

Sustainable Drainage Strategy Addendum No.2

Moorlands Farm, West End

May 2023

Prepared for
Country Homes

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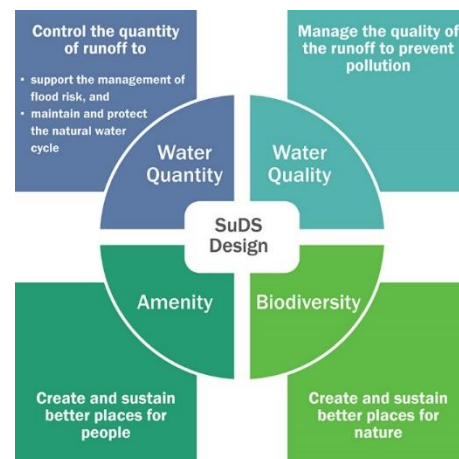
1. Sustainable Drainage Strategy

Introduction

- 1.1 This Sustainable Drainage Strategy Addendum has been produced to support the amendments to Eastleigh Borough Council planning application ref. F/22/93835 at Moorlands Farm, Botley Road, West End, Southampton, SO30 3HD.
- 1.2 This addendum is to be read in conjunction with Fernbrook Consulting Engineers documents:
- Flood Risk Assessment & Sustainable Drainage Strategy (ref. 21035-FCE-XX-XX-RP-D-0001, dated 13.09.22) and
 - Sustainable Drainage Strategy Addendum No.1 (ref. 21035-FCE-XX-XX-RP-D-0001, dated 13.09.22) and by Fernbrook Consulting Engineers

Sustainable Drainage Design

- 1.3 The proposed surface water management strategy will follow the principles of Sustainable Drainage Design taking account of water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants) and public amenity.



Pre-development surface water run-off conditions

- 1.4 The developable area of the site area is 1.60 ha, and approximately 0.30 ha is comprised of impermeable area (19%). It is assumed that surface water runoff from the existing impermeable areas is currently conveyed to the watercourse unrestricted via a network of land drains.

- 1.5 To ensure that pre-development runoff rates are not exceeded, the brownfield runoff rates from the site were determined using the Wallingford procedure rational method for an assumed critical 5-minute storm: $Q = 2.78 \times C \times i \times A$

Where: Q = Peak discharge (l/s)
 C = Dimensionless Runoff coefficient
 i = Rainfall intensity (mm/hr)
 A = Contributing impermeable areas (ha)

- 1.6 Refer to **Table 1-1** below for calculations.

Table 1-1 Brownfield runoff rate

Rainfall event	Runoff rate (l/s)
Q1	42.4
Q30	94.3
Q100	120.0

Post-development surface water runoff

- 1.7 In accordance with the Building Act 2000 Clause H3.3 surface water run off not collected for re-use must be discharged in the following hierarchy:
- 1) To ground (infiltration techniques);
 - 2) To a surface water body;
 - 3) To a surface water sewer; or
 - 4) To the combined sewer.
- 1.8 Based on the drainage hierarchy assessment, the proposed drainage strategy will seek to convey surface water to the Moorgreen Stream along the site's eastern boundary.

Sustainable Drainage Systems

- 1.9 The proposed strategy will seek to maximise the use of Sustainable Drainage Systems (SuDS) to increase the biodiversity, provide amenity, control discharge volumes, and manage water quality.
- 1.10 Based on the management train approach outlined in CIRIA C753 “The SuDS Manual”, the most appropriate SuDS for this development are green roofs, swales, basins and permeable surfaces.
- 1.11 The proposed buildings and access roads will also be set back from the boundaries which will allow for native woodland and hedge buffer planting. A large open area is proposed in the northern sections of the site which can be planted up with native woodland blocks and an orchard. The increased vegetation will contribute to the sustainable drainage strategy through water interception and infiltration while increasing evapotranspiration potential.

Peak Flow Control

- 1.12 The proposed drainage will be designed to ensure that flooding does not occur on any part of the site for the 1 in 30 year rainfall event, and any flooding up to the 1 in 100 year plus climate change rainfall event will be contained on site.
- 1.13 In accordance with the NPPF, the proposed strategy will allow for a 25% increase to rainfall intensity to allow for predicted impacts of climate change on surface water runoff for the proposed commercial development.
- 1.14 The proposed drainage strategy will seek to restrict surface water runoff to 50% of the existing 1 in 1 year runoff rate at 21 l/s using a vortex flow controls for all events up to the 1 in 100 year plus 40% climate change rainfall event.
- 1.15 The peak surface water run-off generated from the Site for the 1 year, 30 year and 100 year rainfall events, for the pre and post-development scenarios, is detailed in **Table 1-2** below. Refer to **Appendix A** for full MicroDrainage calculations.

Table 1-2 Comparison of runoff rates

Return Period	Existing Brownfield Rate (l/s)	Proposed Rate (l/s)	Reduction
1 in 1 year	42.4	21.0	-50%
1 in 30 year	94.3	21.0	-78%
1 in 100 year	120.0	21.0	-82%
1 in 100 year + 40% CC	-	21.0	-

- 1.16 Refer to drawing **21035-MA-XX-XX-DR-D-0500** for the Indicative Drainage Strategy illustrating how the Site could be drained in **Appendix A**.

Urbanisation & Long Term Storage

- 1.17 Based on the industrial development proposals, it is unlikely that the buildings will be extended. Therefore, urban creep has not been considered.
- 1.18 The long term storage requirement can be provided within the permeable paving sub-base.

Overland Flow Routes

- 1.19 The site will be designed so that exceedance flows above the 1 in 100 year, including climate change rainfall event will be conveyed eastbound towards the Moorgreen Stream via the access roads across the site. Refer to drawing **21035-MA-XX-XX-DR-D-0502** for the Indicative Exceedance Flow Routes in **Appendix A**.

Water Quality Management

- 1.20 In accordance with Policy DM6 of the Local Plan Eastleigh Borough Council for sites of 1 hectare or more, or within 100m of the River Itchen SAC or Solent Maritime SAC, SuDS schemes should include at least three above ground forms of naturalised filtration. The strategy includes green roofs, rain gardens, filter drains, permeable paving, a swale and an attenuation pond to provide filtration.
- 1.21 SuDS will be provided to form a management train in line with the best practice outlined in CIRIA C753 “The SuDS Manual”. Source control techniques rain gardens and permeable paving could manage runoff and reduce the time of concentration within the pipe network, reducing the risk of sewer surcharge and flash flooding, and provide water quality benefits.
- 1.22 In line with CIRIA C753 The SuDS Manual, Tables 26.2 and 26.3, the pollution hazards indices associated with an industrial development are mitigated by the proposed SuDS. Refer to **Table 1-3** below for the Simple Index Method assessment.

Table 1-3 Simple Index Method

Pollution Hazard Indices			
Pollution hazard	TSS	Metals	Hydrocarbons
High – Industrial Estates	0.8	0.8	0.9
Pollution Mitigation Indices provided			
SuDS component	TSS	Metals	Hydrocarbons
Basin / Swale	0.5	0.6	0.6
Filter Drain/ Trench	0.2	0.2	0.2
Downstream Defender	0.25	0.2	0.4
Sediment Forebay	0.25	0.25	0.3
Check	+0.4	+0.45	+0.6

APPENDIX A – DRAINAGE CALCULATIONS & DRAWINGS



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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)	2	PIMP (%)	100
M5-60 (mm)	19.700	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall (pipe 1.001)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.020	4-8	0.000

Total Area Contributing (ha) = 0.020 Total

Pipe Volume (m³) = 1.666

Time Area Diagram at outfall (pipe 2.005)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.378	4-8	0.202

Total Area Contributing (ha) = 0.580 Total

Pipe Volume (m³) = 24.971

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	7.592	0.050	151.8	0.020	4.00	0.0	0.600	o	450	Pipe/Conduit	
1.001	2.881	0.550	5.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.000	40.797	0.170	240.0	0.050	4.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.08	28.250	0.020	0.0	0.0	0.0	1.65	262.0	2.7
1.001	50.00	4.08	28.200	0.020	0.0	0.0	0.0	8.93	1419.8	2.7
2.000	50.00	4.52	29.750	0.050	0.0	0.0	0.0	1.31	208.0	6.8



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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
2.001	16.547	0.070	236.4	0.350	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.002	45.111	0.210	214.8	0.150	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.003	19.984	0.050	399.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.004	25.663	0.150	171.1	0.030	0.00	0.0	0.600	o	450	Pipe/Conduit	
2.005	8.908	0.050	178.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL Σ (m)	I.Area (ha)	Σ Base Flow (l/s)	Foul Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.001	50.00	4.73	29.580	0.400	0.0	0.0	0.0	1.32	209.6
2.002	50.00	5.27	29.510	0.550	0.0	0.0	0.0	1.38	220.0
2.003	50.00	5.60	29.300	0.550	0.0	0.0	0.0	1.01	160.8
2.004	50.00	5.88	29.250	0.580	0.0	0.0	0.0	1.55	246.7
2.005	50.00	5.98	29.100	0.580	0.0	0.0	0.0	1.52	241.8

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Name	Level I. (m)	Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		29.700	27.650	0.000	0	0
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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall C. Name	Level I. (m)	Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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2.005		29.850	29.050	0.000	0	0
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Online Controls for Storm

Hydro-Brake® Optimum Manhole: 9, DS/PN: 1.001, Volume (m³): 3.6

Unit Reference	MD-SHE-0041-1000-1700-1000
Design Head (m)	1.700
Design Flow (l/s)	1.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	41
Invert Level (m)	28.200
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.700	1.0	Kick-Flo®	0.366	0.5
Flush-Flo™	0.181	0.6	Mean Flow over Head Range	-	0.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	1.200	0.9	3.000	1.3	7.000	1.9
0.200	0.6	1.400	0.9	3.500	1.4	7.500	2.0
0.300	0.6	1.600	1.0	4.000	1.5	8.000	2.0
0.400	0.5	1.800	1.0	4.500	1.5	8.500	2.1
0.500	0.6	2.000	1.1	5.000	1.6	9.000	2.1
0.600	0.6	2.200	1.1	5.500	1.7	9.500	2.2
0.800	0.7	2.400	1.2	6.000	1.8		
1.000	0.8	2.600	1.2	6.500	1.8		

Orifice Manhole: 15, DS/PN: 2.004, Volume (m³): 4.4

Diameter (m) 0.225 Discharge Coefficient 0.600 Invert Level (m) 29.250

Hydro-Brake® Optimum Manhole: 17, DS/PN: 2.005, Volume (m³): 5.5

Unit Reference	MD-SHE-0192-2000-1500-2000
Design Head (m)	1.500
Design Flow (l/s)	20.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	192
Invert Level (m)	29.100
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	20.0	Kick-Flo®	0.984	16.4
Flush-Flo™	0.452	20.0	Mean Flow over Head Range	-	17.3



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Hydro-Brake® Optimum Manhole: 17, DS/PN: 2.005, Volume (m³): 5.5

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m) Flow (l/s)		Depth (m) Flow (l/s)		Depth (m) Flow (l/s)		Depth (m) Flow (l/s)	
0.100	6.7	1.200	18.0	3.000	27.8	7.000	41.9
0.200	17.7	1.400	19.3	3.500	30.0	7.500	43.3
0.300	19.4	1.600	20.6	4.000	32.0	8.000	44.7
0.400	19.9	1.800	21.8	4.500	33.8	8.500	46.0
0.500	20.0	2.000	22.9	5.000	35.6	9.000	47.3
0.600	19.7	2.200	24.0	5.500	37.3	9.500	48.6
0.800	18.8	2.400	25.0	6.000	38.9		
1.000	16.5	2.600	26.0	6.500	40.4		



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Storage Structures for Storm

Porous Car Park Manhole: 13, DS/PN: 2.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	42.0
Max Percolation (l/s)	35.0	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	28.900	Membrane Depth (mm)	0

Tank or Pond Manhole: 15, DS/PN: 2.004

Invert Level (m) 29.250

Depth (m) Area (m²) | Depth (m) Area (m²)

0.000	40.0	1.000	175.0
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Cellular Storage Manhole: 17, DS/PN: 2.005

Invert Level (m)	29.100	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	0.0	0.551	0.0	0.0
0.550	60.0	0.0			



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

Number of Input Hydrographs 0 Number of Storage Structures 3
 Number of Online Controls 3 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.700 Cv (Winter) 0.840
 Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF
 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	7 30	Winter	1	+0%	30/15	Winter			28.409
1.001	9 30	Winter	1	+0%	30/15	Winter			28.409
2.000	10 15	Winter	1	+0%	100/15	Summer			29.811
2.001	11 15	Winter	1	+0%	100/15	Summer			29.742
2.002	12 15	Winter	1	+0%	100/15	Summer			29.682
2.003	13 60	Winter	1	+0%	30/30	Winter			29.500
2.004	15 60	Winter	1	+0%	30/30	Summer			29.491
2.005	17 60	Winter	1	+0%	30/30	Winter			29.293

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Level Exceeded
1.000	7	-0.291	0.000	0.01			1.7	OK
1.001	9	-0.241	0.000	0.00			0.6	OK
2.000	10	-0.389	0.000	0.04			6.8	OK
2.001	11	-0.288	0.000	0.28			45.5	OK
2.002	12	-0.278	0.000	0.31			60.9	OK
2.003	13	-0.250	0.000	0.25		65	32.6	OK
2.004	15	-0.209	0.000	0.13			27.0	OK
2.005	17	-0.257	0.000	0.10		39	17.0	OK



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

Number of Input Hydrographs 0 Number of Storage Structures 3
 Number of Online Controls 3 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.700 Cv (Winter) 0.840
 Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended)
 DTS Status ON
 DVD Status OFF
 Inertia Status OFF
 Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 25

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	7	60 Winter	30	+0%	30/15 Winter				28.929
1.001	9	60 Winter	30	+0%	30/15 Winter				28.929
2.000	10	15 Winter	30	+0%	100/15 Summer				29.912
2.001	11	15 Winter	30	+0%	100/15 Summer				29.902
2.002	12	15 Winter	30	+0%	100/15 Summer				29.851
2.003	13	60 Winter	30	+0%	30/30 Winter				29.769
2.004	15	60 Winter	30	+0%	30/30 Summer				29.755
2.005	17	60 Winter	30	+0%	30/30 Winter				29.700

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	7	0.229	0.000	0.02		2.6	SURCHARGED	
1.001	9	0.279	0.000	0.00		0.7	SURCHARGED	
2.000	10	-0.288	0.000	0.09		16.3	OK	
2.001	11	-0.128	0.000	0.80		130.8	OK	
2.002	12	-0.109	0.000	0.90		177.9	OK	
2.003	13	0.019	0.000	0.55	74	70.9	SURCHARGED	
2.004	15	0.055	0.000	0.23		48.7	SURCHARGED	
2.005	17	0.150	0.000	0.12	58	20.0	SURCHARGED	



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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 3
 Number of Online Controls 3 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.700 Cv (Winter) 0.840

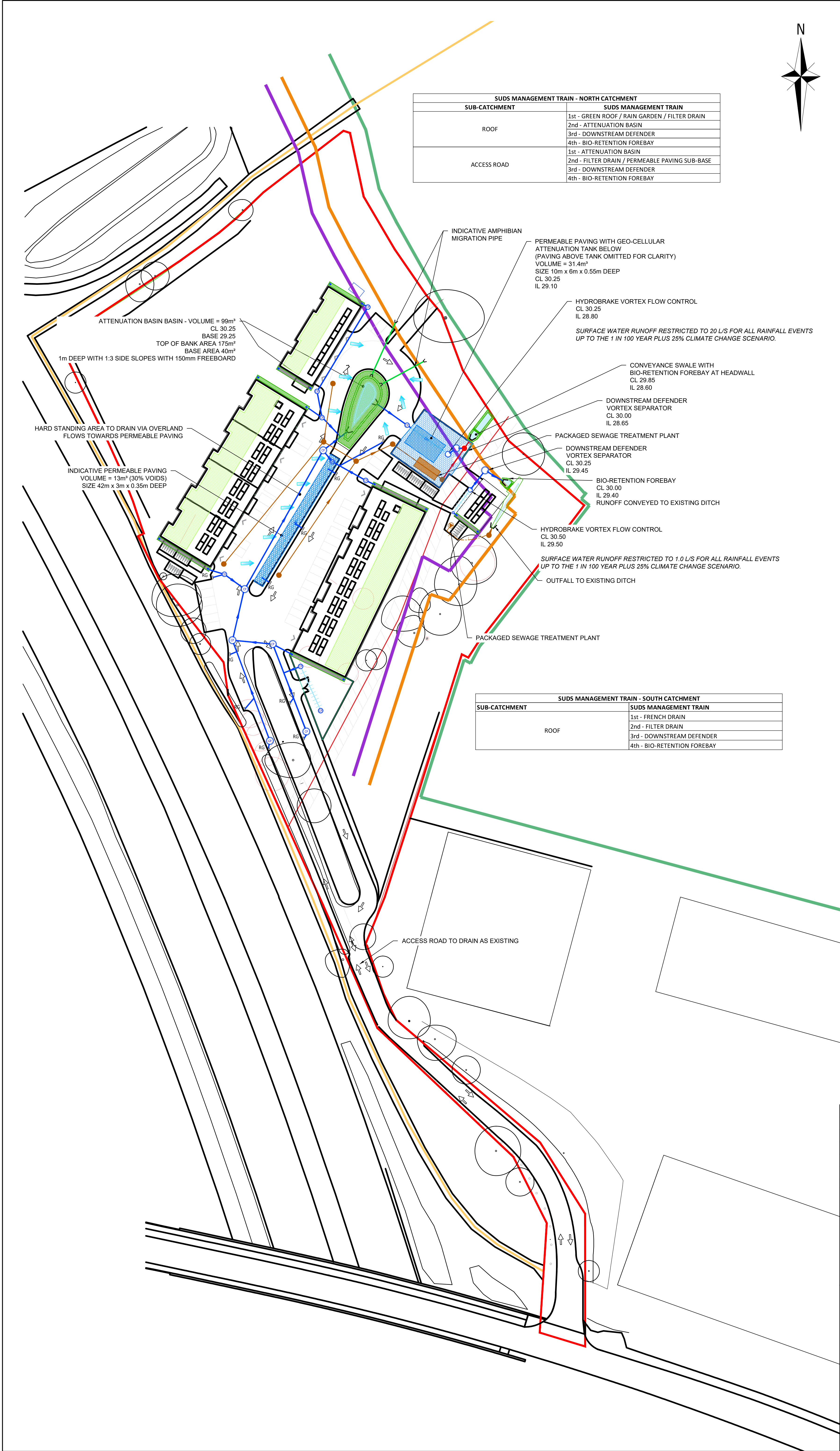
Margin for Flood Risk Warning (mm) 300.0
 Analysis Timestep 2.5 Second Increment (Extended) DTS
 Status
 O
 N
 DVD Status OFF
 Inertia Status OFF

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600,
 720, 960, 1440, 2160, 2880, 4320, 5760, 7200,
 8640, 10080
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 25

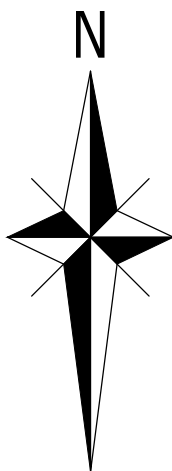
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	7	60 Winter	100	+25%	30/15 Winter				29.786
1.001	9	60 Winter	100	+25%	30/15 Winter				29.786
2.000	10	15 Winter	100	+25%	100/15 Summer				30.351
2.001	11	15 Winter	100	+25%	100/15 Summer				30.339
2.002	12	120 Winter	100	+25%	100/15 Summer				30.262
2.003	13	120 Winter	100	+25%	30/30 Winter				30.254
2.004	15	120 Winter	100	+25%	30/30 Summer				30.247
2.005	17	120 Winter	100	+25%	30/30 Winter				30.196

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m ³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level
1.000	7	1.086	0.000	0.02			3.5	FLOOD RISK	
1.001	9	1.136	0.000	0.00			1.0	FLOOD RISK	
2.000	10	0.151	0.000	0.13			24.0	SURCHARGED	
2.001	11	0.309	0.000	1.20			197.0	SURCHARGED	
2.002	12	0.302	0.000	0.45			88.6	SURCHARGED	
2.003	13	0.504	0.000	0.58		117	75.6	FLOOD RISK	

								Page 9	
									
Innovyze				Network 2020.1.3					
<u>100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm</u>									
PN	US/MH Name Exceeded	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level
2.004	15	0.547	0.000	0.24			50.6	FLOODRISK	
2.005	17	0.646	0.000	0.12			20.0	FLOODRISK	



SUDS MANAGEMENT TRAIN - NORTH CATCHMENT	
SUB-CATCHMENT	SUDS MANAGEMENT TRAIN
ROOF	1st - GREEN ROOF / RAIN GARDEN / FILTER DRAIN
	2nd - ATTENUATION BASIN
	3rd - DOWNSTREAM DEFENDER
	4th - BIO-RETENTION FOREBAY
ACCESS ROAD	1st - ATTENUATION BASIN
	2nd - FILTER DRAIN / PERMEABLE PAVING SUB-BASE
	3rd - DOWNSTREAM DEFENDER
	4th - BIO-RETENTION FOREBAY



NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
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3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES, UNLESS OTHERWISE STATED.
4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
6. THIS DRAWING HAS BEEN BASED ON "ILLUSTRATIVE SITE PLAN", DRAWING No. 7912_D01 REV P, DATED 02.05.23 BY RADLEY HOUSE PARTNERSHIP.
7. THIS DRAWING HAS BEEN BASED ON "SITE SURVEY", DRAWING No. H16-07, BY KND SURVEYS, DATED 9th AUGUST 2007.
8. PROPOSED DRAINAGE WITHIN ROOT PROTECTION AREA TO BE CONSTRUCTED USING NO DIG TECHNIQUES IN ACCORDANCE WITH BS 5837. EXCAVATE/INSTALL DRAINAGE IN ROOT ZONES UNDER THE SUPERVISION OF A SUITABLY QUALIFIED ARBORICULTURALIST TO PREVENT ROOT DAMAGE.

CDM NOTES

THE ATTENTION OF THE CLIENT, PRINCIPAL DESIGNER, PRINCIPAL CONTRACTOR, DESIGNERS AND CONTRACTORS IS DRAWN TO THE FOLLOWING POTENTIAL RISKS IN CONJUNCTION WITH THE PROPOSED ON-SITE AND OFF-SITE WORKS AS DESIGNED FOR THIS PROJECT:

1. WORKS IN THE VICINITY OF LIVE SERVICES INCLUDING GAS, ELECTRICITY AND BT WILL BE NECESSARY AND THE ADVICE OF ALL STATUTORY SERVICE COMPANIES MUST BE SOUGHT BEFORE ANY WORKS COMMENCE.
2. WORKS WITHIN AND ABUTTING THE EXISTING HIGHWAY WILL ENTAIL TRAFFIC HAZARDS AND ALL APPROPRIATE SAFETY MEASURES INCLUDING BARRIERS, SIGNS AND LIGHTING MUST BE UNDERTAKEN TO THE APPROVAL OF THE LOCAL AUTHORITY, THE HIGHWAY AUTHORITY AND THE POLICE DEPARTMENT.
3. HAZARDOUS MATERIALS INCLUDING CEMENT AND BITUMINOUS MATERIALS ARE SPECIFIED AND THE MANUFACTURERS ADVICE ON SAFE HANDLING PROCEDURES MUST BE OBTAINED AND MADE CLEAR TO ALL OPERATIVES.
4. THE CONTRACTOR WILL BE RESPONSIBLE FOR LOCATING ALL EXISTING SERVICES WITHIN THE VICINITY OF THE WORKS HAND DUG AND ENSURE THESE ARE PROTECTED THROUGHOUT THE DURATION OF THE WORKS. ALL UTILITY PLANT SHOULD BE CLEARLY MARKED ON THE GROUND PRIOR TO COMMENCEMENT OF THE WORKS.
5. THE CONTRACTOR MUST ENSURE ALL WORKING AREAS ARE FULLY SECURE.

KEY

- SITE BOUNDARY
- ECOLOGY BUFFER - 15m DEPTH
- ECOLOGY BUFFER - 20m DEPTH
- SSSI BOUNDARY
- INDICATIVE RAINWATER DOWNPIPE
- INDICATIVE SURFACE WATER SEWER
- INDICATIVE ROAD GULLY
- INDICATIVE LINED FILTER DRAIN WITH PERFORATED PIPE
- INDICATIVE PERMEABLE PAVING
- INDICATIVE ATTENUATION TANK
- INDICATIVE GREEN ROOF
- INDICATIVE RAIN GARDEN
- INDICATIVE FRENCH DRAIN
- INDICATIVE ATTENUATION BASIN
- INDICATIVE HEADWALL
- INDICATIVE SAFETY FENCING / KNEE RAIL
- INDICATIVE OVERLAND FLOW ROUTE
- INDICATIVE FOUL SEWER
- INDICATIVE COMBINED SEWER

FOR INFORMATION ONLY

NOT FOR CONSTRUCTION

P04	FOR INFORMATION	DR	CR	DR	10.05.23
P04.2	FOR COORDINATION	DR	CR	-	31.03.23
P04.1	FOR COORDINATION	DR	CR	-	25.03.23
P03	FOR INFORMATION	DR	CR	DR	12.12.22
P02	FOR INFORMATION	DR	CR	DR	13.09.22
P01	FOR INFORMATION	DR	CR	DR	16.08.22
Rev	Description	Drm	Chk	App	Date

FERNBROOK

CONSULTING ENGINEERS

The Finbury Business Centre
40 Bowling Green Lane
London
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info@fermbrook.co

Client

COUNTRY HOMES

Project Title:
MOORLANDS FARM, WEST END

Drawing Title:
INDICATIVE SURFACE WATER & FOUL DRAINAGE STRATEGY

A1 Scale
1:500

Date
AUG 22

Designed by
DR

Drawn by
DR

Checked by
CR

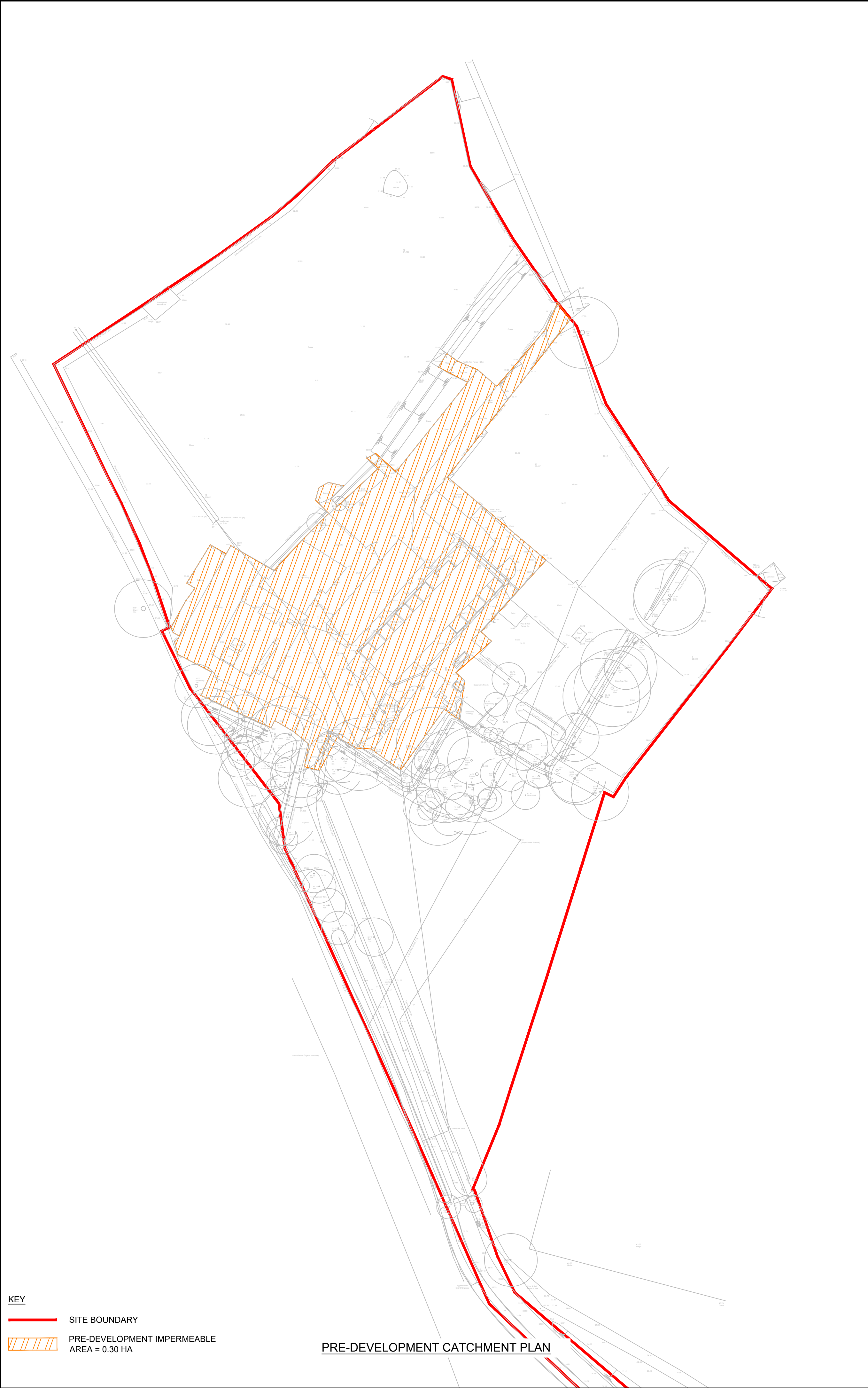
Approved by
DR

Drawing Number
21035-FCE-XX-XX-DR-D-0500

Rev
P04

user name: radley house

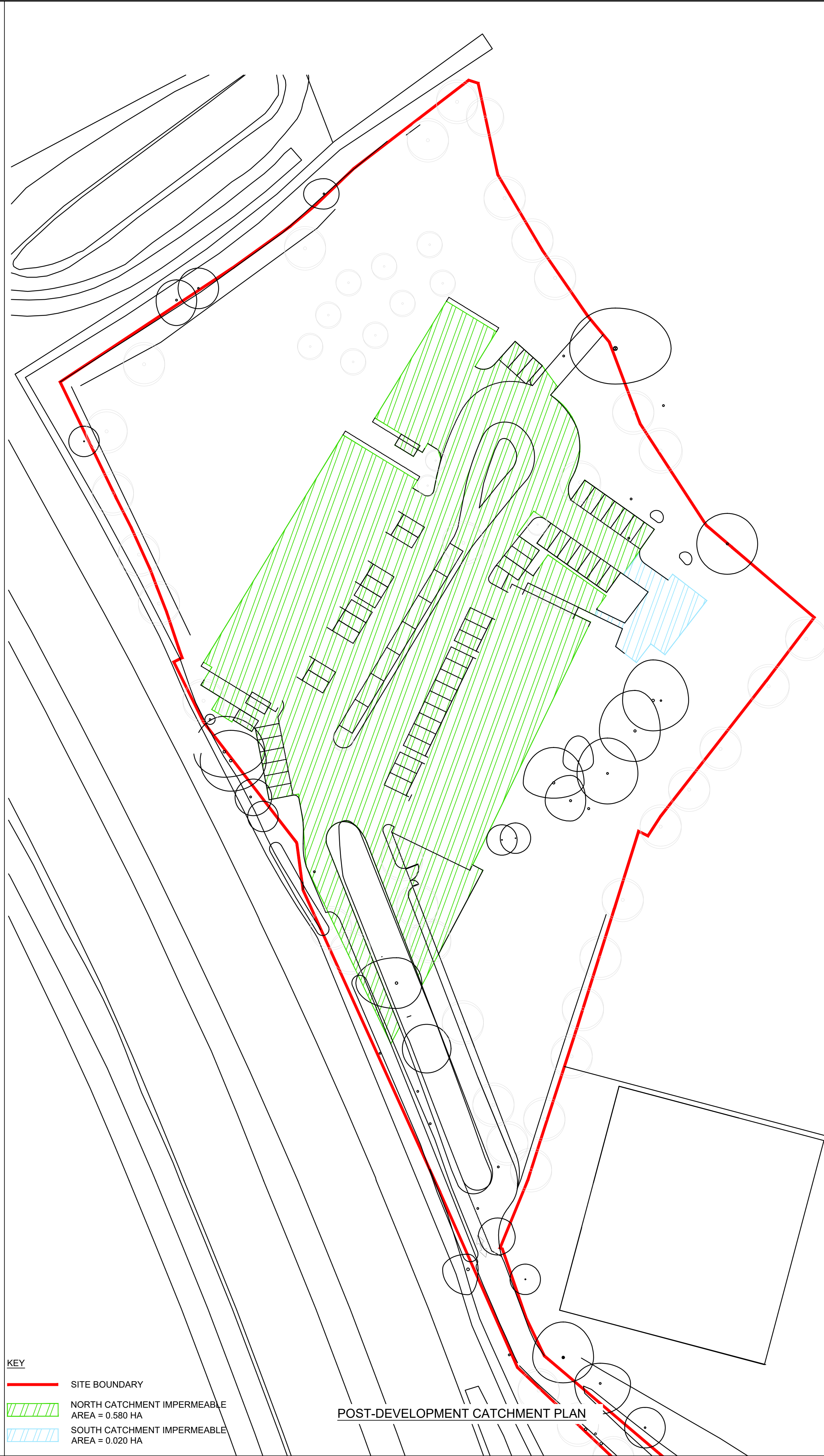
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KEY

- SITE BOUNDARY
- PRE-DEVELOPMENT IMPERMEABLE
AREA = 0.30 HA

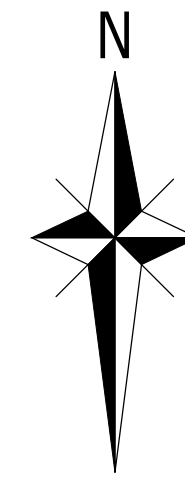
PRE-DEVELOPMENT CATCHMENT PLAN



KEY

- SITE BOUNDARY
- NORTH CATCHMENT IMPERMEABLE
AREA = 0.580 HA
- SOUTH CATCHMENT IMPERMEABLE
AREA = 0.020 HA

POST-DEVELOPMENT CATCHMENT PLAN



NOTES

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- THIS DRAWING HAS BEEN BASED ON "SITE SURVEY", DRAWING No. H16-07, BY KND SURVEYS, DATED 9th AUGUST 2007.



FOR INFORMATION ONLY

P04	FOR INFORMATION	DR	CR	DR	10.05.23
P03	FOR INFORMATION	DR	CR	DR	12.12.22
P02	FOR INFORMATION	DR	CR	DR	13.09.22
P01	FOR INFORMATION	DR	CR	DR	16.08.22
Rev	Description	Dm	Chk	App	Date

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info@fernbrook.co

Client

COUNTRY HOMES

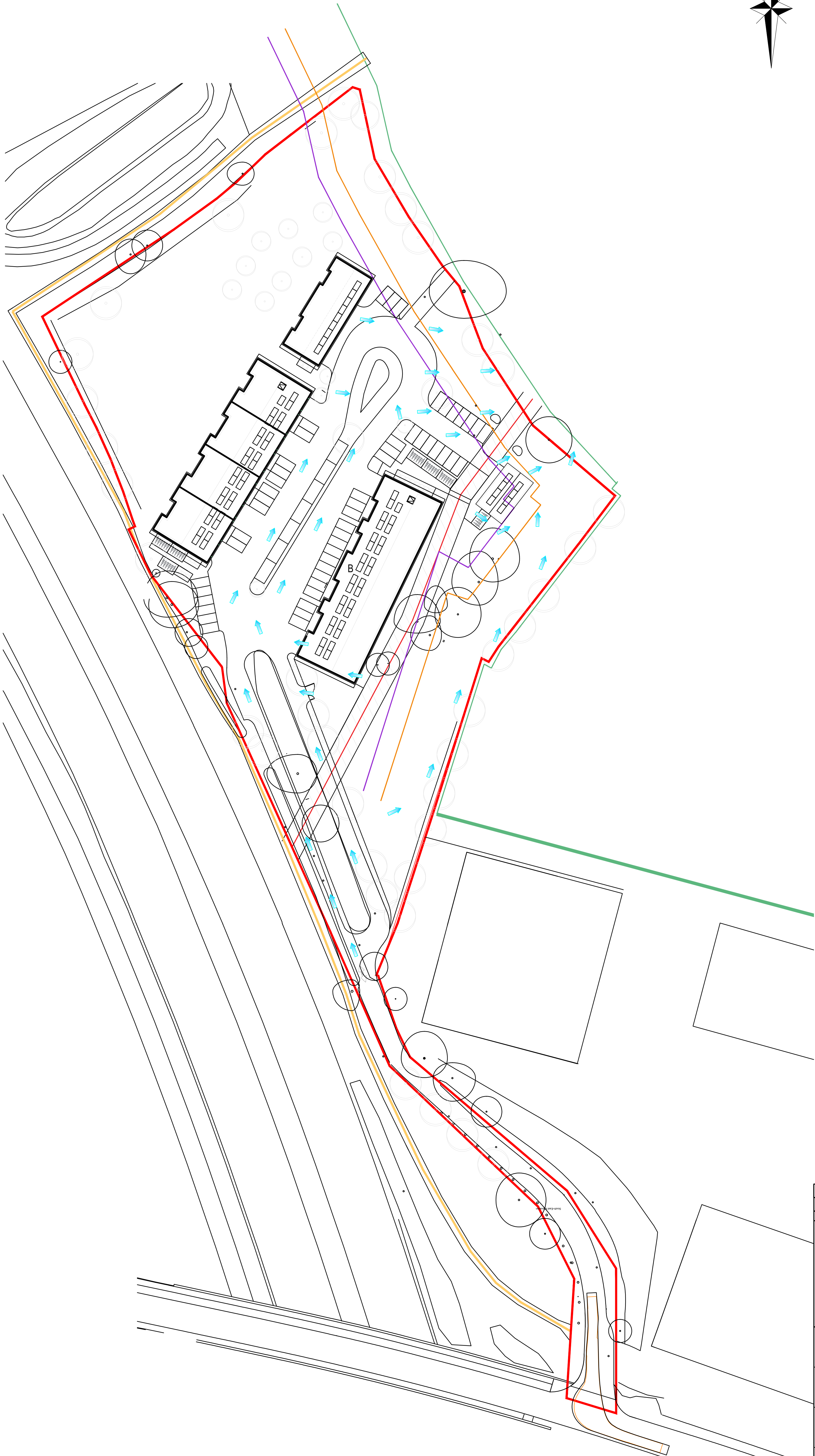
Project Title:

MOORLANDS FARM, WEST END

Drawing Title:

INDICATIVE SURFACE WATER
DRAINAGE CATCHMENT AREAS

A1 Scale	Date	Designed by
1:500	AUG 2022	DR
Drawn by	Checked by	Approved by
DR	CR	DR
Drawing Number	21035-FCE-XX-XX-DR-D-0501	
		Rev P04



NOTES

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6. THIS DRAWING HAS BEEN BASED ON "ILLUSTRATIVE SITE PLAN", DRAWING No. 7912_D01 REV P, DATED 05.05.23 BY RADLEY HOUSE PARTNERSHIP.

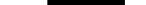
KEY

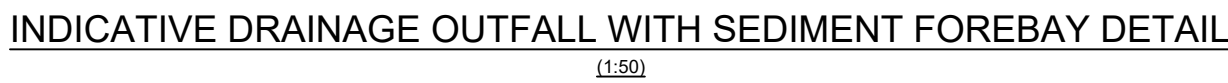
- SITE BOUNDARY
- INDICATIVE OVERLAND FLOW ROUTE

FOR INFORMATION ONLY

P02	FOR INFORMATION	DR	CR	DR	10.05.23
P01	FOR INFORMATION	DR	CR	DR	12.12.22
Rev	Description	Drm	Chk	App	Date
FERNBROOK CONSULTING ENGINEERS The Finbury Business Centre 40 Bowling Green Lane London EC1R 0NE info@ferbrook.co					
Client					
COUNTRY HOMES					
Project Title:					
MOORLANDS FARM, WEST END					
Drawing Title:					
INDICATIVE EXCEEDANCE FLOW ROUTES					
A1 Scale	Date	Designed by			
1:500	DEC 22	DR			
Drawn by	Checked by	Approved by			
DR	CR	DR			
Drawing Number					Rev
21035-FCE-XX-XX-DR-D-0502					P02



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