HA2

HA3

Headwall 21
IL: 1.361

Headwall 18
IL: 1.404

CL 3.013
IL -1.322 (225)

Headwall 20
IL: 1.370

<< 225Ø @ 1:225

<< 600Ø @ 1:225 >>

<< 225Ø @ 1:225

<< 225Ø @ 1:225

Headwall 8
IL: 1.560

HA2 Stub
IL -0.600 (225)

<< 600Ø @ 1:500

Headwall 7
IL: 1.602

<< 225Ø @ 1:225

CL 2.932
IL -0.932 (225)

CL 2.814
IL -0.682 (225)

Headwall 6
IL: 1.700

L 3.136
-1.644 (225)

Headwall 17
IL: 1.565

2250 @ 1:225 >>

CL 3.008
IL -0.883 (150)
IL -0.958 (225)

HA3 Stub
IL -0.812 (150)

<< 150Ø @ 1:150

<< 600 @ 1:249

Headwall 16
IL: 1.608

Headwall 15
IL: 1.613

2250 @ 1:225 >>

Stub
IL: 1.746

LC2 Stub
IL -0.662 (150)

<< 600Ø @ 1:500

150Ø @ 1:150 >>

CL 2.805
IL -0.768 (150)
IL -0.843 (225)

Headwall 14
IL: 1.653

2250 @ 1:225 >>

CL 2.701
IL -0.693 (225)

MH
CL: 2.764
IL: 1.725

Headwall 13
IL: 1.679

FW rising main to receive discharge from later development phases

Filter drain to convey flows from new footway/cycleway adjacent to Brumby Common lane

MH
CL: 3.021
IL: 1.844

FW Rising Main final connection onto public sewer via requisition by Severn Trent Water

MH
CL: 3.189
IL: 1.964

MH
CL: 2.718
IL: 2.084

For continuation, refer to drawing 0500

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Any Surface Water Drainage pipes not specified are to be assumed as 150mm diameter.
6. Refer to BWB Drawing:
   LIN-BWB-CIV-XX-DR-C-0500
   LIN-BWB-CIV-XX-DR-C-0501

Key Plan

Legend

- Proposed Surface Water Drainage
- Proposed Watercourse Extents
- Filter Drain
- Gully
- Surface Water Headwall
- Proposed Foul Sewer Drainage
- Foul Sewer Drainage to be constructed as part of future phased works
- Foul Sewer Rising Main (Final connection to be defined by Severn Trent Water)

Rev	Date	Details of issue / revision	Drw	Rev
P01	18.12.24	Preliminary Issue	AB	CB

Issues & Revisions

BWB
A CAF GROUP COMPANY
Birmingham | 0121 233 3322
Leeds | 0113 233 8000
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Manchester | 0161 233 4260
Nottingham | 0115 924 1100
www.bwbconsulting.com

Client
Hargreaves Land Ltd.

Project Title
Lincolnshire Lakes, Scunthorpe

Drawing Title
Detailed Infrastructure Drainage Layout

Sheet 2

Drawn:	A. Biag		Reviewed:	C. Brackley
BWB Ref:	221638	Date:	Dec '24	Scale@A1: 1:250

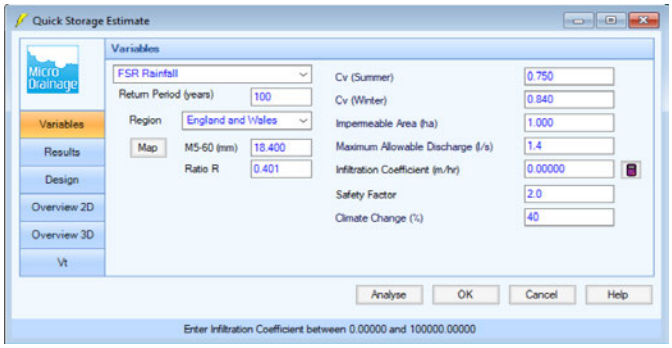
Drawing Status
PRELIMINARY

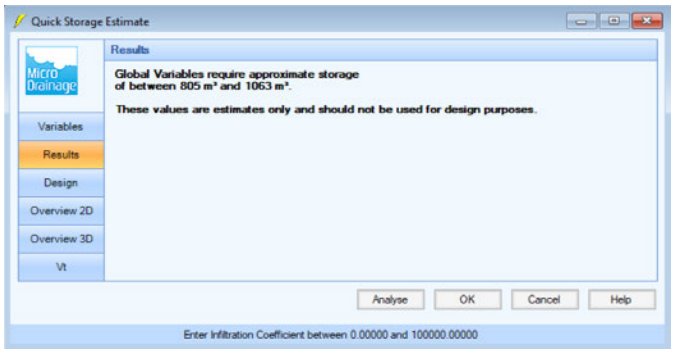
Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LIN-BWB-CIV-XX-DR-C-0502	S1	P01

Appendix 7: Quick Storage Estimate

Attenuation Requirements

Utilising a 1.4 l/s QBAR discharge rate for a hectare of impermeable area in line with the requirements of the local land drainage authority the Quick Storage Estimate module within Microdrainage has been used to calculate the likely attenuation requirements for a 1 in 100 year plus climate change event return period. The output from this can be seen below.





Using this output the following results will be used to assess the discharge restrictions for the site based on the actual area of the development:

Attenuation volume	Design Imp. Area (ha)	Discharge rate (l/s)	Attenuation range Lower (m^3)	Upper (m^3)
Per hectare	*1.000*	*1.4*	*805*	*1063*
Phase 1 Total	14.253	20.0	11,474	15,151
Future Phase Total	28.808	40.3	23,190	30,622
Site-Wide Total	**43.061**	**60.3**	**34,664**	**45,773**

Attenuation Requirements

Using this output the attenuation requirements for the individual parcels has been calculated:

Parcel Reference	Area (ha)	Discharge rate (l/s)	Attenuation range Lower (m^3)	Attenuation range Upper (m^3)	Attenuation location
HA1	4.816	6.7	3,877	5,119	BG1/AB1
HA2	3.688	5.2	2,969	3,921	BG1/AB1
HA3	2.314	3.2	1,863	2,460	BG1/AB1
LC1	0.947	1.3	762	1,007	BG2
Brumby Common Ln	0.500	0.7	403	532	BG1/AB1
LC2	0.983	1.4	792	1,045	BG1/AB1
Access Road Phase 1	0.663	0.9	534	705	BG1/AB1
Access Road Phase 2	0.841	1.2	677	894	BG1/AB1
Phase 1 Total	**14.753**	**20.7**	**11,876**	**15,682**	
HA4	3.711	5.2	2,987	3,945	BG3
HA5	1.331	1.9	1,072	1,415	BG3
HA6	3.569	5.0	2,873	3,794	BG4/AB3
HA7	4.447	6.2	3,580	4,728	BG4/AB3
HA8	4.051	5.7	3,261	4,306	BG4/AB3
HA9	4.079	5.7	3,284	4,336	BG3
NHA1	2.266	3.2	1,824	2,409	BG4/AB3
UA1	1.020	1.4	821	1,084	BG3
E1	2.513	3.5	2,023	2,671	BG4/AB3
Future Access Roads EW	0.737	1.0	593	783	BG4/AB3
Future Access Roads NS	1.083	1.5	871	1,151	BG4/AB3
Future Phase Total	**28.808**	**40.3**	**23,190**	**30,622**	
Site-Wide Total	**43.561**	**61.0**	**35,066**	**46,305**	

Using this output against the conveyance strategy the combined attenuation requirements for the allocated attenuation areas has been summarised:

Attenuation Reference	Catchment Area (ha)	Discharge rate (l/s)	Attenuation range Lower (m^3)	Attenuation range Upper (m^3)
BG1	13.806	19.3	11,114	14,676
BG2	0.947	1.3	762	1,007
BG3	9.858	13.8	7,936	10,479
BG4	18.666	26.1	15,026	19,842

Project Number:	Site Wide	Page	#VALUE!
Project Name:	Hargreaves Land Ltd	Rev.	16.01.2024
Plot Reference / Zone:	LIN-BWB-DDG-XX-CA-D-0001-SW Assessment	Stage	KMJ
Client:	Surface Water Drainage Design	Date	00/01/1900
File Ref:	0	Prepared by	0
Document Title:	0	Authorised by	00/01/1900

Parcel Reference	Typical approach feasible?	Notes
HA1	N	EBWD between parcel and BG1
HA3	N	EBWD between parcel and BG1
AB2 (for use as housing)	N	EBWD between parcel and BG1
HA4	N	EBWD between parcel and BG1
Access Roads 1	Y	Swale alongside road, before outfall into EBWD
LC1	N	VIA BG2
LC2	Y	EBWD between parcel and BG2
HA8	Y	VIA existing drain, diverted into BG3
HA9	Y	VIA existing drain, diverted into BG3
HA10	Y	VIA existing drain, diverted into BG3
HA11	Y	VIA existing drain, diverted into BG3
NHA 1	Y	VIA existing drain, diverted into BG3
E1	Y	VIA BG3
Access Roads 2	Y	VIA BG3
HA5	Y	VIA BG4
HA6	Y	VIA BG4
HA7	Y	VIA BG4
UA1	Y	VIA BG4

Appendix 8: Drainage Model

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	PIMP (%)	100
M5-60 (mm)	18.300	Add Flow / Climate Change (%)	0
Ratio R	0.401	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	5	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul 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 23 (pipe 3.004)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	2.236	4-8	6.052	8-12	4.417	12-16	0.438

Total Area Contributing (ha) = 13.143

Total Pipe Volume (m³) = 4381.029

Time Area Diagram at outfall (pipe 9.001)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.000	4-8	0.151	8-12	0.442	12-16	0.070

Total Area Contributing (ha) = 0.663

Total Pipe Volume (m³) = 804.287

Network Design Table for Storm

- Indicates pipe length does not match coordinates

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

Network Results Table

Network Design Table for Storm

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)

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
3.000	150.000#	0.131	1145.0	1.605	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
3.001	12.207#	0.024	508.6	0.000	0.00	0.0	0.600	o	600	Pipe/Conduit	
4.000	220.000#	0.284	774.6	2.458	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
4.001	12.207#	0.024	508.6	0.000	0.00	0.0	0.600	2 _/	500	1:2 Ditch	
3.002	11.343#	0.023	493.2	0.000	0.00	0.0	0.600	2 _/	500	1:2 Ditch	
3.003	100.000#	0.107	934.6	3.211	0.00	0.0	0.600	2 _/	500	1:2 Ditch	
5.000	150.000#	0.157	955.4	1.230	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
6.000	95.000#	0.073	1301.4	0.505	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
5.001	175.000#	0.221	791.9	0.772	0.00	0.0	0.600	2 _/	500	1:2 Ditch	
7.000	175.000#	0.424	412.7	0.771	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
8.000	46.000#	0.035	1314.3	0.843	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
7.001	80.000#	0.061	1311.5	0.983	0.00	0.0	0.600	2 _/	500	1:2 Ditch	
3.004	35.000#	0.031	1129.0	0.765	0.00	0.0	0.600	o	750	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)
3.000	5.00	9.14	1.716	1.605	0.0	0.0	0.0	0.80	262.5	21.7
3.001	5.00	9.33	1.585	1.605	0.0	0.0	0.0	1.07	303.4	21.7
4.000	5.00	9.78	1.869	2.458	0.0	0.0	0.0	0.97	320.0	33.3
4.001	5.00	9.95	1.585	2.458	0.0	0.0	0.0	1.20	395.8	33.3
3.002	5.00	10.11	1.561	4.063	0.0	0.0	0.0	1.22	402.0	55.0
3.003	5.00	12.00	1.538	7.274	0.0	0.0	0.0	0.88	291.0	98.5
5.000	5.00	8.87	1.809	1.230	0.0	0.0	0.0	0.87	287.7	16.7
6.000	5.00	8.12	1.725	0.505	0.0	0.0	0.0	0.75	246.0	6.8
5.001	5.00	11.91	1.652	2.507	0.0	0.0	0.0	0.96	316.4	33.9
7.000	5.00	8.19	1.916	0.771	0.0	0.0	0.0	1.33	439.8	10.4
8.000	5.00	7.03	1.527	0.843	0.0	0.0	0.0	0.74	244.7	11.4
7.001	5.00	9.98	1.492	2.597	0.0	0.0	0.0	0.74	245.0	35.2
3.004	5.00	12.70	1.431	13.143	0.0	0.0	0.0	0.82	364.1	178.0

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
9.000	400.000	0.580	689.7	0.663	6.00	0.0	0.600	2 _/	500	1:2 Ditch	
9.001	10.000	0.050	200.0	0.000	0.00	0.0	0.600	o	300	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)
9.000	5.00	12.48	1.615	0.663	0.0	0.0	0.0	1.03	339.4	9.0
9.001	5.00	12.63	1.035	0.663	0.0	0.0	0.0	1.11	78.3	9.0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
3.000	-	-	100	1.605	1.605	1.605
3.001	-	-	100	0.000	0.000	0.000
4.000	-	-	100	2.458	2.458	2.458
4.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
3.003	-	-	100	3.211	3.211	3.211
5.000	-	-	100	1.230	1.230	1.230
6.000	-	-	100	0.505	0.505	0.505
5.001	-	-	100	0.772	0.772	0.772
7.000	-	-	100	0.771	0.771	0.771
8.000	-	-	100	0.843	0.843	0.843
7.001	-	-	100	0.983	0.983	0.983
3.004	-	-	100	0.765	0.765	0.765
9.000	-	-	100	0.663	0.663	0.663
9.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				13.806	13.806	13.806

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)
3.004	23	2.950	1.400	0.000	1800	0

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)
9.001		2.300	0.985	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.200	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: MH2 - Flow, DS/PN: 3.004, Volume (m³): 1562.6

Unit Reference	MD-SHE-0181-1680-1200-1680
Design Head (m)	1.200
Design Flow (l/s)	16.8
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	181
Invert Level (m)	1.431
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	16.8
Flush-Flo™	0.369	16.8
Kick-Flo®	0.814	14.0
Mean Flow over Head Range	-	14.4

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	6.4	1.200	16.8	3.000	26.0	7.000	39.1
0.200	15.8	1.400	18.1	3.500	28.0	7.500	40.5
0.300	16.6	1.600	19.3	4.000	29.9	8.000	41.7
0.400	16.8	1.800	20.4	4.500	31.6	8.500	43.0
0.500	16.5	2.000	21.4	5.000	33.3	9.000	44.2
0.600	16.2	2.200	22.4	5.500	34.8	9.500	45.4
0.800	14.3	2.400	23.4	6.000	36.3		
1.000	15.4	2.600	24.3	6.500	37.8		

Hydro-Brake® Optimum Manhole: FC2, DS/PN: 9.001, Volume (m³): 803.6

Unit Reference	MD-SHE-0075-2500-1000-2500
Design Head (m)	1.000
Design Flow (l/s)	2.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	75
Invert Level (m)	1.035
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Hydro-Brake® Optimum Manhole: FC2, DS/PN: 9.001, Volume (m³): 803.6

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.5
Flush-Flo™	0.307	2.5
Kick-Flo®	0.627	2.0
Mean Flow over Head Range	-	2.2

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	2.1	1.200	2.7	3.000	4.1	7.000	6.2
0.200	2.4	1.400	2.9	3.500	4.5	7.500	6.4
0.300	2.5	1.600	3.1	4.000	4.7	8.000	6.6
0.400	2.5	1.800	3.3	4.500	5.0	8.500	6.8
0.500	2.4	2.000	3.4	5.000	5.3	9.000	7.0
0.600	2.1	2.200	3.6	5.500	5.5	9.500	7.1
0.800	2.3	2.400	3.7	6.000	5.7		
1.000	2.5	2.600	3.9	6.500	6.0		

Offline Controls for Storm

Weir Manhole: MH2 - Flow, DS/PN: 3.004, Loop to PN: 9.000

Discharge Coef 0.544 Width (m) 3.500 Invert Level (m) 2.100

Storage Structures for Storm

Tank or Pond Manhole: FC2, DS/PN: 9.001

Invert Level (m) 1.035

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	0.0	0.300	9915.0	0.600	12436.0	0.900	14879.0
0.100	2770.0	0.400	11002.0	0.700	13164.0	1.000	15595.0
0.200	7490.0	0.500	11710.0	0.800	13949.0		

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 Coeffiecient	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	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.401
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.400	Cv (Winter)	0.840

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

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, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	HW 4	240 Winter	1	+0%				
3.001	11	240 Winter	1	+0%	1/60 Summer			
4.000	HW 15	180 Winter	1	+0%				
4.001	13	240 Winter	1	+0%				
3.002	14	240 Winter	1	+0%				
3.003	15	240 Winter	1	+0%				
5.000	16	240 Winter	1	+0%				
6.000	17	240 Winter	1	+0%				
5.001	17	240 Winter	1	+0%				
7.000	19	240 Winter	1	+0%				
8.000	20	240 Winter	1	+0%				
7.001	20	240 Winter	1	+0%				
3.004	MH2 - Flow	240 Winter	1	+0%	1/120 Winter		1/30 Winter	107
9.000	HW24	240 Winter	1	+0%				
9.001	FC2	960 Winter	1	+0%	30/30 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	HW 4	2.260	-0.690	0.000	0.01		37.9	OK	
3.001	11	2.249	0.064	0.000	0.13		20.9	SURCHARGED	
4.000	HW 15	2.285	-0.665	0.000	0.01		69.7	OK	
4.001	13	2.249	-0.701	0.000	0.00		33.9	OK	
3.002	14	2.246	-0.704	0.000	0.02		54.5	OK	
3.003	15	2.244	-0.706	0.000	0.01		101.0	OK	
5.000	16	2.215	-0.735	0.000	0.01		29.0	OK	
6.000	17	2.211	-0.739	0.000	0.00		12.0	OK	
5.001	17	2.210	-0.740	0.000	0.00		31.9	OK	
7.000	19	2.212	-0.738	0.000	0.00		17.9	OK	
8.000	20	2.212	-0.738	0.000	0.00		20.3	OK	
7.001	20	2.210	-0.740	0.000	0.00		32.7	OK	
3.004	MH2 - Flow	2.192	0.011	0.000	0.06	155.1	16.7	SURCHARGED	
9.000	HW24	1.821	-0.679	0.000	0.04		161.4	OK	
9.001	FC2	1.297	-0.038	0.000	0.04		2.5	OK*	

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 Coeffiecient	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	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.401
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.400	Cv (Winter)	0.840

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

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, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	HW 4	60 Winter	30	+35%				
3.001	11	60 Winter	30	+35%	1/60 Summer			
4.000	HW 15	60 Winter	30	+35%				
4.001	13	60 Winter	30	+35%				
3.002	14	60 Winter	30	+35%				
3.003	15	60 Winter	30	+35%				
5.000	16	60 Winter	30	+35%				
6.000	17	60 Winter	30	+35%				
5.001	17	60 Winter	30	+35%				
7.000	19	60 Winter	30	+35%				
8.000	20	60 Winter	30	+35%				
7.001	20	60 Winter	30	+35%				
3.004	MH2 - Flow	60 Winter	30	+35%	1/120 Winter		1/30 Winter	107
9.000	HW24	60 Winter	30	+35%				
9.001	FC2	2160 Winter	30	+35%	30/30 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	HW 4	2.673	-0.277	0.000	0.05		321.5	FLOOD RISK*	
3.001	11	2.580	0.395	0.000	1.11		172.2	SURCHARGED	
4.000	HW 15	2.671	-0.279	0.000	0.09		487.4	FLOOD RISK*	
4.001	13	2.566	-0.384	0.000	0.03		256.6	OK	
3.002	14	2.555	-0.395	0.000	0.13		425.1	OK	
3.003	15	2.551	-0.399	0.000	0.09		820.0	OK	
5.000	16	2.614	-0.336	0.000	0.04		247.8	OK	
6.000	17	2.600	-0.350	0.000	0.02		102.8	OK	
5.001	17	2.533	-0.417	0.000	0.03		216.2	OK	
7.000	19	2.624	-0.326	0.000	0.03		154.4	OK	
8.000	20	2.581	-0.369	0.000	0.02		174.0	OK	
7.001	20	2.526	-0.424	0.000	0.02		233.4	OK	
3.004	MH2 - Flow	2.469	0.288	0.000	0.06	1207.3	16.7	SURCHARGED	
9.000	HW24	2.170	-0.330	0.000	0.33		1219.8	OK	
9.001	FC2	1.789	0.454	0.000	0.04		2.5	SURCHARGED*	

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 Coeffiecient	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	1
Number of Online Controls	2	Number of Time/Area Diagrams	0
Number of Offline Controls	1	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.401
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	18.400	Cv (Winter)	0.840

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

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, 35, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
3.000	HW 4	60 Winter	100	+40%				
3.001	11	60 Winter	100	+40%	1/60 Summer			
4.000	HW 15	60 Winter	100	+40%				
4.001	13	60 Winter	100	+40%				
3.002	14	60 Winter	100	+40%				
3.003	15	60 Winter	100	+40%				
5.000	16	60 Winter	100	+40%				
6.000	17	60 Winter	100	+40%				
5.001	17	60 Winter	100	+40%				
7.000	19	60 Winter	100	+40%				
8.000	20	60 Winter	100	+40%				
7.001	20	60 Winter	100	+40%				
3.004	MH2 - Flow	60 Winter	100	+40%	1/120 Winter		1/30 Winter	107
9.000	HW24	60 Winter	100	+40%				
9.001	FC2	2880 Winter	100	+40%	30/30 Summer			

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

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
3.000	HW 4	2.916	-0.034	0.000	0.07		441.9	FLOOD RISK*	
3.001	11	2.746	0.561	0.000	1.61		249.6	FLOOD RISK	
4.000	HW 15	2.913	-0.037	0.000	0.12		666.6	FLOOD RISK*	
4.001	13	2.731	-0.219	0.000	0.04		358.5	FLOOD RISK*	
3.002	14	2.712	-0.238	0.000	0.19		602.6	FLOOD RISK	
3.003	15	2.706	-0.244	0.000	0.12		1130.2	FLOOD RISK*	
5.000	16	2.802	-0.148	0.000	0.06		340.0	FLOOD RISK*	
6.000	17	2.795	-0.155	0.000	0.02		141.3	FLOOD RISK*	
5.001	17	2.677	-0.273	0.000	0.04		295.8	FLOOD RISK*	
7.000	19	2.833	-0.117	0.000	0.03		212.2	FLOOD RISK*	
8.000	20	2.747	-0.203	0.000	0.03		238.9	FLOOD RISK*	
7.001	20	2.675	-0.275	0.000	0.04		347.7	FLOOD RISK*	
3.004	MH2 - Flow	2.596	0.415	0.000	0.06	1705.3	16.7	SURCHARGED	
9.000	HW24	2.263	-0.237	0.000	0.47		1727.8	FLOOD RISK*	
9.001	FC2	1.999	0.664	0.000	0.04		2.5	SURCHARGED*	

Appendix 9: STW Pre-development Enquiry

WONDERFUL ON TAP

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

Contact: Emma Nowak
Mob: 07970361864

Email:
Network.Solutions@SevernTrent.co.uk

Our ref: 1088039

BWB Consulting Ltd,
Whitehall Waterfront,
2 Riverside Way,
Leeds,
LS1 4EH.

FAO: Jairobi Arnold

13th July 2023

Dear Jairobi,

Proposed Residential Development at: Lincolnshire Lakes, Phase 1, Burringham Road, Scunthorpe, DN17 1YH.

X: 486611 / Y: 409508

I refer to your Development Enquiry Request submitted in respect of the above site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) referred to below.

Public Sewers in Site – Required Protection

There are no public sewers crossing the proposed development.

Due to a change in legislation on 1 October 2011, there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water which are not shown on the statutory sewer records but are located in your client's land. These sewers would also have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

Foul Water Drainage

The proposed number of dwellings is not confirmed for this application. I have sent further correspondence via email and voicemail requesting this but have currently not received a response. Please confirm this information as soon as possible. Looking at the plans the development proposed looks to be substantial, approximately 2000-3000 dwellings.

There is substantial growth within the vicinity of the development site, and surrounding areas have had previous modelling

assessments to determine the impact on the receiving development. Additional development in the area triggered a 'High' flooding impact and 'High' Operation impact which has determined that network improvements are required to enable future development in the area.

It is not clear if the proposed development has been included within the model and this will need confirming from our Tactical Asset Planning team to determine whether this development is accommodated for a potential growth scheme. If this site has not been accommodated, further modelling will be required. I would therefore be grateful if you would forward as soon as possible the following details:

- Proposed submission of your Planning Application
- Proposed planned start and completion date.
- Proposed point of connection(s) on the public sewer
- Whether a pumped connection is needed and the proposed pump rate
- Planned occupation date

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

Note, STW will need to be fully satisfied that all sustainable options have been satisfied before discharge to network is considered, we expect all surface water from the development to be drained in a sustainable way to the nearest watercourse or land drainage channel.

Subject to the above, sewer records show drainage ditches and watercourses within the vicinity of the site. All surface water for the site should be able to gravitate to any of these with flow rates subject to LLFA approval.

Surface water is not proposed to enter the public network.

WONDERFUL ON TAP

SEVERN TRENT

New Connections

For any new connections including the use, reuse and indirect to the public sewerage system, the developer will need to submit Section 106 application. Our Developer Services department are responsible for handling all such enquiries and applications. To contact them for an application form and associated guidance notes, please call 0800 707 6600, email new.connections@severntrent.co.uk or download from www.stwater.co.uk

Please quote the above reference number in any future correspondence (including e-mails) with STW Limited. Please send **all correspondence** to the network.solutions@severntrent.co.uk email inbox address, a response will be made within 15 days.

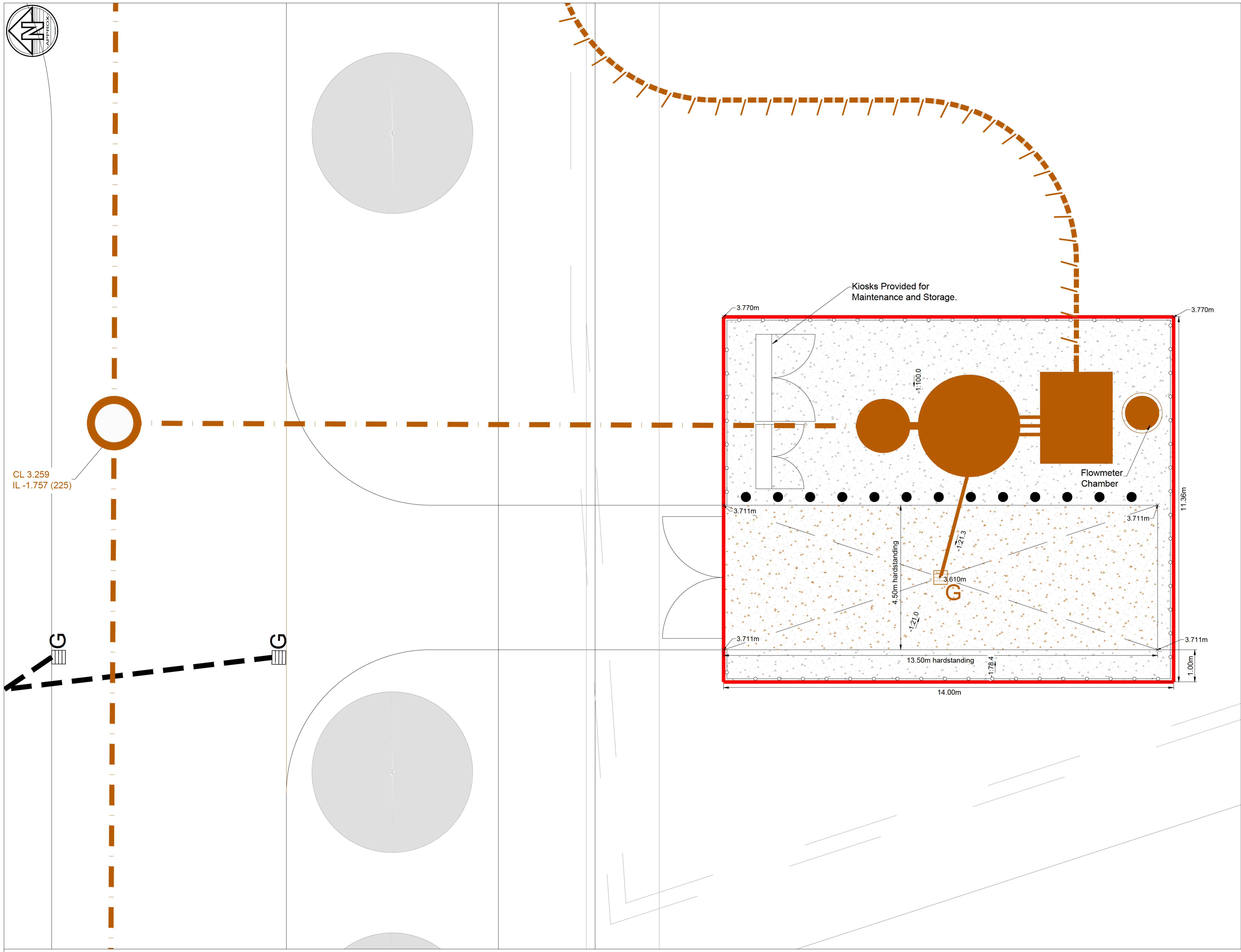
If you require a VAT receipt for the application fee please email MISCINCOME.NC@SEVERNTRENT.CO.UK quoting the above Reference Number.

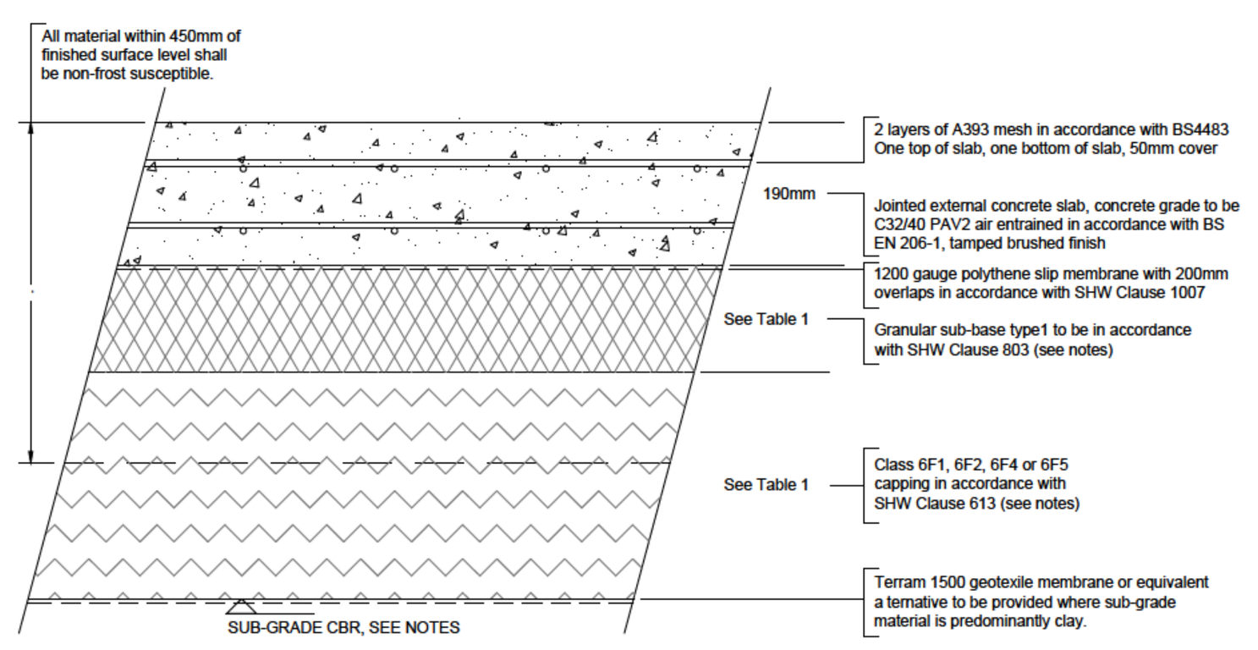
Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

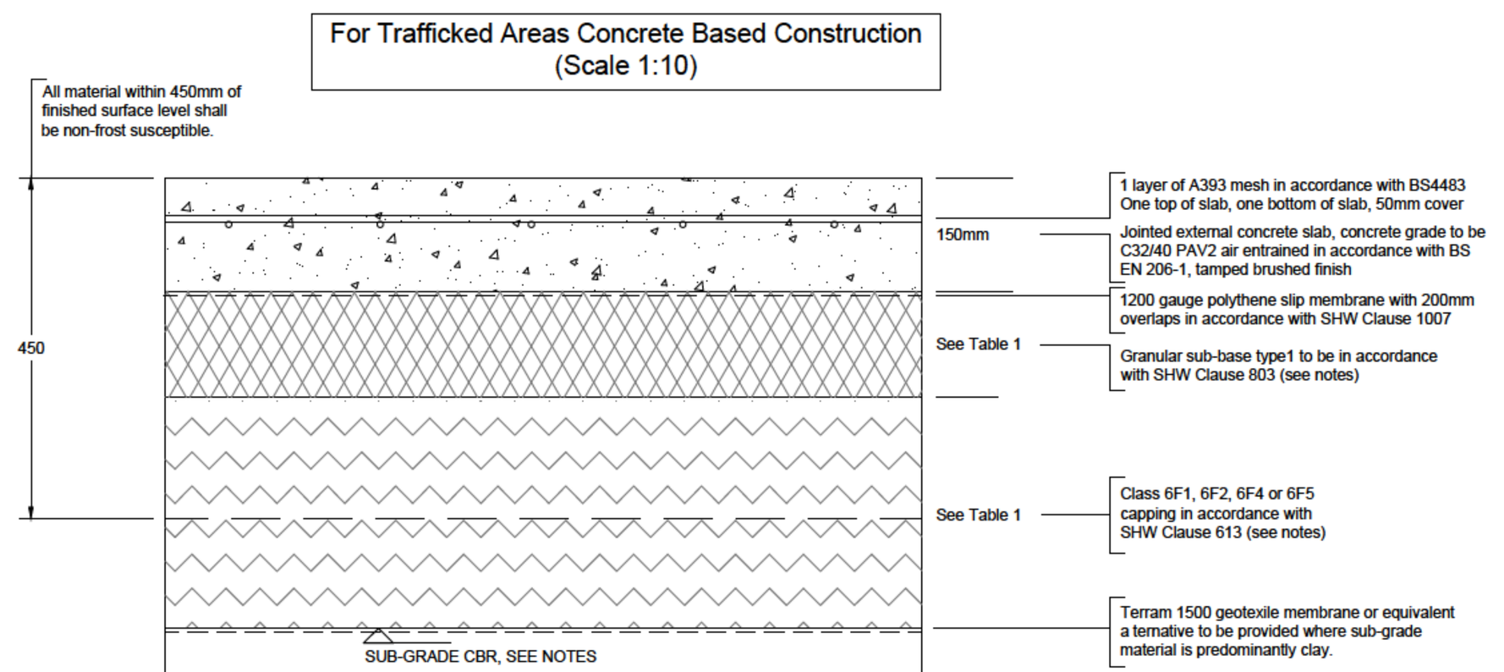
Yours sincerely,

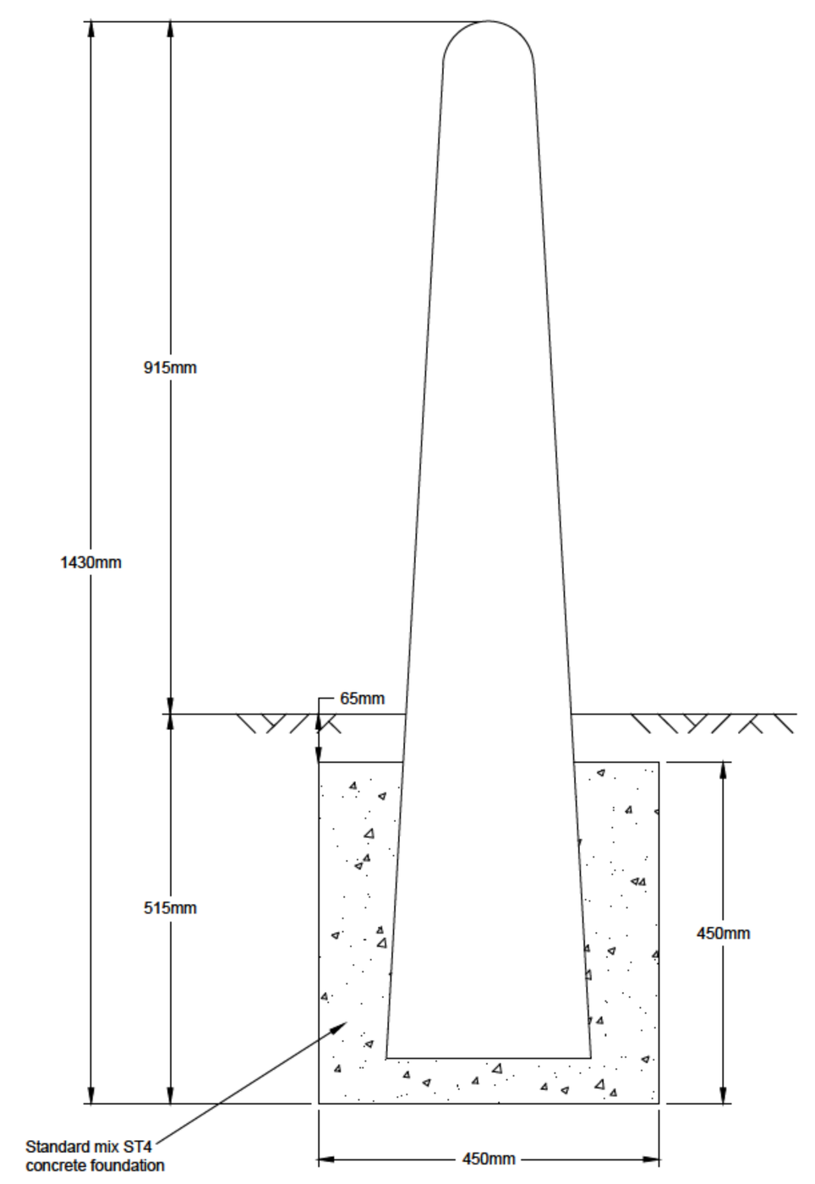
Emma Nowak.
Senior Evaluation Technician
Network Solutions
Developer Services

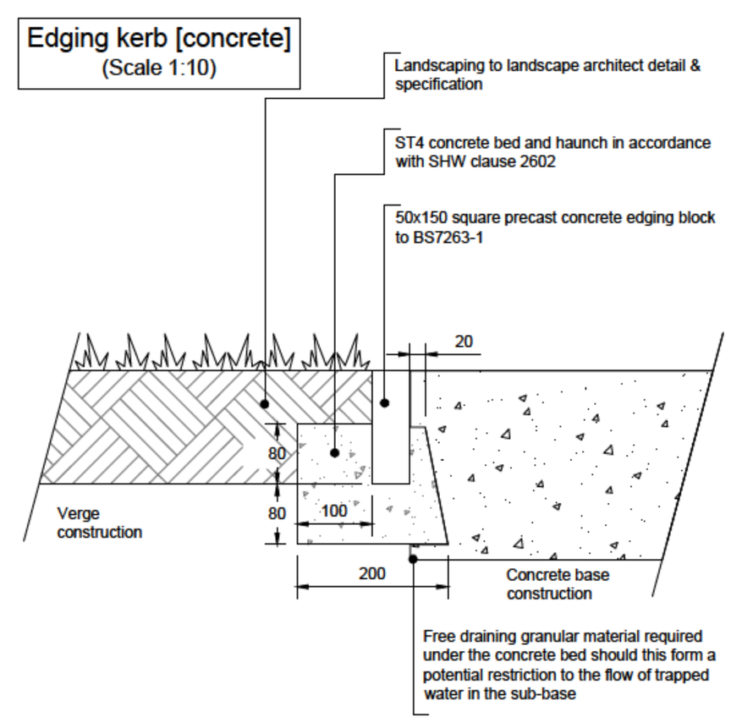
Appendix 10: Proposed Foul Pumping Station Arrangement

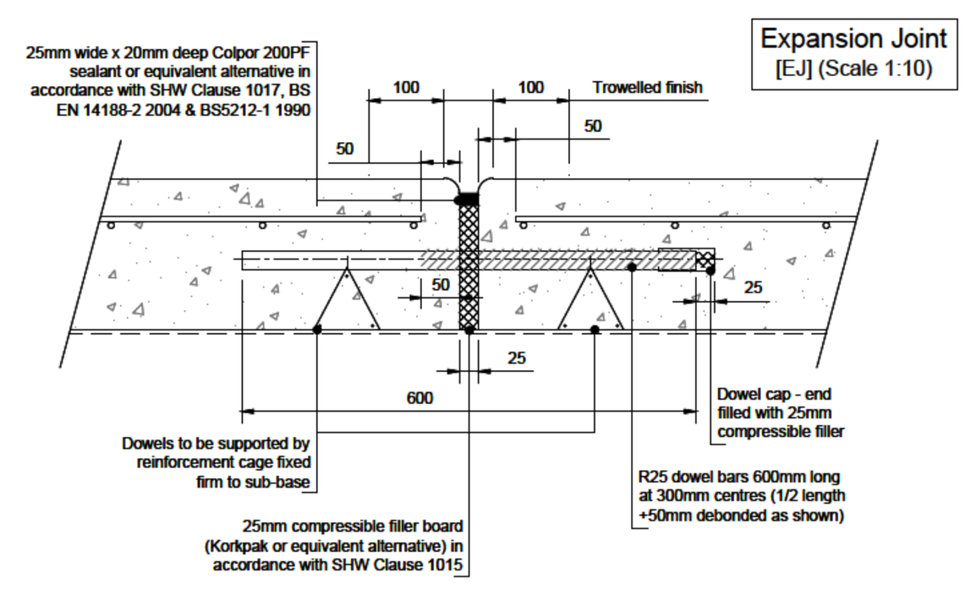



For Trafficked Areas Concrete Based Construction
(Scale 1:10)


For non-trafficked areas Concrete Base Construction
(Scale 1:10)


Typical Precast Concrete Bollard Detail
(Scale 1:10)

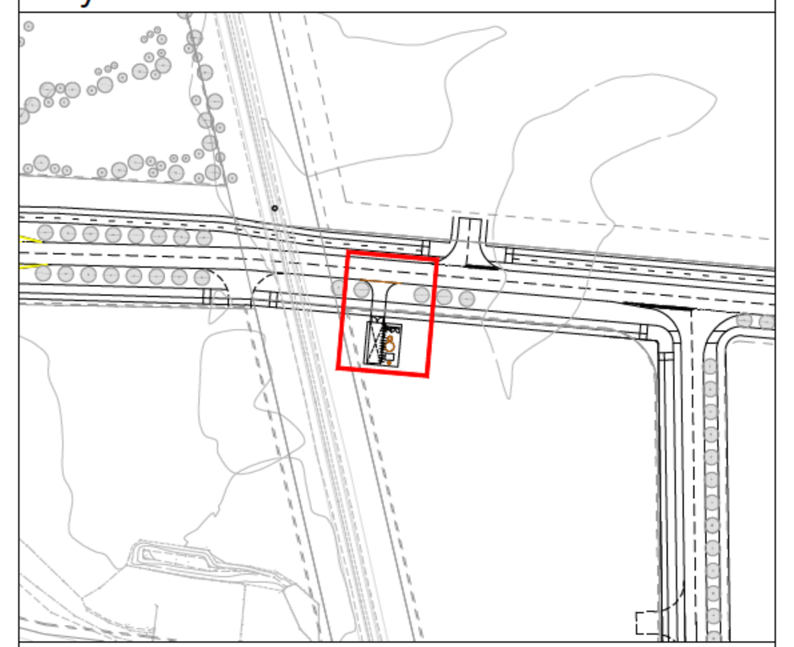

Edging kerb [concrete]
(Scale 1:10)


Expansion Joint
[EJ] (Scale 1:10)

Notes

1. Do not scale this drawing. All dimensions must be checked/ verified on site. If in doubt ask.
2. This drawing is to be read in conjunction with all relevant architects, engineers and specialists drawings and specifications.
3. All dimensions in millimetres unless noted otherwise. All levels in metres unless noted otherwise.
4. Any discrepancies noted on site are to be reported to the engineer immediately.
5. Refer to drawing LIN-BWB-CIV-XX-D-C-0500 for Foul Drainage Gravity and Rising Main Layout.
6. Refer to drawing LIN-BWB-DDG-XX-DR-C-0561, 0562 and 0563 for Standard Details and Drainage Notes.
7. All adoptable sewer works and materials to be in accordance with Codes for Adoption, the relevant British / European and Severn Trent Water's standards / requirements / addendum to the mechanical and electrical specification and kitemarked.

Key Plan



Legend

- Trafficked Concrete Base Construction
- Non-trafficked Concrete Base Construction
- Proposed phase 2 foul water gravity drainage
- Proposed phase 2 foul water raising main
- Proposed fence/gate dictating boundary. Shown indicatively with specificaiton by architect / landscape architect
- Pre-cast concrete edging kerb & Pumping Station boundary
- Proposed Pumping Station Gully
- Proposed Concrete Bollard

TABLE 1: Capping Layer and Sub-base Thickness

Sub-Grade (CBR)	Capping + Sub-base (mm)	Sub-base Only (mm)
<2%	SUB GRADE IMPROVEMENT REQUIRED	
2%	600 + 150	-
2.5%	400 + 150	-
3%	350 + 150	300
4%	300 + 150	275
5%	250 + 150	225
8%	225 + 150	200
10%	175 + 150	175
15%+	-	150

Notes

1. Capping/sub-base depth depends upon equilibrium CBR testing of sub-grade (the contractor is responsible for undertaking these tests and any subsequent in-situ tests to demonstrate validity of equilibrium testing). Capping/sub-base depths to be in accordance with Table 1.
2. The contractor is responsible for ensuring that the sub-grade is not exposed to inclement weather. Sub-grade only design shall only be used where there is adequate drainage and favourable weather at the time of construction.

Design/Specifications subject to change during detailed design and technical approval process ahead of approval provided by Water Authority.

Internal pipework for pump station and valve chamber shown indicatively. Detailed design of internal pumps, fittings and controls etc. to be designed by specialist designer.

Rev	Date	Details of issue / revision	Drw	Rev
P01	23.01.25	Preliminary Issue	AB	KMJ

Issues & Revisions

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☐ Manchester | 0161 233 4260
☐ Nottingham | 0115 924 1100
www.bwbconsulting com

Client
Hargreaves Land Ltd.

Project Title
Phase 1, Lincolnshire Lakes, Scunthorpe

Drawing Title
IIW Information Pack Foul Water Pumping Station Compound Arrangement Plan

Drawn:	A. Biag		Reviewed:	K. Jones	
BWB Ref:	221638	Date:	Jan '25	Scale@A0:	Varies

Drawing Status
Preliminary

Project - Originator - Zone - Level - Type - Role - Number	Status	Rev
LIN-BWB-CIV-XX-D-C-0565	S1	P01

BWB

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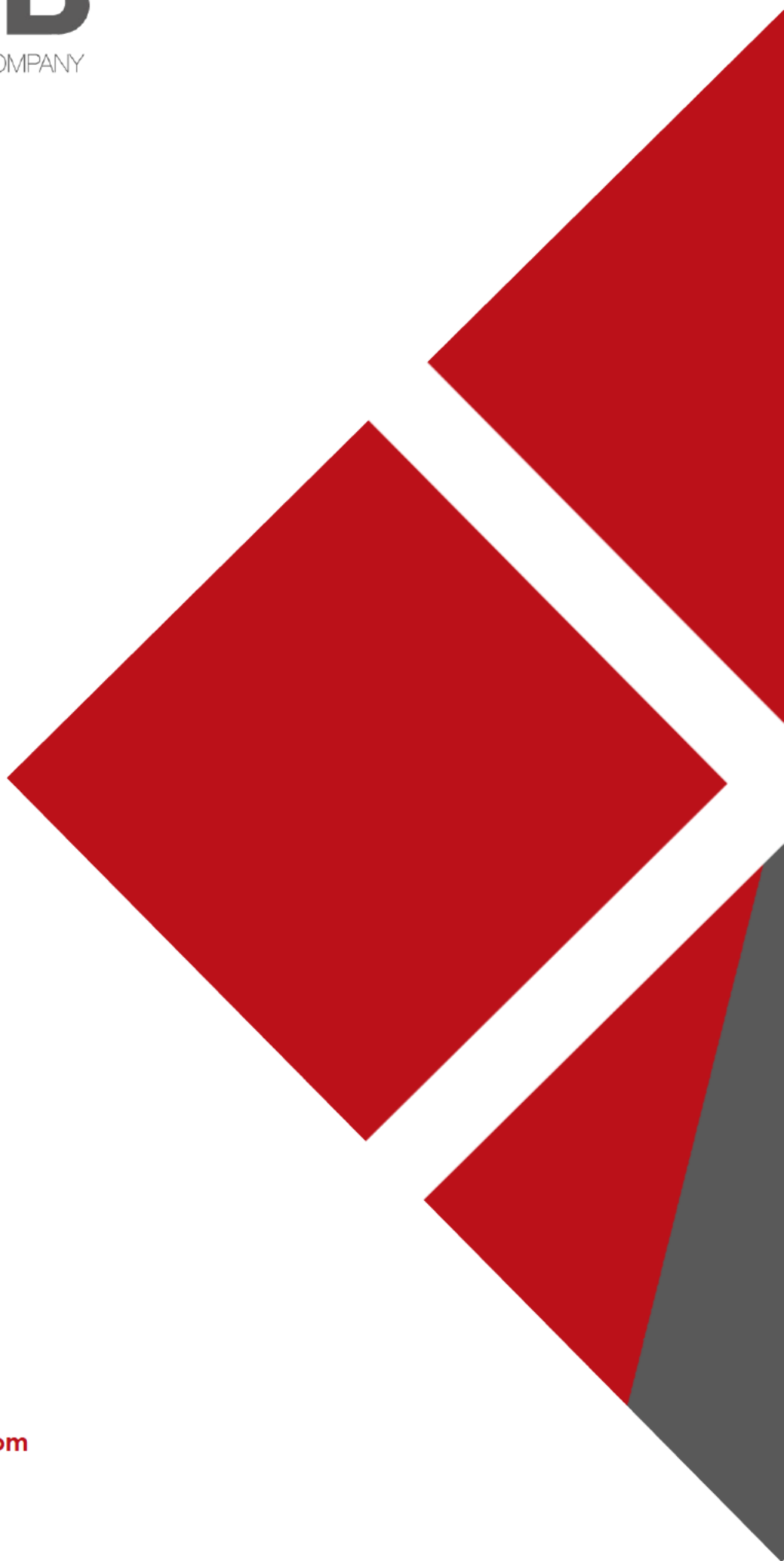

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