

Lidl UK GmbH

Flood Consequence Assessment
For
Proposed Lidl Store
At
Bodhyfryd
Wrexham
Wales
LL12 7BW

Beam Consulting
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Wakefield
West Yorkshire
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EXECUTIVE SUMMARY

This Flood Consequence Assessment (FCA) has been prepared for the proposed Lidl Store Bodhfryd, Wrexham, Wales LL12 7BW.

Flood risk

Surface water flooding within the site is unlikely as the site lies within A zone however, the southern section of the proposed development may be at risk from flooding. Finished floor levels of the Lidl building will be raised to 85.3m AOD which is 500mm higher than the existing finished floor level of 85.25m AOD and maintain similar levels for the fast food restaurant which mitigate the risk of flooding to the buildings.

The site is located some distance from the River Alyn, to the north of the site, and the River Dee, to the south of the site. Although these rivers are the main cause of river flooding in the area it is unlikely that there will flood risk on site from these rivers.

Surface water drainage

Due to the central location of the site in a built up area, infiltration and other similar SUDS systems stated previously are not suitable for this site.

The existing surface water drainage discharge point from the site is to remain, but the remainder of the existing drainage system will be removed and replaced with a new surface water system which will discharge via the existing surface water discharge point.

It is proposed to limit the surface water discharge from the site to the existing discharge, 110.7 l/s, less 30% for betterment, which gives a proposed discharge rate of 77.5 l/s. Based on this discharge rate 182m³ of underground storage would need to be provided based on a 1 in 100 year storm event plus 30% allowance for climate change. The site will be developed as two separate ownership sites where each site will provide proportionate surface water arrangements split between the individual buildings based on hard surface area as stated below.

Site	Hard surface area	Attenuation volume	Flow rate
Lidl	7238 m ²	152 m ³	64.6 l/sec
Fast Food	1445 m ²	30 m ³	12.9 l/sec
Totals	8683 m²	182 m³	77.5 l/sec

All surface water from roadways shall pass through a petrol interceptor.

The final solution to be adopted will depend on further investigation and the development of the detailed design.

Foul water drainage

The existing foul water drainage discharge from the site will remain as existing. The proposed new foul water drainage system will connect into the existing foul sewer connection on site. Based on available information on the existing buildings on site it is anticipated that the foul flows from the proposed developments will be considerably less than the existing.

The final solution to be adopted will depend on further investigation and the development of the detailed design.

1.0 INTRODUCTION

This Flood Consequence Assessment (FCA) has been prepared for the proposed Lidl Store, Bodhfryd, Wrexham, Wales LL12 7BW.

The assessment has been undertaken in accordance with the requirements of the following:

- i. Planning Policy Wales, 2002
- ii. Planning Policy Wales Technical Advice Note 15: Development and Flood Risk, July 2004.

The Report is based on the following information:

- i. Site location
- ii. Current Clients' proposal
- iii. Development advice maps - based on the best available information considered sufficient to determine when flood risk issues need to be taken into account in planning future development. The maps are based on Natural Resources Wales extreme flood outlines and the British Geological Survey (BGS) drift data.
- iv. Consultation with Gareth Thomas, Development Planning Advisor at Natural Resources Wales letter dated 17th August 2017.

All comments and opinions contained in this report, including any conclusions are based on information available to Beam Consulting Engineers during investigations prior to completion of the report. Conclusions drawn by Beam Consulting Engineers may differ if the available information is subsequently found to be inaccurate, incomplete or misleading. Beam Consulting Engineers accept no responsibility should this prove to be the case, nor if additional information exists or becomes available in relation to this site.

Except as otherwise requested by the Client, Beam Consulting Engineers are not obliged and disclaim any obligation to update the report for events outside Beam Consulting Engineers' direct control taking place after:

- i. The date on which the assessment was undertaken, and
- ii. The date on which the report is issued.

Beam Consulting Engineers make no representation whatsoever in relation to the legal significance of findings reported or any legal matters referred to in the following report.

This document is a risk assessment of flooding issues associated with the noted site. The information presented and recommendations/conclusions stated are based on published statistical data and are for guidance only. The statements provide no guarantee against flooding of the site or elsewhere, nor as to the absolute accuracy of water levels, flow rates and associated probabilities referenced.

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2.0 BACKGROUND INFORMATION

The site is located off Bodhfryd, Wrexham, Wales LL12 7BW.

National Grid reference for the site is 333753, 350700.

2.1 EXISTING DEVELOPMENT

The site is currently developed as Wrexham Police Station with associated access road and car parking areas. The total site area is 10974m².

The existing site topographical survey and existing drainage drawings are enclosed in Appendix A. Based on the existing drainage drawing the existing foul water and surface water drainage discharge from the current development into the foul water and surface water systems for the whole site and the local drainage network. The proposed development is a part of a larger site which includes the existing Police Station.

2.2 PROPOSED DEVELOPMENT

It is proposed to demolish the existing Police Station buildings but not the Court buildings, and build a new Lidl store on part of the site with a fast food restaurant adjacent. This will involve reconfiguring the existing access road and car parking to provide additional car parking spaces with an increase in the impermeable area from 7964m² to 8683m², an increase of 719m².

The existing drainage to the car park and buildings will be removed with the exception of the last foul water and surface water manholes on site, these are to remain and the proposed surface water and foul water system will connect into them.

It is proposed to limit the surface water discharge from the site to the existing discharge less 30% for betterment, which gives a proposed discharge rate of 77.5 l/s. See calculations in appendix F.

The overall site impermeable area is to be increased by 719m² as part of the redevelopment, therefore the total new site impermeable area is 8683m² with 2291m² of landscaped area.

The proposed site layout drawing is enclosed in Appendix B.

3.0 FLOOD RISK

3.1 RISK OF FLOODING OF DEVELOPMENT SITE

The flood risk and site drainage assessment is based on the following sources of information:

- i. EA online Flood Maps:
 - a. The site is located within Flood Zone A as defined by the development advice map referred to under TAN15 (see map in Appendix C and a section of Figure 1 from TAN15 below).

Description of Zone		Use within the precautionary framework
Considered to be at little or no risk of fluvial or tidal/coastal flooding	A	Used to indicate that justification test is not applicable and no need to consider flood risk further.

- ii. Consultation with Gareth Thomas, Development Planning Advisor at Natural Resources Wales (key notes from letter dated 17th August 2017 below, full attached in Appendix D):
 - a. The site lies entirely with Zone A and is therefore outside the extreme flood outline.
 - b. Some areas of the site could be at risk from surface water flooding and therefore mitigation measures for the redevelopment should be considered.
 - c. Drainage from areas used for delivery vehicles, servicing, washdown and waste storage must go into the foul drainage system.

Surface water flooding within the site is unlikely as the site lies within A zone however, the southern section of the proposed development may be at risk from flooding. It is proposed to raise the finished floor levels of the Lidl store to 85.3m AOD which is 500mm higher than the existing finished floor level of 85.25m AOD and maintain similar levels for the fast food restaurant. This will assist in mitigate the risk of flooding to the buildings.

3.2 JUSTIFICATION / SOURCES OF FLOODING AND FLOOD RISK

Sources of flooding	Flood risk
Streams and rivers Flooding that can take place from flows that are not contained within the channel due to high levels of rainfall in the catchment.	No flows or streams are present within the site boundary. To the north of the site, at some distance, lies the River Alyn and River Dee lies, at some distance, to the south of the site. Both of these rivers contribute to local flooding.
Coastal or estuarine Flooding that can occur from the sea due to a particularly high tide or surge, or combination of both.	The site is located at some distance from the coastline/River Alyn. See comments above for streams and rivers.
Groundwater Where the water table rises to such a height where flooding occurs. Most common in low-lying areas underlain by permeable ground (aquifers), usually due to extended periods of wet weather.	The site is located in an area that is not at risk of flooding from groundwater.
Sewers and highway drains Combined, foul or surface water sewers and highway drains that are temporarily over-loaded due to excessive rainfall or due to blockage.	The roads next to the site and adjacent developments have their own drainage systems in place. In the case of them being temporarily over-loaded due to excessive rainfall or due to blockage the water is collected within highways, car parks or grassed areas.
Surface water The net rainfall falling on a surface (on or off the site) which acts as runoff which has not infiltrated into the ground or entered into a drainage system.	There are pockets of grassed areas in the area surrounding the site, to the north of the site is the Garden Village. To the southwest of the site is a large car park. The surrounding area is a mixture of residential and retail. From the east round to the west of the site are larger retail units, for example an Asda supermarket. The roads next to the site and adjacent properties have their own drainage systems in place. In excessive rainfall or due to blockage the water is collected within highways, car parking or grassed areas.
Infrastructure failure Canals, reservoirs, industrial processes, burst water mains, blocked sewers or failed pumping stations.	Surface water, Sewers and highway drains Comments above apply.

3.3 JUSTIFICATION / SEQUENTIAL AND EXCEPTION TEST

Possible Hazard	Comments/ Remediation
A. Effect of Development on General Flood Risk Flooding caused to local sources - natural watercourses on or near to the site?	The surface water discharge from the site is into the existing sewer connection along the eastern boundary of the site. The proposed redevelopment shall have its own drainage system in place with onsite storage. In excessive rainfall or due to blockage the water shall be collected within highway, car park or landscaped areas.
B. Effect of Development on General Flood Risk Flooding caused to local sources - run-off from adjacent properties/ adjoining land, or overland flow	The adjacent properties to the site have their own drainage systems in place with the exception of the grassed area to the north of the site. In excessive rainfall or due to blockage the water is collected within highways, car parks or grassed/landscaped areas. Overland flow is unlikely in this area.
C. Contribution to Flood Flows from Development Drainage Flooding caused to adjacent properties from surface run-off from hard-paved areas.	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car park or landscaped areas.
D. Contribution to Flood Flows from Development Flooding caused to 3rd party properties	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car park or landscaped areas.
E. Benefit of Site Development to the Wider Community over Flood Risk	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car park or landscaped areas.
F. Does an alternative site exist for the development?	The site is a redevelopment of the existing Police Station and it has sufficient space to accommodate the proposed Lidl store a fast food drive through within the existing boundary of the site and is at a suitable location. There is no alternative site.
G. Can the site be made safe?	The proposed development shall have its own drainage system in place. In excessive rainfall or due to blockage the water shall be collected within highway, car park or landscaped areas.

4.0 DRAINAGE ASSESSMENT AND STRATEGY

4.1 SURFACE WATER DRAINAGE

Based on existing drainage information (enclosed in Appendix A) the existing foul drainage discharges into an existing sewer to the south of the site. Surface water discharge from the current development is 110.7 l/s and discharges into the sewer along the site boundary to the east of the site. On the existing site drainage plan there are what appear to be soakaways, but these are all ineffective.

The overall site area is to remain as existing 10974m². The total impermeable area is to increase by approximately 719m² to 8683m². The remaining 2291m² is to be landscaped areas.

In compliance with SUDS (Sustainable Urban Drainage Systems) various surface water discharge methods and reducing the amount discharged to the water course/sewer have been considered as per the table below.

Infiltration	The use of soakaways is generally an ideal SUDS solution for developments. Permeability testing in accordance with BRE Digest 365 should be carried out and this information then used to determine the viability of the use of soakaways to deal with rainwater runoff. Soakaways can be used to deal with run-off both from buildings and paved areas. It should also be noted that soakaways can cause flooding to nearby basements and properties. Hence, the groundwater flow paths should be determined by a geotechnical investigation. Soakaways should be located in landscaped areas of the site. In accordance with Building Regulations soakaways are not to be located within 5m of any structure. Soakaways must be designed to cope with a 1 in 30 year storm with an allowance for climate change and a factor of safety greater or equal to 2. It is possible that the road or other areas could, with the management of kerbs and levels, be designed to contribute to the additional storage capacity requirements for a 1 in 100 year storm. However if this is not possible then the soakaways would have to be designed for the 1 in 100 year event.
Permeable paving/discharge to soft landscape	The use of permeable surfacing for parking areas combined with discharge from paths onto adjacent soft areas are ideal for reducing run-off via drainage systems. Permeable paving can be used as an infiltration mechanism to discharge direct to the ground if the sub-strata is sufficiently permeable or alternatively can be used as on-site storage where used in conjunction with a flow restriction to attenuate flows into existing drainage systems.
Ponds or wetlands	Ponds or wetlands can be used in conjunction with restricted discharge outlets to control the maximum rate of discharge from a site. However, the health and safety risks associated with ponds and wetlands may make them inappropriate without incorporating significant control measures into the scheme design.

Swales	Swales are similar to wetlands except they are designed to empty when not required to balance flows; similar comments apply as above.
French drains	French drains can be located in landscaped areas of the site. See the notes on soakaways. It is also possible to use French drain construction lined with an impermeable barrier as a storage facility.
Restricted flows combined with onsite storage	If none of the above solutions are appropriate then the final drainage system may incorporate a flow restriction and on-site storage. This could be in the form of oversized pipes or tanks to attenuate the additional flows and then discharge into the existing surface water sewer system or into the water subject to consent and approvals. The underground storage system must be designed to accommodate the calculated flows for a 1 in 30 year return period together with an allowance for climate change. The road, with the management of kerbs and levels, can be designed to contribute to the storage capacity for a 1 in 100 year storm. Alternatively the underground storage system should be designed to accommodate the 1 in 100 year event. Options for on-site storage include: a) Buried tanks b) Lined French drains c) Oversized pipes and manholes d) Paving with under paving storage The choice of solution depends upon relative levels of surfacing, inlet and discharge points and forms part of the detailed drainage design.

Due to the central location of the site in a built up area, infiltration and other similar SUDS systems stated above are not suitable for this site.

The existing surface water drainage discharge point from the site is to remain, but the remainder of the existing drainage system will be removed and replaced with a new surface water system which will discharge via the existing surface water discharge point.

It is proposed to limit the surface water discharge from the site to the existing discharge, 110.7l/s, less 30% for betterment, which gives a proposed discharge rate of 77.5 l/s. Based on this discharge rate 182m³ of underground storage would need to be provided based on a 1 in 100 year storm event plus 30% allowance for climate change. See calculations in appendix F.

The site will be developed as two separate ownership sites. In order to ensure the surface water drainage systems are independent from each other, each site will provide proportionate surface water arrangements split between the individual buildings based on hard surface area as stated below.

Site	Hard surface area	Attenuation volume	Flow rate
Lidl	7238 m ²	152 m ³	64.6 l/sec
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Totals	8683 m²	182 m³	77.5 l/sec

See Appendix F for drainage strategy drawing.

All surface water from roadways shall pass through a petrol interceptor.

The final solution to be adopted will depend on further investigation and the development of the detailed design.

4.2 FOUL WATER DRAINAGE

The existing foul water drainage discharge from the site will remain as existing. The proposed new foul water drainage system will connect into the existing foul sewer connection on site. Based on available information on the existing buildings on site it is anticipated that the foul flows from the proposed developments will be considerably less than the existing.

See Appendix F for drainage strategy drawing.

The final solution to be adopted will depend on further investigation and the development of the detailed design.

5.0 RECOMMENDATIONS

Based on the Flood Consequence Assessment recommendations are as follows:

Flood risk

Surface water flooding within the site is unlikely as the site lies within A zone however, the southern section of the proposed development may be at risk from flooding. It is proposed to raise the finished floor levels of the Lidl store to 85.3m AOD which is 500mm higher than the existing finished floor level of 85.25m AOD and maintain similar levels for the fast food restaurant. This will assist in mitigate the risk of flooding to the buildings.

The site is located some distance from the River Alyn, to the north of the site, and the River Dee, to the south of the site. Although these rivers are the main cause of river flooding in the area it is unlikely that there will flood risk on site from these rivers.

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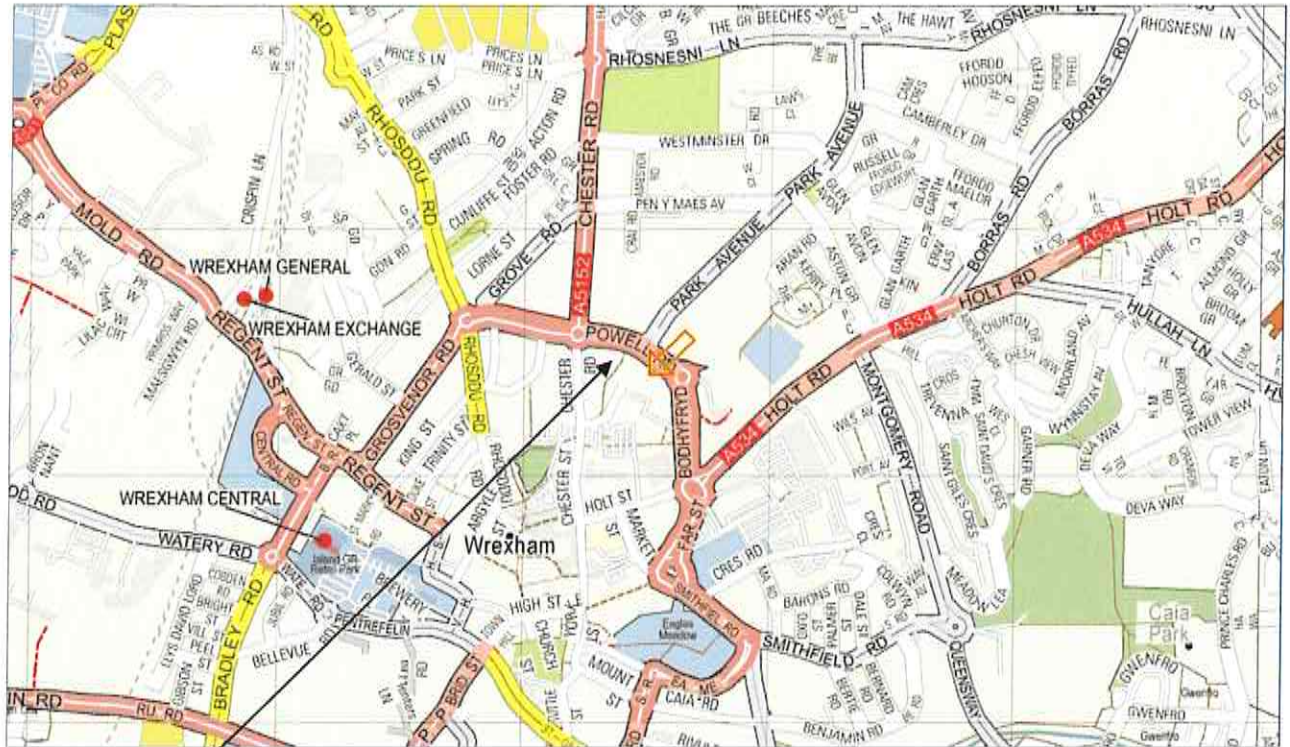
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The final solution to be adopted will depend on further investigation and the development of the detailed design.

APPENDIX A: EXISTING SITE LOCATION, EXISTING DRAINAGE DRAWINGS, TOPOGRAPHICAL AND DRAINAGE SURVEY DRAWINGS

APPENDIX A: EXISTING SITE LOCATION, EXISTING DRAINAGE DRAWINGS, TOPOGRAPHICAL AND DRAINAGE SURVEY DRAWINGS



Site location

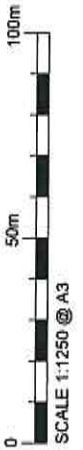
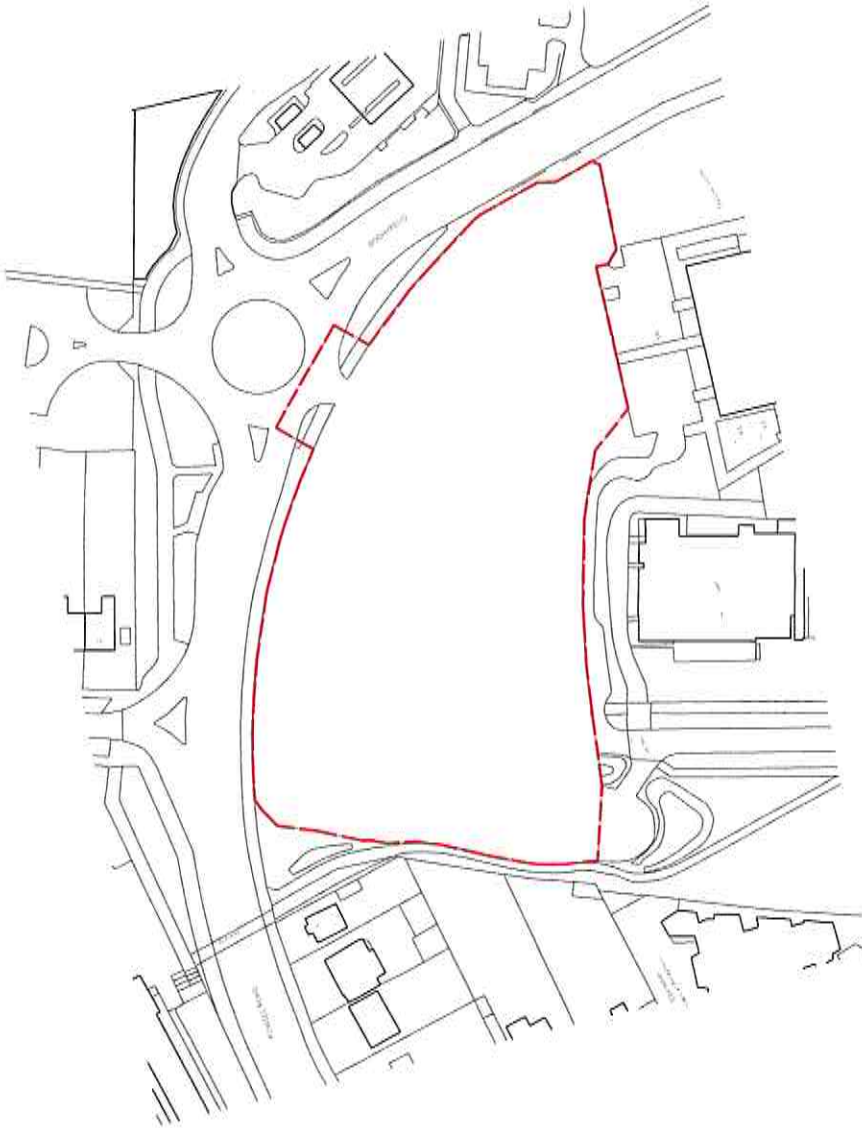
IMPORTANT INFORMATION

Drawings to be confirmed on site prior to start of works and ODSAS is to be informed of discrepancies immediately. No dimensions to be scaled from this drawing.

All materials and works are to be carried out in accordance with current British Standards, Planning Approval, current Building Regulations and Codes of Practice.

Party Wall Act - Notwithstanding the Party Wall Act 1994 to be agreed by the property owner or appointed third party for property owner.

Health and Safety - CDM 2015 Regulations apply to all construction works to be carried out on site and to be agreed by the property owner or appointed third party for property owner. As such all parties have duties under these regulations.



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STATUS: PLANNING

Client
LEL UK GARBI - RUNCORN, WA7 1SE

Project
BODWERYD, WREXHAM

Title
LOCATION PLAN

Job No.
14035

Drawing No.
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Drawn by
SEN

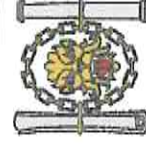
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DO NOT SCALE



DRAWN

NO.	DESCRIPTION	DATE
1	Original	27th March 2016
2	Revised	
3	Revised	
4	Revised	
5	Revised	
6	Revised	
7	Revised	
8	Revised	
9	Revised	
10	Revised	

GENERAL NOTES

1. The drawings are to be read in conjunction with the Bill of Materials and the Specification for the works to be carried out.

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LEGEND

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[Symbol]	100.0m

ABBREVIATIONS

SYMBOL	DESCRIPTION
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[Symbol]	67.0m
[Symbol]	68.0m
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[Symbol]	95.0m
[Symbol]	96.0m
[Symbol]	97.0m
[Symbol]	98.0m
[Symbol]	99.0m
[Symbol]	100.0m

SURVEY AND DATUM INFORMATION

The survey was carried out by the Surveyor General of the State of New South Wales, Australia, on the 27th March 2016.

The datum used for the survey is the Australian Geoid Datum (AGD84).

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The datum used for the survey is the Australian Geoid Datum (AGD84).

WEATHER CONDITIONS

DATE	TIME	TEMPERATURE	HUMIDITY	WIND	PRECIPITATION
27th March 2016	08:00	15.0	65%	10 km/h	0.0
27th March 2016	12:00	20.0	70%	15 km/h	0.0
27th March 2016	16:00	18.0	75%	12 km/h	0.0
27th March 2016	20:00	15.0	70%	10 km/h	0.0
27th March 2016	24:00	12.0	75%	8 km/h	0.0

Technics

100 King Street, Suite 101, Sydney, NSW 1585, Australia

Phone: 02 9550 1234

Email: info@technics.com.au

Website: www.technics.com.au

Logo: Technics

Project No.	4054-0318-01
Revision	00
Drawn By	00
Checked By	00
Approved By	00
Project Name	Overly G/LW Utility Survey
Project Location	27th March 2016
Project Date	27th March 2016
Project Time	08:00
Project Weather	15.0
Project Humidity	65%
Project Wind	10 km/h
Project Precipitation	0.0

APPENDIX B: PROPOSED SITE DRAWINGS

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SCHEDULE	
3 Kilo Store with KP Entrance	
Ancillary	245 m ²
Warehouse	545 m ²
Sales Area	1335 m ²
GP GIA	2125 m ²
GP GEA	2206 m ²
Total Site Area Rep	9044 m ²
Total Site Area Buit	1930 m ²
Combined Site Area Rep & Buit	10974 m ²
Ltd Standard Parking Spaces	106 no. spaces
Ltd Disabled Parking Spaces	7 no. spaces
Ltd P&T Parking Spaces	8 no. spaces
Ltd Total Parking Spaces	121 no. spaces
Drive Thru Standard Parking Spaces	28 no. spaces
Drive Thru Disabled Parking Spaces	2 no. spaces
Drive Thru Total Spaces	30 no. spaces
Site Overall Total Spaces	151 no. spaces
Trolley Bay	1 no. bay

STATUS: PLANNING

Client: LIDL UK GmbH - RUNCORN WAY ISE

Project: BOOTHFORD, WIRSWAN

Title: PROPOSED SITE PLAN

Job No.: 10035

Drawing No.: A1/10

Drawn by: JEH

Checked by: JPH

Date: JUNE 2018

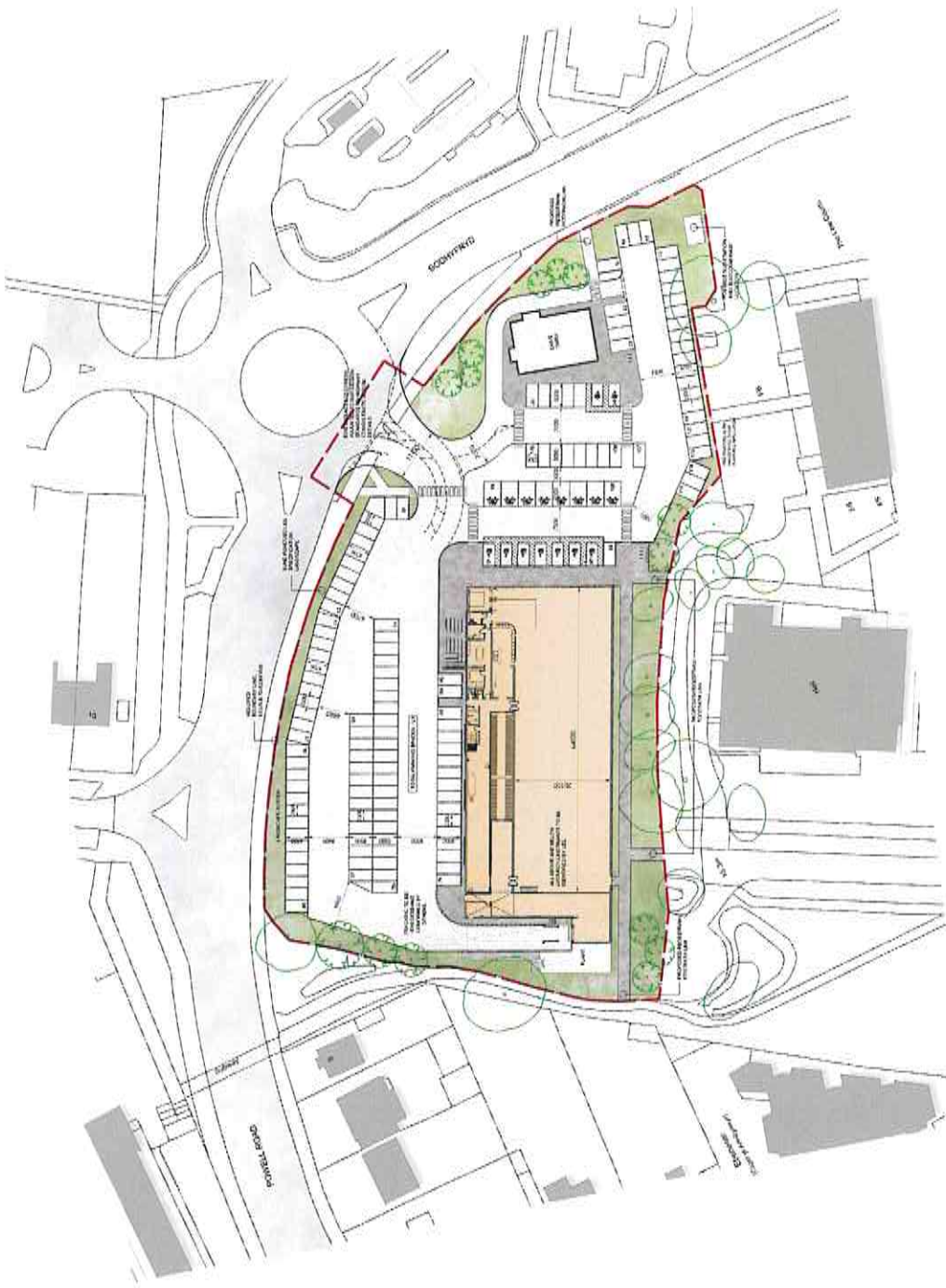
Scale: 1:500

Sheet: A1

ONE DESIGN
 ARCHITECTURAL SERVICES



Chartered Institute of
 Architectural Technologists
 Registered Practitioner
 One Design Architectural Services Ltd
 Unit 1, Merchants Quay, 1st
 Floor, 11, Colby Lane, Shipley
 West Yorkshire, WF17 7DS
 0113 4 5 9 1 1 8 8
 www.onedesignarchitects.com
 info@onedesignarchitects.com



APPLICATION SITE BOUNDARY

PROPOSED STONE

PROPOSED LANDSCAPED AREAS
REFER TO DRAWING NO. 10035

PROPOSED DRIVERS
ACCESS STEPS

FOOTPATHS

DISABLED PARKING

PARENT AND CHILD PARKING

CYCLE PARKING

ZEBRA CROSSING WITH
TACTILE PAVING

HGV WHEEL GUIDES

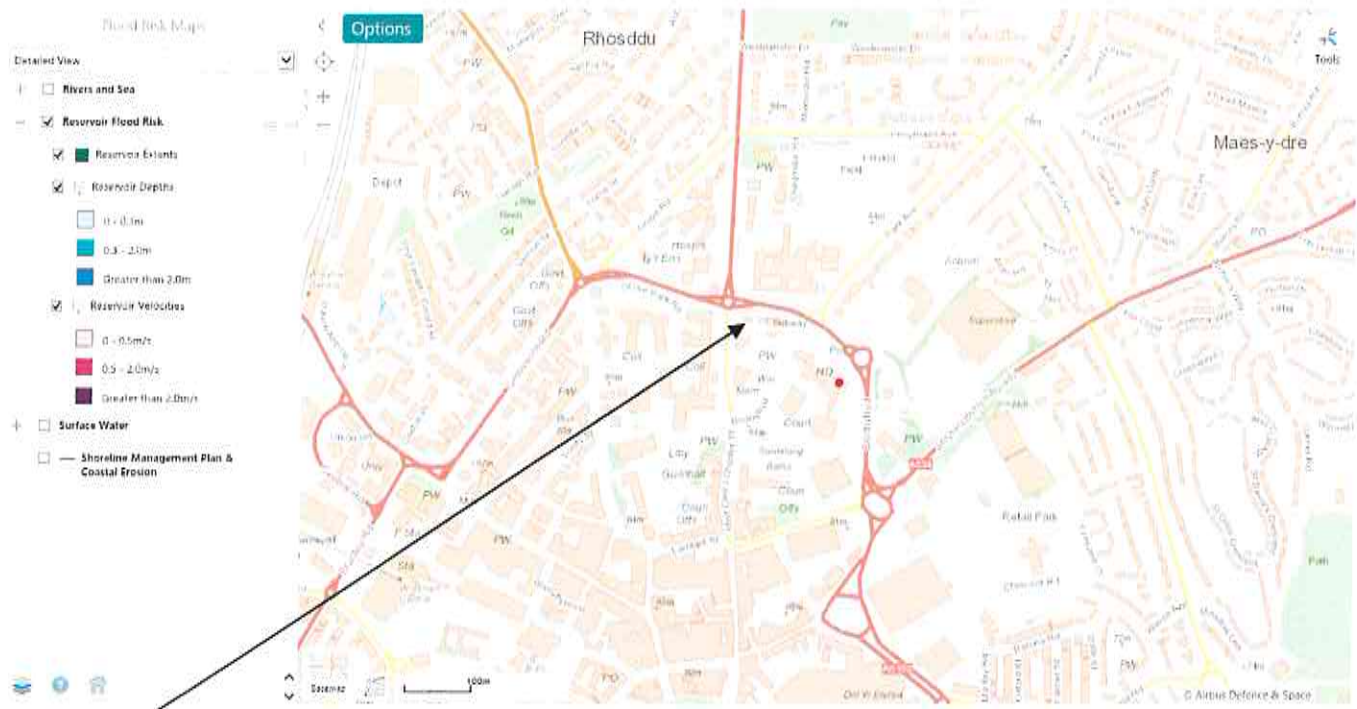
TROLLEY BAY



SCALE 1:500 @ A1

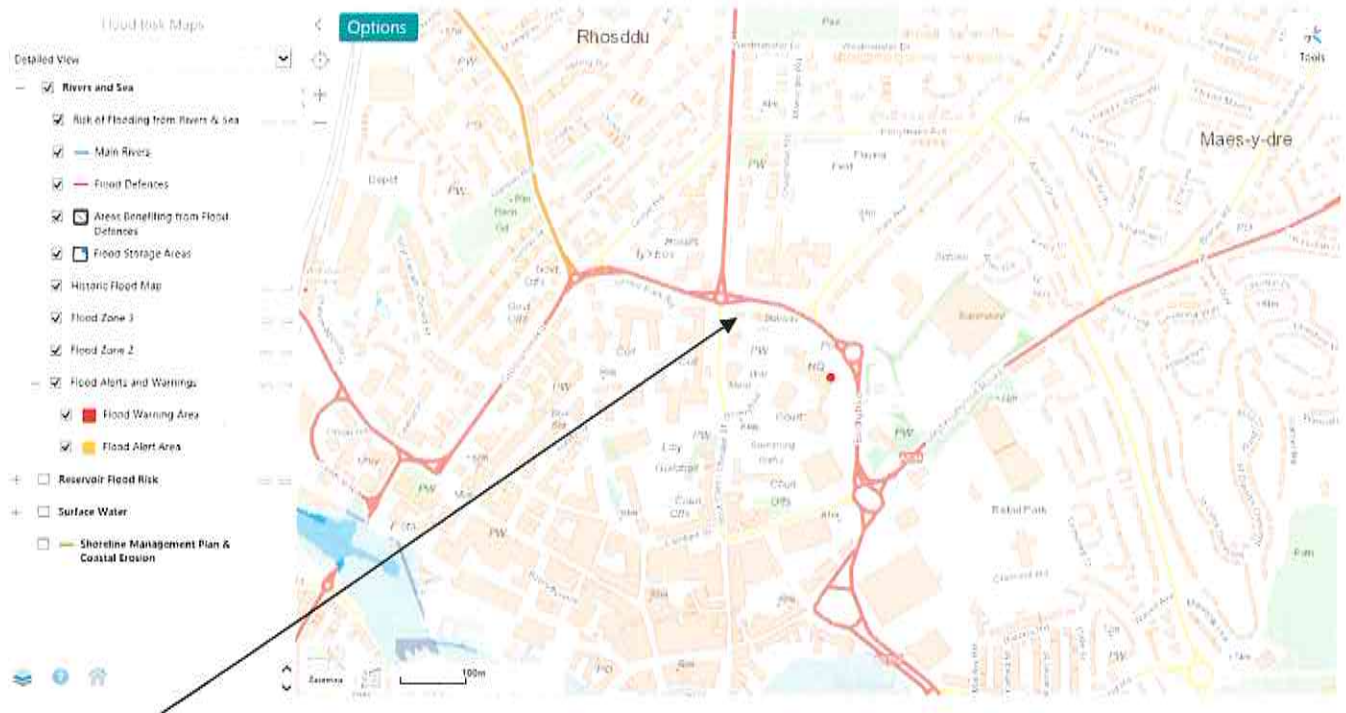
APPENDIX C: FLOOD MAPS

Risk of Flooding from Reservoirs



Site location

Risk of Flooding from Rivers and Sea



Site location

Risk of Flood from Surface Water



Site location

APPENDIX D: CORRESPONDENCE



**Cyfoeth
Naturiol
Cymru
Natural
Resources
Wales**

Ein cyf/Our ref: CAS-36308-Z8S0

Maes y Ffynnon
Penrhosgarnedd
Bangor
LL57 2DW

Ebost/Email: NorthPlanning@cyfoethnaturiolcymru.gov.uk
Ffôn/Phone: (0300) 065 3786

Katie Abbott, Senior Engineer
Beam Consulting
14 Bond Street
Wakefield
West Yorkshire
WF1 2QP

Date: 7th August 2017

Dear Ms Abbott,

**Proposed Supermarket
Bodhyfryd, Wrexham, LL12 7BW**

Thank you for your enquiry regarding the above proposal, which we received on the 19th July 2017.

We have considered your enquiry in relation to our Development Planning [checklist](#). We advise that the following matters are relevant to your site / proposed development and suggest you consider these further prior to the submission of any planning application:

Flood Risk

The site lies entirely in Zone A as defined by Welsh Government's Development Advice Map referred to within TAN15: Development & Flood Risk. Our Flood Map information confirms that the site lies outside of the extreme flood risk outline. The updated Flood Map for Surface Water Flooding indicates that some portions of the site could be at risk from surface water flooding, and therefore you may consider it appropriate to include mitigation measures within the re-developed site to reduce flood risks from this source. This could be assessed within the Flood Consequences Assessment, that we understand you have been commissioned to undertake.

In relation to the management of surface water runoff, we would recommend that you refer to Wrexham County Borough Council's "Management of Surface Water Generated from New Development" guidance. Early liaison with the Council's Flood and Water Management Team, who act as the Lead Local Flood Authority, is encouraged.

https://www.wrexham.gov.uk/english/planning_portal/publications/surface_water.htm

European Protected Species (EPS)

Our records show there may be protected species (bats) in the vicinity of the site. We advise liaison with the LPA ecologist to discuss and agree the scope of any surveys required.

We refer you to our [website](#) for further advice.

Foul Drainage

As the site is within a sewered area, we would fully expect for the foul drainage of the proposed development to connect to the main sewer.

Drainage from any areas used for delivery vehicles, servicing, washdown or waste storage purposes must drain to foul sewer.

Environmental Management

Any waste excavation material or building waste generated in the course of the development must be disposed of satisfactorily in accordance with duty of care requirements under section 34 of the Environmental Protection Act 1990. The waste shall be transported using registered waste carriers to suitably permitted or exempt sites. Transfer notes shall be kept for each load for a minimum of 2 years.

We recommend that a Site Waste Management Plan (SWMP) is drawn up prior to scheme's commencement in order to ensure full duty of care is complied with. Waste should be reused on site where possible. The SWMP should incorporate a monitoring system for wastes removed from site for reuse or disposal.

We request that all piped surface water drainage from the parking area, or areas where spills of oil may occur is passed through an oil interceptor, prior to discharge into the surface water drainage system.

Please note the view expressed in this letter is a response to a pre-planning enquiry only. We trust these comments will prove helpful but they should not set a precedent for any future Natural Resources Wales' response to any formal application for planning permission or other legal consent. Such applications shall be assessed on the information submitted and regulations of relevance at that time. The details contained in this letter are based on the information available to date. We advise that in addition to planning permission, it is the applicant's responsibility to ensure that they secure all other permits/consents relevant to their development.

If you have any queries concerning the above, please contact me on the details below.

Yn gywir / Yours' faithfully,



Mr. GARETH THOMAS

Cynghorydd Cynllunio Datblygiad / Development Planning Adviser

Ebost/Email: NorthPlanning@cyfoethnaturiolcymru.gov.uk

Deialu uniongyrchol/Direct dial: (0300) 065 3786 **Siaradwr Cymraeg / Welsh Speaker** 🇬🇧

9

APPENDIX F: CALCULATIONS

Information derived from
this report is for planning
purposes only. It is not
to be used for legal
proceedings.

Existing Surface Water Drainage	Proposed Combined Drain	Existing Foot Manhole	Proposed Combined Manhole
Existing Foot Water Damage	Proposed Pumped Drain	Existing Combined Manhole	Proposed Pumping Chamber Manhole
Existing Combined Drain to Retention	Existing Surface Manhole	Proposed Surface Water Manhole	Proposed Surface Drainage Gully
Proposed Surface Water Drain	Proposed Foot Manhole	Proposed Foot Water Manhole	Proposed Rainwater Pipe
			Proposed Surface Water Channel Drain
			Demarcate Site Boundary

beamconsulting

Boston Consulting Group
 24 Broad Street
 Waltham, MA 02451
 TEL: 781/326-7000

Lidl Store
Bodnhydryd, Wrexham

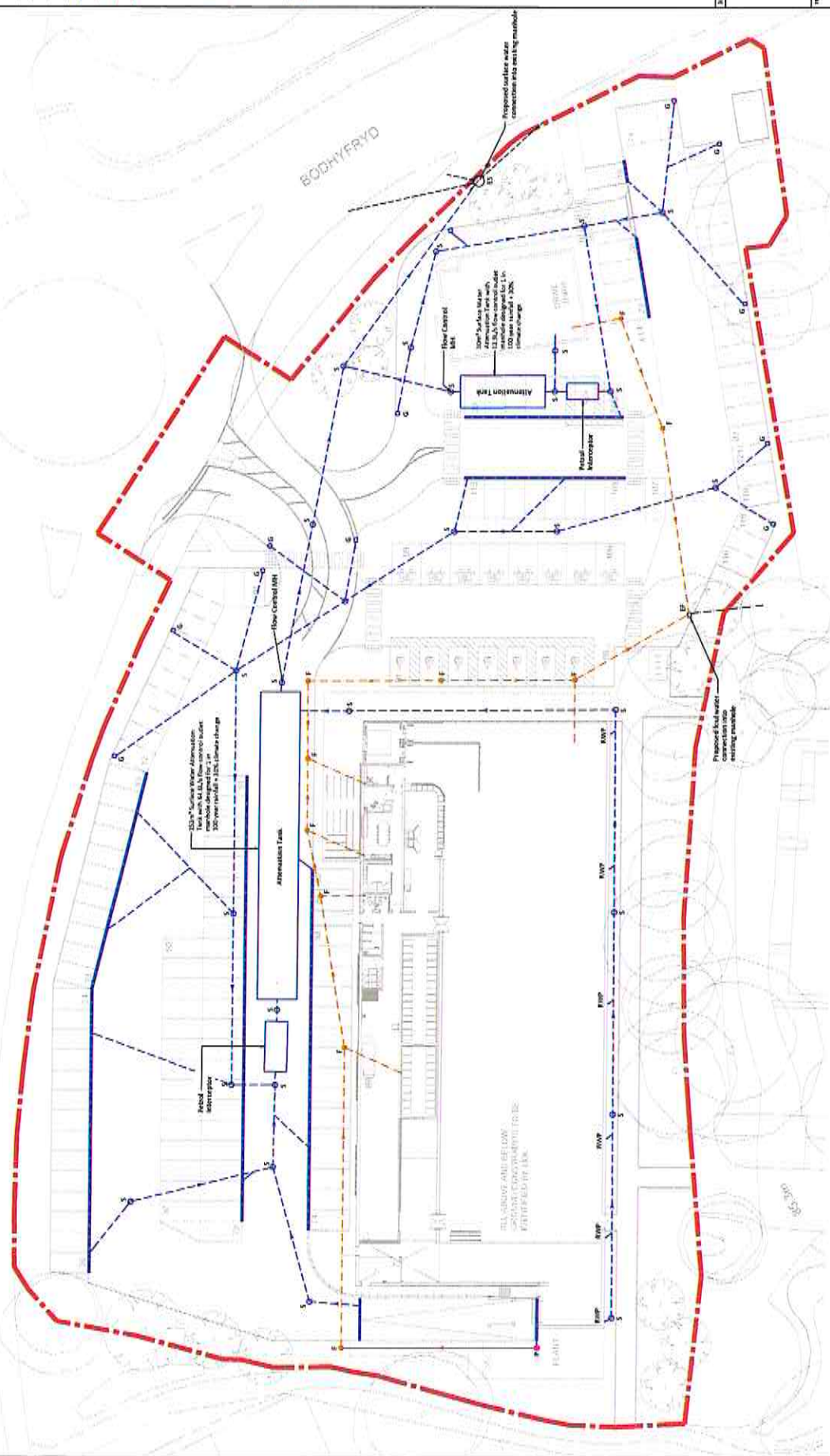
Proposed Drainage General Arrangement

Lidl GmbH UK

NAME	DATE	IN	OUT
Information			

DATE	11/05/1998
TIME	11:15
BY	11/05/1998
REMARKS	11/05/1998

09-174-500	Revisions
------------	-----------



Plan
Scale 1:250

Project Title: Lidl Wrexham

09 / 124

Prepared By: KA

Date: 06/2018

Checked By: KGP

Date: 06/2018

EXISTING AND PROPOSED DEVELOPEMENT SURFACE WATER RUN-OFF 1 in 2 year

DESIGN DATA

Site location =	Wrexham
Rainfall intensity, i (l/s) =	50
Existing Impemeable area, A_i (m ²) =	7964
Routing coefficient, C_r =	1
Volumetric run-off coefficient, C_v =	1

RESULTS

Surface water discharge from the existing site	
Q (existing site)=	110.7 l/s
Proposed site allowable discharge	
Q (proposed site) =	77.5 l/s

EXISTING SITE

Rate of run-off, $Q = A_p \times i \times C_r \times C_v \times 2.78$

Q existing = 110.7 l/s

PROPOSED SITE

Proposed site allowable discharge is Existing less 30% :

Q proposed = 77.5 l/s

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.

Project Title: Lidl Wrexham

09 / 124

Prepared By: KA

Date: 06/2018

Checked By: KGP

Date: 06/2018

SURFACE WATER ATTENUATION FOR 1 YEAR RAINFALL RETURN PERIOD

DESIGN DATA

Site location =	Wrexham
M5-60 rainfall ratio (mm) =	18
60min rainfall ratio to 2 day rainfalls of 5 year return period, r =	0.35
Impemeable area (m ²) =	8683
Total site area (m ²) =	10974
Proposed discharge rate (l/s) =	77.5
Allowance for Climate Change (%) =	30

CALCULATIONS RESULTS

Required storage volume (m ³) =	10
---	----

DETAILED CALCULATIONS

Duration, D	15	30	60	120	240	360	600	1440	2880
Z1	0.64	0.79	1.00	1.20	1.44	1.63	1.85	2.35	2.81
M5-D	11.5	14.2	18.0	21.6	25.9	29.3	33.3	42.3	50.6
Z2	0.613	0.618	0.632	0.646	0.664	0.677	0.687	0.705	0.721
M1-D	7.06	8.79	11.38	13.96	17.20	19.87	22.86	29.80	36.46
i (mm/hr)	28.25	17.59	11.38	6.98	4.30	3.31	2.29	1.24	0.76
i + Climate Change %	36.72	22.86	14.79	9.08	5.59	4.31	2.97	1.61	0.99
Area (m ²)	8683	8683	8683	8683	8683	8683	8683	8683	8683
Qp (l/s)	88.65	55.19	35.70	21.91	13.50	10.39	7.17	3.90	2.38
Qe (l/s)	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
Balancing Q	11.15	-22.31	-41.80	-55.59	-64.00	-67.11	-70.33	-73.60	-75.12
Storage volume (m ³)	10.03	-40.15	-150.49	-400.27	-921.66	-1449.49	-2531.71	-6359.30	-12980.06

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.

Project Title: Lidl Wrexham

09 / 124

Prepared By: KA

Date: 06/2018

Checked By: KGP

Date: 06/2018

SURFACE WATER ATTENUATION FOR 100 YEAR RAINFALL RETURN PERIOD

DESIGN DATA

Site location =	Wrexham
M5-60 rainfall ratio (mm) =	18
60min rainfall ratio to 2 day rainfalls of 5 year return period, r =	0.35
Impemeable area (m ²) =	8683
Total site area (m ²) =	10974
Proposed discharge rate (l/s) =	77.5
Allowance for Climate Change (%) =	30

CALCULATIONS RESULTS

Required storage volume (m ³) =	182
Rainfall intensity (mm/hr) =	116

DETAILED CALCULATIONS

Duration, D	15	30	60	120	240	360	600	1440	2880
Z1	0.64	0.79	1.00	1.20	1.44	1.63	1.85	2.35	2.81
M5-D	11.5	14.2	18.0	21.6	25.9	29.3	33.3	42.3	50.6
Z2	1.934	1.978	2.014	2.024	2.003	1.975	1.944	1.872	1.806
M100-D	22.28	28.12	36.25	43.71	51.91	57.95	64.72	79.17	91.35
i (mm/hr)	89.13	56.24	36.25	21.85	12.98	9.66	6.47	3.30	1.90
i + Climate Change %	115.87	73.11	47.13	28.41	16.87	12.56	8.41	4.29	2.47
Area (m ²)	8683	8683	8683	8683	8683	8683	8683	8683	8683
Qp (l/s)	279.70	176.49	113.76	68.58	40.72	30.31	20.31	10.35	5.97
Qe (l/s)	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50	77.50
Balancing Q	202.20	98.99	36.26	-8.92	-36.78	-47.19	-57.19	-67.15	-71.53
Storage volume (m ³)	181.98	178.17	130.54	-64.21	-529.59	-1019.29	-2058.84	-5801.64	-12360.02

DESIGN NOTES

1. Surface water storage design is in accordance with the Wallingford Procedure - Design and Analysis of Urban Drainage. Volume 1 Principles, Methods and Practice. Volume 4 - Modified Rational Method.