PROPOSED RESIDENTIAL DEVELOPMENT

GLEN GARAGE

GLEN ROAD

YORK

YO31 7XZ

DRAINAGE STRATEGY REPORT

24/07/2018

HM DESIGN

10 The Green York YO26 5LR 07919 031289

1. INTRODUCTION

This report provides an assessment of the proposed drainage for this development site. It considers the disposal of foul and surface water from the development and provides outline information about how the development can be drained successfully.

2. LOCATION AND SITE

The site is adjacent to Glen Road and Hawthorn Grove, York. An aerial view of the site is shown below.

LOCATION PLAN

A topographical survey has been undertaken for the development site. The topographical survey shows that the site is level with levels varying from about 13.50 to 13.60m AOD.

The pre-development site is wholly impermeable and consists of a garage building and canopy over a concrete external hard-standing area.

The garage, canopy and concrete hard-standings under the canopy are all positively drained and assumed that they all connect with the local sewer network.

Photographs showing the site are shown below.

PRE-DEVELOPMENT SITE PHOTOGRAPH

PRE-DEVELOPMENT SITE PHOTOGRAPHS

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3. PROPOSALS

The proposals are for new residential building. The proposals are shown below.

PROPOSALS PLAN

The development will use the whole of the site, as per the existing site, but some areas will be garden and so reduce impermeable areas overall and so reduce surface water flows to sewer.

4. PUBLIC SEWER RECORDS

The local public sewer records have been obtained and these are shown below.

A public combined sewer is present within Hawthorne Road and Glen Road adjacent to the development.

No surface water sewers are available on or close to the development site.

PUBLIC SEWER RECORDS

No detailed drainage survey has been undertaken. However, it is likely that the whole of the pre-development site drains to the public sewer.

5. FOUL SEWERAGE

Foul sewers from the development will be connected to the combined public sewer within Hawthorne Grove or Glen Road. Preferably using an existing connection on site.

A separate system of foul drainage will be provided on site.

6. SURFACE WATER ASSESSMENT

The surface water from this development should be disposed of through one or more of the following, in this order of priority.

- Discharge to the ground (infiltration).
- Discharge to a surface water body.

- Discharge to a surface water sewer, highway drain or other drain.
- Discharge to a combined sewer.

There is no available space for infiltration on the proposed development. The development is small, urban and so the correct drainage methodology will be to mimic the existing drainage system and discharge flows to the existing public sewers.

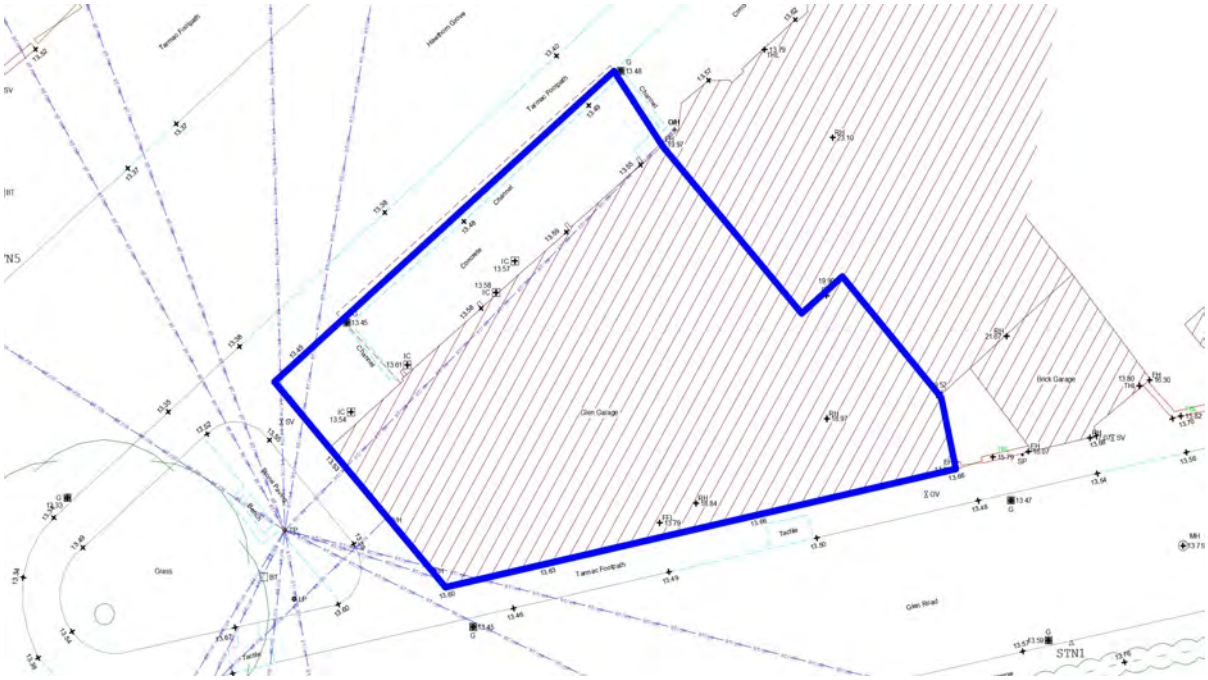
There are no watercourses available on or close to this site.

The existing surface water from the development is discharged to the public sewer network. From site inspection, the roofs and canopy are drained positively through gutters and rainwater pipes and the concrete hard-standing area below the canopy has a drainage channel and gully. Therefore, the post-development surface water drainage will mimic the pre-development site and have an outfall to sewer.

PRE-DEVELOPMENT DISCHARGE TO SEWER

The development site is 318 sq m. The 1 in 1 year discharge rate for this area, taken as 140l/s/hectare is 140 x 0.0318 = 4.45 l/s.

For the re-development, the discharge rate to sewer should be reduced by a minimum of 30% and so the post-development discharge rate for all storm events, up to the 1 in 100 year plus climate change storm event should be limited to 4.45l/s minus 30% = 3.1l/s.



PRE-DEVELOPMENT IMPERMEABLE AREAS

POST-DEVELOPMENT DISCHARGE TO SEWER

The post development site will be building with an impermeable area of 255 sq m; and garden areas for the remainder of the site.

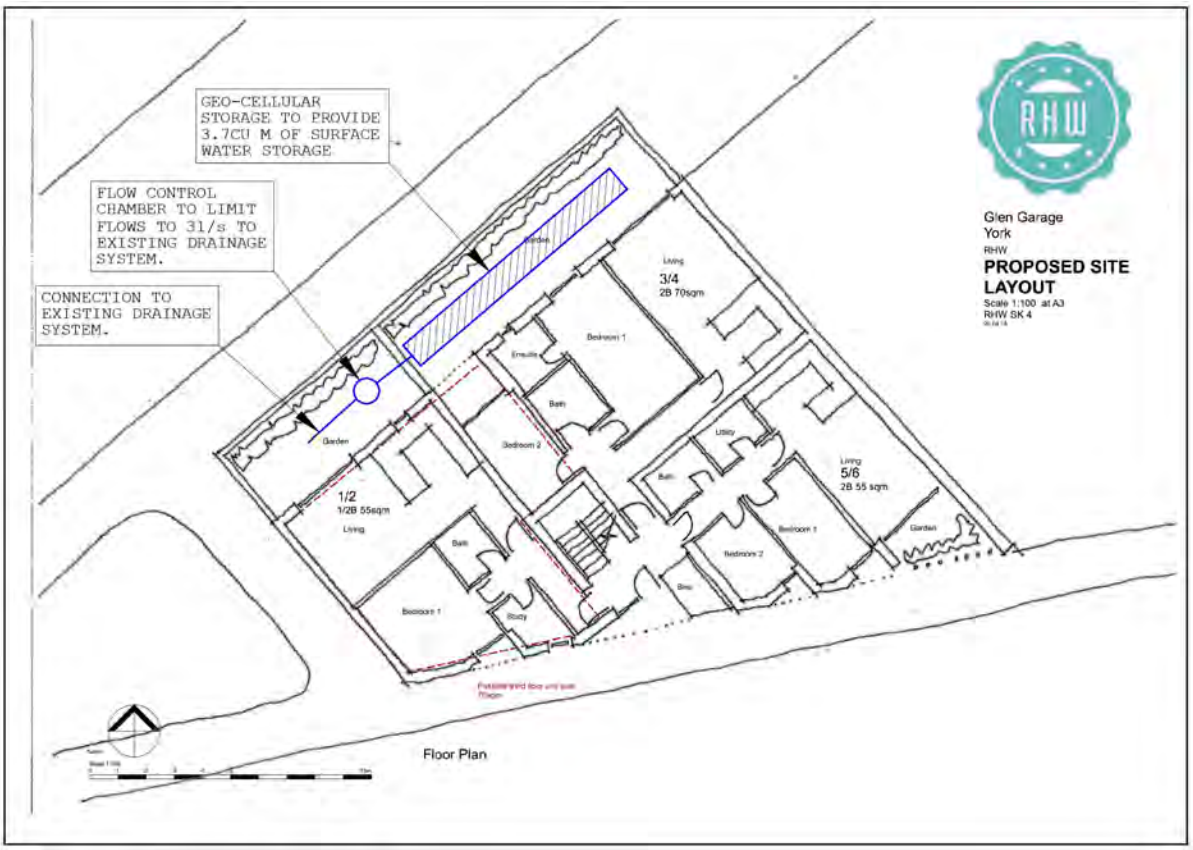
To limit flows to 3.1l/s, surface water storage will be required on the proposed surface water drainage system. The Microdrainage program has been used to determine the size of the storage system required, using the following criteria:-

Impermeable area of post-development site = 255 sq m (0.026hectares).
Discharge rate 3.1l/s
Return Period: 1 in 100 year storm event.
Climate Change: + 20% added to rainfall.
M5-60 = 19mm
R= 0.400

The Microdrainage calculations are at the rear of this report and show that a surface water storage system constructed from cellular storage blocks and providing 3.7 cu m will be satisfactory for this development.

This could be located under the garden area to the front of the development facing Hawthorn Grove. Existing drainage chambers exist within this area and so likely that existing drainage exists within this area for connection of flows from the development.

A sketch of the location and size of the surface water attenuation features are shown below.



PRELIMINARY SURFACE WATER DRAINAGE DESIGN

7. CONCLUSIONS

- This development site can be drained successfully.
- Foul water and surface water will have separate systems on site.
- Foul water flows will be connected to the public combined sewer, preferably via on site existing drainage.
- Surface water from the development will be disposed of by connection to the combined sewer on site at restricted flow of 3.1l/s.
- Surface water storage (3.7 Cu m) will be supplied by cellular storage under the garden area proposed on the development.
- The surface water storage will cater for all storms up to 1 in 100 year plus 20% climate change.

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[redacted] Morris BSc CEng MICE

24/07/2018

APPENDIX

- MICRODRAINAGE STORAGE CALCULATIONS
  1 in 100 year plus 20% climate change

Summary of Results for 100 year Return Period (+20%)

Half Drain Time : 10 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	13.018	0.318	0.0	3.1	3.1	3.0	O K
30 min Summer	13.035	0.335	0.0	3.1	3.1	3.2	O K
60 min Summer	12.995	0.295	0.0	3.1	3.1	2.8	O K
120 min Summer	12.866	0.166	0.0	3.1	3.1	1.6	O K
180 min Summer	12.772	0.072	0.0	3.1	3.1	0.7	O K
240 min Summer	12.721	0.021	0.0	3.0	3.0	0.2	O K
360 min Summer	12.700	0.000	0.0	2.5	2.5	0.0	O K
480 min Summer	12.700	0.000	0.0	2.0	2.0	0.0	O K
600 min Summer	12.700	0.000	0.0	1.7	1.7	0.0	O K
720 min Summer	12.700	0.000	0.0	1.5	1.5	0.0	O K
960 min Summer	12.700	0.000	0.0	1.2	1.2	0.0	O K
1440 min Summer	12.700	0.000	0.0	0.8	0.8	0.0	O K
2160 min Summer	12.700	0.000	0.0	0.6	0.6	0.0	O K
2880 min Summer	12.700	0.000	0.0	0.5	0.5	0.0	O K
4320 min Summer	12.700	0.000	0.0	0.3	0.3	0.0	O K
5760 min Summer	12.700	0.000	0.0	0.3	0.3	0.0	O K
7200 min Summer	12.700	0.000	0.0	0.2	0.2	0.0	O K
8640 min Summer	12.700	0.000	0.0	0.2	0.2	0.0	O K
10080 min Summer	12.700	0.000	0.0	0.2	0.2	0.0	O K
15 min Winter	13.079	0.379	0.0	3.1	3.1	3.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	111.940	0.0	5.4	14
30 min Summer	73.565	0.0	7.1	23
60 min Summer	46.096	0.0	8.8	40
120 min Summer	27.939	0.0	10.8	72
180 min Summer	20.582	0.0	12.0	100
240 min Summer	16.478	0.0	12.8	128
360 min Summer	11.961	0.0	14.0	0
480 min Summer	9.535	0.0	14.9	0
600 min Summer	7.993	0.0	15.6	0
720 min Summer	6.916	0.0	16.2	0
960 min Summer	5.501	0.0	17.2	0
1440 min Summer	3.977	0.0	18.6	0
2160 min Summer	2.871	0.0	20.2	0
2880 min Summer	2.276	0.0	21.3	0
4320 min Summer	1.639	0.0	23.0	0
5760 min Summer	1.296	0.0	24.3	0
7200 min Summer	1.081	0.0	25.3	0
8640 min Summer	0.931	0.0	26.1	0
10080 min Summer	0.820	0.0	26.9	0
15 min Winter	111.940	0.0	6.2	15

Summary of Results for 100 year Return Period (+20%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	13.089	0.389	0.0	3.1	3.1	3.7	O K
60 min Winter	13.020	0.320	0.0	3.1	3.1	3.0	O K
120 min Winter	12.815	0.115	0.0	3.1	3.1	1.1	O K
180 min Winter	12.711	0.011	0.0	3.0	3.0	0.1	O K
240 min Winter	12.700	0.000	0.0	2.5	2.5	0.0	O K
360 min Winter	12.700	0.000	0.0	1.8	1.8	0.0	O K
480 min Winter	12.700	0.000	0.0	1.5	1.5	0.0	O K
600 min Winter	12.700	0.000	0.0	1.2	1.2	0.0	O K
720 min Winter	12.700	0.000	0.0	1.1	1.1	0.0	O K
960 min Winter	12.700	0.000	0.0	0.8	0.8	0.0	O K
1440 min Winter	12.700	0.000	0.0	0.6	0.6	0.0	O K
2160 min Winter	12.700	0.000	0.0	0.4	0.4	0.0	O K
2880 min Winter	12.700	0.000	0.0	0.3	0.3	0.0	O K
4320 min Winter	12.700	0.000	0.0	0.3	0.3	0.0	O K
5760 min Winter	12.700	0.000	0.0	0.2	0.2	0.0	O K
7200 min Winter	12.700	0.000	0.0	0.2	0.2	0.0	O K
8640 min Winter	12.700	0.000	0.0	0.1	0.1	0.0	O K
10080 min Winter	12.700	0.000	0.0	0.1	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	73.565	0.0	8.0	25
60 min Winter	46.096	0.0	9.9	44
120 min Winter	27.939	0.0	12.2	74
180 min Winter	20.582	0.0	13.5	98
240 min Winter	16.478	0.0	14.4	0
360 min Winter	11.961	0.0	15.7	0
480 min Winter	9.535	0.0	16.7	0
600 min Winter	7.993	0.0	17.5	0
720 min Winter	6.916	0.0	18.1	0
960 min Winter	5.501	0.0	19.2	0
1440 min Winter	3.977	0.0	20.8	0
2160 min Winter	2.871	0.0	22.6	0
2880 min Winter	2.276	0.0	23.9	0
4320 min Winter	1.639	0.0	25.8	0
5760 min Winter	1.296	0.0	27.2	0
7200 min Winter	1.081	0.0	28.3	0
8640 min Winter	0.931	0.0	29.3	0
10080 min Winter	0.820	0.0	30.1	0

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+20

Time Area Diagram

Total Area (ha) 0.026

Time (mins) From:	To:	Area (ha)
0	4	0.026

Model Details

Storage is Online Cover Level (m) 13.500

Cellular Storage Structure

Invert Level (m) 12.700 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	10.0	10.0	0.401	0.0	15.1
0.400	10.0	15.1			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0090-3100-0550-3100
Design Head (m)	0.550
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	90
Invert Level (m)	12.600
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	3.1
Flush-Flo™	0.168	3.1
Kick-Flo®	0.383	2.6
Mean Flow over Head Range	-	2.6

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	2.8	1.200	4.4	3.000	6.8	7.000	10.2
0.200	3.1	1.400	4.8	3.500	7.3	7.500	10.6
0.300	3.0	1.600	5.1	4.000	7.8	8.000	10.9
0.400	2.7	1.800	5.4	4.500	8.3	8.500	11.3
0.500	3.0	2.000	5.6	5.000	8.7	9.000	11.6
0.600	3.2	2.200	5.9	5.500	9.1	9.500	11.9
0.800	3.7	2.400	6.1	6.000	9.5		
1.000	4.1	2.600	6.4	6.500	9.8		