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The Planning Officer
Hillingdon Borough Council
Civic Centre
High Street
Uxbridge
Middlesex
UB8 1UW

Our Ref: 181099/ml/KBL-01

28 January 2019

Dear Sirs

JOEL STREET - NORTHWOOD

This letter has been prepared in response to the comments issued by Flood and Management Specialist of Hillingdon Borough Council. The reasons given for objection are the greenfield runoff rates for the existing site, the proposals do not provide detail of the long-term management and maintenance, opportunities for more sustainable drainage have not been explored.

The first comment in the response suggest that the SuDS Flows and Volumes – (Hillingdon LLFA Technical Assessment Proforma). This has been completed is enclosed with this letter. The LLFA states it has not been demonstrated the discharge rate can be reduced lower than the 2l/s.

The proposed drainage strategy uses a Hydrobrake to restrict the flow rate from the site, the discharge rate of 2l/s was set based on the advice of the manufacturer, that recommend this minimum discharge rate to prevent maintenance issues of blockages etc. Therefore it is considered reducing the discharge rate below 2l/s will increase the risk of blockages in the outfall and increase the risk of flooding across the site.

The LLFA also make reference to fact there will be a reduction in runoff when comparison to the existing situation, but question if the discharge to the Thames Water sewer would be acceptable. The site is currently a car park the vast majority of which is hard surfaced. This is drained via a series of gullies in the car park to the on site drainage network. As pointed out there are no surface water sewers in the areas so all the runoff from the site discharges to the adopted Thames Water foul sewer. The proposals will therefore reduce the rate of discharge to the existing adopted foul sewer not only in the runoff from the site. The site already discharges surface water to the Thames Water Foul sewer so it has achieved a right to discharge to the sewer established over the years.

LLFA also question the lack of SuDS and use of underground attenuation. SuDS was considered at the design stage, greenroofs were an option as the roofs are pitched. Rainwater harvesting was discounted on the grounds it would have to serve several properties and the maintenance of it would be complicated and the attenuation benefits provided would be limited. Soakaways were discounted on the grounds of poor soil conditions and also there lack of space, it is not possible to provide the 5m clearance from buildings to the soakaway. The LLFA suggested Rainwater Gardens but these are considered point infiltration devices similar to soakaways, there is not guidance in the UK as to minimum distances required from buildings, but in Australia where they are widely used they recommend a minimum clearance of 5m in clayey soils. Similar to the requirements of the Building Regs for Soakaway. On this basis Rainwater Gardens were discounted on the grounds that is not possible to provide a 5m clearance from the building to the Garden. However the design has been amended to incorporate aboveground Rainwater Planters, these are now indicated on the revised drainage plan 181099/500/01 enclosed.

The LLFA questioned why the permeable paving depth was not increased to provide more attenuation. The reason the permeable paving has been designed to provide minimal storage is due to the site level and outfall. There is only 1m level difference from the finished ground level to the invert level of the outfall from the site. To provide the required storage the cellular crate system needs to be 500mm. This means we are only able to provide 500mm of cover at one end and 400mm at the other end, neither of which is acceptable to accommodate vehicle loading. Therefore, a 200mm thick concrete protection slab will be required over the crates. The surface construction of the parking area will be in the region of 150mm thick and with a separate layer between the slab and base of permeable paving you are only able to achieve a granular sub-base of between 50 to 150mm. To provide a deeper layer of granular sub-base the attenuation tank would have to be lowered and that would mean that a gravity connection to the sewer would not be possible and a pump would be required to discharge runoff from the site. it is for these reasons that the majority of the storage is provided with the attenuation tank, the permeable paving to the front of the site will provide some storage but the worst case has been assumed for sizing the attenuation tank that this is limited.

Finally, the LLFA questioned how would be responsible for the long-term maintenance of the SuDS features, we can confirm that the SuDS will be maintained by the developer or the management company appointed to run the developed in line with regime set out in the Technical Note accompanying the drainage design.

I trust the above has answered the queries raised by your drainage consultant and you are now able to discharge the planning condition, but if you require any further information than please do not hesitate to contact me.

Yours sincerely

Kevin Lang

SuDS Flows and Volumes –
Hillingdon LLFA Technical Assessment Proforma

This form identifies the information required by the LLFA to enable technical assessment of flows and volumes determined as part of drainage / SuDS calculations. *Note : * means delete as appropriate; Numbers in brackets refer to accompanying notes.*

SITE BACKGROUND INFORMATION

1.0 SITE DETAILS AND RELEVANT CLASSIFICIATIONS

1.1 Planning application reference ..... 5564/APP/2018/2088 .....

1.2 Site name ..... 53-55 Joel Street, Northwood, HA6 1NZ .....

1.3 Total application site area (1) ..... 475 ..... m^2 ..... 0.0475 ..... ha

1.4 Is the site in an area at SW flood risk, a CDA or LFRZ (see L.B. Hillingdon website SWMP) ~~Y~~ / N

1.5 Is the site located in a SPZ (refer to Environment Agency website Groundwater) ~~Y~~ / N

2.0 VOLUME AND FLOW DESIGN INPUTS

2.1 Site area which is positively drained by SuDS (2) ..... 475 ..... m^2

2.2 Impermeable area drained pre development (3) ..... 475 ..... m^2

2.3 Impermeable area drained post development (3) ..... 426 ..... m^2

2.4 Additional impermeable area (2.3 minus 2.2) ..... -49 ..... m^2

2.5 Predevelopment use (4) ~~Greenfield~~ / Brownfield / ~~Mixed~~*

2.6 Coefficient of runoff (Cv) (6) ..... 0.95 .....

The LLFA would typically anticipate a Cv of 0.95 from roofed areas and a Cv of 0.9 from other hard standing areas.
These values should be applied for both summer and winter scenarios if using hydraulic design software

2.7 Justification for Cv used if less than this .....

2.8 FEH rainfall data used (for Hillingdon typical value 4l/s/ha (Note that FSR not to be used)) Y / ~~N~~

3.0 DISCHARGE(5)

3.1 Infiltration
Rate (evidence to be supplied to BRE365 as minimum) ..... N/A ..... m/s
Influencing factors on infiltration ..... Clearance to buildings, soil (clay) .....
Depth to highest known ground water table ..... Unknown ..... mAOD
Appropriate site investigations should be undertaken at the likely highest ground water level time in the year, as this fluctuates.

3.2 Waterbody
Invert level at outlet (invert level of final flow control) ..... N/A ..... mAOD
1in 100 year plus CC Waterbody Flood Level ..... N/A ..... mAOD
Surcharged outfall Y / N

3.3 Adopted surface water storm sewer (Note no combined sewer in LBH)
Provide confirmation of invert levels at discharge point Y / ~~N~~

SuDS Flows and Volumes – Hillingdon LLFA Technical Assessment Proforma

3.4 Private Sewer

Provide condition and levels of private system and any remediation works ~~Y~~ / N

Provide legal easement agreement, where not within same ownership ~~Y~~ / N

CALCULATION OUTPUTS REQUIRED

Note: Sections 3 and 4 refer to site where storage is provided by attenuation and / or partial infiltration.
Where all flows are infiltrated to ground omit Sections 3 -5 and complete Section 6.

4.0 Defining rate of runoff from the site and betterment. These values must be calculated for each return period and should vary.

	Max Discharge	Greenfield		Existing		Proposed		Reduction
		l/s/ha	l/s for the site	l/s/ha	l/s for the site	l/s/ha	l/s for the site	%
4.1	1 in 1 year rainfall	0.42	0.2	7.5	3.6	4.2	2.0	44
4.2	Q_{med} rainfall	0.42	0.2	7.7	3.7	4.2	2.0	45
4.3	1 in 30 year rainfall	0.84	0.4	17.8	8.5	4.2	2.0	76
4.4	1 in 100 year rainfall	1.26	0.6	23.8	11.3	4.2	2.0	82
4.5	1 in 100 year plus 40%CC			33.3	15.8	4.2	2.0	87

5.0 Attenuation storage to manage peak runoff rates from the site. These values must be calculated for each

		m^3	m^3/m^2 (of developed impermeable area)
5.1	Storage - 1 in 1 year	2.7	0.007
5.2	Storage - 1in 30 year (7)	9.0	0.023
5.3	Storage - 1in 100 year (8)	14.3	0.036
5.4	Storage - 1 in 100 year plus 40%CC (10)	21.1	0.053

6.0 Controlling volume of runoff from the site

6.1 Pre development runoff volume 31.9 ..... m^3 for the site

6.2 Post development runoff volume (unmitigated) 28.6 ..... m^3 for the site

6.3 Volume to be controlled/ does not leave site (5.2 - 5.1) -3.3 ..... m^3 for the site

6.4 Volume control provided by:

1. Interception losses(12) 1.0 ...m^3
2. Rain harvesting(13) 0.0 ...m^3
3. Infiltration (even at very low rates) 0.0 ...m^3
4. Separate area designated as long term storage(14) 0.0 ...m^3

6.5 Total volume control (sum of inputs for 5.4 (1-4) 1.0 ...m^3 (15)

7.0 Site storage volumes (full infiltration only)

7.1 Storage - 1in 30 year (7) .....m^3 .....m^3/m^2 (of developed impermeable area)

7.2 Storage - 1 in 100 year plus CC (8) .....m^3 .....m^3/m^2

SuDS Flows and Volumes – Hillingdon LLFA Technical Assessment Proforma

Notes

1. All area with the proposed application site boundary to be included.
2. The site area which is positively drained, includes all green areas which drain to the SuDS system and area of surface SuDS features. It excludes large open green spaces which do not drain to the SuDS system. http://www.uksuds.com/
3. Impermeable area should be measured pre and post development. Impermeable surfaces includes, roofs, pavements, driveways and paths where runoff is conveyed to the drainage system.
4. Predevelopment use may impact on the allowable discharge rate. The LLFA will seek for reduction in flow rates to GF status in all instances. The design statement and drawings explain / demonstrate how flows will be managed from the site.
5. Runoff may be discharge via one or a number of means.
6. Sewers for Adoption 6th Edition recommends a Cv of 100% when designing drainage for impermeable area (assumes no loss of runoff from impermeable surfaces) and 0% for permeable areas. Where lower Cv's are used the application should justify the selection of Cv.
7. Storage for the 1 in 30 year must be fully contained within the SuDS components. Note that standing water within SuDS components such as ponds, basins and swales is not classified as flooding. Storage should be calculated for the critical duration rainfall event.
8. Runoff generated from rainfall events up to the 1 in 100 year (plus Climate Change) will not be allowed to leave the site in an uncontrolled way.
9. Temporary flooding of specified areas to shallow depths (150-300mm) may be permitted in agreement with the LLFA.
10. Climate change is specified as 40% increase to rainfall intensity, unless otherwise agreed with the LLFA / EA.
11. To be determined using the 100 year return period 6 hour duration rainfall event.
12. Where Source Control is provided Interception losses will occur. An allowance of 5mm rainfall depth can be subtracted from the net inflow to the storage calculation where interception losses are demonstrated. The Applicant should demonstrate use of subcatchments and source control techniques.
13. Please refer to Rainwater harvesting systems BS 8515:2009+A1:2013 for guidance on available storage.
14. Flow diverted to Long term storage areas should be infiltrated to the ground, or where this is not possible, discharged to the receiving water at slow flow rates (maximum 2 l/s/ha). LT storage would not be allowed to empty directly back into attenuation storage and would be expected to drain away over 5-10 days. Typically LT storage may be provided on multi-functional open space or sacrificial car parking areas.
15. Careful consideration should be used for calculations where flow control / storage is likely to be influenced by surcharged sewer or peak levels within a watercourse. Storm sewers are designed for pipe full capacity for 1 in 1 - 1 in 5year return period. Beyond this, the pipe network will usually be in conditions of surcharge. Where information cannot be gathered from Thames Water, engineering judgement should be used to evaluate potential impact (using sensitivity analysis for example).
16. In controlling the volume of runoff the total volume from mitigation measures should be greater than or equal to the additional volume generated.

DWG No. 181099-500-01

Thames Water Foul Water Drainage
Proposed Foul Water Drainage
Proposed Surface Water Drainage
Permeable Paving

NORTH
EAST
SOUTH
WEST

3201
CL=66.81
IL=65.74

150mm Ø Pipe 1 in 30 Fall

New connection to existing Thames Water foul water sewer subject to S106 approval

F E R N D O W N

CW 1.04 150mm Dia Fall 1:100

Attenuation Tank
9m x 4.5m x 0.5m deep

Protection slab as per requirement of structural engineer to cater for proposed vehicle loading

CW 4
CL=66.810
IL=65.815

SW 1.04 150mm Dia Fall 1:150

SW 1.05 150mm Dia Fall 1:150

SW 4 - Hydrobrake
CL=66.810 Flow Rate = 2.0 l/s
IL=65.829 Design Head = 0.4m

FW 1.03 100mm Dia Fall 1:100

SW 1.03 150mm Dia Fall 1:204

SW 3
CL=66.810
IL=66.096

SW 1.02 150mm Dia Fall 1:142

SW 2
CL=66.810
IL=66.117

FW 1
CL=66.810
IL=65.982

FW 2
CL=66.810
IL=65.925

FW 3
CL=66.810
IL=65.869

FW 1.01 100mm Dia Fall 1:100

FW 1.02 100mm Dia Fall 1:100

3

4

2

+66.81

Rainwater Garden Planter

Rainwater Garden Planter

FW 1.00 100mm Dia Fall 1:40

1

2

780 Sqft

1

Bedroom 1

obscure window

obscure window

FW 3.00 100mm Dia Fall 1:40

Plant area

FW 2.00 100mm Dia Fall 1:40

1.8m High Fence

1.8m High Fence

SW 1.01 150mm Dia Fall 1:150

Kitchen

Bathroom

SVP from above

SVP from above

FFL:66.96

Sitting Room

Spaces for 8 bicycles

bin storage area

Garden

Rainwater Garden Planter

Bedroom 2

SW 1
CL=66.810
IL=66.200

SW 1.00 100mm Dia Fall 1:100

321A
CL=N/A
IL=N/A

45 degree line from neighbouring window

0.0m 1.0m 2.0m 3.0m 4.0m 5.0m
1:50

NOTES

1. All dimensions are in meters unless expressed otherwise and all levels are shown in meters and relate to an arbitrary site datum.
2. This drawing shall be read in conjunction with the drainage schedules and standard details.
3. All existing sewer routes are to be proved on site by the contractor and any discrepancies notified to engineer.
4. All sewers shall be constructed in accordance with Part H of the Building Regulations and Sewers for Adoption 7th Edition.
5. It is the contractors responsibility to ensure compliance with current building regulations and codes of practice.
6. Reference should be made to the structural engineers details for all aspects of foundation design and construction.
7. The contractor should check all dimensions on site. Any discrepancies shall be reported to the engineer immediately.
8. Connections to the adopted drainage authority sewers shall be made under the supervision of the authority. The contractor shall be responsible for obtaining the necessary consents required from the drainage authority.
9. Bed type S shall be used for rigid pipes. Bed type Z shall be used for all gully connections and pipes under proposed carriageways with less than 700mm cover. The concrete bed and surround is to extend to the side of the trench or be of minimum width and voids filled with well compacted selected backfill.
10. All precast concrete manhole units are to conform to B.S. 5911. Precast concrete cover slabs are to be heavy duty.
11. Downstream exit pipes of 600mm dia. and over should be fitted with heavy duty safety chains across their mouths.
12. Where large differential settlement is probable, several short lengths of pipe with flexible joints should be laid on either side of the chamber.
13. Where drains pass through foundations, a flexible joint should be provided within 150mm of the face of the structure.
14. Fast setting resin mortars may be used in lieu of cement mortar for bedding manhole frames where agreed with the Engineer to enable early cover loading.
15. The concrete base slab shall be 225mm minimum thickness for chambers up to 4500mm deep. Manholes over 4500mm deep require a slab 450mm thick.
16. All manholes over 2000mm deep are to be fitted with a "DANGER TEST FOR OXYGEN" sign
17. Appropriate measures (to be agreed with the district council's building control section) are to be taken to discourage rodent entry into the properties.
18. The contractor is to keep a record of any variations made on site, including the relocation of sewers or drains, so that an as built drawing can be prepared upon completion of the project.
19. Location of RWP's and SVP's to be confirmed by the architect, Sub Stacks shall not be used unless connected to a ventilated section of the sewer in accordance with Building Regulations.

Rev	Amendment	Drawn	Checked	Approved	Date
A	Revised to Council's comments	MK	RS	KBL	25/01/19

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Joel Street
Northwood Hills

Drainage Layout
Site Plan

1 of 3

DRAWN MK	CHECKED RS	APPROVED KBL	
DATE Oct-18	DATE Oct-18	DATE Oct-18	
SCALE 1:50	PRJ No. 181099	SIZE A1	REV A
DWG No. 181099-500-01			

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	66.179	0.350	2.0	15.0	O K
30 min Summer	66.203	0.374	2.0	16.0	O K
60 min Summer	66.205	0.376	2.0	16.0	O K
120 min Summer	66.181	0.352	2.0	15.0	O K
180 min Summer	66.155	0.326	2.0	13.9	O K
240 min Summer	66.130	0.301	2.0	12.8	O K
360 min Summer	66.077	0.248	2.0	10.6	O K
480 min Summer	66.032	0.203	2.0	8.7	O K
600 min Summer	65.995	0.166	2.0	7.1	O K
720 min Summer	65.966	0.137	2.0	5.8	O K
960 min Summer	65.930	0.101	2.0	4.3	O K
1440 min Summer	65.905	0.076	1.6	3.2	O K
2160 min Summer	65.889	0.060	1.2	2.6	O K
2880 min Summer	65.881	0.052	1.0	2.2	O K
4320 min Summer	65.871	0.042	0.7	1.8	O K
5760 min Summer	65.865	0.036	0.6	1.5	O K
7200 min Summer	65.862	0.033	0.5	1.4	O K
8640 min Summer	65.859	0.030	0.4	1.3	O K
10080 min Summer	65.857	0.028	0.3	1.2	O K
15 min Winter	66.278	0.449	2.1	19.2	O K
30 min Winter	66.313	0.484	2.2	20.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	223.446	0.0	16.3	18
30 min Summer	126.868	0.0	18.5	32
60 min Summer	72.033	0.0	21.0	60
120 min Summer	40.898	0.0	23.9	90
180 min Summer	29.370	0.0	25.8	124
240 min Summer	23.221	0.0	27.1	158
360 min Summer	16.676	0.0	29.2	224
480 min Summer	13.184	0.0	30.8	286
600 min Summer	10.988	0.0	32.1	344
720 min Summer	9.468	0.0	33.2	400
960 min Summer	7.549	0.0	35.3	510
1440 min Summer	5.485	0.0	38.5	738
2160 min Summer	3.986	0.0	41.9	1104
2880 min Summer	3.177	0.0	44.6	1468
4320 min Summer	2.223	0.0	46.8	2200
5760 min Summer	1.726	0.0	48.4	2888
7200 min Summer	1.418	0.0	49.7	3648
8640 min Summer	1.208	0.0	50.8	4304
10080 min Summer	1.054	0.0	51.8	5128
15 min Winter	223.446	0.0	20.6	18
30 min Winter	126.868	0.0	23.5	32

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

Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	66.323	0.494	2.2	21.1	O K
120 min Winter	66.293	0.464	2.1	19.8	O K
180 min Winter	66.259	0.430	2.0	18.4	O K
240 min Winter	66.223	0.394	2.0	16.8	O K
360 min Winter	66.152	0.323	2.0	13.8	O K
480 min Winter	66.075	0.246	2.0	10.5	O K
600 min Winter	66.011	0.182	2.0	7.8	O K
720 min Winter	65.962	0.133	2.0	5.7	O K
960 min Winter	65.918	0.089	1.9	3.8	O K
1440 min Winter	65.895	0.066	1.4	2.8	O K
2160 min Winter	65.882	0.053	1.0	2.3	O K
2880 min Winter	65.875	0.046	0.8	2.0	O K
4320 min Winter	65.866	0.037	0.6	1.6	O K
5760 min Winter	65.861	0.032	0.4	1.4	O K
7200 min Winter	65.858	0.029	0.4	1.2	O K
8640 min Winter	65.856	0.027	0.3	1.1	O K
10080 min Winter	65.854	0.025	0.3	1.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
60 min Winter	72.033	0.0	26.7	60
120 min Winter	40.898	0.0	30.3	96
180 min Winter	29.370	0.0	32.6	136
240 min Winter	23.221	0.0	34.4	174
360 min Winter	16.676	0.0	37.0	248
480 min Winter	13.184	0.0	39.1	314
600 min Winter	10.988	0.0	40.7	370
720 min Winter	9.468	0.0	42.1	420
960 min Winter	7.549	0.0	44.7	510
1440 min Winter	5.485	0.0	48.7	748
2160 min Winter	3.986	0.0	53.1	1104
2880 min Winter	3.177	0.0	56.5	1464
4320 min Winter	2.223	0.0	59.3	2200
5760 min Winter	1.726	0.0	61.4	2936
7200 min Winter	1.418	0.0	63.0	3592
8640 min Winter	1.208	0.0	64.4	4288
10080 min Winter	1.054	0.0	65.6	4976

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
Site Location	GB 509550 190400 TQ 09550 90400
C (1km)	-0.026
D1 (1km)	0.303
D2 (1km)	0.332
D3 (1km)	0.239
E (1km)	0.311
F (1km)	2.510
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.950
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.039

Time (mins) From:	To:	Area (ha)
0	4	0.039

Model Details

Storage is Online Cover Level (m) 66.810

Tank or Pond Structure

Invert Level (m) 65.829

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	42.7	0.500	42.7	0.501	0.0

Hydro-Brake Optimum® Outflow Control

Unit Reference	MD-SHE-0075-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	75
Invert Level (m)	65.829
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0
Flush-Flo™	0.124	2.0
Kick-Flo®	0.285	1.7
Mean Flow over Head Range	-	1.6

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	2.0	1.200	3.3	3.000	5.0	7.000	7.5
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.8
0.300	1.7	1.600	3.7	4.000	5.7	8.000	8.1
0.400	2.0	1.800	3.9	4.500	6.0	8.500	8.3
0.500	2.2	2.000	4.1	5.000	6.4	9.000	8.6
0.600	2.4	2.200	4.3	5.500	6.7	9.500	8.8
0.800	2.7	2.400	4.5	6.000	7.0		
1.000	3.0	2.600	4.7	6.500	7.3		

Event: 120 min Winter