PROPOSED NEW DEVELOPMENT BEHIND WINDMILL COURT, ROMAN BANK, SPALDING, PE11 2HN.

PROPOSED DRAINAGE STRATEGY

Introduction

A new block of flats is proposed behind the existing building Windmill Court on the west side of Roman Bank, Spalding, PE11 2HN.

A surface water scheme was drawn up for both of the buildings when the original block of flats was constructed which was designed for the whole site. This proposed that the surface water from the roofs and the hardstandings should be discharged into the River Welland. As far as is known at the present time an alternative scheme was implemented for the front building which discharged the surface water into the Highways Sewer in Roman Bank.

It is proposed that a separate surface water scheme should be designed and constructed for the proposed building and associated parking areas at the rear of the site.

The Philosophy of SuDS

There is a requirement that all new developments should incorporate SuDS in the design of the surface water disposal 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.

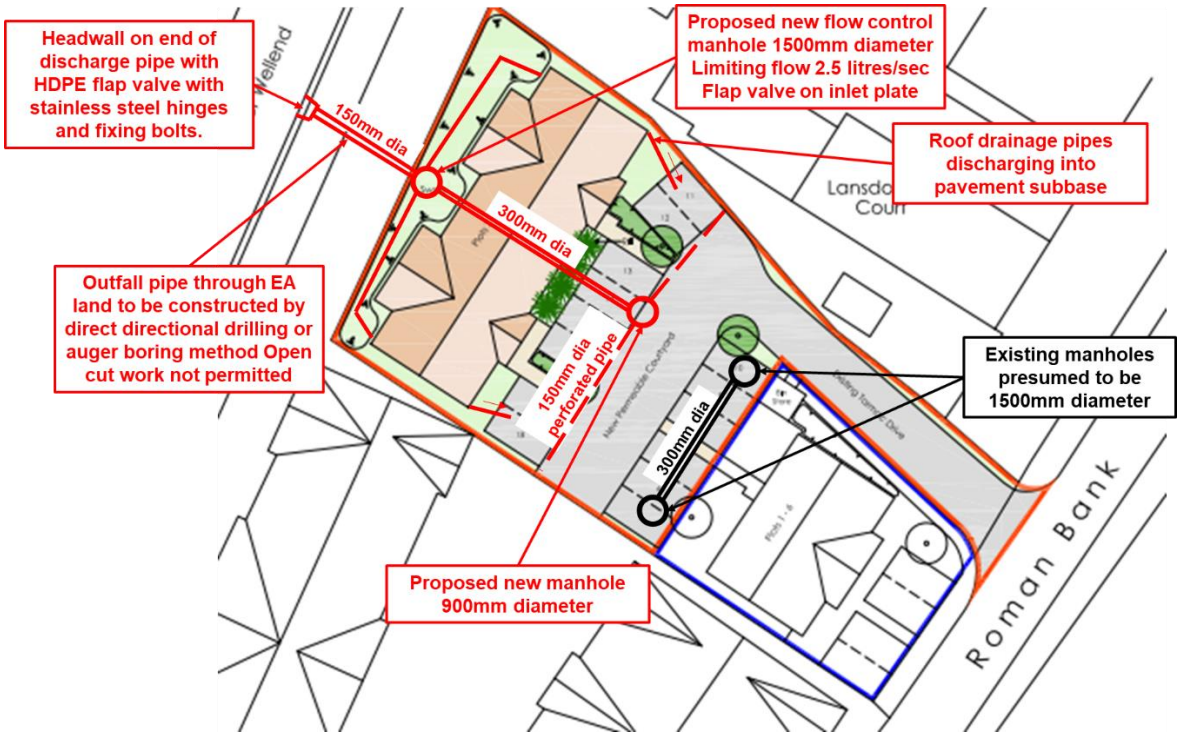
The Technical Standards for Sustainable Drainage produced by the Local Authority SuDS Officer Organisation (LASOO) states that generally the aim for should be to discharge surface water runoff as high up the following hierarchy of drainage options as reasonably practicable:

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

Surface Water Drainage Scheme

The possibility of drainage into the ground (infiltration was first considered. The nature of the soil conditions and the site itself, along with the proximity of the River Welland would make the use of soakaway drainage unreliable. Therefore this method of disposal has been discounted.

The second option to discharge the surface water into a surface water body has been chosen. The permeable paving will be drained with a permeable pipe which discharges into a manhole at the centre of the paved area. The roof water from the east side of the building will discharge into the pavement subbase and the roof water from the west side of the building will drain into a second manhole on the west side of the building. A 300mm diameter pipe will convey the surface water from the first to the second manhole where the flow will be limited by a flow restrictor. A new 150mm diameter pipe will be bored through the bank to allow a discharge into the River Welland. This is shown on the plan below.



Calculation of Rainfall Volumes

The areas of the site are as follows:

Proposed building……..(24.1 x 8.4) + (2 x 6.6 x 1.5) + (2 x 0.6 x 4.20 = 227.3 sm

Car Parking Area ……(15.7 x 22.9) = 359.5 sm

Total hard surfacing = 586.8 sm

Design of Surface Water Storage

The suggested design of the hardstandings is as follows:

- 80mm depth paving blocks

- 50mm depth laying course material
- 150mm depth dense bitumen macadam with 75mm cored holes at 750mm intervals
- 300mm depth subbase 20 – 4mm no fines aggregate

The proposed depth of the subbase has been calculated on the required storage volume for surface water and the contractor should check that this depth of subbase provides the required structural properties for the hardstanding.

The volume of rainfall discharged from the roofs and hardstandings 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	Volume with 30% climate litres/sec
15	20	0.64	12.8	1.98	25.34	101.38	0.94	95.29	0.059	56.223	73.09	18.3	14.06	15.618	20.303
30	20	0.81	16.2	1.97	31.91	63.83	0.95	60.64	0.059	35.776	46.51	23.3	17.89	9.938	12.919
60	20	1	20	1.93	38.60	38.60	0.96	37.06	0.059	21.863	28.42	28.4	21.86	6.073	7.895
120	20	1.2	24	1.89	45.36	22.68	0.97	22.00	0.059	12.980	16.87	33.7	25.96	3.605	4.687
240	20	1.42	28.4	1.86	52.82	13.21	0.97	12.81	0.059	7.558	9.83	39.3	30.23	2.099	2.729
360	20	1.57	31.4	1.83	57.46	9.58	0.98	9.39	0.059	5.537	7.20	43.2	33.22	1.538	2.000
600	20	1.74	34.8	1.81	62.99	6.30	0.98	6.17	0.059	3.642	4.73	47.3	36.42	1.012	1.315
1440	20	2.16	43.2	1.81	78.19	3.26	0.98	3.19	0.059	1.884	2.45	58.8	45.21	0.523	0.680
2880	20	2.5	50	1.81	90.50	1.89	0.98	1.85	0.059	1.090	1.42	68.0	52.33	0.303	0.394

The discharge into the River Welland will be limited to a rate of 2.5 litres/second and the following volumes of storage are required:

Duration mins	Rainfall Volume cu m per hour into storage facility	Total Rainfall Volume cu m into storage facility in duration	Outflow into River Welland at 2.5 litres/sec	Total Storage Required	Total Time to empty Storage hours
15	73.1	18.27	2.25	16.02	1.02
30	46.5	23.25	4.50	18.75	1.29
60	28.4	28.42	9.00	19.42	1.58
120	16.9	33.75	18.00	15.75	1.87
240	9.8	39.30	36.00	3.30	2.18
360	7.2	43.19	54.00	-10.81	2.40
600	4.7	47.35	90.00	-42.65	2.63
1440	2.4	58.77	216.00	-157.23	3.27
2880	1.4	68.03	432.00	-363.97	3.78

Volume of storage provided by the manhole and the 300mm pipework can be calculated as follows:

1 No manholes (1.5m diameter)…….. $1.6 \times 3.142 \times 0.75^2 = 2.8$ cu m

Pipework……...$(10 + 8.6 + 9.6 + 14) \times 3.142 \times 0.15^2 = 3.0$ cu m

Sub base to pavement…….30% of 0.3 x 360 = 32.4 cu m

Therefore as the total volume of storage provided is 38.2cu metres the storage volume is adequate.

Stuart Hemmings

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