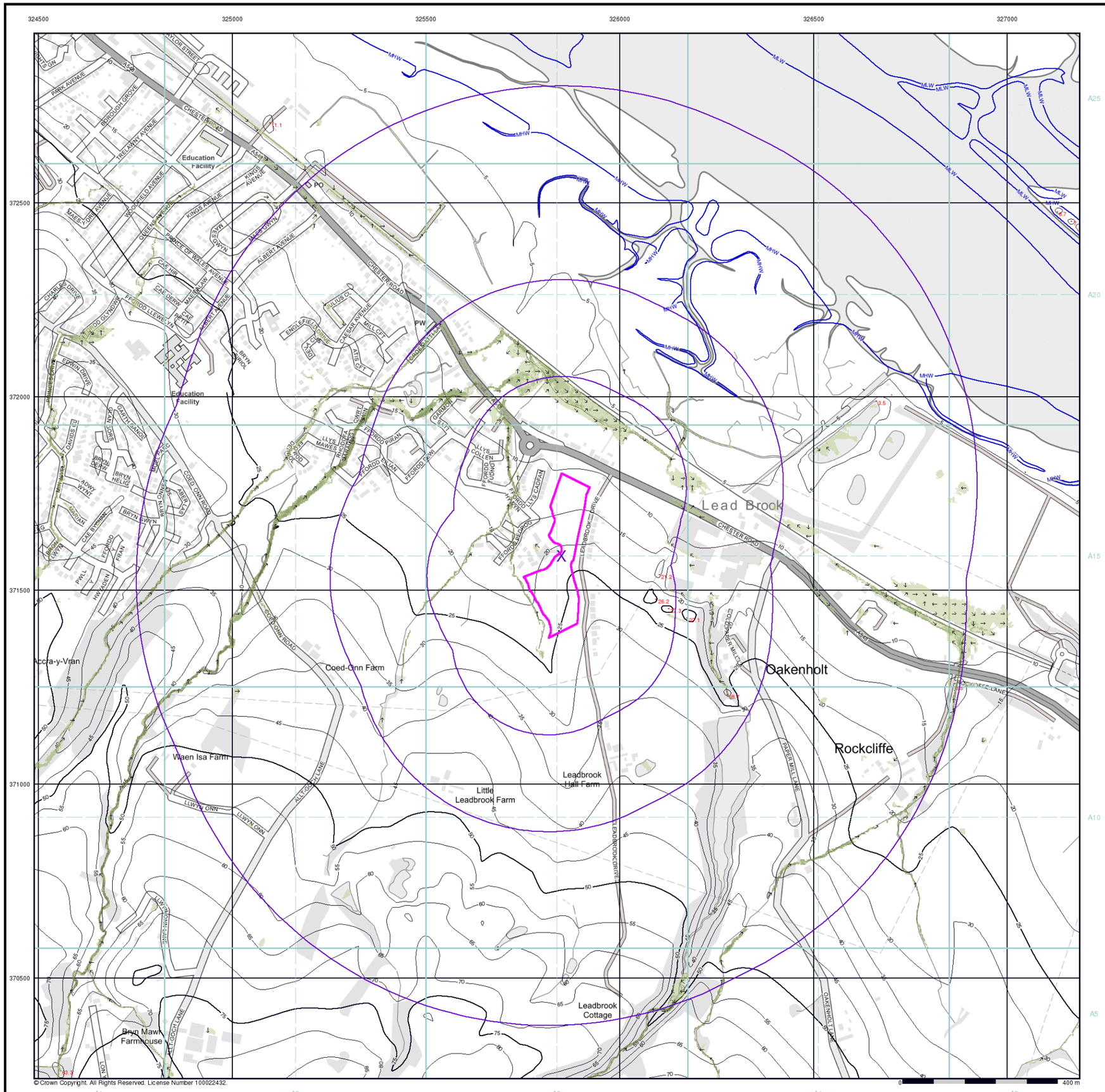

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

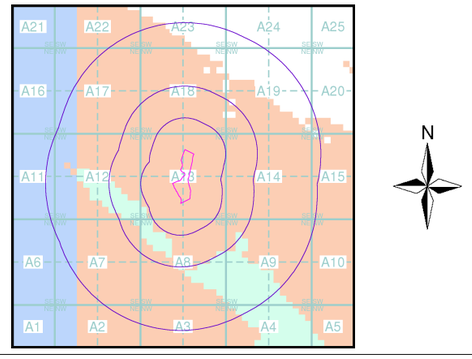
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

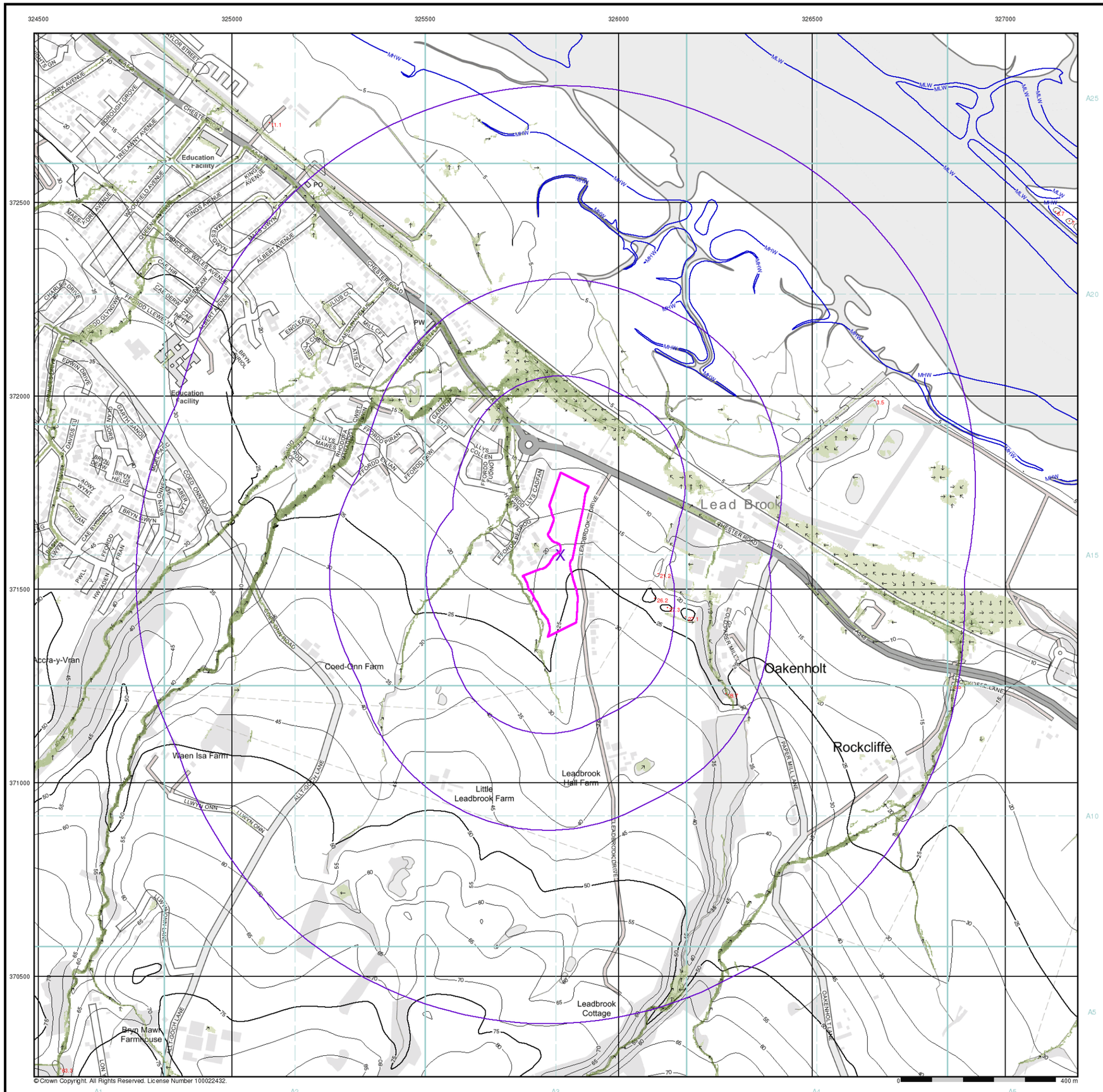
Order Number:	312162444_1_1
Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

Landmark INFORMATION GROUP

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



Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

Suitability

See the suitability map below

- National to county
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- Town to street
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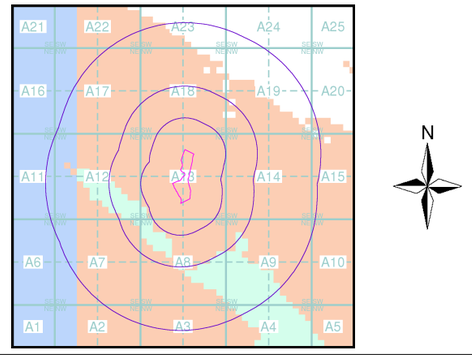
EA/NRW Suitability Map - Slice A



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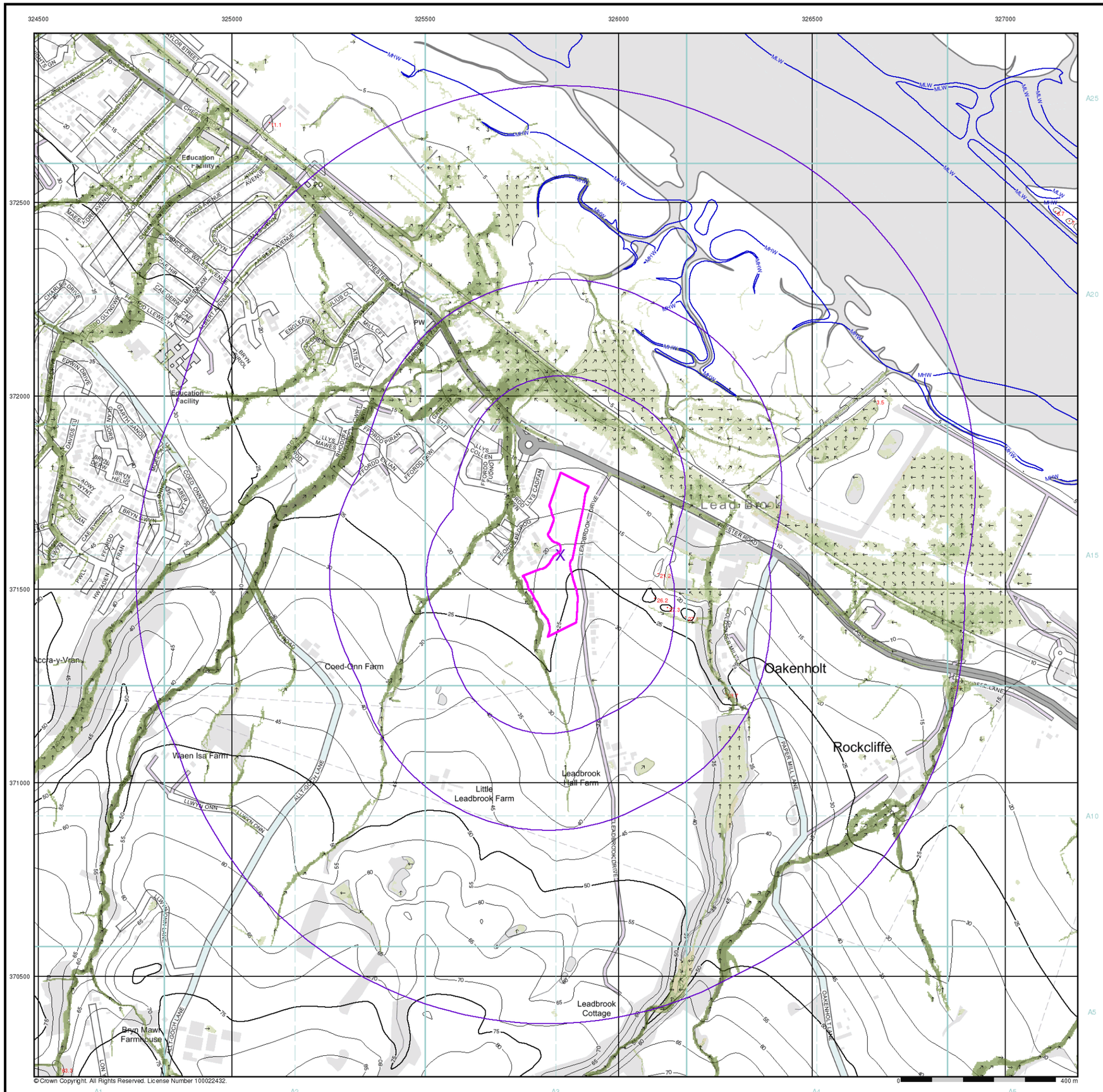


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 1000 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Velocity and Direction

- 0.00 - 0.25m/s
- 0.25 - 0.50m/s
- 0.50 - 1.00m/s
- 1.00 - 2.00m/s
- > 2.00m/s

Flow Direction at maximum velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

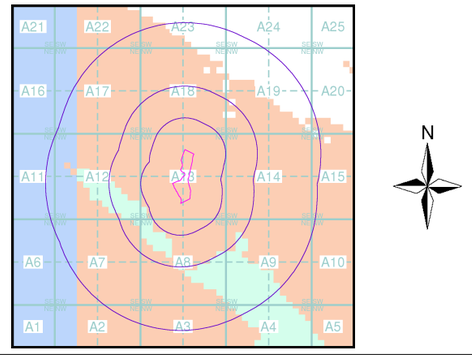
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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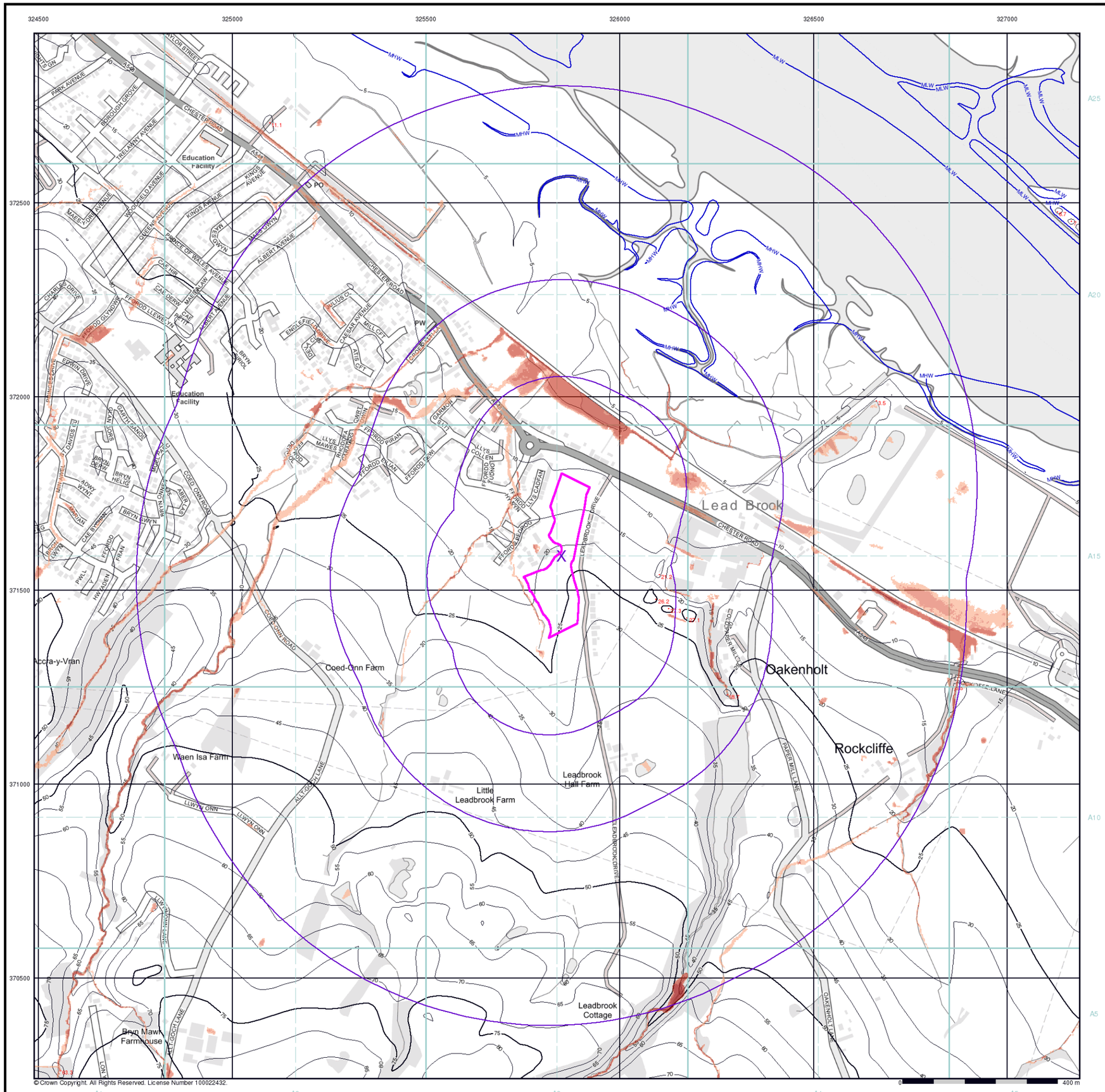


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 30 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height *167.8

MLW Mean Low Water

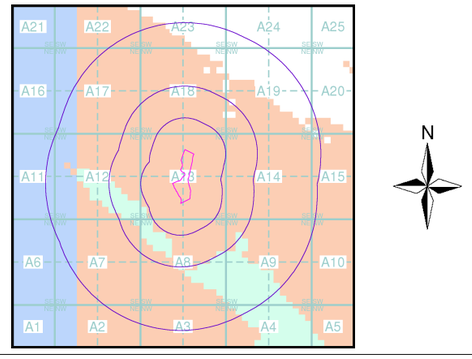
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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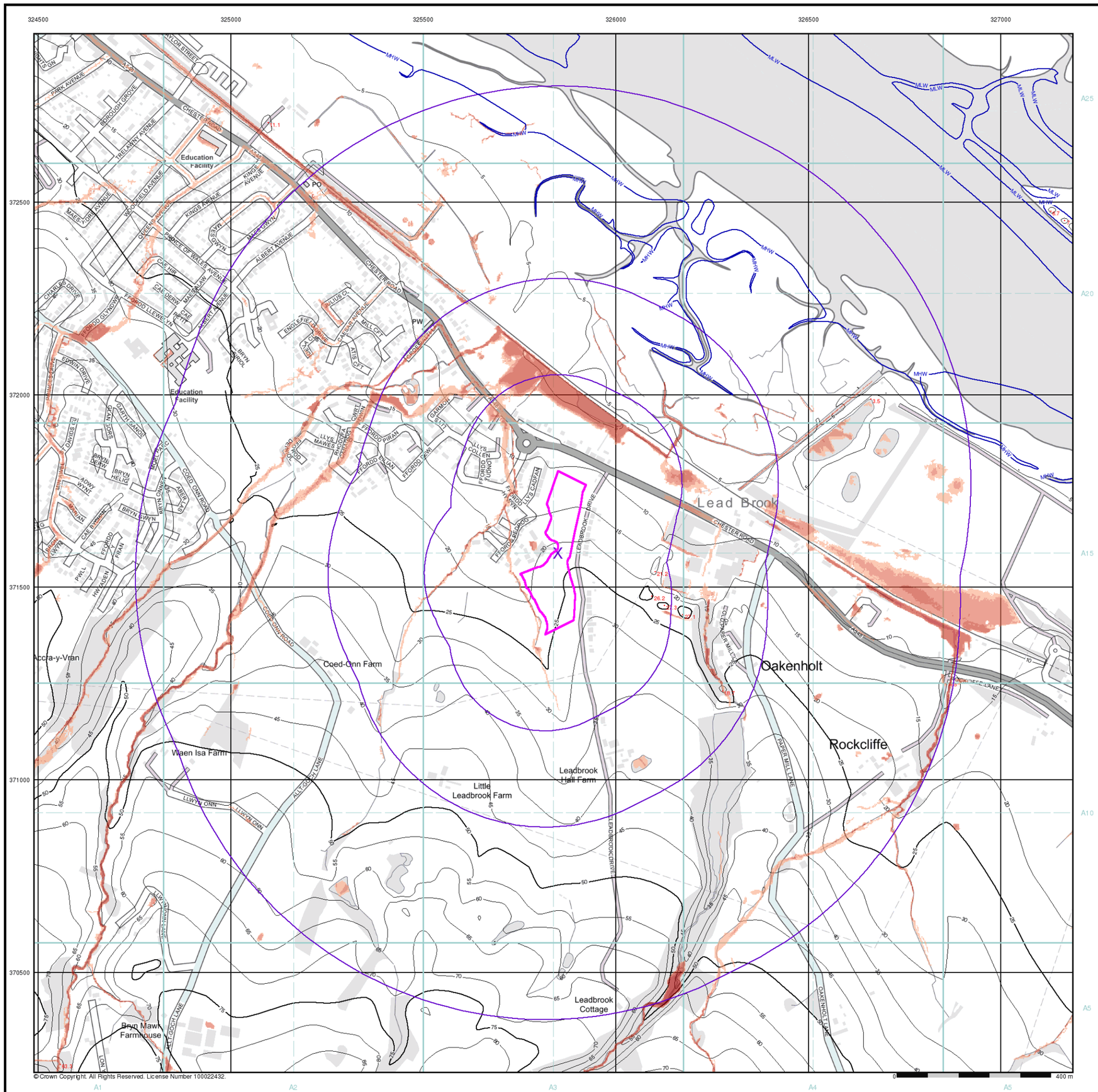


Envirocheck®

LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 100 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour — 105 — 100 — 95

Master Contour

Spot Height *167.8

MLW Mean Low Water

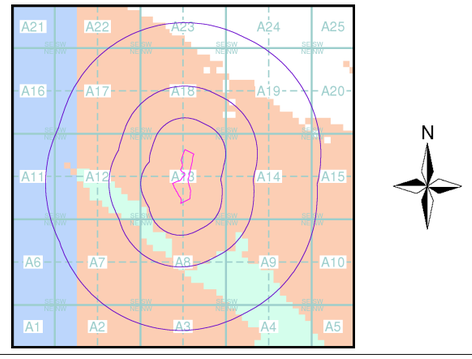
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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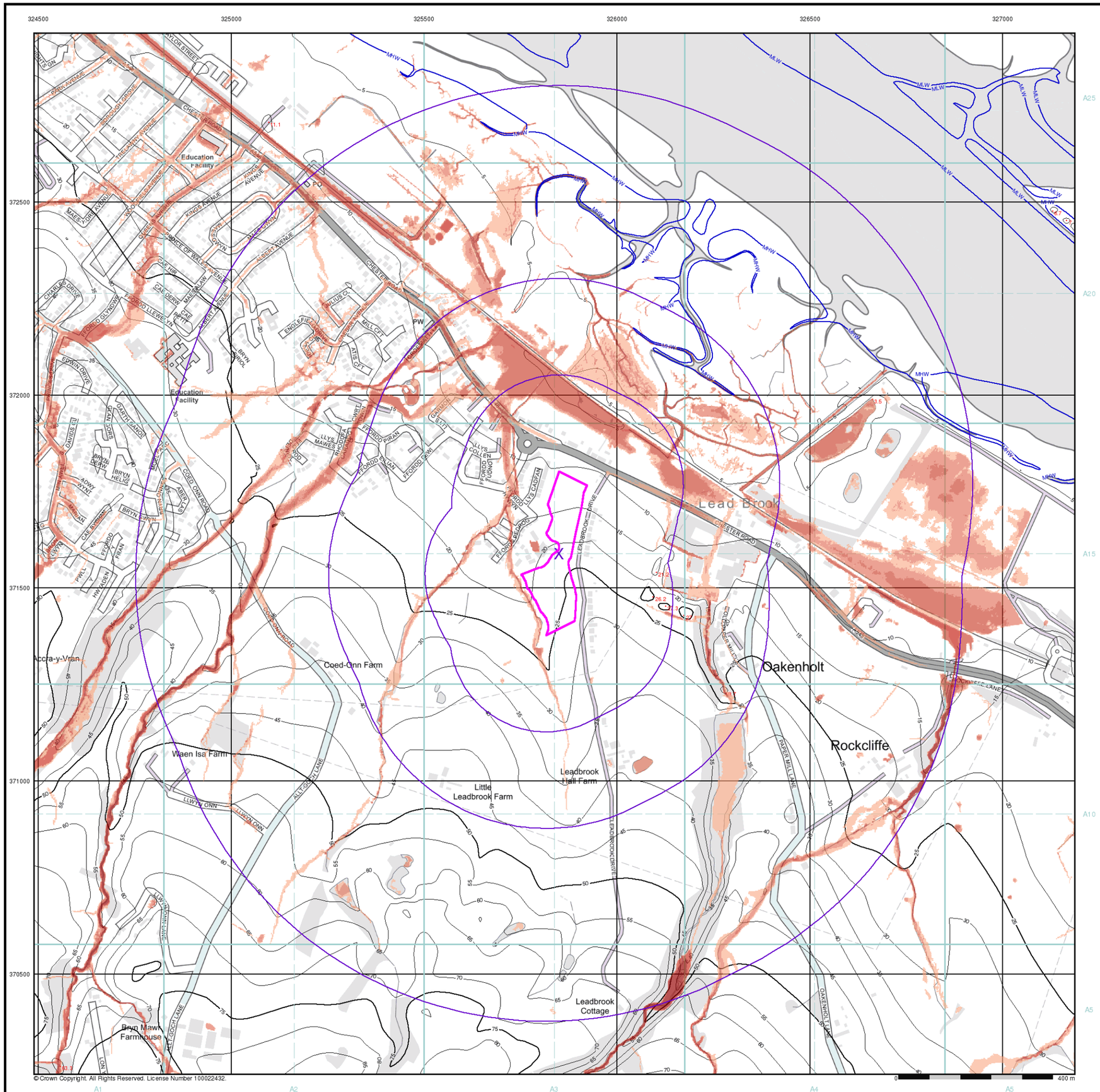

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LANDMARK INFORMATION GROUP®

EA/NRW Surface Water 1000 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | X Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height (*167.8)

MLW Mean Low Water

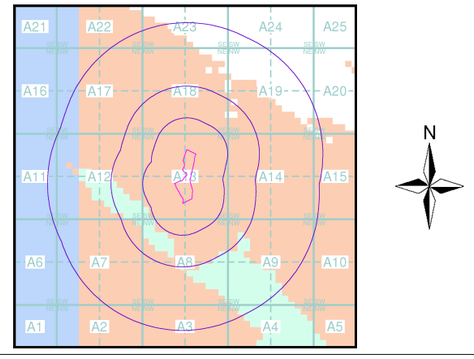
MHW Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



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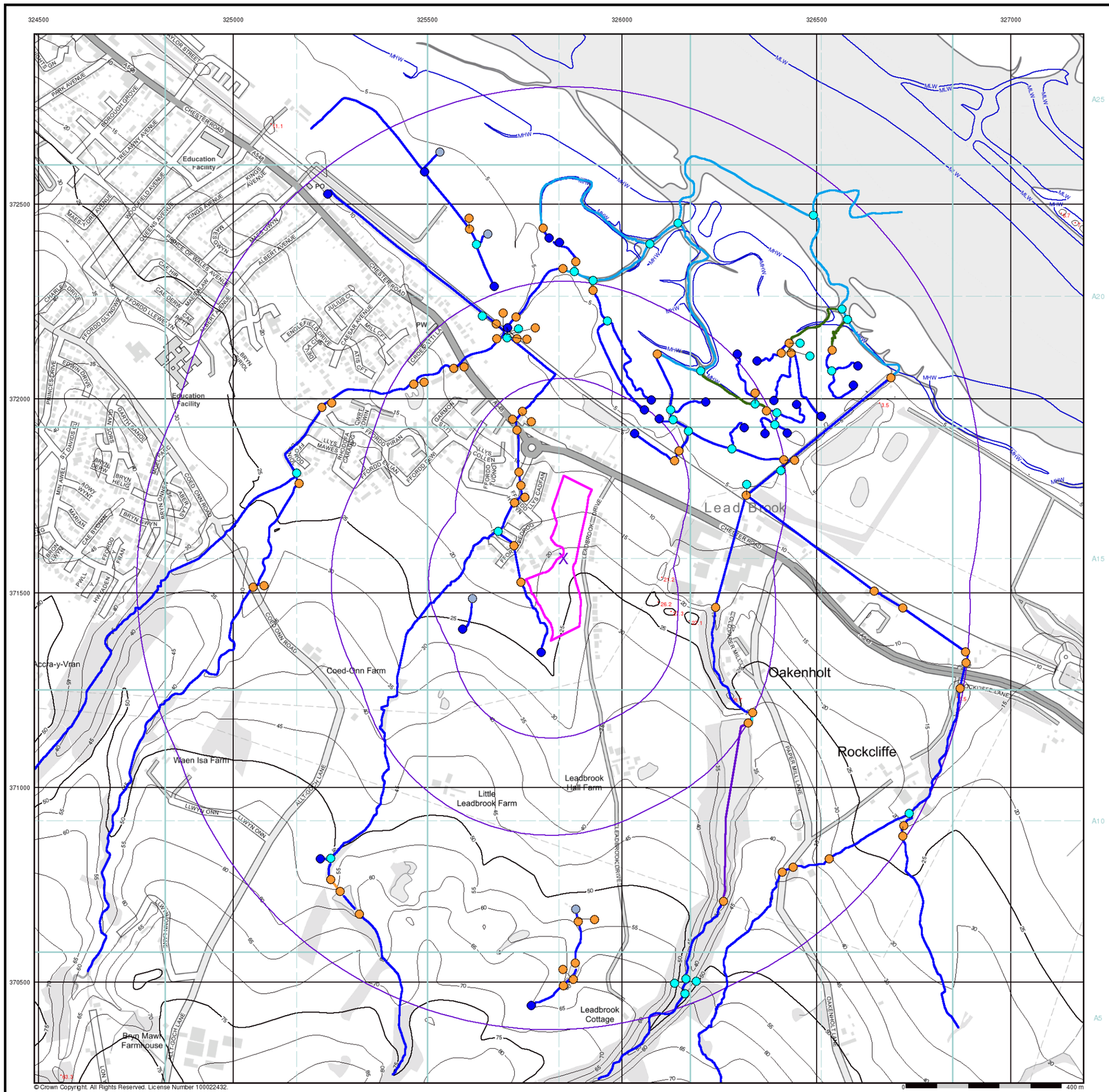


Envirocheck®

LANDMARK INFORMATION GROUP®

OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- X Bearing Reference Point

OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea
- Junction
- Outlet
- Pseudo
- Source
- Other

Contours (height in meters)

Standard Contour 105 100 95

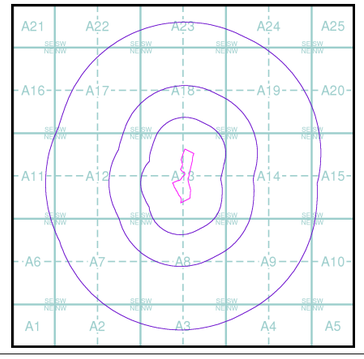
Master Contour

Spot Height 167.3

MLW Mean Low Water

MHW Mean High Water

OS Water Network Map - Slice A



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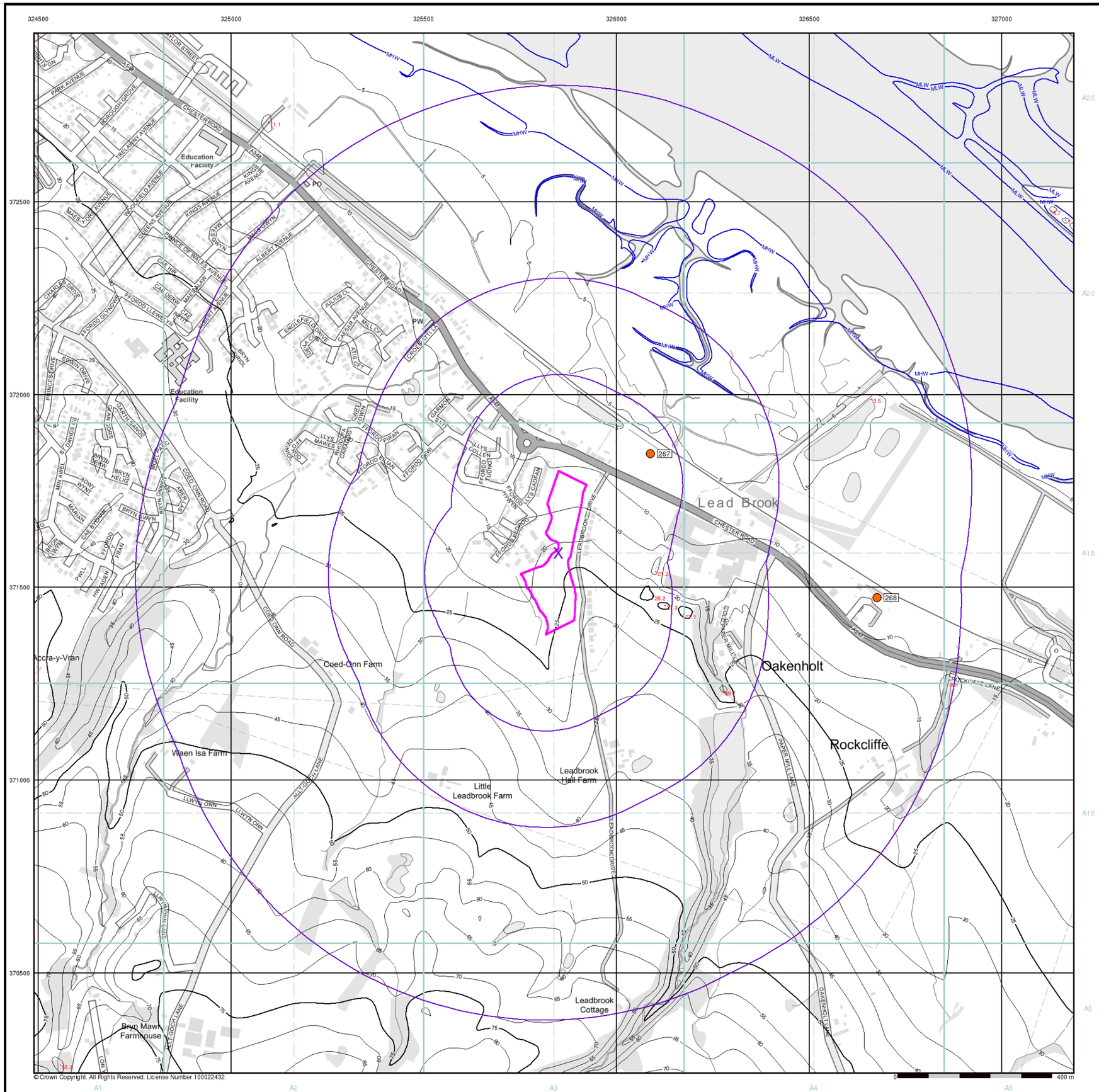

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EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point
- Map ID

Historic Flood Events Data

- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded /Surface Water
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Surface Water
- Unknown

Contours (height in metres)

Standard Contour 105 100 95

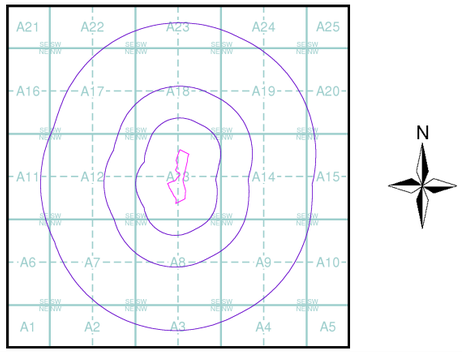
Master Contour

Spot Height *167.8

MLW Mean Low Water

MHW Mean High Water

EA/NRW Historic Flood Map - Slice A



Order Details

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Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

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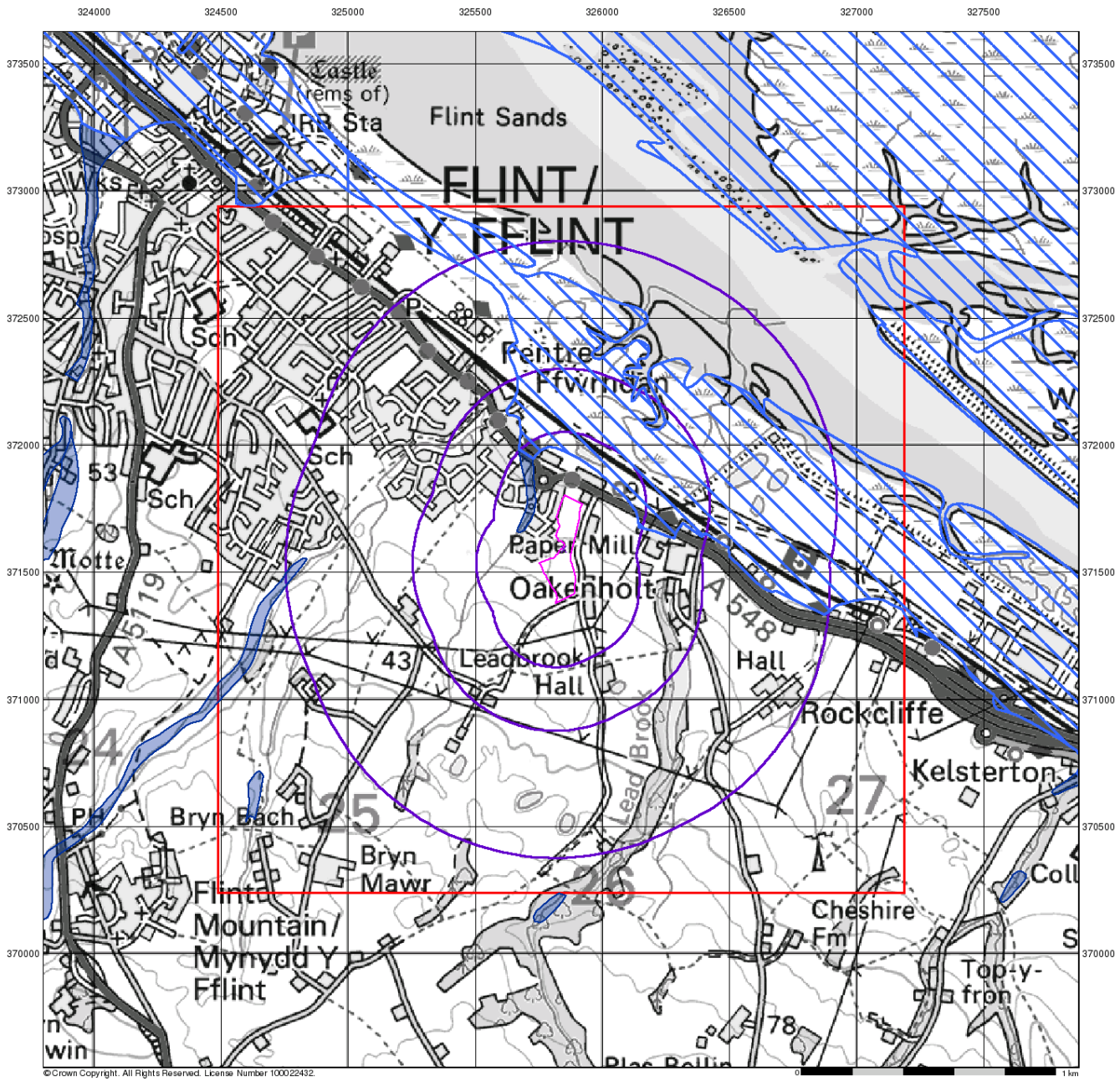

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BGS Flood Data (1:50,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Slice | Map ID

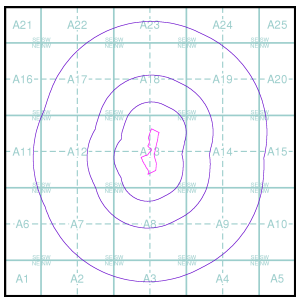
BGS Geological Indicators of Flooding

Coastal

Inland

Bodies of Water

BGS Flood Data Map - Slice A



Order Details

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Customer Ref:	8211
National Grid Reference:	325850, 371590
Slice:	A
Site Area (Ha):	3.19
Search Buffer (m):	1000

Site Details

Quarry Farm, Oakenholt, CH6 5ST

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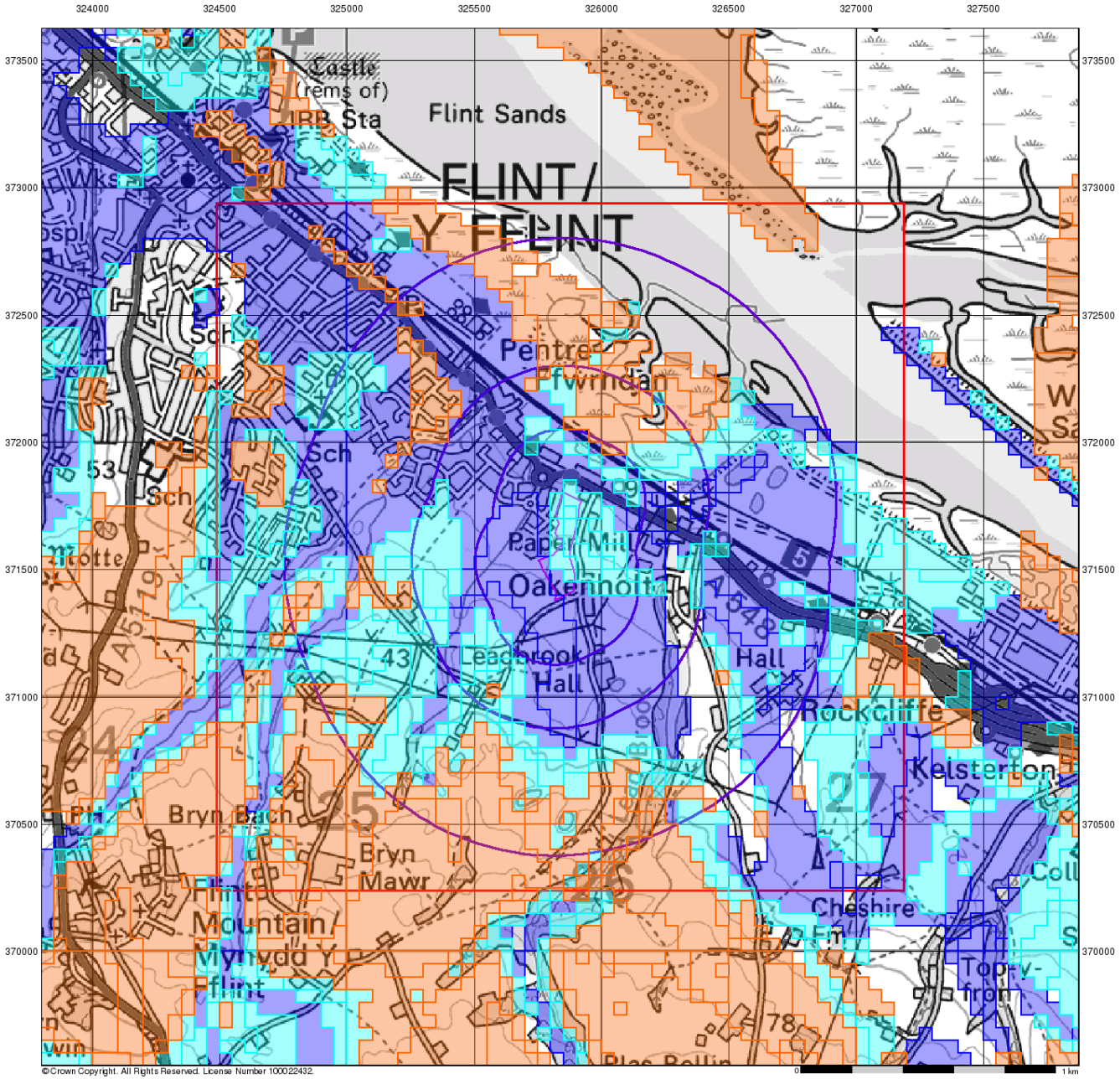

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BGS Flood Data (1:50,000)

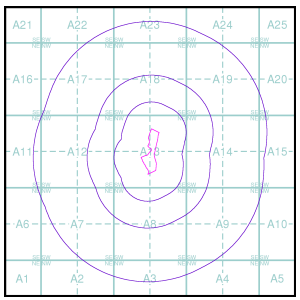
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice | Map ID

BGS Groundwater Flooding Susceptibility

- Potential for Groundwater Flooding to Occur at Surface
- Potential for Groundwater Flooding of Property Situated Below Ground Level
- Limited Potential for Groundwater Flooding to Occur

BGS Flood Data Map - Slice A



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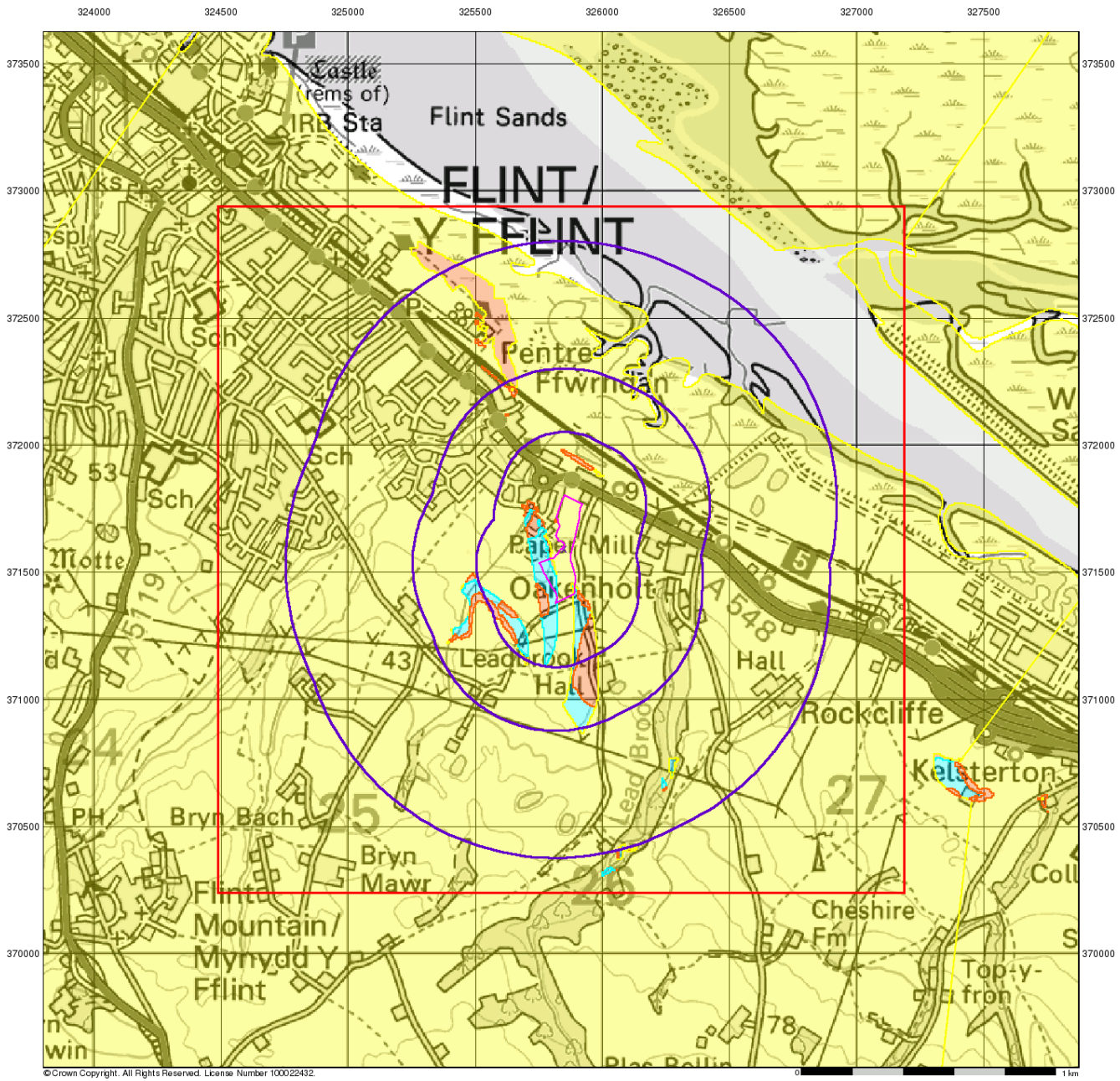

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LANDMARK INFORMATION GROUP®

GeoSmart Information Groundwater Flood Map (1:50,000)

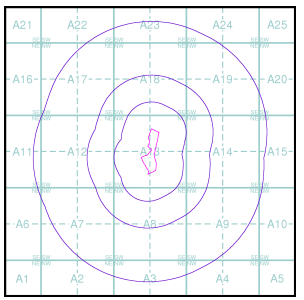
General

Specified Site | Specified Buffer(s) | Bearing Reference Point | Slice

GeoSmart Information Groundwater Flooding Risk

- High Risk
- Moderate Risk
- Low Risk
- Negligible Risk

GeoSmart Information Groundwater Flood Map - Slice A



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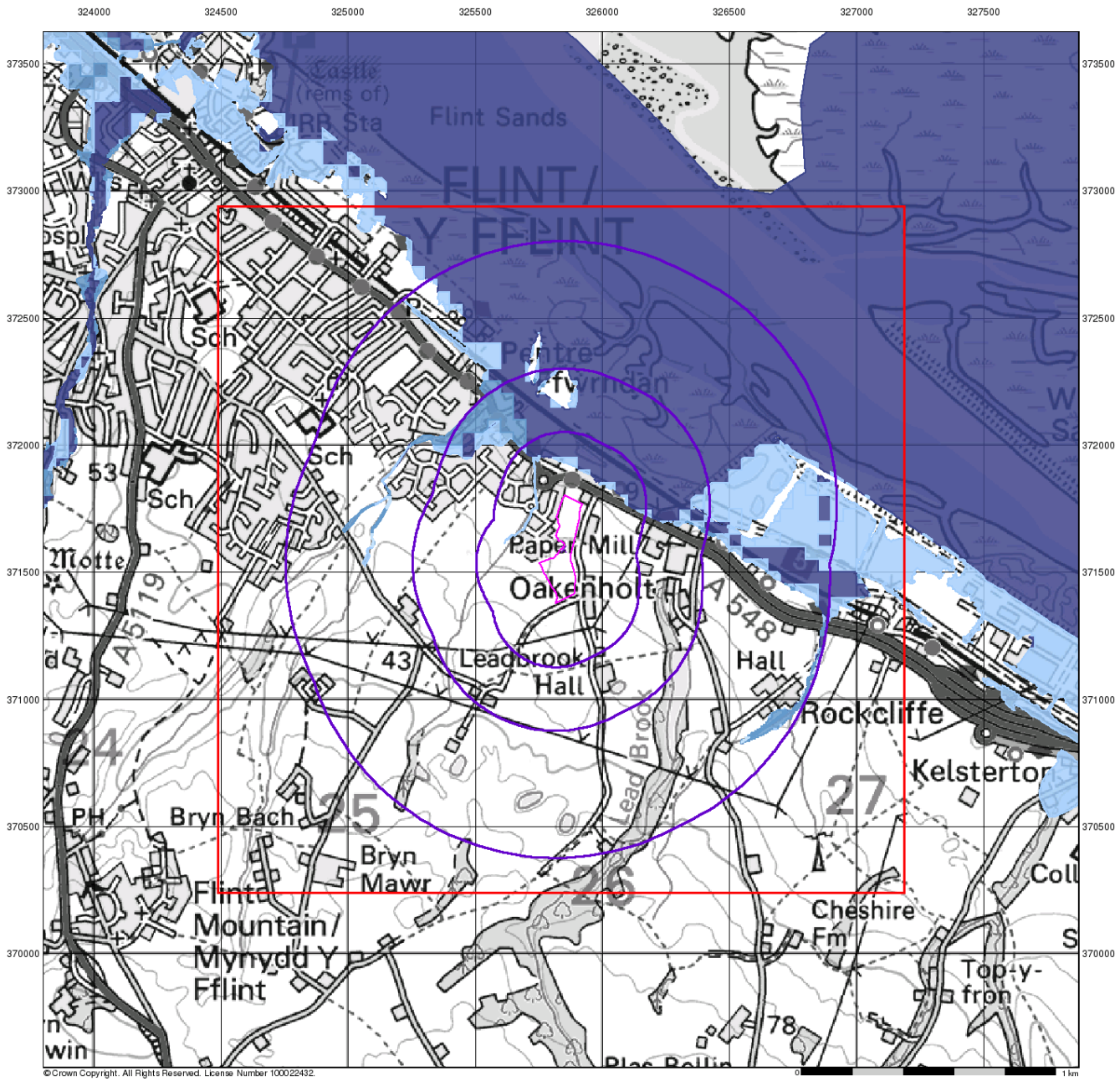

Envirocheck®

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EA/NRW RoFRS Data (1:50,000)

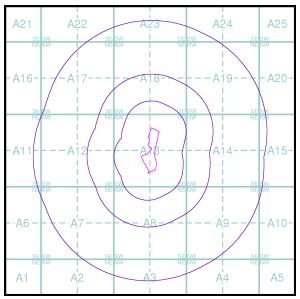
General

Specified Site | Specified Buffer(s) | Bearing Reference Point
Slice | Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

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

EA/NRW RoFRS Data Map - Slice A



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Tel: 0844 844 9952
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Appendix 3

Infiltration Consideration

Trial Pit Information

and

Infiltration Test Results

DO NOT SCALE

NORTH

KEY TO EXISTING FEATURES
(All positions are approximate unless otherwise stated)

- Surveyed tree / vegetation (taken from ref. a)
- Surveyed stream (taken from ref. a)
- Topographical contours (taken from ref. a)
- Surveyed top of bank (taken from ref. a)
- Surveyed bottom of bank (taken from ref. a)
- Surveyed fenceline (taken from ref. a)
- Scheduled Ancient monument (taken from ref. c)
- Tree protection orders (TPO's) (taken from ref. j))
- Surface depression feature noted on LiDAR mapping (taken from ref. k)
- Site boundary (taken from ref. b)

KEY TO EXPLORATORY HOLES
(All positions are approximate unless otherwise stated)

- Infiltration pit locations ITP01 - ITP05 excavated by Coopers between 16 & 17 August 2023.

KEY TO GEOLOGICAL FEATURES
(All positions are approximate unless otherwise stated)

- Fault line (taken from ref. c)
- Inferred coal seam (taken from ref. c)

KEY TO FORMER FEATURES
(All positions are approximate unless otherwise stated)

- Former buildings (taken from ref. c)
- Former pond (taken from ref. c)
- Former coal mine shaft (taken from ref. c)
- Former stream (taken from ref. c)
- Former quarry (taken from ref. c)

KEY TO CONJECTURED SERVICES
(All positions are approximate unless otherwise stated)

- BT lines (taken from ref. d)
- High voltage electricity lines (taken from ref. e)
- Low voltage electricity lines (taken from ref. e)
- Gas lines (taken from ref. f)
- Potable water lines (taken from ref. g)
- Foul sewer line (taken from ref. g)
- Foul (combined) water (taken from ref. g)
- EirGrid lines (taken from ref. h)
- GTC electric lines (taken from ref. i)

Note:
Only above services available to Coopers at time of drawing production.

This drawing is to be read in conjunction with the following:-

a) Wardell Armstong LLP, Quarry Farm, Flintshire, [Topographical Survey], ref. CP10907, dated 03 June 2014.

b) PDF' ref. 'Infiltration Test Location Plan', received by Coopers on 19 May 2023.

c) GroundSure, Quarry Farm Oakenholt, ref. GS-T8W-574-JQH-H7G, dated 25 May 2023.

d) BT Openreach utilities map, ref. HJK08416L, dated 26 May 2023.

e) SP Energy Networks, Quarry Farm, Oakenholt, ref. 29615597, dated 25 May 2023.

f) Wales and West Utilities, Quarry Farm, Oakenholt, ref. 29615597, dated 25 May 2023.

g) Welsh Water, map centre: 325855, 371468, dated 16 July 2014.

h) EirGrid, East West Interconnector, ref. VIL-X-8.3.2-477, rev. 3.3, dated 27 July 2015 & ref. VIL-X-8.3.2-478, rev. 3.2, dated 15 November 2012.

i) GTC, Oakenholt, Flint, ref. 24263, dated 04 August 2014.

j) Flintshire County Council, Tree Preservation Orders database search.

k) Environment Agency, 1m DTM 2022 LiDAR records.

THIS DRAWING SHOULD ONLY BE PRINTED IN COLOUR

REVISION BOX				
Rev.	Date	Revision	By	Appd.
A	30.08.23	Infiltration pit locations added to drawing.	OS	AW

coopers
chartered consulting engineers
Park House
Sandpiper Court
Chester Business Park
Chester
CH4 9QU
Tel: 01244 684910
Email: admin@coopers.co.uk
Web: http://coopers.co.uk

Client: Castle Green

Project: Quarry Farm, Leadbrook Drive, Oakenholt.

Title: SITE PLAN

DRAWING NUMBER: 8215 / 01

SCALE at A0	1:500	REVISION
DATE	13.07.23	A
DRAWN	AH	
CHECKED	AW	

SCALE BAR (m) 0 5 10 15 20 25 30 35 40 45 50

coopers
chartered consulting engineers

Coopers (Chester) Ltd
tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Site
QUARRY FARM, OAKENHOLT, FLINT

Trial Pit Number
ITP01

Machine : JCB 3CX

Method : Mechanical Excavation

Dimensions
2.30 x 0.60 x 2.00m

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8215

Location (Observed measurements)

Dates
16/08/2023

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	TOPSOIL. Grass over brown, slightly gravelly, clayey SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.		
					0.30			
0.40	SV 82kPa					Very weak, orangish brown mottled grey MUDSTONE, recovered as firm, slightly sandy, slightly gravelly, silty clay. Residual.		
0.45	B					At 0.40m: Ceramic land drain, approximately 75mm in diameter, orientated east to west. Dry		
						From 0.40m: Firm to stiff, high strength		
					(1.50)			
1.10	SV 94kPa							
					1.80			
1.90	B				(0.20)	Weak, greyish brown MUDSTONE, recovered as stiff, gravelly clay. Residual.		
					2.00			
						Complete at 2.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated for infiltration test and backfilled with single size stone and slotted pipe. Reinstated at surface with topsoil.
Trial pit location shown on Drawing No. 8215/01.

North	Scale (approx)	Logged By	Checked By
	1:25	ST	PRS

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chartered consulting engineers

Coopers (Chester) Ltd
tel: 01244 684 910
web: www.coopers.co.uk
email: admin@coopers.co.uk

Site
QUARRY FARM, OAKENHOLT, FLINT

Trial Pit Number
ITP02

Machine : JCB 3CX

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 2.30m.

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8215

Location (Observed measurements)

Dates
16/08/2023

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	TOPSOIL. Grass over brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.		
0.50	SV 88kPa				0.30	Firm, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to coarse. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies including coal. From 0.50m: Firm to stiff, high strength		
0.70	B				(0.70)			
0.90	SV 84kPa				1.00	Very weak, orangish brown mottled grey MUDSTONE, recovered as stiff, slightly sandy, gravelly, silty clay. Residual.		
1.10	B							
1.30	SV 164kPa					From 1.30m: Very stiff, very high strength		
					(1.30)			
					2.30	Complete at 2.30m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated for infiltration test and backfilled with single size stone and slotted pipe. Reinstated at surface with topsoil.
Trial pit location shown on Drawing No. 8215/01.

Scale (approx)	Logged By	Checked By
1:25	ST	PRS

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Site
QUARRY FARM, OAKENHOLT, FLINT

Trial Pit Number
ITP03

Machine : JCB 3CX

Method : Mechanical Excavation

Dimensions
2.50 x 0.60 x 1.40m.

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8215

Location (Observed measurements)

Dates
16/08/2023

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	TOPSOIL. Grass over brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.		
0.40	B				0.30			
0.60	SV 104kPa				(0.50)	Stiff, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies including coal. From 0.60m: High strength		
0.90	B				0.80	Weak, orangish brown and grey MUDSTONE, recovered as fine to coarse gravel with a high cobble content and boulder content in a clay matrix. Residual. From 1.00 - 1.40m: Recovered as cobbles and boulder of siltstone. Hard to dig		
					(0.60)			
					1.40	From 1.40m: Coal		
						Complete at 1.40m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Trial pit excavated for infiltration test and backfilled with single size stone and slotted pipe. Reinstated at surface with topsoil.
Trial pit location shown on Drawing No. 8215/01.

Scale (approx)	Logged By	Checked By
1:25	ST	PRS

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Site
QUARRY FARM, OAKENHOLT, FLINT

Trial Pit Number
ITP04

Machine : JCB 3CX

Method : Mechanical Excavation

Dimensions
2.40 x 0.60 x 2.00m.

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8215

Location (Observed measurements)

Dates
16/08/2023

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.30)	TOPSOIL. Grass over dark brown, slightly gravelly, clayey, fine to coarse SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.		
0.40	SV 102kPa				0.30	Stiff, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies including coal and mudstone. From 0.40m: High strength		
0.50	B				(0.70)			
0.80	SV 109kPa				1.00	Weak, grey MUDSTONE, recovered as very stiff clay with gravel of mudstone. Residual.		
1.20	B				(1.00)	From 1.60 - 2.00m: Recovered as fine to coarse gravel of mudstone		
					2.00	Complete at 2.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Smoking bucket at 2.00m.
Trial pit excavated for infiltration test and backfilled with single size stone and slotted pipe. Reinstated at surface with topsoil.
Trial pit shown on Drawing No. 8215/01.

Scale (approx)	Logged By	Checked By
1:25	ST	PRS

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Site
QUARRY FARM, OAKENHOLT, FLINT

Trial Pit Number
ITP05

Machine : JCB 3CX

Method : Mechanical Excavation

Dimensions
2.30 x 0.60 x 2.00m.

Ground Level (mOD)

Client
Castle Green Homes Ltd

Job Number
8215

Location (Observed measurements)

Dates
16/08/2023

Engineer
Coopers (Chester) Ltd

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10	B				(0.40)	TOPSOIL. Grass over brown, slightly gravelly, clayey SAND. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies.		
					0.40			
0.60	B				(0.60)	Stiff, reddish brown, slightly sandy, slightly gravelly, silty CLAY. Sand is fine to medium. Gravel is sub-angular to sub-rounded, fine to coarse of various lithologies including coal.		
					1.00			
1.30	B				(1.00)	Weak, orangish brown mottled grey MUDSTONE, recovered as very stiff, slightly sandy, slightly gravelly, silty clay. Residual. From 1.60 - 2.00m: Competent bedrock of mudstone		
					2.00	Complete at 2.00m		

Remarks

Location CAT scanned prior to excavation.
Sides stable during excavation.
No groundwater encountered during excavation.
Please note that discolouration of photographs may occur when viewed on screen as a PDF, or when printed as a hard copy.
Smoking bucket at 1.60m on the north face of the trial pit. Smoking bucket at 2.00m across whole of pit.
Trial pit excavated for infiltration test and backfilled with single size stone and slotted pipe. Reinstated at surface with topsoil.
Trial pit location shown on Drawing No. 8215/01.

North	Scale (approx)	Logged By	Checked By
←	1:25	ST	PRS

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Date of Test: 16th August 2023

Produced by: S Thomas

Coopers

Consulting Engineers

QUARRY FARM, OAKENHOLT, FLINT

INFILTRATION TEST PIT No 1 (Test 1)

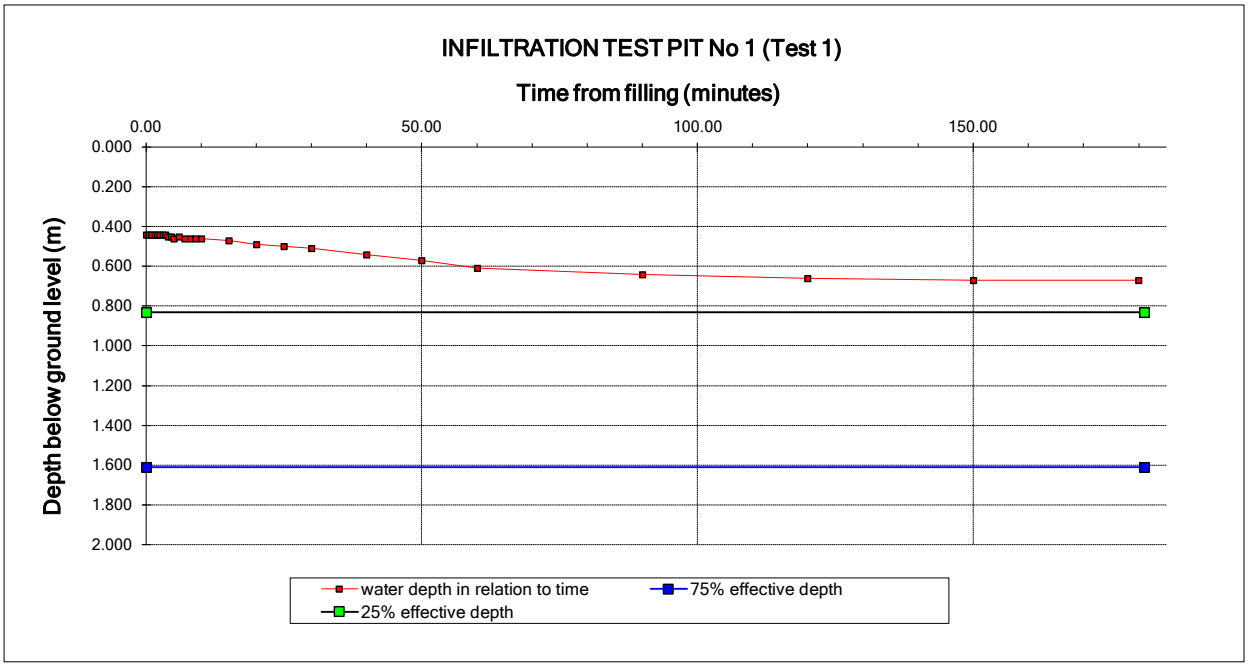
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.440
0	00	30	0.50	0.440
0	01	00	1.00	0.440
0	01	30	1.50	0.440
0	02	00	2.00	0.440
0	02	30	2.50	0.440
0	03	00	3.00	0.440
0	03	30	3.50	0.440
0	04	00	4.00	0.450
0	04	30	4.50	0.450
0	05	00	5.00	0.460
0	06	00	6.00	0.450
0	07	00	7.00	0.460
0	08	00	8.00	0.460
0	09	00	9.00	0.460
0	10	00	10.00	0.460
0	15	00	15.00	0.470
0	20	00	20.00	0.490
0	25	00	25.00	0.500
0	30	00	30.00	0.510
0	40	00	40.00	0.540
0	50	00	50.00	0.570
1	00	00	60.00	0.610
1	30	00	90.00	0.640
2	00	00	120.00	0.660
2	30	00	150.00	0.670
3	00	00	180.00	0.670

Test Pit Dimensions

Test Pit Length	2.30 m
Test Pit Width	0.60 m
Test Pit Depth	2.00 m
Standing Water Level	m

Infiltration Parameters

Total Depth	1.560 m
Total Effective Depth	1.560 m
25% Depth	0.830 m
75% Depth	1.610 m
25% Time	FAIL min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Chester, CH4 9QU

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Date of Test: 16th August 2023

Produced by: S Thomas

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QUARRY FARM, OAKENHOLT, FLINT
INFILTRATION TEST PIT No 2 (Test 1)

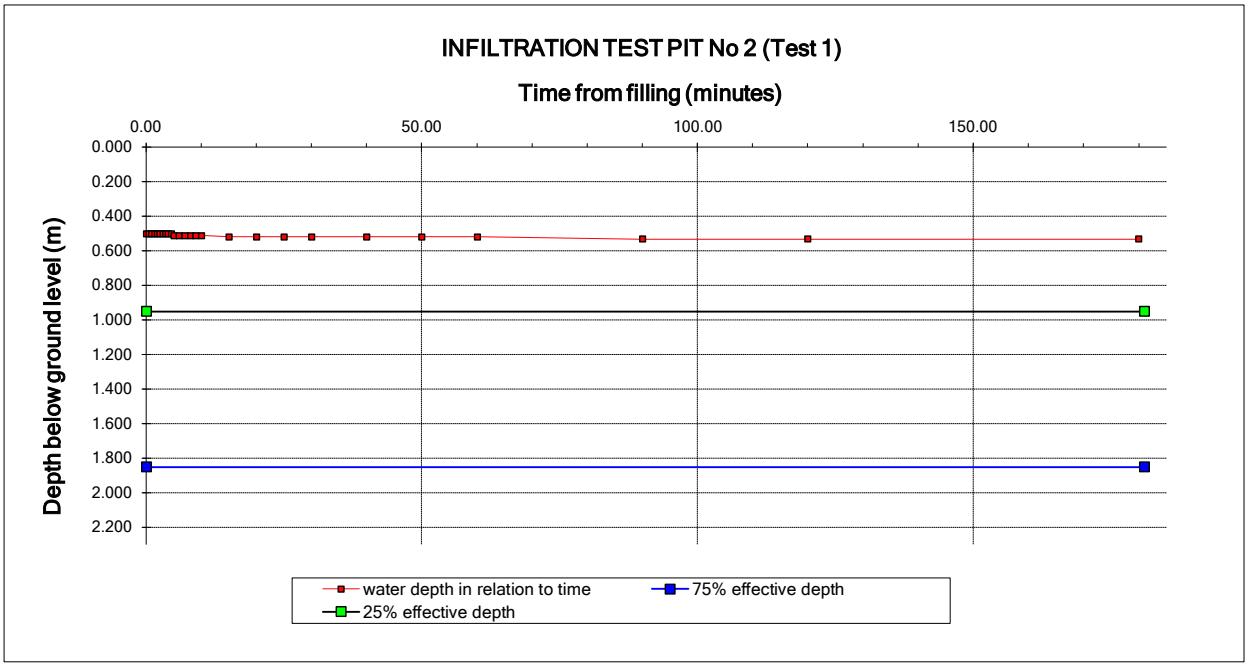
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.500
0	00	30	0.50	0.500
0	01	00	1.00	0.500
0	01	30	1.50	0.500
0	02	00	2.00	0.500
0	02	30	2.50	0.500
0	03	00	3.00	0.500
0	03	30	3.50	0.500
0	04	00	4.00	0.500
0	04	30	4.50	0.500
0	05	00	5.00	0.510
0	06	00	6.00	0.510
0	07	00	7.00	0.510
0	08	00	8.00	0.510
0	09	00	9.00	0.510
0	10	00	10.00	0.510
0	15	00	15.00	0.520
0	20	00	20.00	0.520
0	25	00	25.00	0.520
0	30	00	30.00	0.520
0	40	00	40.00	0.520
0	50	00	50.00	0.520
1	00	00	60.00	0.520
1	30	00	90.00	0.530
2	00	00	120.00	0.530
3	00	00	180.00	0.530

Test Pit Dimensions

Test Pit Length	2.50 m
Test Pit Width	0.60 m
Test Pit Depth	2.30 m
Standing Water Level	m

Infiltration Parameters

Total Depth	1.800 m
Total Effective Depth	1.800 m
25% Depth	0.950 m
75% Depth	1.850 m
25% Time	FAIL min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Date of Test: 16th August 2023

Produced by: S Thomas

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QUARRY FARM, OAKENHOLT, FLINT
INFILTRATION TEST PIT No 3 (Test 1)

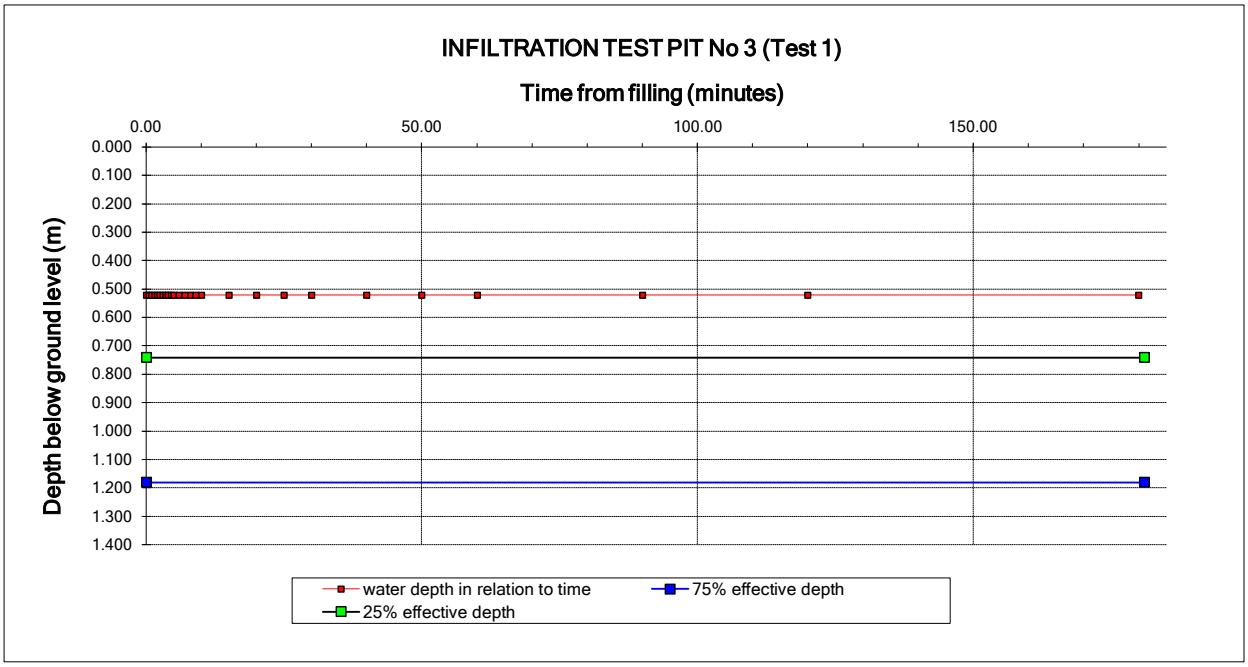
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.520
0	00	30	0.50	0.520
0	01	00	1.00	0.520
0	01	30	1.50	0.520
0	02	00	2.00	0.520
0	02	30	2.50	0.520
0	03	00	3.00	0.520
0	03	30	3.50	0.520
0	04	00	4.00	0.520
0	04	30	4.50	0.520
0	05	00	5.00	0.520
0	06	00	6.00	0.520
0	07	00	7.00	0.520
0	08	00	8.00	0.520
0	09	00	9.00	0.520
0	10	00	10.00	0.520
0	15	00	15.00	0.520
0	20	00	20.00	0.520
0	25	00	25.00	0.520
0	30	00	30.00	0.520
0	40	00	40.00	0.520
0	50	00	50.00	0.520
1	00	00	60.00	0.520
1	30	00	90.00	0.520
2	00	00	120.00	0.520
3	00	00	180.00	0.520

Test Pit Dimensions

Test Pit Length	2.50	m
Test Pit Width	0.60	m
Test Pit Depth	1.40	m
Standing Water Level		m

Infiltration Parameters

Total Depth	0.880	m
Total Effective Depth	0.880	m
25% Depth	0.740	m
75% Depth	1.180	m
25% Time	FAIL	min
75% Time	FAIL	min
Free Volume	FAIL	cu.m
Surface Area	FAIL	sq.m
Time of Outflow	FAIL	min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Date of Test: 17th August 2023

Produced by: S Thomas

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QUARRY FARM, OAKENHOLT, FLINT

INFILTRATION TEST PIT No 4 (Test 1)

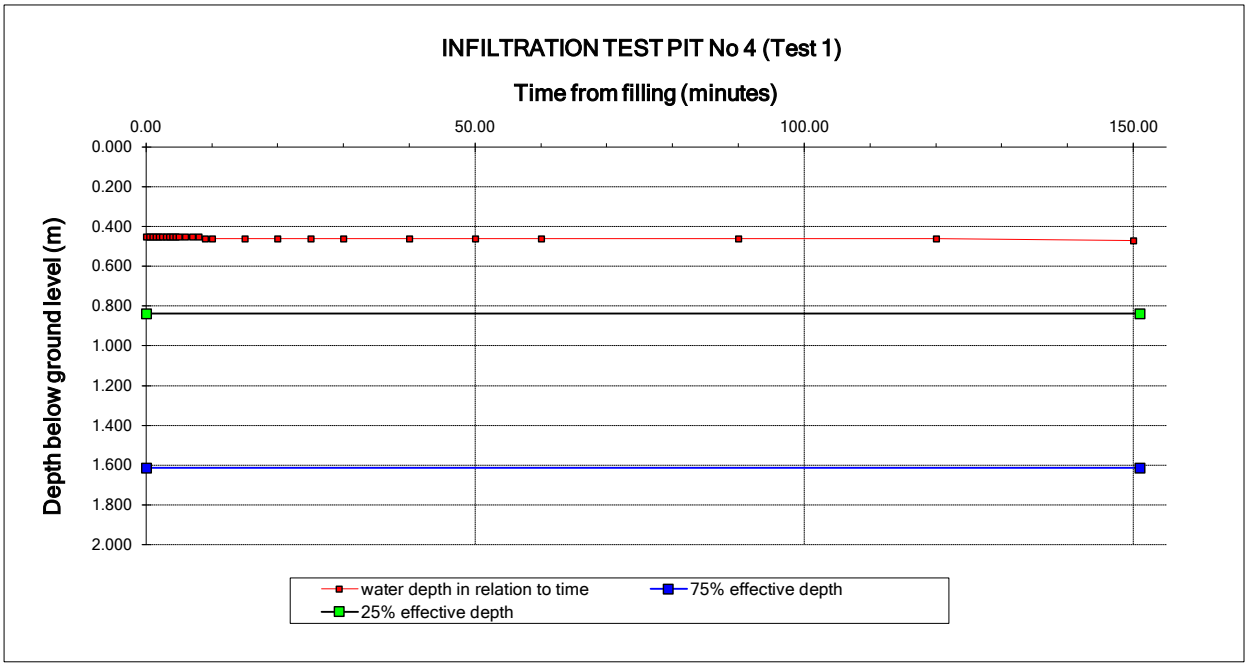
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.450
0	00	30	0.50	0.450
0	01	00	1.00	0.450
0	01	30	1.50	0.450
0	02	00	2.00	0.450
0	02	30	2.50	0.450
0	03	00	3.00	0.450
0	03	30	3.50	0.450
0	04	00	4.00	0.450
0	04	30	4.50	0.450
0	05	00	5.00	0.450
0	06	00	6.00	0.450
0	07	00	7.00	0.450
0	08	00	8.00	0.450
0	09	00	9.00	0.460
0	10	00	10.00	0.460
0	15	00	15.00	0.460
0	20	00	20.00	0.460
0	25	00	25.00	0.460
0	30	00	30.00	0.460
0	40	00	40.00	0.460
0	50	00	50.00	0.460
1	00	00	60.00	0.460
1	30	00	90.00	0.460
2	00	00	120.00	0.460
2	30	00	150.00	0.470

Test Pit Dimensions

Test Pit Length	2.40	m
Test Pit Width	0.60	m
Test Pit Depth	2.00	m
Standing Water Level		m

Infiltration Parameters

Total Depth	1.550	m
Total Effective Depth	1.550	m
25% Depth	0.838	m
75% Depth	1.613	m
25% Time	FAIL	min
75% Time	FAIL	min
Free Volume	FAIL	cu.m
Surface Area	FAIL	sq.m
Time of Outflow	FAIL	min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Date of Test: 17th August 2023

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QUARRY FARM, OAKENHOLT, FLINT

INFILTRATION TEST PIT No 5 (Test 1)

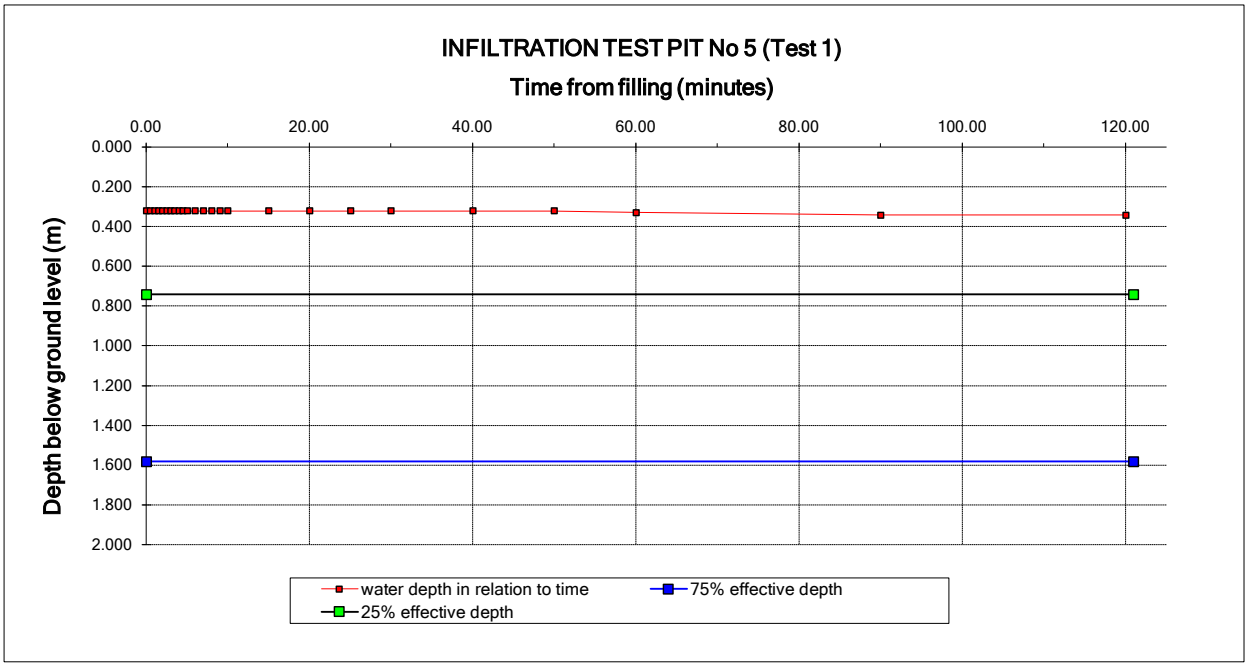
Time of reading			Absolute Time	Depth below Ground level
hrs	min	sec	mins	m
0	00	00	0.00	0.320
0	00	30	0.50	0.320
0	01	00	1.00	0.320
0	01	30	1.50	0.320
0	02	00	2.00	0.320
0	02	30	2.50	0.320
0	03	00	3.00	0.320
0	03	30	3.50	0.320
0	04	00	4.00	0.320
0	04	30	4.50	0.320
0	05	00	5.00	0.320
0	06	00	6.00	0.320
0	07	00	7.00	0.320
0	08	00	8.00	0.320
0	09	00	9.00	0.320
0	10	00	10.00	0.320
0	15	00	15.00	0.320
0	20	00	20.00	0.320
0	25	00	25.00	0.320
0	30	00	30.00	0.320
0	40	00	40.00	0.320
0	50	00	50.00	0.320
1	00	00	60.00	0.330
1	30	00	90.00	0.340
2	00	00	120.00	0.340

Test Pit Dimensions

Test Pit Length	2.30 m
Test Pit Width	0.60 m
Test Pit Depth	2.00 m
Standing Water Level	m

Infiltration Parameters

Total Depth	1.680 m
Total Effective Depth	1.680 m
25% Depth	0.740 m
75% Depth	1.580 m
25% Time	FAIL min
75% Time	FAIL min
Free Volume	FAIL cu.m
Surface Area	FAIL sq.m
Time of Outflow	FAIL min



Soil infiltration Rate	**N/A**	**m/hr**
	N/A	**m/sec**

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Appendix 4

Correspondence

Dwr Cymru Welsh Water Historical Flooding

Flintshire County Council Historical Flooding

Natural Resources Wales Historical Flooding

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
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Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Mr S McBridge
Castle Green
Unit 20
St Asaph Business Park,
St Asaph,
Denbighshire
LL17 0LJ

Date: 16/01/2023
Our Ref: PPA0008445

Dear Mr McBridge

Grid Ref: 325849 371583
Site Address: Land at Quarry Farm, Oakenholt, Flintshire
Development: Erection of 128 Dwellings, Construction new vehicular accesses, landscaping & associated works

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

APPRAISAL

Firstly, we note that the proposal relates to 128 dwellings at Oakenholt and acknowledge that the site comprises of a potential windfall development with no allocated status in the Local Development Plan (LDP). Accordingly, whilst it does not appear an assessment has been previously undertaken of the public sewerage and watermains systems, we offer the following comments as part of our appraisal of this development.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a separate sewerage system, comprising combined, foul and surface water public sewers, which drains to Flint Wastewater Treatment Works (WwTW) via Oakenholt Main Sewerage Pumping Station (SPS).

You are also advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site.

Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

Surface Water Drainage

Having discussed the proposed drainage strategy in detail, we note that you propose to discharge surface water to the nearby surface water sewer, at an attenuated rate of 5 l/s. In principle we offer no objection to this proposal, however for the avoidance of doubt we advise that as of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy which states that discharge to a combined sewer shall only be made as a last resort. Disposal should be made through the hierarchical approach, preferring infiltration and, where infiltration is not possible, disposal to a surface water drainage body in liaison with the Land Drainage Authority and/or Natural Resources Wales.

It is therefore recommended that the developer consult with Flintshire Council, as the determining SuDS Approval Body (SAB), in relation to their proposals for SuDS features. Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public sewerage system. We advise that the flows should be connected to the combined sewer at or downstream of manholes SJ25719882 located in Chester Road to the north. Should a planning application be submitted for this development we will seek to control these points of communication via appropriate planning conditions and therefore recommend that any drainage layout or strategy submitted as part of your application takes this into account. However, should you wish for an alternative connection point to be considered please provide further information to us in the form of a drainage strategy, preferably in advance of a planning application being submitted.

SEWAGE TREATMENT

No problems are envisaged with the Waste Water Treatment Works for the treatment of domestic discharges from this site.

WATER SUPPLY

Capacity is currently available in the water supply system to accommodate the development. Initial indications are that a connection can be made from the '315mm HPPE' diameter watermain in 325798, 371692 location. We reserve the right however to reassess our position as part of the formal application for the provision of new water mains under Section 41 and Section 51 of the Water Industry Act (1991) to ensure there is sufficient capacity available to serve the development without causing detriment to existing customers' supply as demands upon our water systems change continually.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

Please note that our response is based on the information provided in your enquiry and should the information change we reserve the right to make a new representation. Should you have any queries or wish to discuss any aspect of our response please do not hesitate to contact our dedicated team of planning officers, either on 0800 917 2652 or via email at **developer.services@dwrcymru.com**

Please quote our reference number in all communications and correspondence.

Yours faithfully,

Owain George
Planning Liaison Manager
Developer Services

ENC. SEWER PLAN
WATER PLAN
PRE PLANNING NOTES

***Please Note** that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.*

Andy Jones

From: Environmental Information Requests <EnvironmentalInformationRequests@dwrcymru.com>
Sent: 05 July 2023 11:50
To: Andy Jones
Subject: RE: FCA Historical Flood Information

Our Reference: EIR/1528/2023

Dear Andy Jones,

Request for information
Re: 8211 Land Off Chester Road / Leadbrook Drive, Oakenholt, Flint, Flintshire, Wales, CH6 5ST, United Kingdom. SJ258716

We write further to your request for information dated 20th June 2023, which we have been considering under the Environmental Information Regulations 2004.

We can confirm that we have reviewed our flooding database and we have no flooding risk within the location or vicinity requested. We have however, had instances of flooding in the area due to blockages which have now been resolved.

Turning to your query on specific drainage requirements, we have a dedicated Planning Team within our Developer Services function that can provide advice on the capacity in our infrastructure to accommodate new development.

Our pre-planning service will review the capacity available in our sewerage network, wastewater treatment works and clean water network to accommodate the flows/demand from a proposed development. It will also raise awareness of any of our assets crossing the site which will need to be factored into the layout of your development and provide general advice on surface water drainage.

An application for pre-planning advice can be submitted online via the following address https://developers.dwrcymru.com/en/applications/planning/pre-planning. If you wish to discuss in more detail our Planning Team are contactable on 08009172652 or alternatively by email developer.services@dwrcymru.com.

We hope that this response is clear. Should you have any questions, please contact us by email at EnvironmentalInformationRequests@dwrcymru.com.

If you are dissatisfied with the handling of your request, you have the right to ask for an internal review. Internal review requests should be submitted within 40 working days of the date of receipt of this response and should be addressed to Company Secretary, Linea, Fortran Road, St Mellons, Cardiff CF3 0LT.

If you are not content with the outcome of the internal review, you have the right to apply directly to the Information Commissioner for a decision.

Yours faithfully

Dŵr Cymru Welsh Water

From: Andy Jones <ajones@coopers.co.uk>
Sent: Tuesday, June 20, 2023 11:20 AM

Andy Jones

From: Neil L Parry (S&T - Drainage) <Neil.L.Parry@Flintshire.Gov.UK>
Sent: 05 July 2023 10:26
To: Andy Jones; Flood Risk Management
Subject: RE: EXTERNAL FCA Historical Flood Information

Morning Andy

I refer to your enquiry pertinent to Chester Road / Leadbrook Drive, Oakenholt.

I have consulted with colleagues and none of us has any recollection of flooding at this location which would help inform a FCA.

Kind regards

Neil.

From: Flood Risk Management <FloodRiskManagement@flintshire.gov.uk>
Sent: 29 June 2023 10:08
To: Neil L Parry (S&T - Drainage) <Neil.L.Parry@Flintshire.Gov.UK>
Subject: FW: EXTERNAL FCA Historical Flood Information

Hi Neil,

Are you able to help with this enquiry please re: flooding info.

Thanks
Diane

Diane Strong
Information Technician / Technogydd Gwybodaeth
Built Conservation Section / Chadwraeth Adeiledig
Planning, Environment & Economy / Cynllunio, Amgylchedd ac Economi
Flintshire County Council / Cyngor Sir y Fflint
County Hall / Neuadd y Sir
Mold / Yr Wyddgrug CH7 6NF
_____
Tel/Ffon: 01352 703218 / **07770 211401**
Welsh/Cymraeg: 01267 224923

E-mail/Ebost: diane.strong@flintshire.gov.uk / diane.strong@siryfflint.gov.uk

http://www.flintshire.gov.uk / http://www.siryfflint.gov.uk

From: Andy Jones <ajones@coopers.co.uk>
Sent: 20 June 2023 11:32
To: SAB <SAB@flintshire.gov.uk>
Cc: Info <info@aura.wales>
Subject: EXTERNAL FCA Historical Flood Information

8211 Land Off Chester Road / Leadbrook Drive, Oakenholt, Flint, Flintshire, Wales, CH6 5ST, United Kingdom
SJ258716
FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment for the above site (see attached Site Location Plan) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.

Regards

Andy Jones
Senior Infrastructure Engineer
COOPERS
Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

☎: (01244) 684910 ☎: Direct Dial No. (01244) 684933
🖷: (01244) 684911
✉: ajones@coopers.co.uk
Web: http://www.coopers.co.uk

********** Rydym yn croesawu gohebiaeth yn y Gymraeg a'r Saesneg a byddwn yn ymateb i ohebiaeth yn yr un iaith. Ni fydd y defnydd o'r naill iaith yn arwain at oedi. Mae'r e-bost hwn, gan gynnwys unrhyw atodiadau, yn breifat a chyfrinachol ac ni ddylid ei rannu heb ganiatâd yr anfonwr. Os derbynioch chi'r e-bost hwn ar gam, rhowch wybod i'r anfonwr a dileu'r e-bost. Os cyflwynir unrhyw farn, cyngor, casgliadau ac unrhyw wybodaeth arall yn y neges hon nad oes a wnelo â busnes swyddogol Cyngor Sir y Fflint, deellir nad ydynt wedi'u rhoi na'u cymeradwyo ganddo nac ar ei ran, ac felly ni fydd Cyngor Sir y Fflint yn derbyn unrhyw gyfrifoldeb o gwbl amdanynt. We welcome correspondence in Welsh and English and you will receive a response in the same language. Use of either language will not lead to a delay. This email, including any attachments, is private and confidential and should not be shared without permission from the sender. If you have received this message in error, please notify the sender and delete it from your account.

Andy Jones

From: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Sent: 20 June 2023 11:29
To: Andy Jones
Subject: RE: FCA Historical Flood Information
Attachments: Briefing Note Flood Products - External.pdf; Flood Products FAQs V3.pdf; NRW Flood Product Descriptions.pdf

Dear Mr Jones,

Thank you for your email concerning the above.

Historical information is available here – Recorded Flood Extents | DataMapWales (gov.wales)

Do you still require any flood model data? Please see attached documentation and let me know if you do.

We look forward to hearing from you in due course.

Enw / Name Michelle Lewis
Teitl swydd / Job title Data Licensing Officer
Adran / Department Customer, Communications and Commercial
Rhif ffôn / Phone number 07917243096
Dyddiau gweithio (os yn berthnasol) / Working days Mon-Fri

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: Andy Jones <ajones@coopers.co.uk>
Sent: 20 June 2023 11:21
To: Data Distribution <datadistribution@cyfoethnaturiolcymru.gov.uk>
Subject: FCA Historical Flood Information

8211 Land Off Chester Road / Leadbrook Drive, Oakenholt, Flint, Flintshire, Wales, CH6 5ST, United Kingdom
SJ258716
FCA Historical Flood Information

To whom it may concern

We are undertaking a Flood Consequences Assessment for the above site (see attached Site Location Plan) and request any information you may have in relation to historical flooding or any information you may consider relevant to assist with the production of the FCA report.

Please let me know if you require any further information or please contact me on the details below should you want to discuss further.

Regards

Andy Jones
Senior Infrastructure Engineer
COOPERS
Park House, Sandpiper Court, Chester Business Park, Chester, CH4 9QU

☎: (01244) 684910 ☎: Direct Dial No. (01244) 684933
🖷: (01244) 684911
✉: ajones@coopers.co.uk
Web: http://www.coopers.co.uk

DataMapWales

Sign in

Home > New map

Appendix 5

Calculations

Source Control Greenfield Run-off Calculation (1ha)

Surface Water Design – Causeway Flow Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Andy Jones
Site name:	Quarry Farm
Site location:	Oakenhall, Flint

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	53.23672° N
Longitude:	3.11229° W
Reference:	3264946486
Date:	Sep 13 2023 17:35

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	741	741
Hydrological region:	9	9
Growth curve factor 1 year:	0.88	0.88
Growth curve factor 30 years:	1.78	1.78
Growth curve factor 100 years:	2.18	2.18
Growth curve factor 200 years:	2.46	2.46

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	5.16	5.16
1 in 1 year (l/s):	4.54	4.54
1 in 30 years (l/s):	9.19	9.19
1 in 100 year (l/s):	11.25	11.25
1 in 200 years (l/s):	12.69	12.69

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.350	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
101	0.108	5.00	26.870	1500	325877.280	371434.117	1.500
102	0.063	5.00	26.686	1500	325874.995	371419.609	1.800
103	0.009	5.00	25.934	1500	325856.519	371417.644	1.800
104	0.023	5.00	25.364	1800	325846.531	371413.282	3.847
105	0.058	5.00	24.797	2100	325836.985	371407.177	3.608
106	0.052	5.00	23.500	2400	325815.277	371385.690	2.317
107	0.026	5.00	23.843	2400	325816.921	371401.222	2.706
108	0.022	5.00	23.150	2400	325809.405	371417.324	2.062
109	0.000		22.000		325796.955	371425.365	1.000

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	101	102	14.687	0.600	25.370	24.886	0.484	30.3	300	5.09	50.0
1.001	102	103	18.580	0.600	24.886	24.134	0.752	24.7	300	5.18	50.0
1.002	103	104	10.899	0.600	24.134	23.017	1.117	9.8	300	5.22	50.0
1.003	104	105	11.331	0.600	21.517	21.489	0.028	400.0	750	5.35	50.0
1.004	105	107	20.929	0.600	21.189	21.137	0.052	400.0	1050	5.56	50.0
2.000	106	107	15.619	0.600	21.183	21.144	0.039	400.0	1050	5.15	50.0
1.005	107	108	17.770	0.600	21.137	21.093	0.044	400.0	1050	5.73	50.0
1.006	108	109	13.167	0.600	21.088	21.000	0.088	149.6	300	5.90	50.0

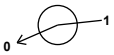
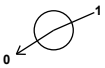
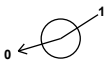
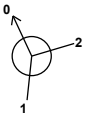
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.864	202.5	14.6	1.200	1.500	0.108	0.0	54	1.688
1.001	3.175	224.5	23.2	1.500	1.500	0.171	0.0	65	2.076
1.002	5.061	357.7	24.4	1.500	2.047	0.180	0.0	52	2.929
1.003	1.393	615.3	27.5	3.097	2.558	0.203	0.0	107	0.720
1.004	1.717	1486.3	35.4	2.558	1.656	0.261	0.0	109	0.742
2.000	1.717	1486.3	7.0	1.267	1.649	0.052	0.0	51	0.458
1.005	1.717	1486.3	45.9	1.656	1.007	0.339	0.0	124	0.799
1.006	1.283	90.7	48.9	1.762	0.700	0.361	0.0	157	1.305

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	14.687	30.3	300	Circular_Default Sewer Type	26.870	25.370	1.200	26.686	24.886	1.500
1.001	18.580	24.7	300	Circular_Default Sewer Type	26.686	24.886	1.500	25.934	24.134	1.500
1.002	10.899	9.8	300	Circular_Default Sewer Type	25.934	24.134	1.500	25.364	23.017	2.047
1.003	11.331	400.0	750	Circular_Default Sewer Type	25.364	21.517	3.097	24.797	21.489	2.558
1.004	20.929	400.0	1050	Circular_Default Sewer Type	24.797	21.189	2.558	23.843	21.137	1.656
2.000	15.619	400.0	1050	Circular_Default Sewer Type	23.500	21.183	1.267	23.843	21.144	1.649
1.005	17.770	400.0	1050	Circular_Default Sewer Type	23.843	21.137	1.656	23.150	21.093	1.007
1.006	13.167	149.6	300	Circular_Default Sewer Type	23.150	21.088	1.762	22.000	21.000	0.700

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	101	1500	Manhole	Adoptable	102	1500	Manhole	Adoptable
1.001	102	1500	Manhole	Adoptable	103	1500	Manhole	Adoptable
1.002	103	1500	Manhole	Adoptable	104	1800	Manhole	Adoptable
1.003	104	1800	Manhole	Adoptable	105	2100	Manhole	Adoptable
1.004	105	2100	Manhole	Adoptable	107	2400	Manhole	Adoptable
2.000	106	2400	Manhole	Adoptable	107	2400	Manhole	Adoptable
1.005	107	2400	Manhole	Adoptable	108	2400	Manhole	Adoptable
1.006	108	2400	Manhole	Adoptable	109		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
101	325877.280	371434.117	26.870	1.500	1500	 0	1.000	25.370	300
102	325874.995	371419.609	26.686	1.800	1500	 1	1.000	24.886	300
						0	1.001	24.886	300
103	325856.519	371417.644	25.934	1.800	1500	 1	1.001	24.134	300
						0	1.002	24.134	300
104	325846.531	371413.282	25.364	3.847	1800	 1	1.002	23.017	300
						0	1.003	21.517	750
105	325836.985	371407.177	24.797	3.608	2100	 1	1.003	21.489	750
						0	1.004	21.189	1050
106	325815.277	371385.690	23.500	2.317	2400	 0	2.000	21.183	1050
107	325816.921	371401.222	23.843	2.706	2400	 1	2.000	21.144	1050
						2	1.004	21.137	1050
						0	1.005	21.137	1050

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
108	325809.405	371417.324	23.150	2.062	2400	1	1.005	21.093	1050
						0	1.006	21.088	300
109	325796.955	371425.365	22.000	1.000		1	1.006	21.000	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	✓
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	18.000	Starting Level (m)	
Ratio-R	0.350	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Normal		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 108 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	21.088	Product Number	CTL-SHE-0080-3500-1600-3500
Design Depth (m)	1.600	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.5	Min Node Diameter (mm)	1200

Node 106 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	21.183
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	72.0	0.0	1.600	72.0	0.0	1.601	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	101	10	25.421	0.051	13.1	0.1643	0.0000	OK
15 minute winter	102	10	24.951	0.065	20.6	0.1603	0.0000	OK
15 minute winter	103	10	24.186	0.052	21.5	0.0973	0.0000	OK
15 minute winter	104	11	21.620	0.103	24.1	0.2753	0.0000	OK
120 minute winter	105	104	21.387	0.198	10.9	0.7479	0.0000	OK
120 minute winter	106	102	21.387	0.204	7.9	15.6694	0.0000	OK
120 minute winter	107	102	21.387	0.250	11.0	1.1769	0.0000	OK
120 minute winter	108	102	21.387	0.299	4.0	1.4144	0.0000	OK
15 minute summer	109	1	21.000	0.000	2.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	101	1.000	102	13.0	1.358	0.064	0.1408	
15 minute winter	102	1.001	103	20.4	2.109	0.091	0.1800	
15 minute winter	103	1.002	104	21.3	2.711	0.060	0.0856	
15 minute winter	104	1.003	105	24.1	0.723	0.039	0.3780	
120 minute winter	105	1.004	107	9.9	0.306	0.007	2.8149	
120 minute winter	106	2.000	107	-5.8	0.197	-0.004	2.0909	
120 minute winter	107	1.005	108	3.1	0.321	0.002	3.1435	
120 minute winter	108	Hydro-Brake®	109	3.0				43.2

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	101	10	25.452	0.082	31.9	0.2617	0.0000	OK
15 minute winter	102	10	24.991	0.104	50.3	0.2578	0.0000	OK
15 minute winter	103	10	24.218	0.084	52.6	0.1572	0.0000	OK
240 minute winter	104	236	21.810	0.293	12.5	0.7806	0.0000	OK
240 minute winter	105	236	21.810	0.621	15.9	2.3507	0.0000	OK
240 minute winter	106	236	21.810	0.627	11.2	48.2660	0.0000	OK
240 minute winter	107	236	21.810	0.673	15.7	3.1741	0.0000	OK
240 minute winter	108	236	21.810	0.722	4.9	3.4203	0.0000	SURCHARGED
15 minute summer	109	1	21.000	0.000	3.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	101	1.000	102	31.7	1.705	0.156	0.2739	
15 minute winter	102	1.001	103	49.9	2.633	0.222	0.3529	
15 minute winter	103	1.002	104	52.2	3.438	0.146	0.1657	
240 minute winter	104	1.003	105	12.4	0.595	0.020	1.9215	
240 minute winter	105	1.004	107	14.1	0.324	0.009	11.6751	
240 minute winter	106	2.000	107	-8.0	-0.075	-0.005	8.7062	
240 minute winter	107	1.005	108	3.6	0.233	0.002	10.7711	
240 minute winter	108	Hydro-Brake®	109	3.0				75.0

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.63%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	101	10	25.489	0.119	61.8	0.3826	0.0000	OK
15 minute winter	102	10	25.040	0.154	97.5	0.3797	0.0000	OK
15 minute winter	103	10	24.258	0.124	102.0	0.2314	0.0000	OK
360 minute winter	104	352	23.150	1.633	18.0	4.3503	0.0000	SURCHARGED
360 minute winter	105	344	23.150	1.961	21.8	7.4233	0.0000	SURCHARGED
360 minute winter	106	344	23.150	1.967	19.6	125.0184	0.0000	SURCHARGED
360 minute winter	107	344	23.152	2.015	20.6	9.5020	0.0000	SURCHARGED
360 minute winter	108	344	23.150	2.062	6.9	9.7675	0.4029	FLOOD
15 minute summer	109	1	21.000	0.000	3.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	101	1.000	102	61.4	1.968	0.303	0.4589	
15 minute winter	102	1.001	103	96.8	3.035	0.431	0.5931	
15 minute winter	103	1.002	104	101.4	4.030	0.283	0.2745	
360 minute winter	104	1.003	105	16.7	0.592	0.027	4.9870	
360 minute winter	105	1.004	107	18.3	0.322	0.012	18.0541	
360 minute winter	106	2.000	107	-16.1	-0.118	-0.011	13.4735	
360 minute winter	107	1.005	108	6.9	0.286	0.005	15.3291	
360 minute winter	108	Hydro-Brake®	109	3.9				113.7

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.350	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
201	0.070	5.00	26.927	1500	325878.406	371476.041	2.350
202	0.041	5.00	26.723	1500	325876.192	371491.751	2.750
203	0.012	5.00	25.710	2400	325853.660	371487.639	5.044
204	0.048	5.00	24.961	2400	325839.552	371483.010	4.332
205	0.057	5.00	23.986	2400	325824.301	371475.219	3.400
206	0.052	5.00	23.054	2400	325811.859	371468.010	5.981
207	0.077	5.00	21.396	2400	325789.828	371456.143	4.386
208	0.114	5.00	25.516	1500	325867.190	371523.812	3.150
209	0.054	5.00	24.455	2400	325859.764	371543.950	5.624
210	0.082	5.00	23.196	2400	325843.464	371563.258	4.578
211	0.012	5.00	22.690	2400	325821.098	371545.675	4.143
212	0.012	5.00	22.221	2400	325811.101	371539.035	3.704
213	0.084	5.00	21.606	2400	325799.869	371533.783	3.120
214	0.059	5.00	20.497	2400	325778.562	371527.601	3.603
215	0.157	5.00	19.327	2400	325757.652	371517.786	2.491
216	0.000		17.100		325742.665	371523.565	0.300

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	201	202	15.865	0.600	24.577	23.973	0.604	26.3	450	5.07	50.0
1.001	202	203	22.904	0.600	23.973	23.066	0.907	25.3	450	5.16	50.0
1.002	203	204	14.848	0.600	20.666	20.629	0.037	400.0	1350	5.28	50.0
1.003	204	205	17.126	0.600	20.629	20.586	0.043	400.0	1350	5.43	50.0
1.004	205	206	14.380	0.600	20.586	19.773	0.813	17.7	300	5.49	50.0
1.005	206	207	25.024	0.600	17.073	17.010	0.063	400.0	1500	5.69	50.0
1.006	207	215	69.535	0.600	17.010	16.836	0.174	400.0	1500	6.23	50.0
2.000	208	209	21.464	0.600	22.366	21.531	0.835	25.7	450	5.09	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	3.979	632.8	9.5	1.900	2.300	0.070	0.0	38	1.490
1.001	4.058	645.4	15.0	2.300	2.194	0.111	0.0	47	1.731
1.002	2.004	2868.8	16.7	3.694	2.982	0.123	0.0	72	0.572
1.003	2.004	2868.8	23.2	2.982	2.050	0.171	0.0	83	0.630
1.004	3.756	265.5	30.9	3.100	2.981	0.228	0.0	69	2.543
1.005	2.138	3778.4	37.9	4.481	2.886	0.280	0.0	103	0.721
1.006	2.138	3778.4	48.4	2.886	0.991	0.357	0.0	115	0.774
2.000	4.022	639.7	15.4	2.700	2.474	0.114	0.0	48	1.736

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.001	209	210	25.268	0.600	18.831	18.768	0.063	400.0	1350	5.30	50.0
2.002	210	211	28.450	0.600	18.618	18.547	0.071	400.0	1500	5.52	50.0
2.003	211	212	12.001	0.600	18.547	18.517	0.030	400.0	1500	5.61	50.0
2.004	212	213	12.399	0.600	18.517	18.486	0.031	400.0	1500	5.71	50.0
2.005	213	214	22.186	0.600	18.486	18.094	0.392	56.6	300	5.89	50.0
2.006	214	215	23.099	0.600	16.894	16.836	0.058	400.0	1500	6.07	50.0
1.007	215	216	8.639	0.600	16.836	16.800	0.036	240.0	300	6.37	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.001	2.004	2868.8	22.8	4.274	3.078	0.168	0.0	83	0.627
2.002	2.138	3778.4	33.9	3.078	2.643	0.250	0.0	97	0.695
2.003	2.138	3778.4	35.5	2.643	2.204	0.262	0.0	99	0.705
2.004	2.138	3778.4	37.1	2.204	1.620	0.274	0.0	101	0.714
2.005	2.094	148.0	48.5	2.820	2.103	0.358	0.0	118	1.883
2.006	2.138	3778.4	56.5	2.103	0.991	0.417	0.0	124	0.810
1.007	1.010	71.4	126.2	2.191	0.000	0.931	0.0	300	1.023

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.865	26.3	450	Circular_Default Sewer Type	26.927	24.577	1.900	26.723	23.973	2.300
1.001	22.904	25.3	450	Circular_Default Sewer Type	26.723	23.973	2.300	25.710	23.066	2.194
1.002	14.848	400.0	1350	Circular_Default Sewer Type	25.710	20.666	3.694	24.961	20.629	2.982
1.003	17.126	400.0	1350	Circular_Default Sewer Type	24.961	20.629	2.982	23.986	20.586	2.050
1.004	14.380	17.7	300	Circular_Default Sewer Type	23.986	20.586	3.100	23.054	19.773	2.981
1.005	25.024	400.0	1500	Circular_Default Sewer Type	23.054	17.073	4.481	21.396	17.010	2.886
1.006	69.535	400.0	1500	Circular_Default Sewer Type	21.396	17.010	2.886	19.327	16.836	0.991
2.000	21.464	25.7	450	Circular_Default Sewer Type	25.516	22.366	2.700	24.455	21.531	2.474
2.001	25.268	400.0	1350	Circular_Default Sewer Type	24.455	18.831	4.274	23.196	18.768	3.078
2.002	28.450	400.0	1500	Circular_Default Sewer Type	23.196	18.618	3.078	22.690	18.547	2.643
2.003	12.001	400.0	1500	Circular_Default Sewer Type	22.690	18.547	2.643	22.221	18.517	2.204
2.004	12.399	400.0	1500	Circular_Default Sewer Type	22.221	18.517	2.204	21.606	18.486	1.620
2.005	22.186	56.6	300	Circular_Default Sewer Type	21.606	18.486	2.820	20.497	18.094	2.103

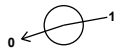
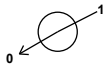
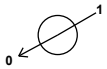
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	201	1500	Manhole	Adoptable	202	1500	Manhole	Adoptable
1.001	202	1500	Manhole	Adoptable	203	2400	Manhole	Adoptable
1.002	203	2400	Manhole	Adoptable	204	2400	Manhole	Adoptable
1.003	204	2400	Manhole	Adoptable	205	2400	Manhole	Adoptable
1.004	205	2400	Manhole	Adoptable	206	2400	Manhole	Adoptable
1.005	206	2400	Manhole	Adoptable	207	2400	Manhole	Adoptable
1.006	207	2400	Manhole	Adoptable	215	2400	Manhole	Adoptable
2.000	208	1500	Manhole	Adoptable	209	2400	Manhole	Adoptable
2.001	209	2400	Manhole	Adoptable	210	2400	Manhole	Adoptable
2.002	210	2400	Manhole	Adoptable	211	2400	Manhole	Adoptable
2.003	211	2400	Manhole	Adoptable	212	2400	Manhole	Adoptable
2.004	212	2400	Manhole	Adoptable	213	2400	Manhole	Adoptable
2.005	213	2400	Manhole	Adoptable	214	2400	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
2.006	23.099	400.0	1500	Circular_Default Sewer Type	20.497	16.894	2.103	19.327	16.836	0.991
1.007	8.639	240.0	300	Circular_Default Sewer Type	19.327	16.836	2.191	17.100	16.800	0.000

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
2.006	214	2400	Manhole	Adoptable	215	2400	Manhole	Adoptable
1.007	215	2400	Manhole	Adoptable	216		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
201	325878.406	371476.041	26.927	2.350	1500				
						0	1.000	24.577	450
202	325876.192	371491.751	26.723	2.750	1500	1	1.000	23.973	450
									
						0	1.001	23.973	450
203	325853.660	371487.639	25.710	5.044	2400	1	1.001	23.066	450
									
						0	1.002	20.666	1350
204	325839.552	371483.010	24.961	4.332	2400	1	1.002	20.629	1350
									
						0	1.003	20.629	1350
205	325824.301	371475.219	23.986	3.400	2400	1	1.003	20.586	1350
									
						0	1.004	20.586	300
206	325811.859	371468.010	23.054	5.981	2400	1	1.004	19.773	300
									
						0	1.005	17.073	1500
207	325789.828	371456.143	21.396	4.386	2400	1	1.005	17.010	1500
									
						0	1.006	17.010	1500
208	325867.190	371523.812	25.516	3.150	1500				
						0	2.000	22.366	450
209	325859.764	371543.950	24.455	5.624	2400	1	2.000	21.531	450
									
						0	2.001	18.831	1350
210	325843.464	371563.258	23.196	4.578	2400	1	2.001	18.768	1350
									
						0	2.002	18.618	1500

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
211	325821.098	371545.675	22.690	4.143	2400	1	2.002	18.547	1500
						0	2.003	18.547	1500
212	325811.101	371539.035	22.221	3.704	2400	1	2.003	18.517	1500
						0	2.004	18.517	1500
213	325799.869	371533.783	21.606	3.120	2400	1	2.004	18.486	1500
						0	2.005	18.486	300
214	325778.562	371527.601	20.497	3.603	2400	1	2.005	18.094	300
						0	2.006	16.894	1500
215	325757.652	371517.786	19.327	2.491	2400	1	2.006	16.836	1500
						2	1.006	16.836	1500
						0	1.007	16.836	300
216	325742.665	371523.565	17.100	0.300		1	1.007	16.800	300

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	18.000	Starting Level (m)	
Ratio-R	0.350	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	1
Greenfield Method	IH124	Growth Factor 1 year	0.85
Positively Drained Area (ha)		Growth Factor 30 year	1.95
SAAR (mm)		Growth Factor 100 year	2.48
Soil Index	1	Betterment (%)	0
SPR	0.10	QBar	

Pre-development Discharge Rate

Q 1 year (l/s)	Q 100 year (l/s)
Q 30 year (l/s)	

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 205 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	20.586	Product Number	CTL-SHE-0091-6000-3000-6000
Design Depth (m)	3.000	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	6.0	Min Node Diameter (mm)	1200

Node 213 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	18.486	Product Number	CTL-SHE-0083-5000-3000-5000
Design Depth (m)	3.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 215 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	16.836	Product Number	CTL-SHE-0112-8200-2500-8200
Design Depth (m)	2.500	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.2	Min Node Diameter (mm)	1200

Node 207 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	17.900
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	50.0	0.0	1.600	50.0	0.0	1.601	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	201	10	24.613	0.036	8.5	0.0854	0.0000	OK
15 minute winter	202	10	24.018	0.045	13.4	0.0933	0.0000	OK
60 minute winter	203	47	20.927	0.261	8.1	1.1934	0.0000	OK
60 minute winter	204	47	20.927	0.298	8.6	1.4149	0.0000	OK
60 minute winter	205	47	20.927	0.341	7.2	1.6570	0.0000	SURCHARGED
240 minute winter	206	216	17.324	0.251	5.2	1.1790	0.0000	OK
240 minute winter	207	216	17.324	0.314	6.7	1.5304	0.0000	OK
15 minute winter	208	10	22.412	0.046	13.8	0.1150	0.0000	OK
15 minute winter	209	11	18.911	0.080	20.1	0.3787	0.0000	OK
120 minute winter	210	96	18.909	0.291	10.5	1.4218	0.0000	OK
120 minute winter	211	94	18.909	0.362	8.0	1.6582	0.0000	OK
120 minute winter	212	94	18.909	0.392	4.7	1.7991	0.0000	OK
120 minute winter	213	94	18.909	0.423	5.3	2.1417	0.0000	SURCHARGED
240 minute winter	214	220	17.324	0.430	4.9	2.0869	0.0000	OK
240 minute winter	215	220	17.324	0.488	11.4	2.8234	0.0000	SURCHARGED
15 minute summer	216	1	16.800	0.000	6.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	201	1.000	202	8.4	1.198	0.013	0.1124	
15 minute winter	202	1.001	203	13.2	1.626	0.020	0.1858	
60 minute winter	203	1.002	204	5.5	0.256	0.002	3.1651	
60 minute winter	204	1.003	205	3.6	0.173	0.001	4.4162	
60 minute winter	205	Hydro-Brake®	206	4.1				
240 minute winter	206	1.005	207	4.8	0.333	0.001	5.7599	
240 minute winter	207	1.006	215	4.9	0.104	0.001	26.5285	
15 minute winter	208	2.000	209	13.6	1.629	0.021	0.1794	
15 minute winter	209	2.001	210	19.8	0.646	0.007	0.7741	
120 minute winter	210	2.002	211	7.5	0.291	0.002	8.0531	
120 minute winter	211	2.003	212	4.2	0.295	0.001	4.1550	
120 minute winter	212	2.004	213	3.2	0.145	0.001	4.7922	
120 minute winter	213	Hydro-Brake®	214	3.3				
240 minute winter	214	2.006	215	3.9	0.118	0.001	10.5487	
240 minute winter	215	Hydro-Brake®	216	6.7				143.1

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	201	10	24.632	0.055	20.7	0.1301	0.0000	OK
15 minute winter	202	10	24.043	0.070	32.7	0.1451	0.0000	OK
120 minute winter	203	116	21.482	0.816	12.3	3.7314	0.0000	OK
120 minute winter	204	116	21.482	0.853	12.3	4.0498	0.0000	OK
120 minute winter	205	116	21.482	0.896	9.5	4.3552	0.0000	SURCHARGED
600 minute winter	206	570	17.861	0.788	5.7	3.7036	0.0000	OK
600 minute winter	207	570	17.861	0.851	6.9	4.1502	0.0000	OK
15 minute winter	208	10	22.438	0.072	33.7	0.1793	0.0000	OK
180 minute winter	209	180	19.387	0.556	12.5	2.6239	0.0000	OK
180 minute winter	210	176	19.387	0.769	15.6	3.7561	0.0000	OK
180 minute winter	211	176	19.387	0.840	9.6	3.8507	0.0000	OK
180 minute winter	212	176	19.387	0.870	4.8	3.9941	0.0000	OK
180 minute winter	213	176	19.387	0.901	6.3	4.5627	0.0000	SURCHARGED
600 minute winter	214	570	17.861	0.967	5.0	4.6924	0.0000	OK
600 minute winter	215	570	17.861	1.025	11.4	5.9304	0.0000	SURCHARGED
15 minute summer	216	1	16.800	0.000	6.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	201	1.000	202	20.6	1.544	0.033	0.2124	
15 minute winter	202	1.001	203	32.3	2.109	0.050	0.3506	
120 minute winter	203	1.002	204	7.5	0.272	0.003	13.7509	
120 minute winter	204	1.003	205	3.8	0.173	0.001	16.7483	
120 minute winter	205	Hydro-Brake®	206	4.1				
600 minute winter	206	1.005	207	4.5	0.296	0.001	24.6377	
600 minute winter	207	1.006	215	4.2	0.108	0.001	80.4633	
15 minute winter	208	2.000	209	33.4	2.110	0.052	0.3394	
180 minute winter	209	2.001	210	9.7	0.581	0.003	15.0621	
180 minute winter	210	2.002	211	8.7	0.337	0.002	27.3766	
180 minute winter	211	2.003	212	4.1	0.310	0.001	12.4497	
180 minute winter	212	2.004	213	2.9	0.074	0.001	13.4208	
180 minute winter	213	Hydro-Brake®	214	3.3				
600 minute winter	214	2.006	215	3.8	0.100	0.001	28.6850	
600 minute winter	215	Hydro-Brake®	216	6.7				278.1

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	201	10	24.654	0.077	40.1	0.1812	0.0000	OK
15 minute winter	202	10	24.072	0.099	63.4	0.2044	0.0000	OK
180 minute winter	203	136	23.987	3.321	18.1	15.1791	0.0000	SURCHARGED
180 minute winter	204	136	23.986	3.357	17.4	15.9345	0.0000	SURCHARGED
120 minute winter	205	104	23.986	3.400	17.2	16.5206	1.1957	FLOOD
720 minute winter	206	705	19.327	2.254	6.7	10.5900	0.0000	SURCHARGED
720 minute winter	207	705	19.327	2.317	10.1	82.6779	0.0000	SURCHARGED
15 minute winter	208	10	22.468	0.102	65.3	0.2529	0.0000	OK
360 minute winter	209	344	21.424	2.593	14.9	12.2274	0.0000	SURCHARGED
360 minute winter	210	344	21.424	2.806	17.9	13.6978	0.0000	SURCHARGED
360 minute winter	211	344	21.424	2.877	9.5	13.1816	0.0000	SURCHARGED
360 minute winter	212	344	21.424	2.907	5.6	13.3394	0.0000	SURCHARGED
360 minute winter	213	344	21.424	2.938	7.4	14.8713	0.0000	FLOOD RISK
720 minute winter	214	705	19.327	2.433	6.2	11.8026	0.0000	SURCHARGED
720 minute winter	215	705	19.327	2.491	12.8	14.4079	0.5924	FLOOD
15 minute summer	216	1	16.800	0.000	6.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	201	1.000	202	39.9	1.836	0.063	0.3462	
15 minute winter	202	1.001	203	62.7	2.532	0.097	0.5671	
180 minute winter	203	1.002	204	10.3	0.284	0.004	21.1731	
180 minute winter	204	1.003	205	7.3	0.171	0.003	24.4215	
120 minute winter	205	Hydro-Brake®	206	6.4				
720 minute winter	206	1.005	207	5.8	0.294	0.002	44.0543	
720 minute winter	207	1.006	215	5.1	0.112	0.001	122.4152	
15 minute winter	208	2.000	209	64.7	2.531	0.101	0.5493	
360 minute winter	209	2.001	210	10.6	0.553	0.004	36.0319	
360 minute winter	210	2.002	211	8.5	0.332	0.002	50.0857	
360 minute winter	211	2.003	212	5.0	0.314	0.001	21.1276	
360 minute winter	212	2.004	213	3.7	0.094	0.001	21.8282	
360 minute winter	213	Hydro-Brake®	214	4.9				
720 minute winter	214	2.006	215	6.1	0.104	0.002	40.6654	
720 minute winter	215	Hydro-Brake®	216	8.2				388.5

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.350	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
301	0.094	5.00	21.775	2100	325832.474	371589.032	4.996
302	0.025	5.00	20.132	2100	325835.254	371621.947	3.436
303	0.066	5.00	19.665	2100	325885.455	371638.771	2.900
304	0.011	5.00	19.438	2100	325873.013	371644.431	2.707
305	0.055	5.00	19.190	2100	325858.212	371646.771	2.496
306	0.058	5.00	18.843	2100	325833.714	371647.570	2.211
307	0.051	5.00	17.476	2100	325835.754	371674.984	2.676
308	0.013	5.00	15.871	2100	325842.165	371705.646	3.616
309	0.014	5.00	15.179	2100	325836.747	371717.121	2.956
310	0.012	5.00	14.382	2400	325823.074	371720.359	2.194
311	0.015	5.00	13.936	2400	325813.134	371714.561	1.777
312			13.820	1200	325800.370	371698.757	1.780

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	301	302	33.032	0.600	16.779	16.696	0.083	400.0	900	5.35	50.0
1.001	302	306	25.669	0.600	16.696	16.632	0.064	400.0	900	5.63	50.0
2.000	303	304	13.669	0.600	16.765	16.731	0.034	400.0	900	5.15	50.0
2.001	304	305	14.985	0.600	16.731	16.694	0.037	400.0	900	5.31	50.0
2.002	305	306	24.511	0.600	16.694	16.633	0.061	400.0	900	5.57	50.0
1.002	306	307	27.490	0.600	16.632	14.950	1.682	16.3	300	5.74	50.0
1.003	307	308	31.325	0.600	14.800	13.905	0.895	35.0	450	5.90	50.0
1.004	308	309	12.690	0.600	12.255	12.223	0.032	400.0	750	6.05	50.0
1.005	309	310	14.051	0.600	12.223	12.188	0.035	400.0	750	6.22	50.0
1.006	310	311	11.507	0.600	12.188	12.159	0.029	400.0	750	6.35	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.560	992.5	12.7	4.096	2.536	0.094	0.0	70	0.559
1.001	1.560	992.5	16.1	2.536	1.311	0.119	0.0	78	0.598
2.000	1.560	992.5	8.9	2.000	1.807	0.066	0.0	59	0.504
2.001	1.560	992.5	10.4	1.807	1.596	0.077	0.0	64	0.527
2.002	1.560	992.5	17.9	1.596	1.310	0.132	0.0	82	0.619
1.002	3.907	276.2	41.9	1.911	2.226	0.309	0.0	78	2.842
1.003	3.445	547.9	48.8	2.226	1.516	0.360	0.0	90	2.169
1.004	1.393	615.3	50.6	2.866	2.206	0.373	0.0	143	0.856
1.005	1.393	615.3	52.4	2.206	1.444	0.387	0.0	146	0.866
1.006	1.393	615.3	54.1	1.444	1.027	0.399	0.0	148	0.874

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	311	312	20.315	0.600	12.159	12.040	0.119	170.7	225	6.69	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	0.998	39.7	56.1	1.552	1.555	0.414	0.0	225	1.016

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	33.032	400.0	900	Circular_Default Sewer Type	21.775	16.779	4.096	20.132	16.696	2.536
1.001	25.669	400.0	900	Circular_Default Sewer Type	20.132	16.696	2.536	18.843	16.632	1.311
2.000	13.669	400.0	900	Circular_Default Sewer Type	19.665	16.765	2.000	19.438	16.731	1.807
2.001	14.985	400.0	900	Circular_Default Sewer Type	19.438	16.731	1.807	19.190	16.694	1.596
2.002	24.511	400.0	900	Circular_Default Sewer Type	19.190	16.694	1.596	18.843	16.633	1.310
1.002	27.490	16.3	300	Circular_Default Sewer Type	18.843	16.632	1.911	17.476	14.950	2.226
1.003	31.325	35.0	450	Circular_Default Sewer Type	17.476	14.800	2.226	15.871	13.905	1.516
1.004	12.690	400.0	750	Circular_Default Sewer Type	15.871	12.255	2.866	15.179	12.223	2.206
1.005	14.051	400.0	750	Circular_Default Sewer Type	15.179	12.223	2.206	14.382	12.188	1.444
1.006	11.507	400.0	750	Circular_Default Sewer Type	14.382	12.188	1.444	13.936	12.159	1.027
1.007	20.315	170.7	225	Circular_Default Sewer Type	13.936	12.159	1.552	13.820	12.040	1.555

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	301	2100	Manhole	Adoptable	302	2100	Manhole	Adoptable
1.001	302	2100	Manhole	Adoptable	306	2100	Manhole	Adoptable
2.000	303	2100	Manhole	Adoptable	304	2100	Manhole	Adoptable
2.001	304	2100	Manhole	Adoptable	305	2100	Manhole	Adoptable
2.002	305	2100	Manhole	Adoptable	306	2100	Manhole	Adoptable
1.002	306	2100	Manhole	Adoptable	307	2100	Manhole	Adoptable
1.003	307	2100	Manhole	Adoptable	308	2100	Manhole	Adoptable
1.004	308	2100	Manhole	Adoptable	309	2100	Manhole	Adoptable
1.005	309	2100	Manhole	Adoptable	310	2400	Manhole	Adoptable
1.006	310	2400	Manhole	Adoptable	311	2400	Manhole	Adoptable
1.007	311	2400	Manhole	Adoptable	312	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
301	325832.474	371589.032	21.775	4.996	2100	 0	1.000	16.779	900
302	325835.254	371621.947	20.132	3.436	2100	 1	1.000	16.696	900
						0	1.001	16.696	900
303	325885.455	371638.771	19.665	2.900	2100	 0	2.000	16.765	900

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
304	325873.013	371644.431	19.438	2.707	2100	1	2.000	16.731	900
						0	2.001	16.731	900
305	325858.212	371646.771	19.190	2.496	2100	1	2.001	16.694	900
						0	2.002	16.694	900
306	325833.714	371647.570	18.843	2.211	2100	1	2.002	16.633	900
						2	1.001	16.632	900
						0	1.002	16.632	300
307	325835.754	371674.984	17.476	2.676	2100	1	1.002	14.950	300
						0	1.003	14.800	450
308	325842.165	371705.646	15.871	3.616	2100	1	1.003	13.905	450
						0	1.004	12.255	750
309	325836.747	371717.121	15.179	2.956	2100	1	1.004	12.223	750
						0	1.005	12.223	750
310	325823.074	371720.359	14.382	2.194	2400	1	1.005	12.188	750
						0	1.006	12.188	750
311	325813.134	371714.561	13.936	1.777	2400	1	1.006	12.159	750
						0	1.007	12.159	225
312	325800.370	371698.757	13.820	1.780	1200	1	1.007	12.040	225

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	England and Wales	Additional Storage (m³/ha)	20.0
M5-60 (mm)	18.000	Starting Level (m)	
Ratio-R	0.350	Check Discharge Rate(s)	✓
Summer CV	0.750	Check Discharge Volume	✓
Winter CV	0.840	100 year 360 minute (m³)	
Analysis Speed	Detailed		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
1	0	0	0
30	0	0	0
100	50	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	IH124	Growth Factor 100 year	2.48
Positively Drained Area (ha)		Betterment (%)	0
SAAR (mm)		QBar	
Soil Index	1	Q 1 year (l/s)	
SPR	0.10	Q 30 year (l/s)	
Region	1	Q 100 year (l/s)	
Growth Factor 1 year	0.85		

Pre-development Discharge Volume

Site Makeup	Greenfield	Return Period (years)	100
Greenfield Method	FSR/FEH	Climate Change (%)	0
Positively Drained Area (ha)		Storm Duration (mins)	360
Soil Index	1	Betterment (%)	0
SPR	0.10	PR	
CWI		Runoff Volume (m³)	

Node 306 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	16.632	Product Number	CTL-SHE-0070-3000-2000-3000
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node 311 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	12.159	Product Number	CTL-SHE-0094-5000-1800-5000
Design Depth (m)	1.800	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.0	Min Node Diameter (mm)	1200

Node 305 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	16.694
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	0.0	1.200	60.0	0.0	1.201	0.0	0.0

Other (defaults)

Entry Loss (manhole)	0.250	Entry Loss (junction)	0.000	Apply Recommended Losses	x
Exit Loss (manhole)	0.250	Exit Loss (junction)	0.000	Flood Risk (m)	0.300

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute winter	301	144	16.886	0.107	3.0	0.4125	0.0000	OK
180 minute winter	302	144	16.886	0.190	3.8	0.6870	0.0000	OK
180 minute winter	303	144	16.886	0.121	2.1	0.4753	0.0000	OK
180 minute winter	304	144	16.886	0.155	2.2	0.5506	0.0000	OK
180 minute winter	305	144	16.886	0.192	4.4	12.2896	0.0000	OK
180 minute winter	306	144	16.886	0.254	4.4	1.0144	0.0000	OK
15 minute winter	307	10	14.838	0.038	8.2	0.1467	0.0000	OK
60 minute winter	308	47	12.386	0.131	6.2	0.4648	0.0000	OK
60 minute winter	309	47	12.386	0.163	6.3	0.5814	0.0000	OK
60 minute winter	310	47	12.386	0.198	5.6	0.9191	0.0000	OK
60 minute winter	311	47	12.386	0.227	5.0	1.0671	0.0000	SURCHARGED
15 minute summer	312	1	12.040	0.000	3.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute winter	301	1.000	302	3.0	0.252	0.003	2.3142	
180 minute winter	302	1.001	306	2.5	0.141	0.002	3.1385	
180 minute winter	303	2.000	304	1.9	0.285	0.002	0.8446	
180 minute winter	304	2.001	305	1.8	0.336	0.002	1.2869	
180 minute winter	305	2.002	306	1.4	0.073	0.001	3.0045	
180 minute winter	306	Hydro-Brake®	307	2.2				
15 minute winter	307	1.003	308	7.9	1.256	0.015	0.1986	
60 minute winter	308	1.004	309	5.4	0.385	0.009	0.7760	
60 minute winter	309	1.005	310	4.9	0.328	0.008	1.1497	
60 minute winter	310	1.006	311	4.1	0.241	0.007	1.1827	
60 minute winter	311	Hydro-Brake®	312	4.1				38.8

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	301	236	17.200	0.421	5.7	1.6170	0.0000	OK
240 minute winter	302	236	17.200	0.504	5.7	1.8194	0.0000	OK
240 minute winter	303	236	17.200	0.435	4.0	1.7059	0.0000	OK
240 minute winter	304	236	17.200	0.469	3.9	1.6636	0.0000	OK
240 minute winter	305	236	17.200	0.506	7.7	32.3522	0.0000	OK
240 minute winter	306	236	17.200	0.568	6.7	2.2660	0.0000	SURCHARGED
15 minute winter	307	10	14.855	0.055	17.2	0.2110	0.0000	OK
120 minute winter	308	96	12.677	0.422	8.6	1.4938	0.0000	OK
120 minute winter	309	96	12.677	0.454	8.5	1.6169	0.0000	OK
120 minute winter	310	96	12.677	0.489	7.2	2.2676	0.0000	OK
120 minute winter	311	96	12.677	0.518	6.1	2.4330	0.0000	SURCHARGED
15 minute summer	312	1	12.040	0.000	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	301	1.000	302	4.2	0.241	0.004	10.8405	
240 minute winter	302	1.001	306	3.3	0.145	0.003	10.1026	
240 minute winter	303	2.000	304	3.2	0.248	0.003	4.3601	
240 minute winter	304	2.001	305	2.5	0.365	0.003	5.2561	
240 minute winter	305	2.002	306	-2.2	0.036	-0.002	9.6594	
240 minute winter	306	Hydro-Brake®	307	2.2				
15 minute winter	307	1.003	308	16.9	1.566	0.031	0.3385	
120 minute winter	308	1.004	309	7.1	0.351	0.012	3.3915	
120 minute winter	309	1.005	310	6.0	0.344	0.010	4.0985	
120 minute winter	310	1.006	311	4.6	0.249	0.007	3.6191	
120 minute winter	311	Hydro-Brake®	312	4.4				72.7

Results for 100 year +50% CC Critical Storm Duration. Lowest mass balance: 99.66%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute winter	301	456	18.683	1.904	6.7	7.3113	0.0000	SURCHARGED
480 minute winter	302	456	18.683	1.987	6.4	7.1722	0.0000	SURCHARGED
480 minute winter	303	456	18.684	1.919	4.7	7.5209	0.0000	SURCHARGED
480 minute winter	304	456	18.684	1.953	4.4	6.9235	0.0000	SURCHARGED
480 minute winter	305	456	18.684	1.990	9.8	79.7987	0.0000	SURCHARGED
480 minute winter	306	456	18.684	2.052	7.4	8.1820	0.0000	FLOOD RISK
15 minute winter	307	10	14.874	0.074	31.4	0.2842	0.0000	OK
180 minute winter	308	152	13.936	1.681	11.3	5.9448	0.0000	SURCHARGED
180 minute winter	309	152	13.936	1.713	10.9	6.0954	0.0000	SURCHARGED
180 minute winter	310	152	13.936	1.748	8.7	8.0987	0.0000	SURCHARGED
180 minute winter	311	148	13.936	1.777	7.2	8.3395	0.3188	FLOOD
15 minute summer	312	1	12.040	0.000	4.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute winter	301	1.000	302	4.6	0.247	0.005	20.9348	
480 minute winter	302	1.001	306	4.6	0.123	0.005	16.2683	
480 minute winter	303	2.000	304	3.6	0.234	0.004	8.6631	
480 minute winter	304	2.001	305	2.6	0.343	0.003	9.4971	
480 minute winter	305	2.002	306	-4.5	0.040	-0.005	15.5344	
480 minute winter	306	Hydro-Brake®	307	3.0				
15 minute winter	307	1.003	308	30.9	1.865	0.056	0.5192	
180 minute winter	308	1.004	309	8.8	0.365	0.014	5.5851	
180 minute winter	309	1.005	310	6.9	0.361	0.011	6.1841	
180 minute winter	310	1.006	311	5.3	0.233	0.009	5.0645	
180 minute winter	311	Hydro-Brake®	312	5.0				102.5