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OLDLANDS FARM PHASE 1A, LIDL SITE, BOGNOR REGIS DRAINAGE STRATEGY

**OLDLANDS FARM PHASE 1A, LIDL SITE, BOGNOR
REGIS
DRAINAGE STRATEGY**

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Made by **Brett White**
Checked by **Chris Leigh**
Approved by **Mark Dewson**
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Prepared by:



Brett White

Graduate Engineer

Reviewed by:



Chris Leigh

Senior Engineer

Approved by:



Mark Dewson

Director

Ramboll
Carlton House
Ringwood Road
Woodlands
Southampton
SO40 7HT
United Kingdom
T +44 (0) 238 081 7500
F +44 (0) 845 299 1610
www.ramboll.co.uk

CONTENTS

1.	INTRODUCTION	1
2.	DRAINAGE STRATEGY	2
2.1	General	2
2.2	Proposed Surface Water Drainage Strategy	2
2.3	Proposed Foul Water Drainage Strategy	3
3.	WATER QUALITY	3
4.	CONCLUSION	4

APPENDICES

Appendix 1

Drainage Layout Plan

Appendix 2

Microdrainage Surface Water Simulatiuon Results

Appendix 3

Foul Water Flow Rate Calculations

1. INTRODUCTION

This drainage design strategy is to support the planning submission for the Oldlands Farm Phase 1A development. This report should not be relied upon exclusively for decision making purposes and should be read in conjunction with other Engineer's reports, specifications and drawings in addition to all other relevant reports, drawings and specifications.

The site is located to the south of the A259, Bognor Regis Relief Road north of Bognor Regis, West Sussex.

The site (Phase 1A) comprises a cut to fill earthworks plateau as a result of flood compensation works completed in a previous stage of works and has a drainage ditch running along the north eastern boundary. The commercial development of Phase 1A - LIDL Site will comprise of one unit with surrounding car parking and a service yard. The unit will measure 2,125 square metres gross surrounded by a carpark for 149 car spaces. The future occupier in this development will be LIDL.

Access to the site will be provided on the western boundary and a separate access specifically for the service yard will be provided on the eastern boundary. The total area for the commercial development (Phase 1A – LIDL Site) will be 1.074 hectares.

The plan below (Figure 1) shows the boundary for Phase 1A – LIDL Site in red, service yard nib in green, and an approximate location of the drainage ditch in blue.



Figure 1: Site Plan

The topography of the site consists of 0.5m to 1.1m of made ground underlain by river and marine deposits with a chalk base at depths between 2.7m and 15m below ground level. Monitoring data has indicated that the groundwater table is standing at approximately 0.5m AOD. This area has undergone land raising associated with the building of the industrial units adjacent. Previous ground water levels are known to have been between 1.2m AOD in the north of the site and up to 3m AOD to the south.

The north-eastern ditch indicated in Figure 1 will provide the new outfall for the development drainage networks. The outfall rate into the ditch will be controlled through an attenuation pond, and an hydrobrake system which will be provided adjacent to the ditch. The use of infiltration will not be permitted due to the high ground water table present.

The maximum discharge rate from impermeable areas of the site development shall be limited to 3.7l/s as calculated from the ICP SuDS mean annual flood flow rate equation.

2. DRAINAGE STRATEGY

The drainage scope of works includes the design of surface water drainage, below ground foul water drainage and the SuDS strategy and design.

2.1 General

The following information has been used in the preparation of the planning proposal:

- Architect drawing 1821-LE-101.3 by LDA Chartered Architects
- Flood Risk Assessment by MJA Consulting
- Ground Investigation Report by Hydrock

The following documents have been used in the drainage design analysis:

- Building Regulations - Part H
- BS EN 752: Drain and Sewer Systems outside buildings: hydraulic design and environmental considerations
- BS EN 12056-2:2000 Gravity drainage systems inside buildings
- CIRIA C753: The SuDs Manual

2.2 Proposed Surface Water Drainage Strategy

The commercial development area is to be self-contained from a surface water drainage standpoint with the exception of a single outlet into the existing Oldlands Farm ditch to the north east of the site. Source control will be used in the form of an attenuation pond and hydrobrake to manage the flow discharging to Oldlands Farm ditch so that the drainage system replicates the natural drainage regime as closely as possible, thus reducing the impact on receiving watercourses.

The surface water drainage network will consist of trapped gullies, linear drains and underground pipes that will direct flow towards the detention basin where flow will then be conveyed to Oldlands Farm ditch at a restricted flow rate.

2.2.1 Building Surface Water Strategy

Roof runoff will be collected by traditional guttering and downpipe systems before connecting to the piped networks which share its use with the car park drainage system.

For the building unit it is assumed that 50% of the roof runoff will be collected on the north-western side and the other 50% on south-eastern side.

2.2.2 Car Park Surface Water Strategy

Runoff from roads and parking areas will drain via trapped gullies and linear channels that will link to their main storm systems. The individual system can be maintained with no conflict on future construction to the east of the site.

2.2.3 Attenuation – Detention Basin

The detention basin has been designed as a dry landscape pond and will cater for all storm events up to and including for the 1 in 100 year + 40% climate change events in accordance with Environment Agency and West Sussex County Council requirements. The discharge from the attenuation pond will be restricted to a maximum discharge rate of 3.7l/s (QBar) to the Oldlands Farm Ditch. The basin will be sealed with an impermeable membrane to prevent site runoff infiltrating into the made ground and migration of ground water.

The attenuation requirements for the site have been estimated using a hydraulic model developed using Microdrainage software. This is based on the following parameters:

- Total impermeable area: 1.074ha;
- A maximum discharge rate of 3.7 l/s;
- Return period of 100 years + 40% allowance for climate change
- Attenuation requirement of $\approx 825 \text{ m}^3$

2.3 Proposed Foul Water Drainage Strategy

It is proposed that the foul water discharge will drain via gravity through a piped network before discharging into the new foul drainage network running underneath the new private estate road along the site perimeter, which in turn will discharge into the existing pumping station under adopted with Southern Water.

The foul network drainage design is based on the total flow rate calculations as supplied in Appendix 3. There is assumed to be sufficient capacity within the existing pumping station to cater for the design flows required as per the wider Oldlands Farm site drainage strategy.

3. WATER QUALITY

The surface water network comprises multiple pollution control measures including trapped gullies and chambers for removal of silts and debris, a full retention fuel interceptor with silt capacity to remove silts, oils and floatables and the detention basin that will allow for further removal of suspended solids and metals. The three stage treatment train provided combined with regular maintenance will ensure reduction of contaminants and safeguard the Oldlands Farm ditch from potential pollution from the site.

The impact of the proposed development on local water quality has been assessed quantitatively adapting the simple index approach in accordance with Chapter 26 of the CIRIA (C753) The SuDS Manual.

The pollution hazard levels were established based on land use and presented in Table 1.

Table 1 Pollution Hazard Indices¹

Land Use	Pollution Hazard Level	Total Suspended Solids	Metals	Hydro-Carbons	Proposed Treatment
Other Roofs (typically commercial/industrial roofs)	Low	0.3	0.2	0.05	

¹ In accordance with Table 26.2 of CIRIA (C753) The SuDS Manual

Car Park (non-residential with frequent change-retail)	Medium	0.7	0.6	0.7
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The risk of pollution associated with the runoff generated by the roof and other external hard paved areas are proposed to be mitigated by the SuDS components as part of the drainage strategy and proprietary systems. The pollutant removal potential of each SuDS component is shown in Table 2.

Table 2 Indicative SuDS Mitigation Indices

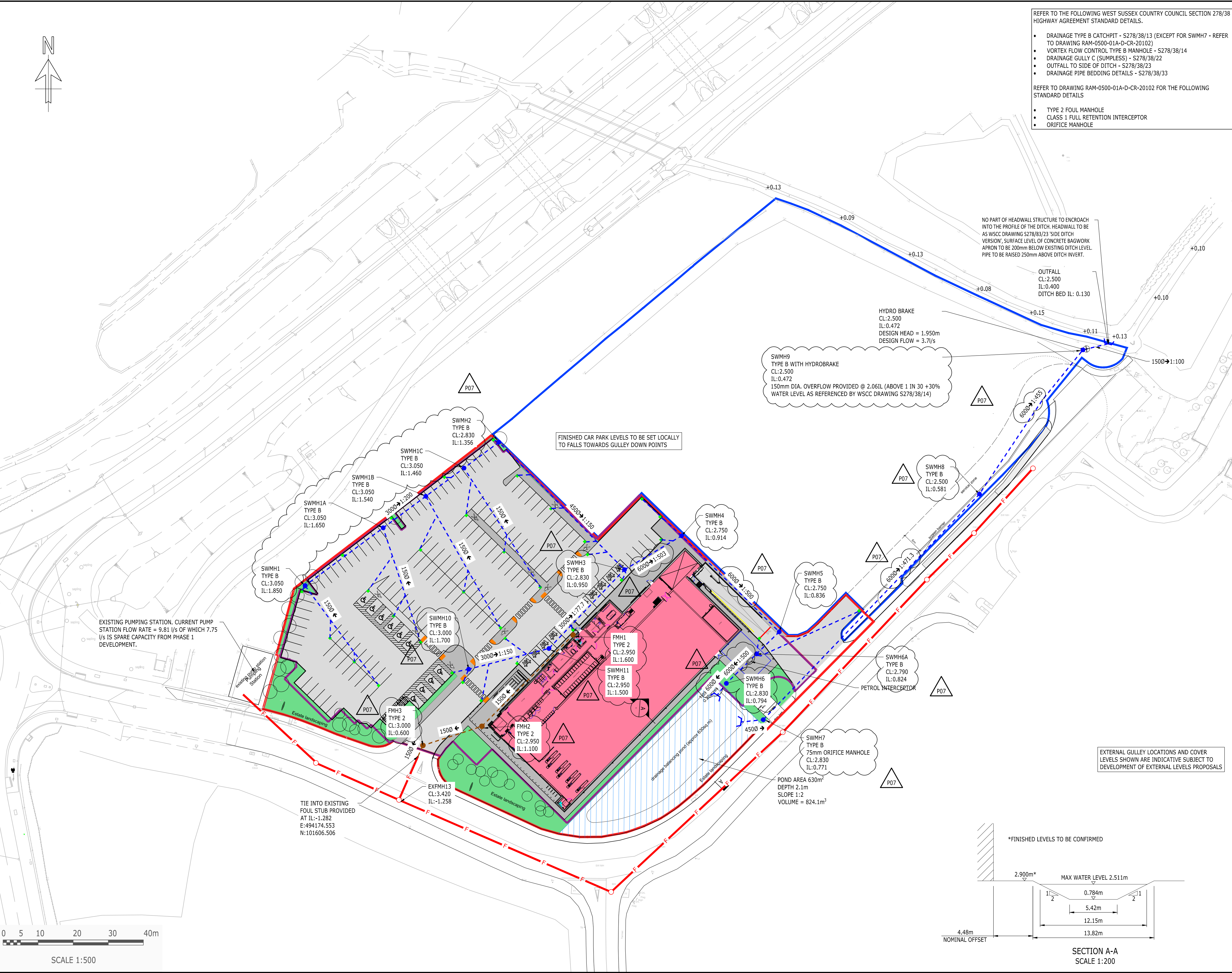
Type of SuDS Component	Total Suspended Solids	Metals	Hydro-Carbons
Detention Basin	0.5	0.5	0.6
Full Retention Interceptor	-	-	-
Catchpits (Gulleys and Manholes)	-	-	-

To deliver adequate treatment, the SuDS components incorporated in the drainage design should have a total pollution mitigation index that equals or exceeds the pollution hazard index shown in Table 2. The pollution removal potential of the detention basin alone does not exceed the hazard level associated with roof and car park drainage, therefore not considered to provide an adequate level of mitigation for such land use. As such Additional mitigation is provided by proprietary treatment systems including a Class 1 Full Retention Separator. This together with trapped gullies and catchpits within the manholes will ensure the system provides more than sufficient treatment for the anticipated level of contamination (low risk).

4. CONCLUSION

- The surface water network for the LIDL building, car park and service area is designed to convey and store surface water from the site for a 1 in 100-year storm plus a 40% allowance for climate change.
- An isolated drainage network will be provided for the unit and its surrounding areas before outfalling to the detention basin.
- This Greenfield runoff rate is limited to 3.7l/s and is maintained through the use of an detention basin and flow restriction systems (Orifice and vortex flow control).
- The foul water network uses a gravity-based system connecting to the foul drainage network located within the private estate road and directed to the pumping station.
- Fuel separator will be used to treat against any contaminants picked up within surface water runoff from the car park areas. This in conjunction with trapped gulleys, catchpits and the detention basin provides a surface water treatment train sufficient for discharge to watercourse. (Class 1 required for discharge to water bodies).

APPENDIX 1
DRAINAGE LAYOUT PLAN



- REFER TO THE FOLLOWING WEST SUSSEX COUNTRY COUNCIL SECTION 278/38 HIGHWAY AGREEMENT STANDARD DETAILS.
- DRAINAGE TYPE B CATCHPIT - S278/38/13 (EXCEPT FOR SWMH7 - REFER TO DRAWING RAM-0500-01A-D-CR-20102)
 - VORTEX FLOW CONTROL TYPE B MANHOLE - S278/38/14
 - DRAINAGE GULLY C (SUMPLESS) - S278/38/22
 - OUTFALL TO SIDE OF DITCH - S278/38/23
 - DRAINAGE PIPE BEDDING DETAILS - S278/38/33
- REFER TO DRAWING RAM-0500-01A-D-CR-20102 FOR THE FOLLOWING STANDARD DETAILS
- TYPE 2 FOUL MANHOLE
 - CLASS 1 FULL RETENTION INTERCEPTOR
 - ORIFICE MANHOLE

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- NOTES
1. DO NOT SCALE FROM THIS DRAWING.
 2. ALL DIMENSIONS ARE METRES UNLESS OTHERWISE STATED.
 3. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS OTHERWISE STATED.
 4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS AND ENGINEERS DRAWINGS AND SPECIFICATIONS.
 5. RAIN WATER PIPE AND FOUL CONNECTIONS FROM BUILDING TO CONNECT TO NEAREST MANHOLE VIA INSPECTION CHAMBER. POSITIONS TO BE CONFIRMED AT DETAILED DESIGN STAGE.
 6. ALLOWANCE TO BE MADE FOR 8NO. INSPECTION CHAMBERS (4500 POLYPROPYLENE INSPECTION CHAMBER) FOR FOUL CONNECTIONS PER BUILDING AND ASSOCIATES UNDER SLAB PIPE WORK (CAST IRON)
 7. ALL SURFACE WATER PIPES TO BE MADE FROM POLYPROPYLENE TWIN WALL PLASTIC.
 8. ALL FOUL WATER PIPES TO BE MADE FROM VITRIFIED CLAY.
 9. ALL MANHOLE COVERS WITHIN THE CARRIAGEWAY TO BE CLASS D400 TO BS EN 124 AND ALL OTHER COVERS TO BE B125 LOAD RATING.

- SURFACE WATER DRAINAGE
- FOUL WATER DRAINAGE
- MANHOLE (SURFACE WATER)
- MANHOLE (FOUL WATER)
- GULLY
- LDC
- PETROL INTERCEPTOR
- HYDRO-BRAKE
- HEADWALL AS S278/38/23 CONCRETE BAGWORK
- EXISTING FOUL WATER DRAINAGE

P07	PRELIMINARY	27/08	SC	MRD
P06	PRELIMINARY	11/08	CL	MRD
P05	PRELIMINARY	29/07	CL	MRD
P04	PRELIMINARY	09/09	CL	MRD
P03	PRELIMINARY	30/08	BW	MRD
P02	PRELIMINARY	02/07	BW	MRD
P01	PRELIMINARY	28/06	BW	MRD
Rev	Description	Date	By	App

PRELIMINARY

OLDLANDS FARM
BOGNOR REGIS

RAMBOLL

tel 023 8081 7500 fax 023 8081 7600 southampton@ramboll.co.uk
www.ramboll.co.uk

PHASE 1A - LIDL SITE
DRAINAGE LAYOUT

Project No:	Scale (@A1):	Drawn:	Date:
1620003993	1:500	BW	JUN.19
Drawing No:	Rev:		
RAM-0500-01A-DR-CR-20001	P07		

APPENDIX 2

MICRODRAINAGE SURFACE WATER SIMULATION RESULTS

Summary of results

- Total impermeable area: 1.074ha;
- 3.7l/s allowable surface water discharge rate;
- Allowance of 40% climate change in accordance with current guidance.
- Return Period (Years) 1 in 100 + 40% CC
- Attenuation pond storage volume: 824m³
- No flooding for 1 in 1, 1 in 30 and 1 in 100 storm events

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Micro Drainage	Network 2019.1
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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	19.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	0.900
Ratio R	0.350	PIMP (%)	100	Min Vel for Auto Design only (m/s)	0.75
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	68.802	0.344	200.0	0.060	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	57.114	0.381	150.0	0.249	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	26.224	0.175	150.0	0.032	4.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	31.099	0.400	77.7	0.127	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	E I.Area (ha)	E Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	44.85	6.03	1.850	0.060	0.0	0.0	0.0	1.11	78.3	7.3
1.001	43.02	6.61	1.356	0.309	0.0	0.0	0.0	1.66	263.6	36.0
2.000	50.00	4.34	1.700	0.032	0.0	0.0	0.0	1.28	90.6	4.3
2.001	50.00	4.63	1.500	0.159	0.0	0.0	0.0	1.78	126.2	21.5

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Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	18.127	0.036	503.5	0.183	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.003	39.039	0.078	500.0	0.036	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.004	21.068	0.042	500.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.005	9.624	0.010	1000.0	0.200	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.006	12.875	0.013	990.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.007	89.540	0.190	471.3	0.048	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.008	49.597	0.109	455.0	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
1.009	7.201	0.022	327.3	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	

Network Results Table

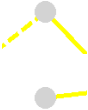
PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	42.19	6.89	0.800	0.651	0.0	0.0	0.0	1.08	304.9	74.4
1.003	40.53	7.49	0.764	0.687	0.0	0.0	0.0	1.08	306.0	75.4
1.004	39.69	7.81	0.686	0.687	0.0	0.0	0.0	1.08	306.0	75.4
1.005	39.17	8.03	0.644	0.887	0.0	0.0	0.0	0.76	215.4	94.1
1.006	38.37	8.36	0.784	0.887	0.0	0.0	0.0	0.64	101.4	94.1
1.007	35.54	9.70	0.621	0.935	0.0	0.0	0.0	1.12	315.3	94.1
1.008	34.19	10.43	0.431	0.935	0.0	0.0	0.0	1.14	320.9	94.1
1.009	34.03	10.52	0.322	0.935	0.0	0.0	0.0	1.34	379.0	94.1

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Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam., L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
1	3.050	1.200	Open Manhole	1200	1.000	1.850	300				
2	2.830	1.474	Open Manhole	1350	1.001	1.356	450	1.000	1.506	300	
10	3.000	1.300	Open Manhole	1200	2.000	1.700	300				
11	2.950	1.450	Open Manhole	1200	2.001	1.500	300	2.000	1.525	300	25
3	2.830	2.030	Open Manhole	1500	1.002	0.800	600	1.001	0.975	450	25
								2.001	1.100	300	
4	2.750	1.986	Open Manhole	1500	1.003	0.764	600	1.002	0.764	600	
5	2.750	2.064	Open Manhole	1500	1.004	0.686	600	1.003	0.686	600	
6	2.830	2.186	Open Manhole	1500	1.005	0.644	600	1.004	0.644	600	
POND	2.900	2.266	Open Manhole	1500	1.006	0.784	450	1.005	0.634	600	
7	2.830	2.209	Open Manhole	1500	1.007	0.621	600	1.006	0.771	450	
8	2.500	2.069	Open Manhole	1500	1.008	0.431	600	1.007	0.431	600	
9	2.500	2.178	Open Manhole	1500	1.009	0.322	600	1.008	0.322	600	
Outfall	2.500	2.200	Open Manhole	0		OUTFALL		1.009	0.300	600	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	494142.380	101655.234	494142.380	101655.234	Required	
2	494196.552	101697.649	494196.552	101697.649	Required	
10	494189.016	101631.412	494189.016	101631.412	Required	

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Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
11	494215.062	101634.470	494215.062	101634.470	Required	
3	494236.588	101656.916	494236.588	101656.916	Required	
4	494249.690	101669.443	494249.690	101669.443	Required	
5	494277.527	101642.073	494277.527	101642.073	Required	
6	494262.449	101627.359	494262.449	101627.359	Required	
POND	494261.743	101617.761	494261.743	101617.761	Required	
7	494274.301	101614.920	494274.301	101614.920	Required	
8	494336.779	101679.059	494336.779	101679.059	Required	
9	494368.535	101717.156	494368.535	101717.156	Required	
Outfall	494373.015	101722.794			No Entry	

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.060	0.060	0.060
1.001	-	-	100	0.249	0.249	0.249
2.000	-	-	100	0.032	0.032	0.032
2.001	-	-	100	0.127	0.127	0.127
1.002	-	-	100	0.183	0.183	0.183
1.003	-	-	100	0.036	0.036	0.036
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.200	0.200	0.200
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.048	0.048	0.048
1.008	-	-	100	0.000	0.000	0.000
1.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.935	0.935	0.935

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.009 Outfall 2.500 0.300 0.000 0 0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
60	1.000	180	1.000	300	1.000	420	1.000	540	1.000	660	1.000	780	1.000	900	1.000	1020	1.000
120	1.000	240	1.000	360	1.000	480	1.000	600	1.000	720	1.000	840	1.000	960	1.000	1080	1.000
																1200	1.000
																1320	1.000
																1440	1.000

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<u>Simulation Criteria for Storm</u> Volumetric Runoff Coeff 0.750 Manhole Headloss Coeff (Global) 0.500 Inlet Coefficient 0.800 Areal Reduction Factor 1.000 Foul Sewage per hectare (l/s) 0.000 Flow per Person per Day (l/per/day) 0.000 Hot Start (mins) 0 Additional Flow - % of Total Flow 0.000 Run Time (mins) 60 Hot Start Level (mm) 0 MADD Factor * 10m³/ha Storage 2.000 Output Interval (mins) 1 Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0 Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0 <u>Synthetic Rainfall Details</u> Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750 Return Period (years) 1 Ratio R 0.350 Cv (Winter) 0.840 Region England and Wales Profile Type Summer Storm Duration (mins) 30		
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Storage Structures for Storm

Tank or Pond Manhole: POND, DS/PN: 1.006

Invert Level (m) 0.784

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	184.0	1.050	389.0	2.100	630.0

Ramboll UK Ltd		Page 8
240 Blackfriars Road		
London		
SE1 8NW		
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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coeffiecient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 40, 40

PN	US/MH		Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water	Surcharged	Flooded	Pipe		Status	Level Exceeded
	Name	Storm							Level (m)	Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (1/s)	Flow (1/s)	
1.000	1	15 Winter	1	+0%	30/600 Winter				1.914	-0.236	0.000	0.10		7.6	OK
1.001	2	15 Winter	1	+0%	30/120 Winter				1.468	-0.338	0.000	0.14		33.5	OK
2.000	10	15 Winter	1	+0%	30/360 Winter				1.744	-0.256	0.000	0.05		4.3	OK
2.001	11	15 Winter	1	+0%	30/120 Winter				1.579	-0.221	0.000	0.15		17.8	OK
1.002	3	1440 Winter	1	+0%	30/15 Summer				1.288	-0.112	0.000	0.03		5.3	OK
1.003	4	1440 Winter	1	+0%	30/15 Summer				1.288	-0.076	0.000	0.02		5.3	OK
1.004	5	1440 Winter	1	+0%	1/1440 Winter				1.286	0.000	0.000	0.02		4.8	SURCHARGED
1.005	6	1440 Winter	1	+0%	1/720 Winter				1.287	0.043	0.000	0.04		6.2	SURCHARGED
1.006	POND	1440 Winter	1	+0%	1/600 Winter				1.286	0.052	0.000	0.19		12.1	SURCHARGED
1.007	7	1440 Winter	1	+0%	1/480 Winter				1.303	0.082	0.000	0.01		2.8	SURCHARGED

Ramboll UK Ltd		Page 9
240 Blackfriars Road London SE1 8NW		
Date 01/09/2020 10:12	Designed by CLEIG	
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Micro Drainage	Network 2019.1	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

									Water	Surcharged	Flooded	Pipe				
PN	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow	Level	
	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status	Exceeded
1.008	8	1440	Winter	1	+0%	1/120	Winter		1.193	0.162	0.000	0.01		3.3	SURCHARGED	
1.009	9	1440	Winter	1	+0%	1/120	Summer		1.193	0.271	0.000	0.01		2.9	SURCHARGED	

Ramboll UK Ltd		Page 10
240 Blackfriars Road		
London		
SE1 8NW		
Date 01/09/2020 10:12	Designed by CLEIG	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Manhole Headloss Coeff (Global) 0.500 MADD Factor * 10m³/ha Storage 2.000
Hot Start (mins) 0 Foul Sewage per hectare (l/s) 0.000 Inlet Coefficient 0.800
Hot Start Level (mm) 0 Additional Flow - % of Total Flow 0.000 Flow per Person per Day (l/per/day) 0.000

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 2 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 19.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.350 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 150.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 40, 40

PN	US/MH		Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level	Surcharged Depth	Flooded Volume	Flow / Overflow		Pipe Flow	Status	Level Exceeded
	Name	Storm							(m)	(m)	(m ³)	Cap.	(l/s)	(l/s)		
1.000	1	1440 Winter	30	+40%	30/600 Winter				2.260	0.110	0.000	0.02		1.4	SURCHARGED	
1.001	2	1440 Winter	30	+40%	30/120 Winter				2.260	0.454	0.000	0.03		7.1	SURCHARGED	
2.000	10	1440 Winter	30	+40%	30/360 Winter				2.261	0.261	0.000	0.01		0.7	SURCHARGED	
2.001	11	1440 Winter	30	+40%	30/120 Winter				2.261	0.461	0.000	0.03		3.5	SURCHARGED	
1.002	3	1440 Winter	30	+40%	30/15 Summer				2.260	0.860	0.000	0.07		14.3	SURCHARGED	
1.003	4	1440 Winter	30	+40%	30/15 Summer				2.260	0.896	0.000	0.06		14.9	SURCHARGED	
1.004	5	1440 Winter	30	+40%	1/1440 Winter				2.260	0.974	0.000	0.07		14.8	SURCHARGED	
1.005	6	1440 Winter	30	+40%	1/720 Winter				2.259	1.016	0.000	0.13		19.2	SURCHARGED	
1.006	POND	1440 Winter	30	+40%	1/600 Winter				2.259	1.025	0.000	0.11		6.7	SURCHARGED	
1.007	7	1440 Winter	30	+40%	1/480 Winter				2.274	1.053	0.000	0.01		3.6	SURCHARGED	

Ramboll UK Ltd		Page 11
240 Blackfriars Road		
London		
SE1 8NW		
Date 01/09/2020 10:12	Designed by CLEIG	
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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

									Water		Surcharged		Flooded		Pipe	
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	Level Exceeded
1.008	8	1440 Winter	30	+40%	1/120 Winter				2.159	1.128	0.000	0.01		3.6	SURCHARGED	
1.009	9	1440 Winter	30	+40%	1/120 Summer				2.159	1.237	0.000	0.02		3.5	SURCHARGED	

Ramboll UK Ltd										Page 12																																																																																																																																																																																																
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PN	US/MH Name	Storm	Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded																																																																																																																																																																																										
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Ramboll UK Ltd		Page 13
240 Blackfriars Road		
London		
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Date 01/09/2020 10:12	Designed by CLEIG	
File OLDLANDS FARM - PHASE 1A - LIDL SITE - SURCHARG...	Checked by CLEIGH	

Micro Drainage	Network 2019.1
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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

										Water	Surcharged	Flooded	Pipe			
PN	US/MH			Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level	Depth	Volume	Flow /	Overflow	Flow	Level
	Name	Storm		Period	Change	Surcharge	Flood	Overflow	Act.	(m)	(m)	(m³)	Cap.	(l/s)	(l/s)	Status
1.008	8	1440	Winter	100	+40%	1/120	Winter			2.483	1.452	0.000	0.01		3.8	FLOOD RISK
1.009	9	1440	Winter	100	+40%	1/120	Summer			2.483	1.561	0.000	0.02		3.7	FLOOD RISK

APPENDIX 3

FOUL WATER FLOW RATE CALCULATION

LIDL

2007 PLANNING APPLICATION ESTIMATED FOUL FLOWS

Application Form		Suggested dry weather flow rates			No	DWF	(6 DWF + 10 %) (PEAK)	Cut off - 0.93
		Litres per day				L/S	L/S	
A1	Shops							
	Net tradeable area	1	General Housing	600	per property	0.000	0.00	L/S
A2	Financial and professional services	2	School	80	per pupil	0.000	0.00	0.00
A3	Restaurants and cafes	3	Assembly Hall	10	per seat	0.000	0.00	(SFA 7 estimation for comparison)
A4	Drinking Establishments	4	Cinema	10	per seat	0.000	0.00	
A5	Hot food takeaways	5	Theatre	10	per seat	0.000	0.00	
B1(a)	Office (other than A2)	6	Sports Hall	50	per person	0.000	0.00	
B1(b)	Research and Development	7	Hotel	550	per room	0.000	0.00	
B1(c)	Light industrial	8	Guest House	200	per room	0.000	0.00	
B2	General industrial	9	Motel	300	per room	0.000	0.00	
B8	Storage or distribution	10	Holiday apartments	150	per person	0.000	0.00	
C1	Hotels and halls of residence	11	Leisure park	220	per person	0.000	0.00	
C2	Residential institutions	12	Caravan park standard	250	per space	0.000	0.00	
D1	Non-residential institutions	13	Caravan park serviced	450	per space	0.000	0.00	
D2	Assembly and Leisure	14	Camping Site standard	200	per space	0.000	0.00	
Other		15	Camping Site serviced	350	per space	0.000	0.00	
	Nursing Care Homes	16	Public house	150	per seat	0.000	0.00	
		17	Restaurant	270	per seat	0.000	0.00	
		18	Drive in restaurant	380	per seat	0.000	0.00	
		19	Hospital	750	per bed	0.000	0.00	Total Foul
		20	Nursing Home	375	per bed	0.000	0.00	0.60
		21	Offices	750	per 100 m ²	0.000	0.00	FOUL
		22	Shopping centre	400	per 100 m ²	2125	0.098	
		23	Warehouse	150	per 100 m ²	0.000	0.00	
		24	Commercial premises	300	per 100 m ²	0.000	0.00	
		25	Manufacturing unit	550	per 100 m ²	0.000	0.00	

ESTIMATIONS USED:

3sq mtrs = 1 seat in restaurant/bar
10sq mtrs = 1 hotel room

ESTIMATIONS USED:
3sq mtrs = 1 seat in restaurant/bar
10sq mtrs = 1 hotel room