EWE Associates Limited
7 Waveney Close, Burton Upon Stather, Scunthorpe, DN15 9DT
Office: 01724 721099
Mobile: 07875972270
Email:lea.favill@eweassociates.com

Technical Note: 001
Date: 15th February 2024
Site: Oak Tree Fishery Graizelound
Reference:2024/3102

Surface Water Drainage

Existing Runoff Rate

The site is currently occupied by two large fishing ponds with a total site area of 3.92 hectares. Planning approvals have been granted for leisure use which has seen the impermeable area increase to 1.18 hectares with the introduction of large areas of permeable crushed stone to form access roads and parking areas for caravans. There are also roofed areas such as holiday lodges and reception buildings which currently drain to the adjacent crushed stone areas.

The site is currently supported by a series of filter drains which capture runoff and convey it to the large ponds within the site before being discharged into the adjacent watercourse. The crushed stone areas are at least 300mm deep and assumed to have 30% voids. These areas will provide both attenuation and water treatment.

The discharge from the site is currently controlled by a single 100mm diameter pipe from the second pond to the adjacent watercourse. It is proposed that the pipe is restricted to a discharge rate of 5.71l/s based on the Qbar rate for the 3.92 hectare site.

The Qbar rate has been calculated using the H R Wallingford Method and is provided at Appendix A of this technical note.

Proposed Drainage

The current proposal will introduce an additional 1682m² of paved areas into the site which will be formed using crushed stone at least 300mm deep. These additional areas will be used for touring caravan pitches and lodges.

The additional areas will drain into the existing drainage system and ponds within the site.

The impermeable areas are shown at Appendix B of this technical note.

Hydraulic Modelling

A MicroDrainage model of the drainage system which is shown at Appendix C was constructed in order to determine surface water levels within the site and the ponds.

The MicroDrainage model has been simulated with the 1 in 100 year plus climate change (40%), return period design storm events with durations of 15, 45, 60, 180, 360, 600, 900, 1440 & 10800 minutes.

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It was found that the 1440 minute storm duration produced the largest flows and the highest water levels within the system. The table below shows a summary of the model runs and the impact on the drainage system in terms of peak depth within the system and flow through the hydro-brake. The 1440 minute results are provided at Appendix D of this technical note.

Return Period	Duration (min)	Peak water level Pond 1	Peak water level Pond2	Peak flow into watercourse	Status
100 yr+CC40%	15min	2.027	2.568	0.2	Flood Risk
100 yr+CC40%	45min	2.049	2.599	0.6	Flood Risk
100 yr+CC40%	60min	2.062	2.607	1.0	Flood Risk
100 yr+CC40%	180min	2.127	2.626	2.4	Flood Risk
100 yr+CC40%	360min	2.154	2.615	2.5	Flood Risk
100 yr+CC40%	600min	2.173	2.601	2.5	Flood Risk
100 yr+CC40%	900min	2.187	2.589	2.5	Flood Risk
100 yr+CC40%	1440min	2.202	2.576	2.5	Flood Risk
100 yr+CC40%	10080min	2.195	2.534	2.5	Surcharge

Conclusion

It is therefore concluded that the existing surface water drainage system is adequate during the 1 in 100 year plus climate change standard with the maximum depth in pond 1 at 0.202m and pond 2 at 0.115m. Based on the lowest ground level of 3.6mOD within the site there is at least 1m of freeboard within the ponds.

Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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APPENDIX A – Greenfield Runoff Rate

hrwallingford

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	lea favill
Site name:	Oak Tree Fishery
Site location:	Graizelound

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:	53.47306° N
Longitude:	0.83516° W
Reference:	2479047603
Date:	Feb 15 2024 10:53

Runoff estimation approach: IH124

Site characteristics

Total site area (ha):	3.92

Methodology

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

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	578	578
Hydrological region:	4	4
Growth curve factor 1 year:	0.83	0.83
Growth curve factor 30 years:	2	2
Growth curve factor 100 years:	2.57	2.57
Growth curve factor 200 years:	3.04	3.04

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):	5.71	5.71
1 in 1 year (l/s):	4.74	4.74
1 in 30 years (l/s):	11.42	11.42
1 in 100 year (l/s):	14.67	14.67
1 in 200 years (l/s):	17.36	17.36

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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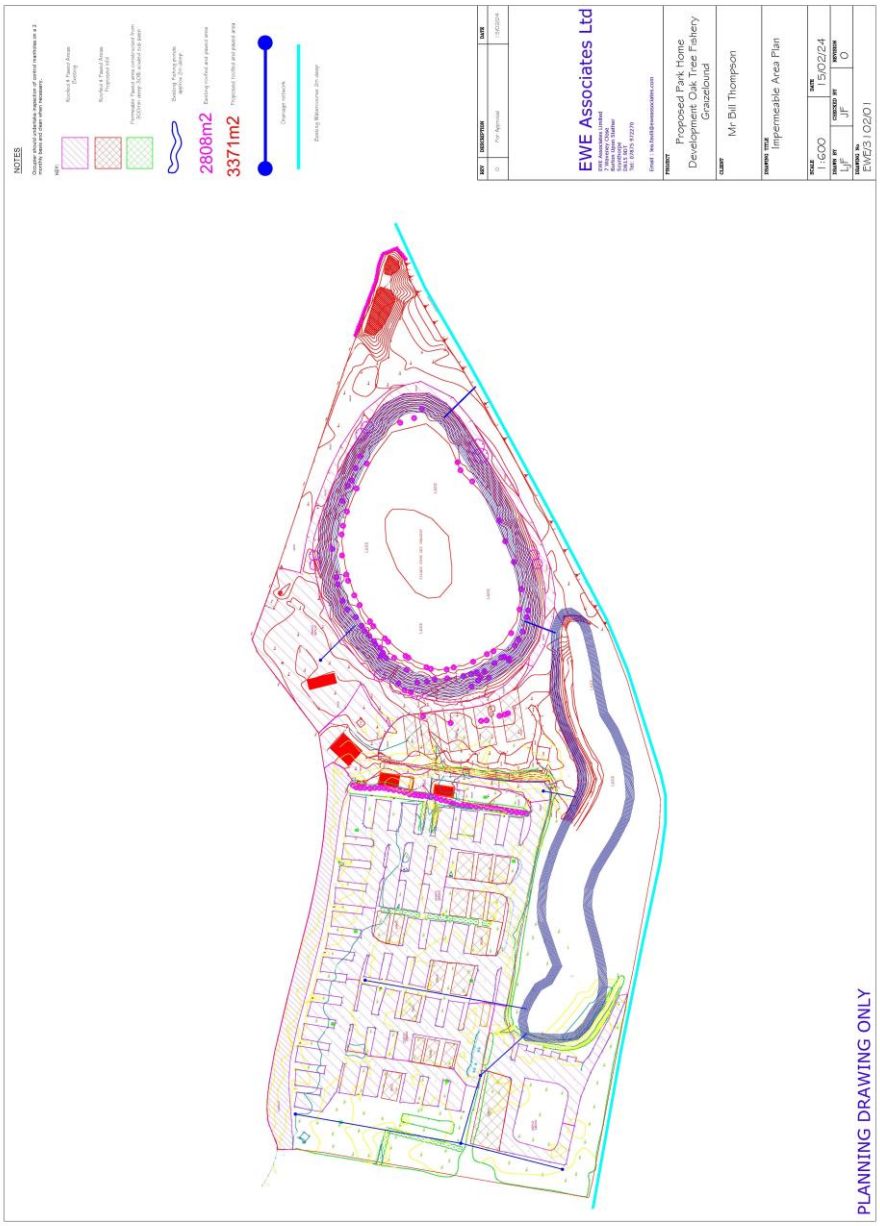
APPENDIX B – Impermeable Area Plan Dwg 01



Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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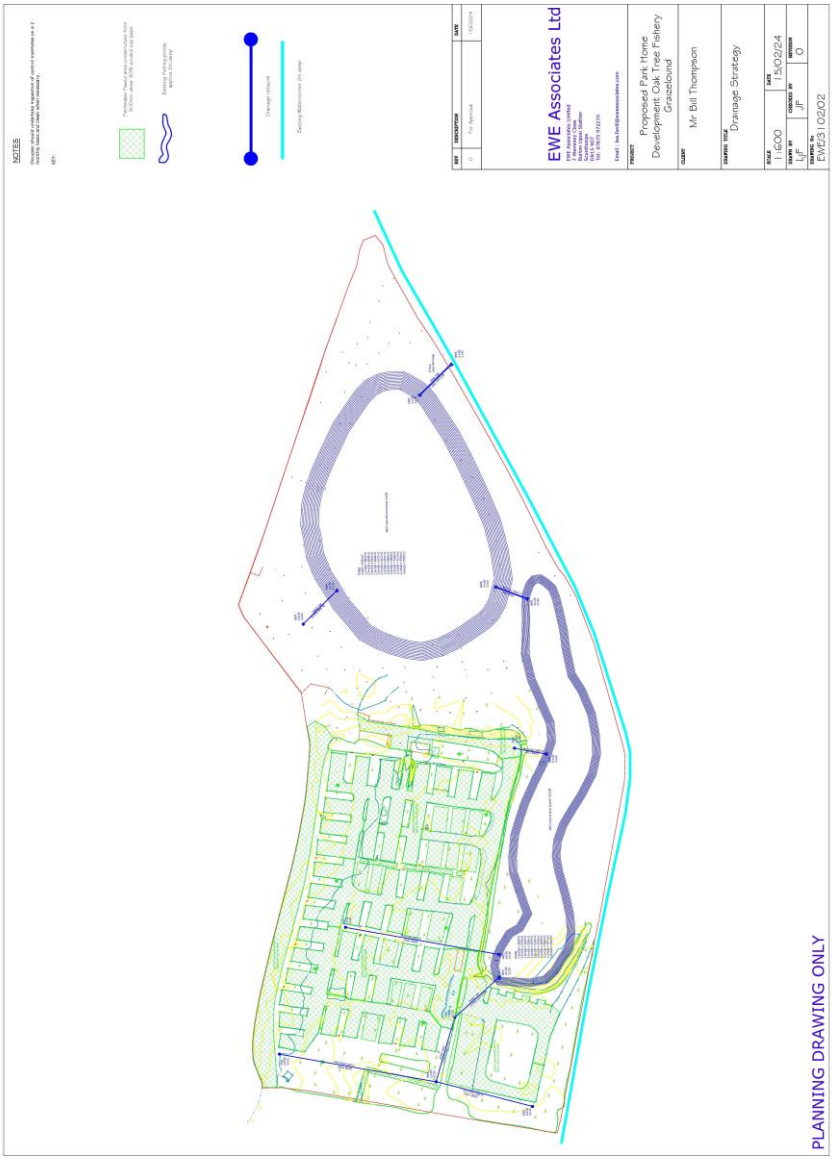
APPENDIX C – Model Schematic Dwg 02



Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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Office: 01724 721099
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APPENDIX D – WINDES Calculation 1440mins

EWE Associates Ltd — Page 1

Windy Ridge Barn
Thealby Lane
Winterton DN15 9TG

Date 14/02/2024 18:36 — Designed By Lea
File 100yr+CC40%Winter... — Checked By
Micro Drainage — Network W.12.4

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	T.E. (mins)	k (mm)	HYD SECT	DIA (mm)
1.000	67.000	0.300	223.3	0.105	5.00	0.600	o	225
2.000	42.000	0.200	210.0	0.138	5.00	0.600	o	225
1.001	28.000	0.120	233.3	0.256	0.00	0.600	o	225
1.002	25.000	0.280	89.3	0.000	0.00	0.600	o	225
3.000	65.000	0.300	216.7	0.382	5.00	0.600	o	225
4.000	15.000	0.500	30.0	0.116	5.00	0.600	o	225
1.003	15.000	0.500	30.0	0.000	0.00	0.600	o	375
5.000	20.000	1.000	20.0	0.337	5.00	0.600	o	300
1.004	18.000	0.200	90.0	0.000	0.00	0.600	o	100

PN	US/MH Name	US/CL (m)	US/IL (m)	US C.Depth (m)	DS/CL (m)	DS/IL (m)	DS C.Depth (m)	Ctrl	US/MH (mm)
1.000	1	4.200	3.200	0.775	3.600	2.900	0.475		1200
2.000	2	3.600	3.100	0.275	3.600	2.900	0.475		1200
1.001	3	3.600	2.900	0.475	3.500	2.780	0.495		1200
1.002	4	3.500	2.780	0.495	4.500	2.500	1.775		1200
3.000	5	3.900	2.800	0.875	4.500	2.500	1.775		1200
4.000	6	4.500	3.000	1.275	4.500	2.500	1.775		1200
1.003	7	4.500	2.500	1.625	4.500	2.000	2.125		1350
5.000	8	5.000	3.000	1.700	4.500	2.000	2.200		1200
1.004	9	4.500	2.000	2.400	4.500	1.800	2.600	Hydro-Brake®	1350

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		4.500	1.800	1.800	0	0

Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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Office: 01724 721099
Mobile: 07875972270
Email:lea.favill@eweassociates.com

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Site: Oak Tree Fishery Graizelound
Reference:2024/3102

EWE Associates Ltd		Page 2
Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 14/02/2024 18:36 File 100yr+CC40%Winter...	Designed By Lea Checked By	
Micro Drainage	Network W.12.4	

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Foul Sewage per hectare (l/s)	0.000
PIMP (% impervious)	100	Additional Flow - % of Total Flow	40.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	0.000
Hot Start (mins)	0	Run Time (mins)	2880
Hot Start Level (mm)	0	Output Interval (mins)	24
Manhole Headloss Coeff (Global)	0.500		

Number of Input Hydrographs	0	Number of Storage Structures	7
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0		

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	477400 398000 SK 77400 98000
C (1km)	-0.024
D1 (1km)	0.321
D2 (1km)	0.297
D3 (1km)	0.262
E (1km)	0.297
F (1km)	2.496
Summer Storms	No
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	1440

Lea Favill - Director
lea.favill@eweassociates.com
07875 972270

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 14/02/2024 18:36 File 100yr+CC40%Winter...	Designed By Lea Checked By	
Micro Drainage	Network W.12.4	

Online Controls for Storm

Hydro-Brake® Manhole: 9, DS/PN: 1.004, Volume (m³): 6.4

Design Head (m) 2.000 Hydro-Brake® Type Md4 Invert Level (m) 2.000
Design Flow (l/s) 5.7 Diameter (mm) 72

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.1	1.200	4.4	3.000	7.0	7.000	10.7
0.200	2.5	1.400	4.8	3.500	7.6	7.500	11.1
0.300	2.3	1.600	5.1	4.000	8.1	8.000	11.4
0.400	2.6	1.800	5.4	4.500	8.6	8.500	11.8
0.500	2.9	2.000	5.7	5.000	9.0	9.000	12.1
0.600	3.1	2.200	6.0	5.500	9.5	9.500	12.5
0.800	3.6	2.400	6.3	6.000	9.9		
1.000	4.0	2.600	6.5	6.500	10.3		

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Tank or Pond Manhole: 7, DS/PN: 1.003

Invert Level (m) 2.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2580.0	1.400	3456.0	2.800	3842.0	4.200	3842.0
0.200	2703.0	1.600	3584.0	3.000	3842.0	4.400	3842.0
0.400	2827.0	1.800	3701.0	3.200	3842.0	4.600	3842.0
0.600	2951.0	2.000	3842.0	3.400	3842.0	4.800	3842.0
0.800	3077.0	2.200	3842.0	3.600	3842.0	5.000	3842.0
1.000	3202.0	2.400	3842.0	3.800	3842.0		
1.200	3329.0	2.600	3842.0	4.000	3842.0		

Tank or Pond Manhole: 9, DS/PN: 1.004

Invert Level (m) 2.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	5362.0	1.400	6511.0	2.800	7577.0	4.200	7577.0
0.200	5520.0	1.600	6683.0	3.000	7577.0	4.400	7577.0
0.400	5680.0	1.800	6858.0	3.200	7577.0	4.600	7577.0
0.600	5842.0	2.000	7035.0	3.400	7577.0	4.800	7577.0
0.800	6006.0	2.200	7213.0	3.600	7577.0	5.000	7577.0
1.000	6172.0	2.400	7394.0	3.800	7577.0		
1.200	6341.0	2.600	7577.0	4.000	7577.0		

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Windy Ridge Barn Thealby Lane Winterton DN15 9TG		Micro Drainage
Date 14/02/2024 18:36 File 100yr+CC40%Winter...	Designed By Lea Checked By	
Micro Drainage	Network W.12.4	

Summary of Results for 1440 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm)	450.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	ON
Inertia Status	ON

PN	US/HH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
1.000	1	3.217	-0.208	0.000	0.02	0.0	0.5	OK
2.000	2	3.153	-0.172	0.000	0.13	0.0	4.3	FLOOD RISK
1.001	3	2.997	-0.128	0.000	0.39	0.0	12.3	OK
1.002	4	2.855	-0.150	0.000	0.24	0.0	12.3	OK
3.000	5	2.892	-0.133	0.000	0.35	0.0	11.9	OK
4.000	6	3.030	-0.195	0.000	0.04	0.0	3.6	OK
1.003	7	2.576	-0.299	0.000	0.09	0.0	25.4	OK
5.000	8	3.042	-0.258	0.000	0.05	0.0	10.5	OK
1.004	9	2.202	0.102	0.000	0.41	0.0	2.5	SURCHARGED

Lea Favill - Director
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07875 972270