Porter, Karen

From:	George Templeman <gtempleman@templemandesign.com>
Sent:	28 August 2018 15:50
To:	3338 - Hix & Son - Station Yard - Mill Drove Cowbit; _planningadvice
Subject:	PP-07234178 Residential Development at Station Road Cowbit.
Attachments:	2018_08_27 Drainage Strategy Old Station Road Cowbit.pdf

This message originated from outside your organization

Dear Sirs,

Please find attached drainage strategy document in respect of the above application.

Many thanks,

Regards

George

George Templeman BSc AssocRICS
Managing Director
Templeman Associates Limited
Tel 01553 776148
Mob 07788260810

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PROPOSED DEVELOPMENT AT OLD STATION ROAD, COWBIT

DRAINAGE STRATEGY

S M Hemmings B Sc C Eng MICE MIWEM,
69 Charlotte Way,
Peterborough,
PE3 9ER

E mail: **stuart.hemmings@btinternet.com**

Telephone: 01733 263700
Mobile: 07804 189365

Introduction

A residential development is proposed north of Stonegate in Cowbit, Spalding, PE12 6AH. The proposed development is in two separate areas on each side of Mill Drove South, which will be realigned so the junction with Stonegate is approximately twenty metres east of the existing junction. The western part of the site is known as the Old Station Yard and the eastern part is a farmyard with old agricultural buildings and a glasshouse. The site is located on the eastern side of the village of Cowbit and is approximately 5 km from Spalding.

The planning authority requires a drainage strategy to be submitted with the application.

For all large developments (more than 10 dwellings) there is a requirement to apply sustainable drainage principles (SuDS) to the disposal of surface water from the site.

The CIRIA SuDS Manual 2015 explains the philosophy of SuDS in Chapter 1 of the manual as follows:

> The philosophy of sustainable drainage systems is about maximising the benefits and minimising the negative impacts of surface water runoff from developed areas.
>
> The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk, and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone.

The Technical Standards for Sustainable Drainage produced by the Local Authority SuDS Officer Organisation (LASOO) states that generally the aim for should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

1) Into the ground (infiltration).
2) To a surface water body.
3) To a surface water sewer or highway drain.
4) To a combined sewer.

Existing Drainage Systems

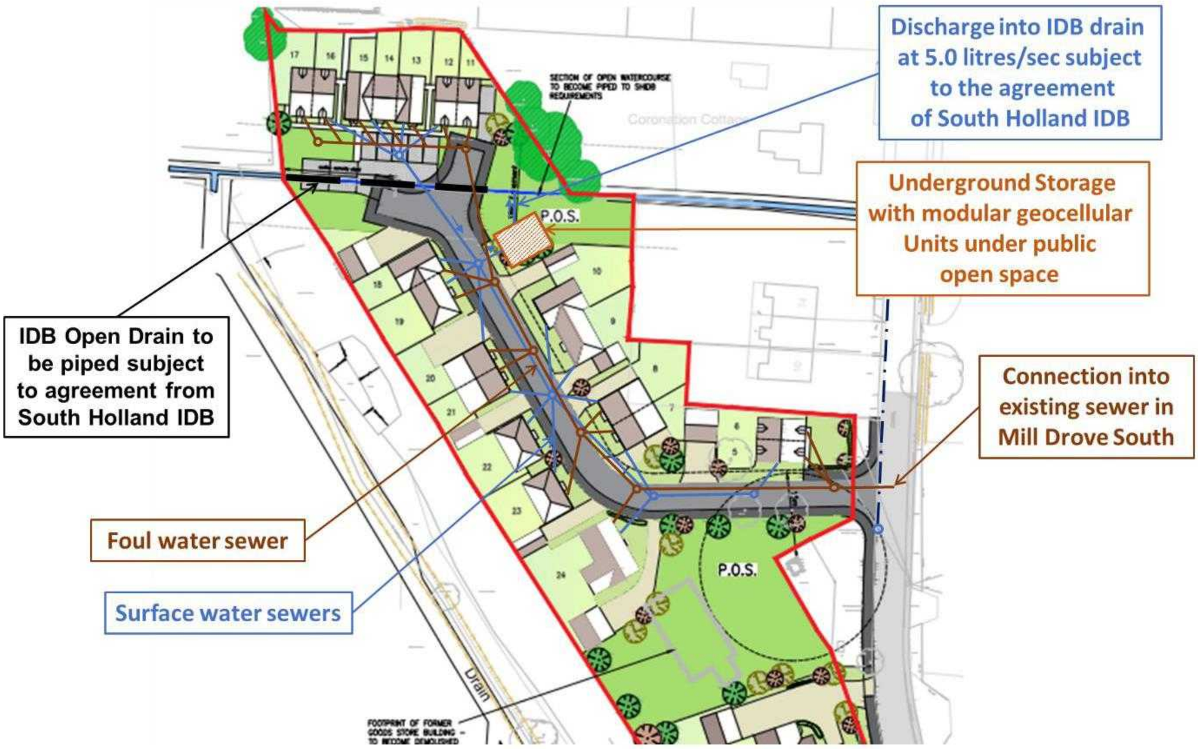
There is an IDB drain near the northern boundary of the west site. This is partly piped and part of it is an open drain and flows westwards. A piped section of IDB drain extends southwards along the west side of Mill Drove South. There is a dyke along the northern boundary of the eastern site which is believed to flow westwards into a culvert under Mill Drove South and discharges into the piped IDB drain.

Design of Surface Water Disposal

No percolation tests have been carried out on this site and although ground conditions seem to show soakaways may work satisfactorily, initially it is proposed to construct two separate surface water drainage systems, one for the eastern site which will discharge into the dyke on the northern boundary and one for the western site which will discharge into the IDB drain. Both discharges will require the approval of South Holland IDB. At this stage it will be assumed that the rainwater from the roofs of the four properties at the southern of the western site can satisfactorily be disposed of into soakaways. However it would be possible to extend the surface water drainage system to cater for these if soakaway drainage is found to be unsustainable on this site.

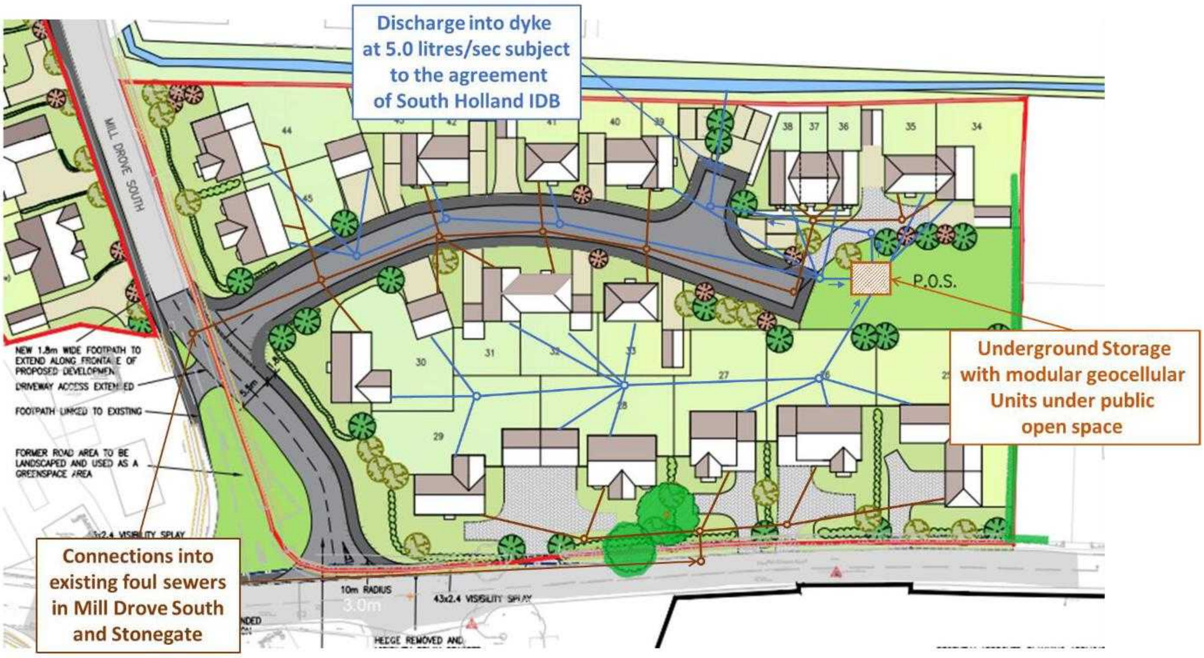
All of the roads will be constructed with impermeable surfacing, and will be drained by gullies which will connect into the surface water drainage systems which will be constructed on each site.

The following plan shows the layout of the proposed surface water and foul water drainage systems for the northern part of the Western site.



The surface water from the access roads and the houses and garages will be drained into the surface water system to be constructed on this part of the site. The surface water will flow to a storage facility constructed with modular geocellular units placed under the public open space. The flow from the storage facility will discharge into the piped section of the IDB drain through a flow limiter which will reduce flows to 5.0 litres/ second.

The plan shown on the next page shows the proposed method of disposing of the surface water from the eastern site.



The surface water from the access roads and the houses and garages will be drained into the surface water system to be constructed on this part of the site. The surface water will flow to a storage facility constructed with modular geocellular units placed under the public open space. The flow from the storage facility will discharge into the dyke on the northern boundary through a flow limiter which will reduce flows to 5.0 litres/ second.

Initial calculations of these schemes are shown on pages 5 – 7.

Foul Water

It is assumed foul water sewers will be located under the new site access roads which will connect into the existing Anglian Water foul water system under Stonegate and Mill Drove South.

DESIGN OF SURFACE WATER DISPOSAL SYSTEMS

Western Site

Area of access road = 130 x 7.2 = 936 sq m

There are 5 larger houses with an average area of 140 sq m, 12 smaller houses with an average area of 90 square metres, and the northern block with a total area of 280 sq m.

Therefore the approximate area of roofs

= (5 x 140) + (12 x 90) + 280 = 2060 sq m

Therefore the total impermeable area will be taken to be 3000 square metres.

The volumes of rainfall for various storm durations in a 1 in 100 year event in 2115 with 30% added for climate change can be calculated as follows:

Duration	M5_60min	Z1	M5-D	Z2	M100-D	Intensity mm/hour	Areal Factor	Areal Intensity mm/hour	Area (ha)	Volume cum/hr	Vol + 30% climate Change cum/hr	Total Volume cu m climate	Total Volume cu m	Volume litres/sec
15	24	0.64	15.36	1.98	30.41	121.65	0.94	114.35	0.3	343.056	445.97	111.5	85.76	95.293
30	24	0.81	19.44	1.97	38.30	76.59	0.95	72.76	0.3	218.292	283.78	141.9	109.15	60.637
60	24	1	24	1.93	46.32	46.32	0.96	44.47	0.3	133.402	173.42	173.4	133.40	37.056
120	24	1.2	28.8	1.89	54.43	27.22	0.97	26.40	0.3	79.199	102.96	205.9	158.40	22.000
240	24	1.42	34.08	1.86	63.39	15.85	0.97	15.37	0.3	46.115	59.95	239.8	184.46	12.810
360	24	1.57	37.68	1.83	68.95	11.49	0.98	11.26	0.3	33.788	43.92	263.5	202.73	9.385
600	24	1.74	41.76	1.81	75.59	7.56	0.98	7.41	0.3	22.222	28.89	288.9	222.22	6.173
1440	24	2.16	51.84	1.81	93.83	3.91	0.98	3.83	0.3	11.494	14.94	358.6	275.86	3.193
2880	24	2.5	60	1.81	108.60	2.26	0.98	2.22	0.3	6.652	8.65	415.1	319.28	1.848

If an outflow from the system of 5.0 litres/sec is taken then the volume of attenuation required can be calculated as follows:

Duration mins	Total Rainfall Volume cu m into storage facility	Volume that has discharged into IDB drain in duration cu m	Total Storage Required cu m	Total Time to empty storage facility hours
15	111.49	4.50	106.99	6.19
30	141.89	9.00	132.89	7.88
60	173.42	18.00	155.42	9.63
120	205.92	36.00	169.92	11.44
240	239.80	72.00	167.80	13.32
360	263.54	108.00	155.54	14.64
600	288.89	180.00	108.89	16.05
1440	358.62	432.00	-73.38	19.92
2880	415.07	864.00	-448.93	23.06

Therefore from the above table it can be seen that a total storage volume of 170 cu metres is required to store the rainfall from a 1 in 100 year event with 30% increase for climate change.

It is proposed to provide this storage with modular geocellular units placed under the public open space. If 900 units 1.0 metre x 500mm x 400mm deep are provided these would be capable of storing 171 cu metres and would take up an area of 15.0m x 15.0m if laid two units deep.

Eastern Site

Area of access road = 115 x 7.2 = 828 sq m

There are 12 larger houses with an average area of 140 sq m and 9 smaller houses with an average area of 90 square metres.

Therefore the approximate area of roofs

= (12 x 140) + (9 x 90) = 2490 sq m

Therefore the total impermeable area will be taken to be 3320 square metres.

The volumes of rainfall for various storm durations in a 1 in 100 year event in 2115 with 30% added for climate change can be calculated as follows:

Duration	M5_60min	Z1	M5-D	Z2	M100-D	Intensity mm/hour	Areal Factor	Areal Intensity mm/hour	Area (ha)	Volume cum/hr	Vol + 30% climate Change cum/hr	Total Volume cu m climate	Total Volume cu m	Volume litres/sec
15	24	0.64	15.36	1.98	30.41	121.65	0.94	114.35	0.332	379.649	493.54	123.4	94.91	105.458
30	24	0.81	19.44	1.97	38.30	76.59	0.95	72.76	0.332	241.576	314.05	157.0	120.79	67.105
60	24	1	24	1.93	46.32	46.32	0.96	44.47	0.332	147.631	191.92	191.9	147.63	41.009
120	24	1.2	28.8	1.89	54.43	27.22	0.97	26.40	0.332	87.646	113.94	227.9	175.29	24.346
240	24	1.42	34.08	1.86	63.39	15.85	0.97	15.37	0.332	51.034	66.34	265.4	204.14	14.176
360	24	1.57	37.68	1.83	68.95	11.49	0.98	11.26	0.332	37.392	48.61	291.7	224.35	10.387
600	24	1.74	41.76	1.81	75.59	7.56	0.98	7.41	0.332	24.593	31.97	319.7	245.93	6.831
1440	24	2.16	51.84	1.81	93.83	3.91	0.98	3.83	0.332	12.720	16.54	396.9	305.29	3.533
2880	24	2.5	60	1.81	108.60	2.26	0.98	2.22	0.332	7.361	9.57	459.3	353.34	2.045

If an outflow from the system of 5.0 litres/sec is taken then the volume of attenuation required can be calculated as follows:

Duration mins	Total Rainfall Volume cu m into storage facility	Volume that has discharged into IDB drain in duration cu m	Total Storage Required cu m	Total Time to empty storage facility hours
15	123.39	4.50	118.89	6.85
30	157.02	9.00	148.02	8.72
60	191.92	18.00	173.92	10.66
120	227.88	36.00	191.88	12.66
240	265.38	72.00	193.38	14.74
360	291.66	108.00	183.66	16.20
600	319.70	180.00	139.70	17.76
1440	396.87	432.00	-35.13	22.05
2880	459.34	864.00	-404.66	25.52

Therefore from the above table it can be seen that a total storage volume of 194 cu metres is required to store the rainfall from a 1 in 100 year event with 30% increase for climate change.

It is proposed to provide this storage with modular geocellular units placed under the public open space. If 1024 units 1.0 metre x 500mm x 400mm deep are provided these would be capable of storing 194 cu metres and would take up an area of 16.0m x 16.0m if laid two units deep.