Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 13 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.693	0.063	8.6	9.1	O K
30 min Summer	99.708	0.078	8.6	11.3	O K
60 min Summer	99.712	0.082	8.6	12.0	O K
120 min Summer	99.701	0.071	8.6	10.3	O K
180 min Summer	99.688	0.058	8.6	8.3	O K
240 min Summer	99.679	0.049	8.4	6.9	O K
360 min Summer	99.669	0.039	6.8	5.5	O K
480 min Summer	99.663	0.033	5.7	4.6	O K
600 min Summer	99.659	0.029	5.0	3.9	O K
720 min Summer	99.656	0.026	4.4	3.5	O K
960 min Summer	99.651	0.021	3.7	2.8	O K
1440 min Summer	99.646	0.016	2.7	2.0	O K
2160 min Summer	99.642	0.012	2.0	1.4	O K
2880 min Summer	99.639	0.009	1.6	1.0	O K
4320 min Summer	99.637	0.007	1.2	0.6	O K
5760 min Summer	99.636	0.006	1.0	0.5	O K
7200 min Summer	99.635	0.005	0.8	0.3	O K
8640 min Summer	99.635	0.005	0.8	0.3	O K
10080 min Summer	99.634	0.004	0.6	0.3	O K
15 min Winter	99.693	0.063	8.6	9.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	117.448	0.0	14
30 min Summer	79.010	0.0	23
60 min Summer	50.812	0.0	40
120 min Summer	31.621	0.0	72
180 min Summer	23.637	0.0	102
240 min Summer	19.105	0.0	130
360 min Summer	14.037	0.0	192
480 min Summer	11.286	0.0	252
600 min Summer	9.522	0.0	312
720 min Summer	8.282	0.0	370
960 min Summer	6.640	0.0	492
1440 min Summer	4.854	0.0	736
2160 min Summer	3.541	0.0	1100
2880 min Summer	2.828	0.0	1468
4320 min Summer	2.055	0.0	2200
5760 min Summer	1.637	0.0	2928
7200 min Summer	1.371	0.0	3480
8640 min Summer	1.186	0.0	4392
10080 min Summer	1.049	0.0	5128
15 min Winter	117.448	0.0	15

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.705	0.075	8.6	10.9	O K
60 min Winter	99.704	0.074	8.6	10.7	O K
120 min Winter	99.685	0.055	8.6	7.9	O K
180 min Winter	99.674	0.044	7.6	6.3	O K
240 min Winter	99.667	0.037	6.4	5.2	O K
360 min Winter	99.659	0.029	5.0	3.9	O K
480 min Winter	99.654	0.024	4.1	3.2	O K
600 min Winter	99.650	0.020	3.5	2.6	O K
720 min Winter	99.648	0.018	3.1	2.3	O K
960 min Winter	99.644	0.014	2.5	1.7	O K
1440 min Winter	99.640	0.010	1.8	1.2	O K
2160 min Winter	99.638	0.008	1.3	0.8	O K
2880 min Winter	99.636	0.006	1.1	0.5	O K
4320 min Winter	99.635	0.005	0.8	0.3	O K
5760 min Winter	99.634	0.004	0.6	0.3	O K
7200 min Winter	99.634	0.004	0.6	0.3	O K
8640 min Winter	99.634	0.004	0.5	0.2	O K
10080 min Winter	99.634	0.004	0.5	0.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	79.010	0.0	24
60 min Winter	50.812	0.0	42
120 min Winter	31.621	0.0	74
180 min Winter	23.637	0.0	102
240 min Winter	19.105	0.0	134
360 min Winter	14.037	0.0	194
480 min Winter	11.286	0.0	254
600 min Winter	9.522	0.0	312
720 min Winter	8.282	0.0	372
960 min Winter	6.640	0.0	502
1440 min Winter	4.854	0.0	748
2160 min Winter	3.541	0.0	1096
2880 min Winter	2.828	0.0	1456
4320 min Winter	2.055	0.0	2164
5760 min Winter	1.637	0.0	2840
7200 min Winter	1.371	0.0	3640
8640 min Winter	1.186	0.0	4024
10080 min Winter	1.049	0.0	4952

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.12400	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	50.0
Max Percolation (l/s)	138.9	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.630	Membrane Depth (m)	0

Summary of Results for 1000 year Return Period (+70%)

Half Drain Time : 37 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.785	0.155	8.6	22.8	O K
30 min Summer	99.826	0.196	8.6	29.1	O K
60 min Summer	99.850	0.220	8.6	32.6	O K
120 min Summer	99.846	0.216	8.6	32.0	O K
180 min Summer	99.824	0.194	8.6	28.8	O K
240 min Summer	99.799	0.169	8.6	25.0	O K
360 min Summer	99.752	0.122	8.6	18.0	O K
480 min Summer	99.718	0.088	8.6	12.8	O K
600 min Summer	99.694	0.064	8.6	9.2	O K
720 min Summer	99.680	0.050	8.6	7.2	O K
960 min Summer	99.671	0.041	7.1	5.8	O K
1440 min Summer	99.660	0.030	5.2	4.2	O K
2160 min Summer	99.652	0.022	3.8	2.9	O K
2880 min Summer	99.648	0.018	3.1	2.3	O K
4320 min Summer	99.643	0.013	2.2	1.5	O K
5760 min Summer	99.640	0.010	1.7	1.1	O K
7200 min Summer	99.638	0.008	1.4	0.8	O K
8640 min Summer	99.637	0.007	1.2	0.7	O K
10080 min Summer	99.636	0.006	1.1	0.5	O K
15 min Winter	99.784	0.154	8.6	22.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	232.306	0.0	16
30 min Summer	159.296	0.0	29
60 min Summer	103.784	0.0	46
120 min Summer	64.855	0.0	80
180 min Summer	48.313	0.0	114
240 min Summer	38.816	0.0	148
360 min Summer	28.142	0.0	208
480 min Summer	22.437	0.0	266
600 min Summer	18.798	0.0	320
720 min Summer	16.255	0.0	372
960 min Summer	12.905	0.0	492
1440 min Summer	9.295	0.0	736
2160 min Summer	6.672	0.0	1100
2880 min Summer	5.262	0.0	1464
4320 min Summer	3.754	0.0	2192
5760 min Summer	2.948	0.0	2936
7200 min Summer	2.441	0.0	3568
8640 min Summer	2.091	0.0	4368
10080 min Summer	1.836	0.0	5136
15 min Winter	232.306	0.0	16

Summary of Results for 1000 year Return Period (+70%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.826	0.196	8.6	29.0	O K
60 min Winter	99.846	0.216	8.6	32.0	O K
120 min Winter	99.830	0.200	8.6	29.6	O K
180 min Winter	99.795	0.165	8.6	24.4	O K
240 min Winter	99.759	0.129	8.6	18.9	O K
360 min Winter	99.699	0.069	8.6	10.0	O K
480 min Winter	99.677	0.047	8.1	6.6	O K
600 min Winter	99.670	0.040	6.8	5.6	O K
720 min Winter	99.665	0.035	6.0	4.8	O K
960 min Winter	99.658	0.028	4.8	3.8	O K
1440 min Winter	99.650	0.020	3.4	2.6	O K
2160 min Winter	99.644	0.014	2.5	1.8	O K
2880 min Winter	99.641	0.011	1.9	1.3	O K
4320 min Winter	99.638	0.008	1.4	0.8	O K
5760 min Winter	99.636	0.006	1.1	0.6	O K
7200 min Winter	99.635	0.005	0.9	0.4	O K
8640 min Winter	99.635	0.005	0.8	0.4	O K
10080 min Winter	99.635	0.005	0.8	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	159.296	0.0	30
60 min Winter	103.784	0.0	48
120 min Winter	64.855	0.0	86
180 min Winter	48.313	0.0	122
240 min Winter	38.816	0.0	154
360 min Winter	28.142	0.0	208
480 min Winter	22.437	0.0	254
600 min Winter	18.798	0.0	314
720 min Winter	16.255	0.0	374
960 min Winter	12.905	0.0	496
1440 min Winter	9.295	0.0	738
2160 min Winter	6.672	0.0	1104
2880 min Winter	5.262	0.0	1468
4320 min Winter	3.754	0.0	2244
5760 min Winter	2.948	0.0	2936
7200 min Winter	2.441	0.0	3608
8640 min Winter	2.091	0.0	4248
10080 min Winter	1.836	0.0	4744

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1000	Cv (Summer)	1.000
Region	England and Wales	Cv (Winter)	1.000
M5-60 (mm)	18.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+70

Time Area Diagram

Total Area (ha) 0.053

Time (mins) From:	To:	Area (ha)
0	4	0.053

Model Details

Storage is Online Cover Level (m) 100.000

Porous Car Park Structure

Infiltration Coefficient Base (m/hr)	0.12400	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	50.0
Max Percolation (l/s)	138.9	Slope (1:X)	10000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	99.630	Membrane Depth (m)	0

N

Ex. Tree to remain

Tree Protection
in compliance with
BS 5837 : 2012

1.8m High Close Boarded Fence

Bins P3

FFL =101.653

PLOT 100m sq.

Entrance

Refuse presentation point P3

P1

P1

300mm border to access road side of fence

Ex.Out-building

1200Ø CHAMBER WITH
300mm DEEP SILT TRAP

Access Road in Gravel

Access Road in Gravel

5m OFFSET FROM SOAKAWAY

150Ø SWS

P2

P2

P3

P3

Bins P2

FFL =101.653

PLOT 100m sq.

Entrance

Refuse presentation point P2

1.8m High Close Boarded Fence

PG

Bins P1

FFL =101.653

PLOT 100m sq.

Entrance

Refuse presentation point P1

PG

Tree Protecti
in compliance
BS 5837 : 20

300mm border to access road side of fence

water butt

New Garage

Parking
85 Grange Road

Ex. Shed

water butt

CELLULAR SOAKAWAY: 4.5 x 7.0 x 0.8m DEEP DESIGNED TO CATER FOR 100 YEAR STORM WITH 40% ALLOWANCE FOR CLIMATE CHANGE

5m OFFSET FROM SOAKAWAY

1.8m High Close Boarded Fence

Visitor 1

Visitor 2

New Tree

New Tree

RG

ACCESS AND PARKING AREAS TO BE PERMEABLE GRAVEL CONSTRUCTION

PERMEABLE CONSTRUCTION

150Ø SWS

1000mm min

800mm

CELLULAR SOAKAWAY TO MANUFACTURERS SPECIFICATION

TYPICAL SOAKAWAY DETAIL

1:50 -A1

50mm LOOSE DECORATIVE FLINT (PERMEABLE) ON FILTER MEMBRANE

20mm AGGREGATE BEDDING LAYER

NW8 GEOTEXTILE LAYER

300mm TYPE 3 DOT GRANULAR MATERIAL

TRIGRID GEOTEXTILE

150x50 EF KERB WITH 100mm GEN 1 CONCRETE SURROUND

PERMEABLE ACCESS DETAIL

INDICATIVE

Notes:

1. Do not scale from this drawing. All dimensions are in metres, unless stated otherwise.
2. Ordnance Survey, (c) Crown Copyright 2020. All rights reserved. Licence number 100022432.
3. Drawing to be read in conjunction with all other drawings. Any discrepancies are to be reported to the engineer 5 working days in advance of undertaking any work.

KEY

- PROPOSED STORM DRAINAGE
- 300m sq — ROOF CATCHMENT FOR CELLULAR SOAKAWAY
- 535m sq — PERMEABLE PAVED AREA AND CONTRIBUTING AREAS
- EXCEEDANCE FLOW ROUTE

Rev	Date	Details	Drawn by	Checked by
E	14.08.22	PERMEBALE PAVING DETAIL REVISED	CE	KT
D	13.07.22	CATCHMENT INFORMATION UPDATED	TB	KT
C	07.22	REVISED IN ACCORDANCE WITH LLFA COMMENTS	SC	KT
B	17.06.22	SECOND ISSUE- NOTES AND DETAILS ADDED	RMR	KT
A	06.22	FIRST ISSUE	SC	KT

rappor
Infrastructure and environmental consultants
rappor.co.uk

CLIENT:
UPTON BUILDERS

PROJECT:
81-83 Grange Road, Tuffley

TITLE:
Surface Water Drainage Strategy

STATUS:
INFORMATION

SCALE @ A1	DATE:	DRAWN:	CHECKED:	APPROVED:
1:100	13.0.22	SC	KT	KT

JOB NO:	DRAWING NO:	REVISION:
22-0436	C100	E