Summit House, Riparian Way, The Crossings
Cross Hills, Keighley, West Yorkshire, BD20 7BW

19205-PWA-00-XX-CA-C-1001

NYMNPA
11/05/2020

Bothams, Whitby

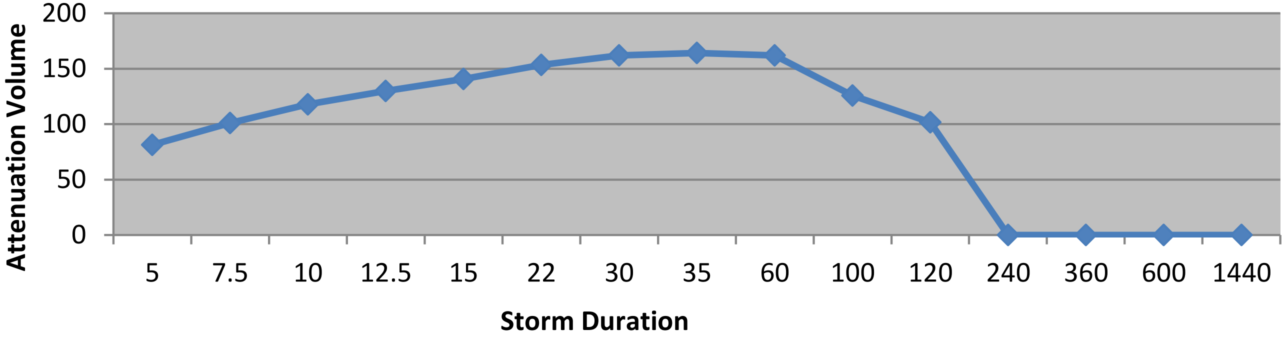
Drainage Attenuation Storage

REVISION P01
DESIGNED. JLE
CHECKED. BLS
DATE. 19/103/2020

Input Data

M5-60 =	**19**	mm	Fig A.1
r =	**0.339**		Fig A.2
T =	**100**	yrs	
C =	**2.78**		
Max Allowable Flow =	**36**	l/s	
Contributing Area =	**5832**	m^2	
Flow/Ha =	61.73	l/s/Ha	
Percentage Increase =	30	%	

Output Data



Duration (Mins)	Z1	M5-D (M5-60)*Z1	Z2	I mm/h	Increased Rainfall	Qp l/s	Increased Flow	Storage m^3	Percentage Increased Storage m^3
5	0.35	6.6	1.83	146	189	236	307	60	81
7.5	0.43	8.3	1.87	123	161	200	260	74	101
10	0.51	9.7	1.90	110	143	179	232	86	118
12.5	0.57	10.8	1.92	99	129	161	209	94	130
15	0.62	11.8	1.94	91	119	148	192	101	141
22	0.71	13.5	1.97	72	94	117	152	107	153
30	0.79	15.0	1.99	60	78	97	126	110	162
35	0.83	15.8	2.00	54	70	88	114	109	164
60	1.00	19.0	2.02	38	50	62	81	95	162
100	1.17	22.3	2.02	27	35	44	57	47	126
120	1.24	23.6	2.02	24	31	39	50	18	102
240	1.54	29.3	1.98	14	19	23	30	0	0
360	1.74	33.1	1.95	11	14	17	23	0	0
600	1.99	37.7	1.91	7	9	12	15	0	0
1440	2.58	49.1	1.82	4	5	6	8	0	0

Paul Waite Associates
Summit House, Riparian Way, The Crossings
Cross Hills, Keighley, West Yorkshire, BD20 7BW

19205-PWA-00-XX-CA-C-1002

Bothams, Whitby

Run-off Analysis of existing Impermeable Area

REVISION.	P01
DESIGNED.	BLS
CHECKED.	BLS
DATE.	19/03/20

The following analysis has been undertaken to establish the peak discharge from the existing (brownfield) development. The analysis relates peak discharge to contributing area, average rainfall intensity and a dimensionless coefficient. The coefficient is generally termed the 'runoff coefficient' and has a range from 0 (no runoff produced) to 1 (perfect conversion of rainfall intensity). A unit conversion factor of 2.78 is applied to account for the units typically used.

The Modified Rational Method can be expressed as:

$$Q_p = 2.78\ CiA$$

Where:

Qp is the peak discharge

C is a dimensionless coefficient

i is the average rainfall intensity during the time of concentration, 50 mm/hr

A is the contributing catchment area

The impermeable area contributing to the surface water outfall, in the existing scenario is: **0.259** ha

Q_p = 36.0 l/s

Proposed Discharge Rate:

In accordance with North Yorkshire Guidelines for brownfield development the updated NYCC SUDS Guidance 2018 has been concidered ''Proposed developments that have a mixed land use of previously developed land and undeveloped, undrained land prior to development can benefit from partial brownfield drainage principles. The equivalent area of land that has an existing drainage connection prior to development should be restricted to brownfield peak run off rates however new areas of undrained, greenfield land must be restricted to greenfield runoff rates before
discharging off site''

In order to utilise the existing ''future'' connections which were installed on site upon completion of the construction of Phase one, and mitigate the requirement for two separate Surface Water Systems, QMAX will be restricted to the current Peak discharge for the development site. The current site is not restricted by a flow control feature, and as such, is discharging at an unrestricted rate, as demponstrated by the above calculation; the Modified Rational method has been applied in order to ascertain the Peak Discharge for the development site in the current scenario. Surface water attenuation will be provided in order to cater for the additional flows induced by an increace of impermeable area within the site, with an allowance for 30% climate change, whilst restricting overall site discharge to a maximum rate of 36 l/s.

NYMNPA
11/05/2020

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)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.339	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
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

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.443	4-8	0.151

Total Area Contributing (ha) = 0.595

Total Pipe Volume (m³) = 152.448

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	28.171	0.720	39.1	0.042	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
2.000	28.130	0.502	56.0	0.042	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
2.001	29.415	0.368	79.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
1.001	11.803	0.120	98.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
1.002	17.266	0.173	99.8	0.077	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)**
1.000	50.00	4.29	101.500	0.042	0.0	0.0	0.0	1.61	28.5	5.7
2.000	50.00	4.35	101.600	0.042	0.0	0.0	0.0	1.35	23.8	5.7
2.001	50.00	4.78	101.098	0.042	0.0	0.0	0.0	1.13	19.9	5.7
1.001	50.00	4.91	100.580	0.084	0.0	0.0	0.0	1.59	112.1	11.4
1.002	50.00	5.09	98.163	0.161	0.0	0.0	0.0	1.57	111.2	21.9

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	20.329	0.339	60.0	0.076	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
3.001	26.283	1.987	13.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	🔒
4.000	30.000	1.212	24.8	0.052	4.00	0.0	0.600	o	150	Pipe/Conduit	🔒
4.001	10.900	0.110	99.1	0.015	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.000	35.000	0.350	100.0	0.111	4.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.001	39.632	0.397	99.8	0.048	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.002	20.168	0.648	31.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.003	13.670	0.140	97.6	0.023	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.004	23.119	0.033	700.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	🔒
5.005	25.500	0.080	318.8	0.096	0.00	0.0	0.600	7 o	-1	Pipe/Conduit	🔒
5.006	14.666	0.153	95.9	0.012	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
4.002	7.736	0.078	99.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
6.000	59.522	1.050	56.7	0.000	4.00	0.0	0.600	o	450	Pipe/Conduit	🔒
6.001	43.891	1.310	33.5	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒
1.003	24.625	0.720	34.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	🔒

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (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	50.00	4.26	100.466	0.076	0.0	0.0	0.0	1.30	23.0	10.3
3.001	50.00	4.42	100.127	0.076	0.0	0.0	0.0	2.78	49.2	10.3
4.000	50.00	4.25	101.240	0.052	0.0	0.0	0.0	2.03	35.9	7.0
4.001	50.00	4.36	100.028	0.067	0.0	0.0	0.0	1.58	111.6	9.1
5.000	50.00	4.37	101.215	0.111	0.0	0.0	0.0	1.57	111.1	15.1
5.001	50.00	4.79	100.865	0.159	0.0	0.0	0.0	1.57	111.2	21.6
5.002	50.00	4.91	100.468	0.159	0.0	0.0	0.0	2.83	199.9	21.6
5.003	50.00	5.05	99.820	0.182	0.0	0.0	0.0	1.59	112.5	24.6
5.004	50.00	5.71	99.680	0.182	0.0	0.0	0.0	0.59	41.5	24.6
5.005	50.00	5.95	98.501	0.278	0.0	0.0	0.0	1.75	7788.4	37.6
5.006	50.00	6.07	98.071	0.290	0.0	0.0	0.0	2.08	330.3	39.3
4.002	50.00	6.13	97.918	0.357	0.0	0.0	0.0	2.04	324.7	48.3
6.000	50.00	4.37	100.200	0.000	0.0	0.0	0.0	2.70	430.1	0.0
6.001	50.00	4.57	99.150	0.000	0.0	0.0	0.0	3.52	560.1	0.0
1.003	50.00	6.25	97.840	0.595	0.0	0.0	0.0	3.49	554.4	80.5

Area Summary for Storm

Pipe Number	**PIMP Type**	**PIMP Name**	**PIMP (%)**	**Gross Area (ha)**	**Imp. Area (ha)**	**Pipe Total (ha)**
1.000	-	-	100	0.042	0.042	0.042
2.000	-	-	100	0.042	0.042	0.042
2.001	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
1.002	User	-	100	0.071	0.071	0.071
	User	-	100	0.007	0.007	0.077
3.000	User	-	100	0.076	0.076	0.076
3.001	-	-	100	0.000	0.000	0.000
4.000	User	-	100	0.052	0.052	0.052
4.001	User	-	100	0.015	0.015	0.015
5.000	User	-	100	0.084	0.084	0.084
	User	-	100	0.027	0.027	0.111
5.001	User	-	100	0.048	0.048	0.048
5.002	-	-	100	0.000	0.000	0.000
5.003	User	-	100	0.023	0.023	0.023
5.004	-	-	100	0.000	0.000	0.000
5.005	User	-	100	0.056	0.056	0.056
	User	-	100	0.003	0.003	0.059
	User	-	100	0.037	0.037	0.096
5.006	User	-	100	0.012	0.012	0.012
4.002	-	-	100	0.000	0.000	0.000
6.000	-	-	100	0.000	0.000	0.000
6.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.595	0.595	0.595

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)**
1.003		99.520	97.120	0.000	0	0

Online Controls for Storm

Hydro-Brake® Optimum Manhole: SW1D, DS/PN: 1.003, Volume (m³): 14.5

Unit Reference	MD-SHE-0242-3600-2000-3600
Design Head (m)	2.000
Design Flow (l/s)	36.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	242
Invert Level (m)	97.840
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	2100

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.000	36.0
Flush-Flo™	0.594	36.0
Kick-Flo®	1.289	29.2
Mean Flow over Head Range	-	31.1

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	7.9	1.200	31.5	3.000	43.7	7.000	65.9
0.200	24.6	1.400	30.3	3.500	47.1	7.500	68.2
0.300	33.3	1.600	32.3	4.000	50.3	8.000	70.3
0.400	35.0	1.800	34.2	4.500	53.2	8.500	72.4
0.500	35.8	2.000	36.0	5.000	56.0	9.000	74.5
0.600	36.0	2.200	37.7	5.500	58.6	9.500	76.5
0.800	35.4	2.400	39.3	6.000	61.2		
1.000	34.2	2.600	40.8	6.500	63.6		

1 year Return Period Summary of Critical Results by Maximum Outflow (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 0
Number of Online Controls 1 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 0.339
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

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

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

PN	**US/MH Name**	**Storm**	**Return Period**	**Climate Change**	**First (X) Surcharge**	**First (Y) Flood**	**First (Z) Overflow**	**Overflow Act.**	**Water Level (m)**
1.000	SW1A	15 Winter	1	+0%					101.546
2.000	SW2A	15 Winter	1	+0%	100/15 Summer				101.650
2.001	SW2B	15 Winter	1	+0%	100/15 Summer				101.153
1.001	SW1B	15 Winter	1	+0%					100.651
1.002	SW1C	15 Winter	1	+0%	1/15 Winter				98.492
3.000	SW3A	15 Winter	1	+0%	30/15 Summer				100.538
3.001	SW3B	15 Winter	1	+0%	100/15 Winter				100.174
4.000	SW4B	15 Winter	1	+0%					101.285
4.001	SW4C	15 Winter	1	+0%					100.092
5.000	SW5B	15 Winter	1	+0%					101.291
5.001	SW5A	15 Winter	1	+0%					100.954
5.002	SW5C	15 Winter	1	+0%					100.535
5.003	SW5D	15 Winter	1	+0%	30/15 Summer				99.919
5.004	SW5E	15 Winter	1	+0%	30/15 Summer				99.872
5.005	SW6A	15 Winter	1	+0%	100/30 Winter				98.528
5.006	SW6B	15 Winter	1	+0%	30/15 Summer				98.517
4.002	SW4D	15 Winter	1	+0%	1/15 Summer				98.483
6.000	EXSW7A	60 Winter	1	+0%					100.200
6.001	EXSW7B	60 Winter	1	+0%	100/30 Winter				99.150

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	SW1A	-0.104	0.000	0.21		5.6	OK	
2.000	SW2A	-0.100	0.000	0.25		5.6	OK	
2.001	SW2B	-0.095	0.000	0.29		5.5	OK	
1.001	SW1B	-0.229	0.000	0.13		11.1	OK	
1.002	SW1C	0.029	0.000	0.20		18.8	SURCHARGED	
3.000	SW3A	-0.078	0.000	0.47		10.2	OK	
3.001	SW3B	-0.103	0.000	0.22		10.2	OK	
4.000	SW4B	-0.105	0.000	0.20		6.9	OK	
4.001	SW4C	-0.236	0.000	0.10		8.5	OK	
5.000	SW5B	-0.224	0.000	0.15		14.8	OK	
5.001	SW5A	-0.211	0.000	0.19		19.5	OK	
5.002	SW5C	-0.233	0.000	0.11		19.7	OK	
5.003	SW5D	-0.201	0.000	0.24		22.1	OK	
5.004	SW5E	-0.108	0.000	0.73		21.9	OK	
5.005	SW6A	-0.873	0.000	0.00		31.2	OK*	
5.006	SW6B	-0.004	0.000	0.13		29.1	OK*	
4.002	SW4D	0.115	0.000	0.16		26.3	SURCHARGED	
6.000	EXSW7A	-0.450	0.000	0.00		0.0	OK	
6.001	EXSW7B	-0.450	0.000	0.00		0.0	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.003	SW1D	60 Winter	1	+0%	1/15 Summer				98.211

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	SW1D	-0.079	0.000	0.07		34.6	OK	

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 1.000 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 2.000 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 2.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 1.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 1.002 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 3.000 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 3.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 4.000 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 4.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.000 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.002 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.003 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.004 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.005 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 5.006 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 15 minute 1 year Winter I+0% for Pipe 4.002 (Storm)

Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)	Time (mins)	Rain (mm/hr)
1	6.622	4	15.932	7	59.385	10	41.724	13	12.586
2	12.084	5	25.788	8	68.980	11	25.788	14	12.084
3	12.586	6	41.724	9	59.385	12	15.932	15	6.622

Rainfall Hyetograph for 60 minute 1 year Winter I+0% for Pipe 6.000 (Storm)

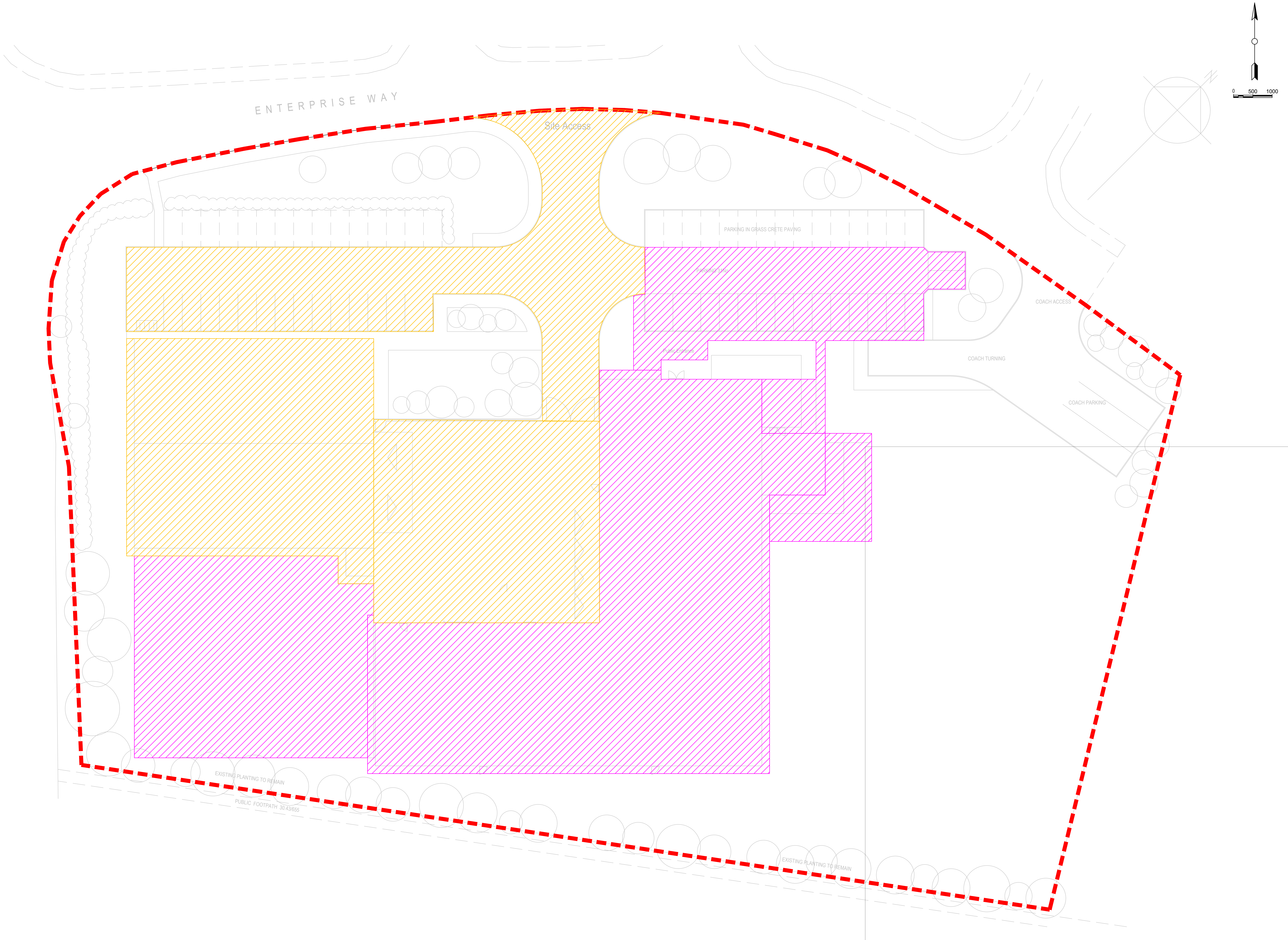
Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	0.859	13	6.000	25	23.165	37	21.024	49	5.644
2	2.470	14	6.485	26	24.988	38	19.103	50	5.468
3	3.652	15	7.128	27	26.688	39	17.211	51	5.386
4	4.526	16	8.074	28	28.357	40	15.170	52	5.374
5	4.990	17	9.115	29	29.541	41	13.472	53	5.385
6	5.254	18	10.326	30	30.395	42	11.901	54	5.371
7	5.371	19	11.901	31	30.395	43	10.326	55	5.254
8	5.385	20	13.472	32	29.541	44	9.115	56	4.990
9	5.374	21	15.170	33	28.357	45	8.074	57	4.526
10	5.386	22	17.211	34	26.688	46	7.128	58	3.653
11	5.468	23	19.103	35	24.988	47	6.485	59	2.470
12	5.644	24	21.024	36	23.165	48	6.000	60	0.859

Rainfall Hyetograph for 60 minute 1 year Winter I+0% for Pipe 6.001 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	0.859	13	6.000	25	23.165	37	21.024	49	5.644
2	2.470	14	6.485	26	24.988	38	19.103	50	5.468
3	3.652	15	7.128	27	26.688	39	17.211	51	5.386
4	4.526	16	8.074	28	28.357	40	15.170	52	5.374
5	4.990	17	9.115	29	29.541	41	13.472	53	5.385
6	5.254	18	10.326	30	30.395	42	11.901	54	5.371
7	5.371	19	11.901	31	30.395	43	10.326	55	5.254
8	5.385	20	13.472	32	29.541	44	9.115	56	4.990
9	5.374	21	15.170	33	28.357	45	8.074	57	4.526
10	5.386	22	17.211	34	26.688	46	7.128	58	3.653
11	5.468	23	19.103	35	24.988	47	6.485	59	2.470
12	5.644	24	21.024	36	23.165	48	6.000	60	0.859

Rainfall Hyetograph for 60 minute 1 year Winter I+0% for Pipe 1.003 (Storm)

Time (mins)	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**	**Time (mins)**	**Rain (mm/hr)**
1	0.859	13	6.000	25	23.165	37	21.024	49	5.644
2	2.470	14	6.485	26	24.988	38	19.103	50	5.468
3	3.652	15	7.128	27	26.688	39	17.211	51	5.386
4	4.526	16	8.074	28	28.357	40	15.170	52	5.374
5	4.990	17	9.115	29	29.541	41	13.472	53	5.385
6	5.254	18	10.326	30	30.395	42	11.901	54	5.371
7	5.371	19	11.901	31	30.395	43	10.326	55	5.254
8	5.385	20	13.472	32	29.541	44	9.115	56	4.990
9	5.374	21	15.170	33	28.357	45	8.074	57	4.526
10	5.386	22	17.211	34	26.688	46	7.128	58	3.653
11	5.468	23	19.103	35	24.988	47	6.485	59	2.470
12	5.644	24	21.024	36	23.165	48	6.000	60	0.859



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KEY

AREA	IMPERMEABLE CATCHMENT AREA, m^2 (ha)	
PROPOSED IMPERMEABLE	▨	3233m^2 (0.323ha)
EXISTING IMPERMEABLE	▨	2599m^2 (0.259ha)
TOTAL		5832m^2 (0.583ha)

*TOTALS FOR HECTARES (ha) AND METERS SQUARED (m^2) DIFFER SLIGHTLY DUE TO ROUNDING AND ACCUMULATION OF INDIVIDUAL AREAS.

■ ■ ■ SITE BOUNDARY

NYMNPA
11/05/2020

Rev	Date	Remarks	Drawn	Chk'd
P01	19/03/20	FIRST ISSUE.	JLE	BLS

Paul Waite Associates
pwa Geo Environmental
Consulting Civil , Structural & Geo-Environmental Engineers
Summit House, Riparian Way, The Crossings, Crosshills, Keighley, BD20 7BW
www.pwaite.co.uk

Client
BOTHAMS BAKERY

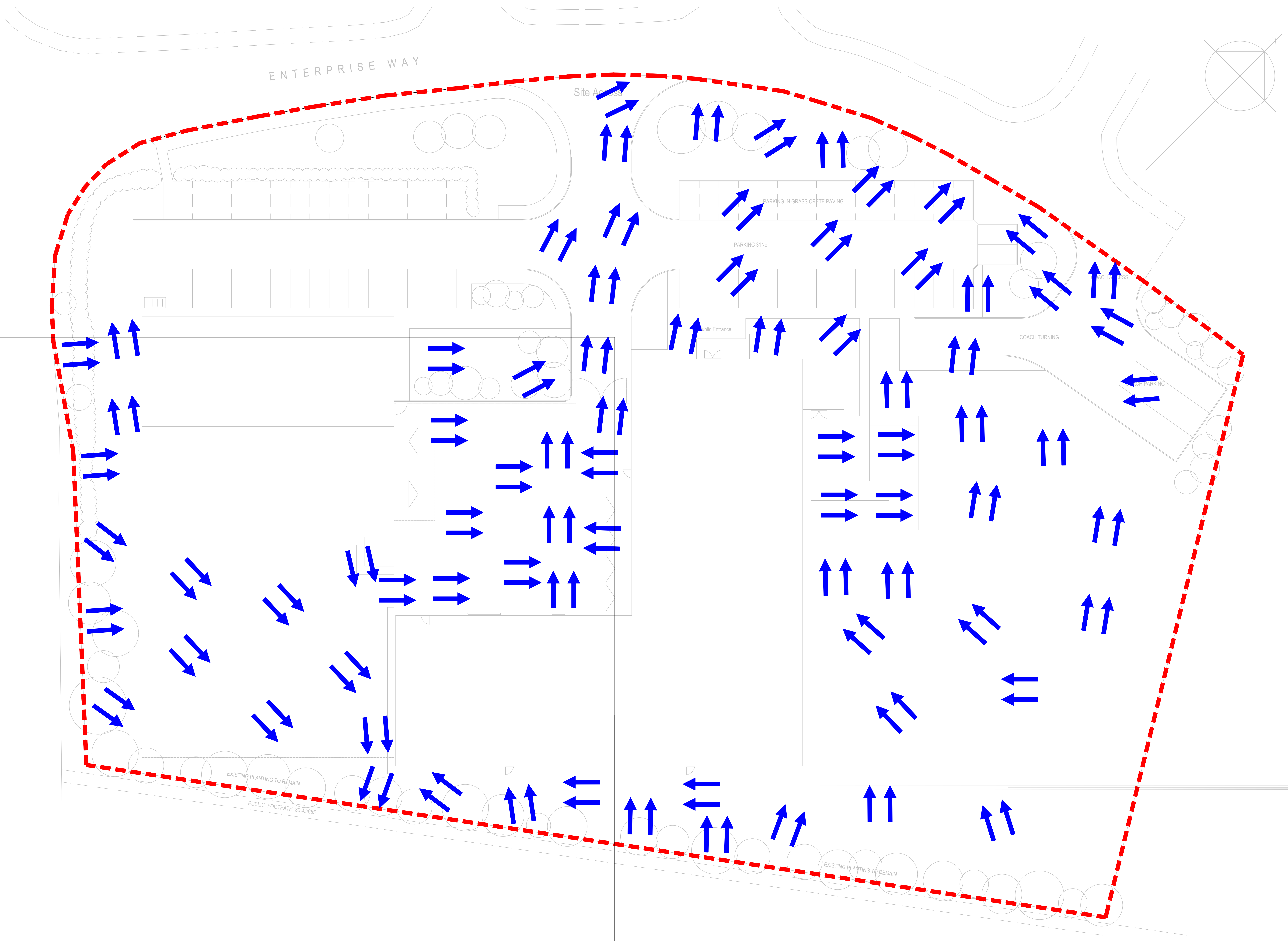
Project
PROPOSED EXTENSION
BOTHAMS
WHITBY

Title
IMPERMEABLE AREA PLAN

Size	Scale	Designed	Checked	Date
A1	1:200	JLE	BLS	MAR 20

Drawing Status
PRELIMINARY

Job Number		Originator		Zone		Level		Type		Role		Drawing No.	Rev
19205	-	PWA	-	00	-	XX	-	DR	-	C	-	1000	P01



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KEY

⇇ FLOOD ROUTING DIRECTION

NYMNPA
11/05/2020

Rev	Date	Remarks	Drawn	Chk'd
P01	27/03/20	FIRST ISSUE	JS	BLS

Paul Waite Associates
pwa Geo Environmental
Consulting Civil , Structural & Geo-Environmental Engineers
Su Way Keighley, BD20 7BW
-M ww.pwaite.co.uk

Client
BOTHAMS OF WHITBY

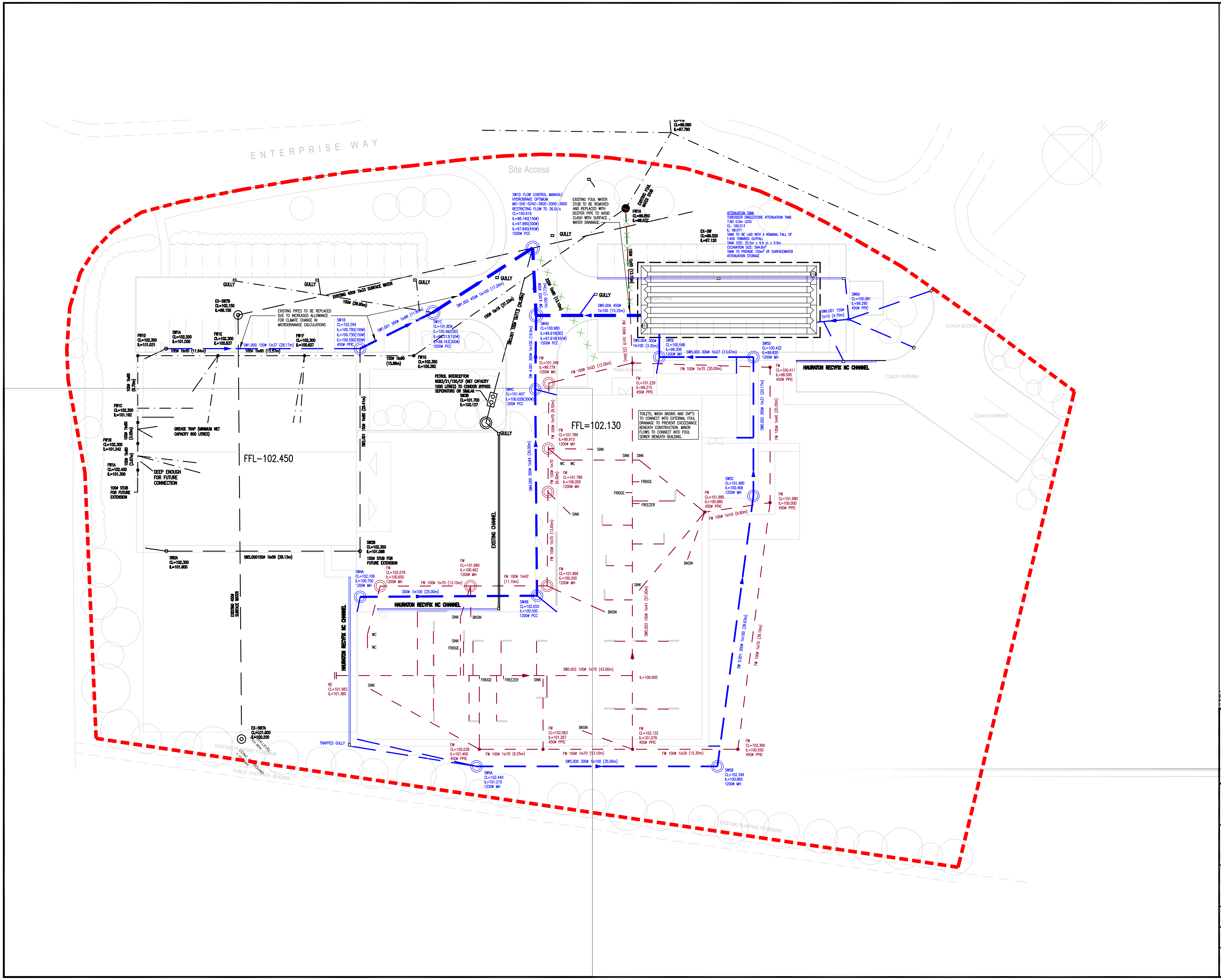
Project
SUDS SCHEME FOR PLANNING

Title
FLOOD EXCEEDANCE PLAN

Size	Scale	Designed	Checked	Date
A1	1:250	JS	BLS	MAR 20

Drawing Status
PRELIMINARY

Job Number	Originator	Volume	Level	Type	Role	Drawing No.	Rev
19205 -	PWA -	00 -	XX -	DR -	C -	1002	P01



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KEY

– – – –	EXISTING SURFACE WATER PIPE
— · — · —	EXISTING FOUL WATER PIPE
○	EXISTING INSPECTION CHAMBER
○	EXISTING MANHOLE
— · — · —	PROPOSED FOUL WATER PIPE
– – – –	PROPOSED SURFACE WATER PIPE
○	PROPOSED SURFACE WATER MANHOLE
○	PROPOSED SURFACE WATER INSPECTION CHAMBER
○	PROPOSED FOUL WATER INSPECTION CHAMBER
═	PROPOSED SURFACE WATER CHANNEL DRAIN
═	PROPOSED FOUL WATER CHANNEL DRAIN
⊗	ABANDONED MAN HOLE
–×–×–×–	ABANDONED PIPE
– – – –	SITE BOUNDARY

NYMNPA
11/05/2020

Rev	Date	Remarks	Drawn	Chk'd
P01	19/03/20	FIRST ISSUE	JS	BLS

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ww.pwaite.co.uk

Client
BOTHAMS OF WHITBY

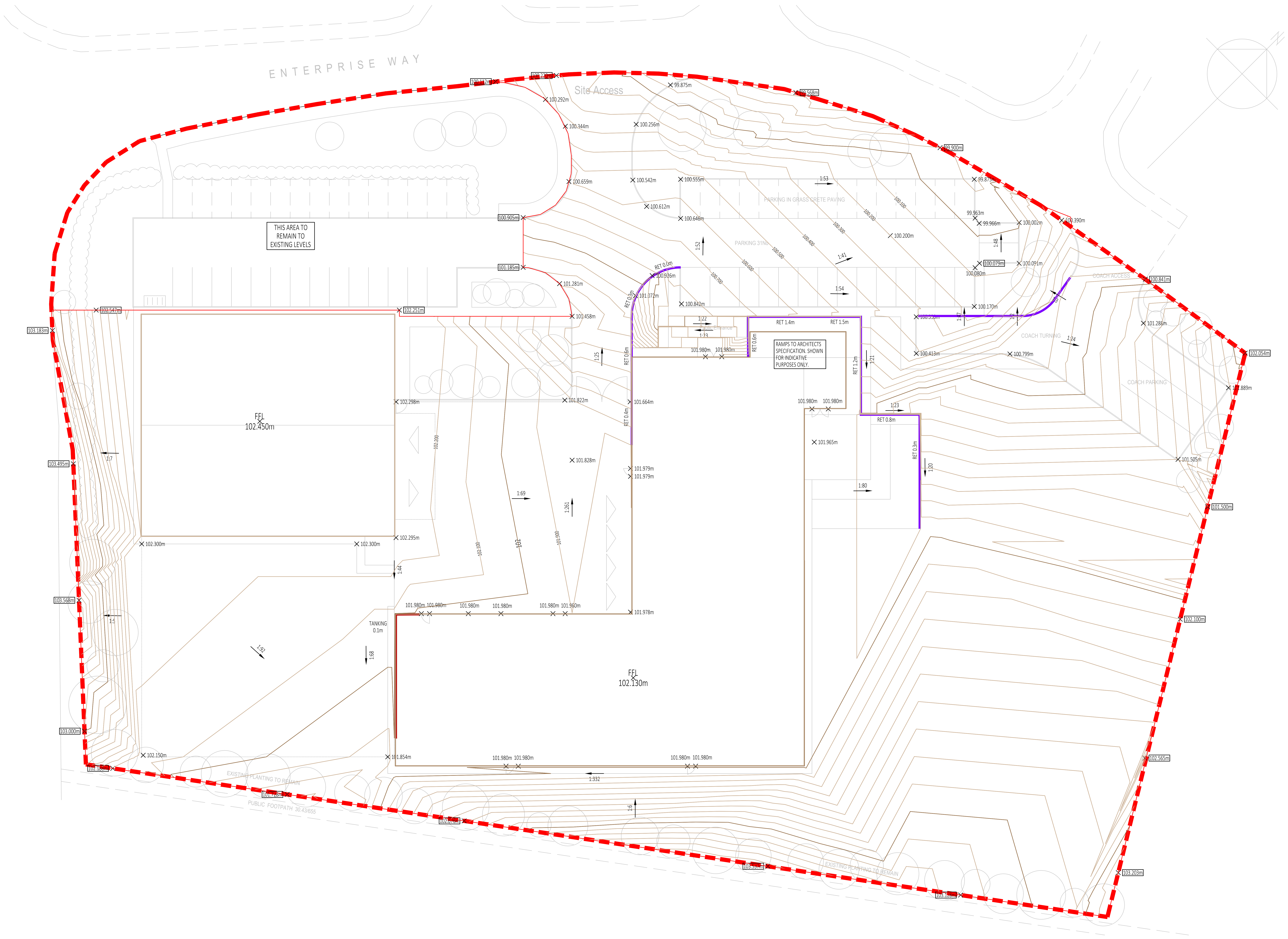
Project
SUDS SCHEME FOR PLANNING

Title
PROPOSED DRAINAGE PLAN

Size	Scale	Designed	Checked	Date
A1	1:200	JS	BLS	MAR 20

Drawing Status
PRELIMINARY

Job Number		Originator		Volume		Level		Type		Role		Drawing No.	Rev
19205	-	PWA	-	00	-	XX	-	DR	-	C	-	1003	P01



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KEY

× 100.000m (boxed)	EXISTING SPOT LEVELS
× 100.000m	PROPOSED SPOT LEVELS
100.000m	CONTOUR LABEL
1:100 →	PROPOSED GRADIENT
🟥 🟥 🟥	SITE BOUNDARY
▬	RETAINING WALL
▬	TANKING

Rev	Date	Remarks	Drawn	Chk'd
P01	19/03/20	FIRST ISSUE	JS	BLS

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Summit House Riparian Way The Crossings Crosshills Keighley, BD20 7BW
:-Mε 'ww.pwaite.co.uk

Client
BOTHAMS OF WHITBY

Project
SUDS SCHEME FOR PLANNING

Title
EXTERNAL WORKS

Size	Scale	Designed	Checked	Date
A1	1:200	JS	BLS	MAR 20

Drawing Status
PRELIMINARY

Job Number		Originator		Volume		Level		Type		Role		Drawing No.	Rev
19205	-	PWA	-	00	-	XX	-	DR	-	C	-	2000	P01

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	36.000
Flush-Flo™	0.594	35.966
Kick-Flo®	1.289	29.160
Mean Flow		31.136

Hydro-Brake® Optimum Flow Control including:

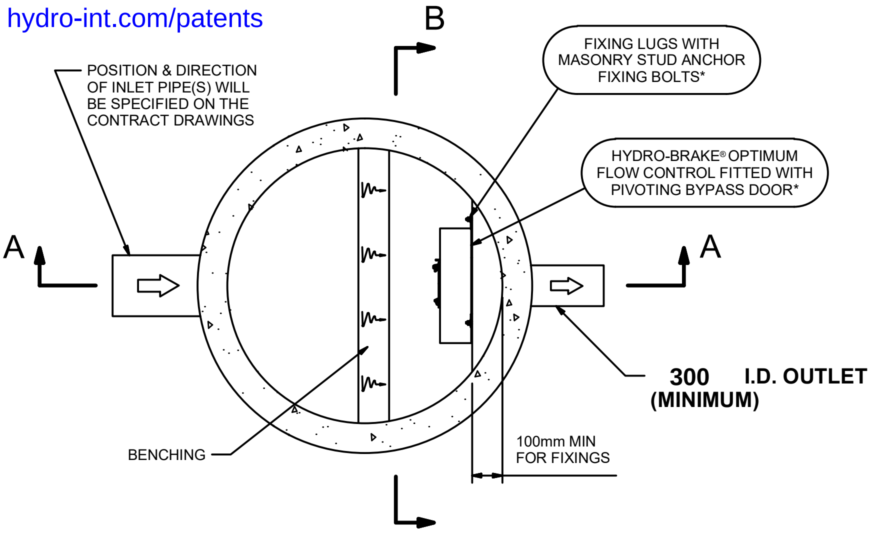
- 5 mm grade 304L stainless steel
- Integral stainless steel pivoting by-pass door allowing clear line of sight through to outlet, c/w stainless steel operating rope
- Beed blasted finish to maximise corrosion resistance
- Stainless steel fixings
- Rubber gasket to seal outlet

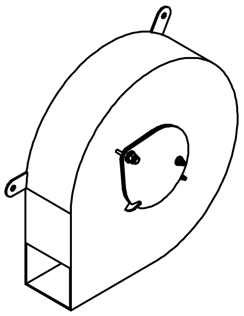
CERTIFICATE 08/4596

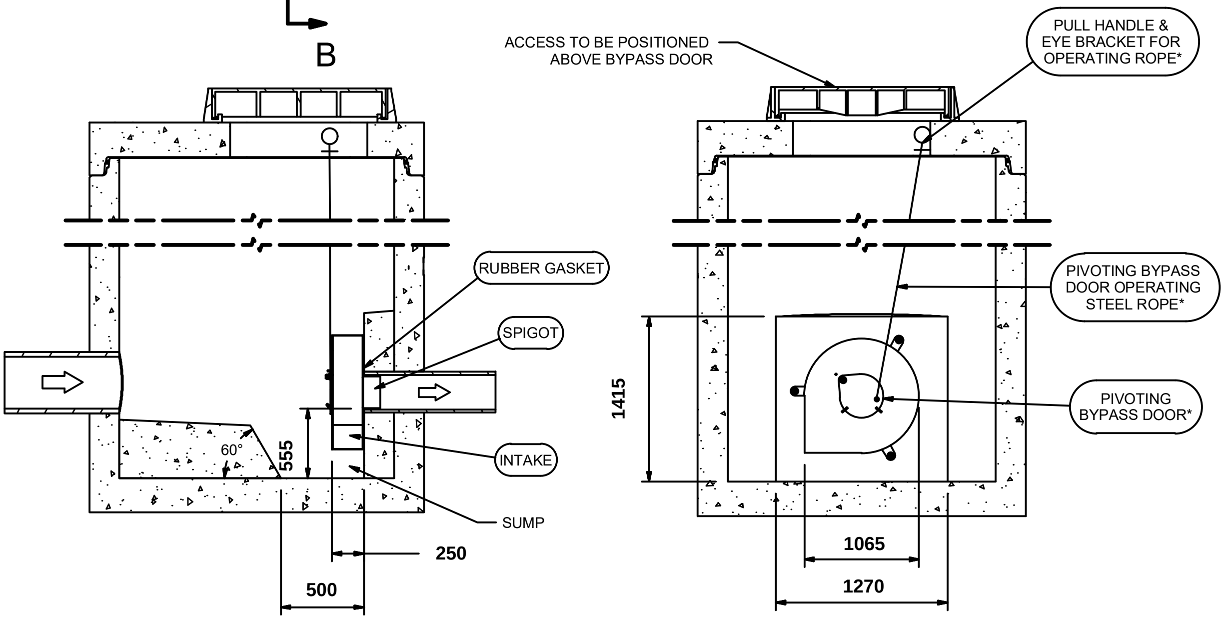
PT/329/0412

hydro-int.com/patents

NYMNPA
11/05/2020







SECTION A-A

SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® FLOW CONTROL & HYDRO-BRAKE® OPTIMUM FLOW CONTROL ARE REGISTERED TRADEMARKS FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0242-3600-2000-3600 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

DATE	3/13/2020 3:33 PM
SITE	Botham's
DESIGNER	Jacob Savage
REF	MD-SHE-0242-3600-2000-3600

SHE-0242-3600-2000-3600

Hydro-Brake® Optimum

JacobS@pwaite.co.uk

Technical Specification

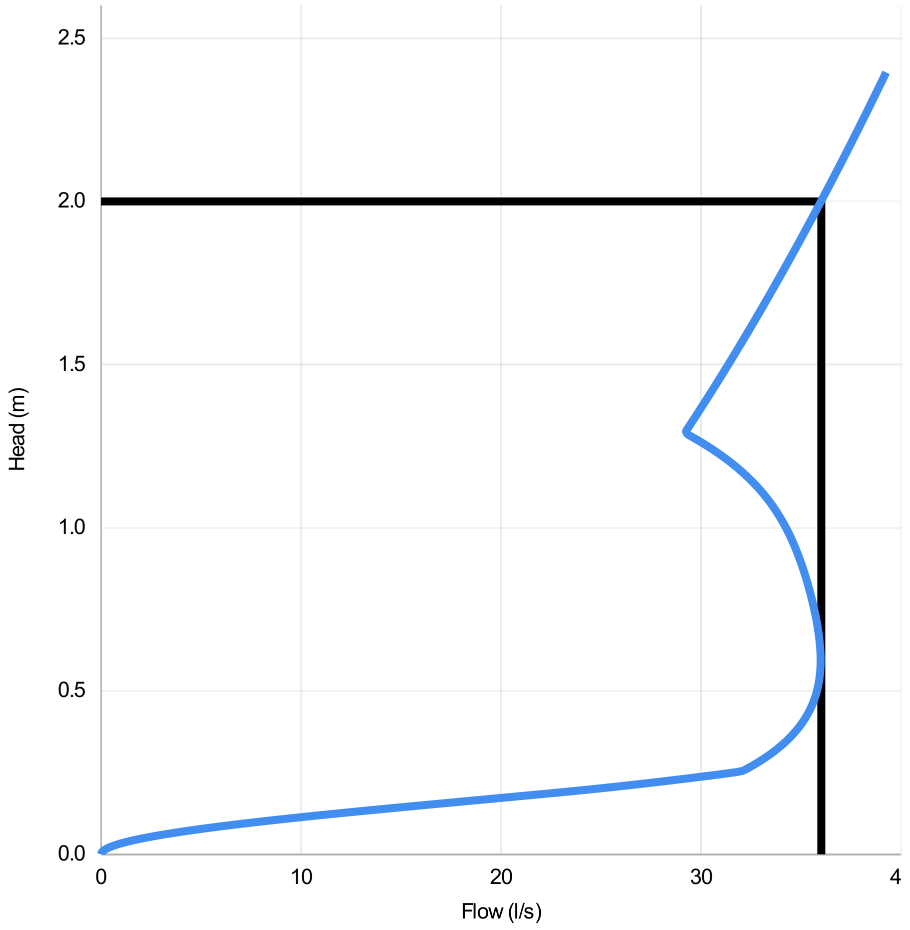
Control Point	Head (m)	Flow (l/s)
Primary Design	2.000	36.000
Flush-Flo	0.594	35.966
Kick-Flo®	1.289	29.160
Mean Flow		31.136

hydro-int.com/patents

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

WRc APPROVED
PT/329/0412

NYMNPA
11/05/2020



Head (m)	Flow (l/s)
0.000	0.000
0.069	3.993
0.138	13.951
0.207	25.701
0.276	32.679
0.345	34.214
0.414	35.166
0.483	35.699
0.552	35.932
0.621	35.955
0.690	35.834
0.759	35.616
0.828	35.325
0.897	34.964
0.966	34.510
1.034	33.917
1.103	33.116
1.172	32.021
1.241	30.538
1.310	29.385
1.379	30.115
1.448	30.826
1.517	31.520
1.586	32.198
1.655	32.861
1.724	33.510
1.793	34.146
1.862	34.770
1.931	35.382
2.000	35.983

DESIGN ADVICE

!

The head/flow characteristics of this SHE-0242-3600-2000-3600 Hydro-Brake Optimum® Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International®

DATE	13/03/2020 15:33
Site	Botham's
DESIGNER	Jacob Savage
Ref	MD-SHE-0242-3600-2000-3600

SHE-0242-3600-2000-3600

Hydro-Brake Optimum®