LANMOR Consulting

Civil Engineers & Transportation Planners

# Sipson

# Drainage Strategy

July 2012

*120406/KTP/ML/DS01*

LANMOR Consulting

Civil Engineers & Transport Planners

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# CONTENTS



**APPENDICES**

*Appendix A:*

APL – 200 Proposed Masterplan

120406-DS-01

*Appendix B:*

Greenfield Runoff Calculations

# 1 INTRODUCTION

1.1.1 Lanmor Consulting has been appointed to prepare a drainage strategy for a new development off Sipson Road in Sipson, Middlesex UB7 0JH. This report has been commissioned to advise on the technical feasibility of providing drainage for the development proposals.

1.1.2 The information and details within this report will be refined, modified and updated as the detailed design in progressed, post planning. The scope of works for this drainage strategy report is outlined below:

- Review available data relating to on site drainage and other drainage networks in the vicinity of the site.
- Review of the sites ground conditions for suitability of SUDS
- Consider the use of Sustainable Urban Drainage Systems as an option for dispose of surface water runoff from the proposed development.
- Undertake drainage assessments to establish attenuation requirements to deal with the increased surface water runoff from the development.

# 2 DEVELOPMENT SITE

## 2.1 Site Location

2.1.1 The site is bounded by the M4 motorway to the north and east, Sipson Lane to the south and Sipson Road to the west. Figure 1 shows a location plan of the proposed development. The red line indicates the site boundary.

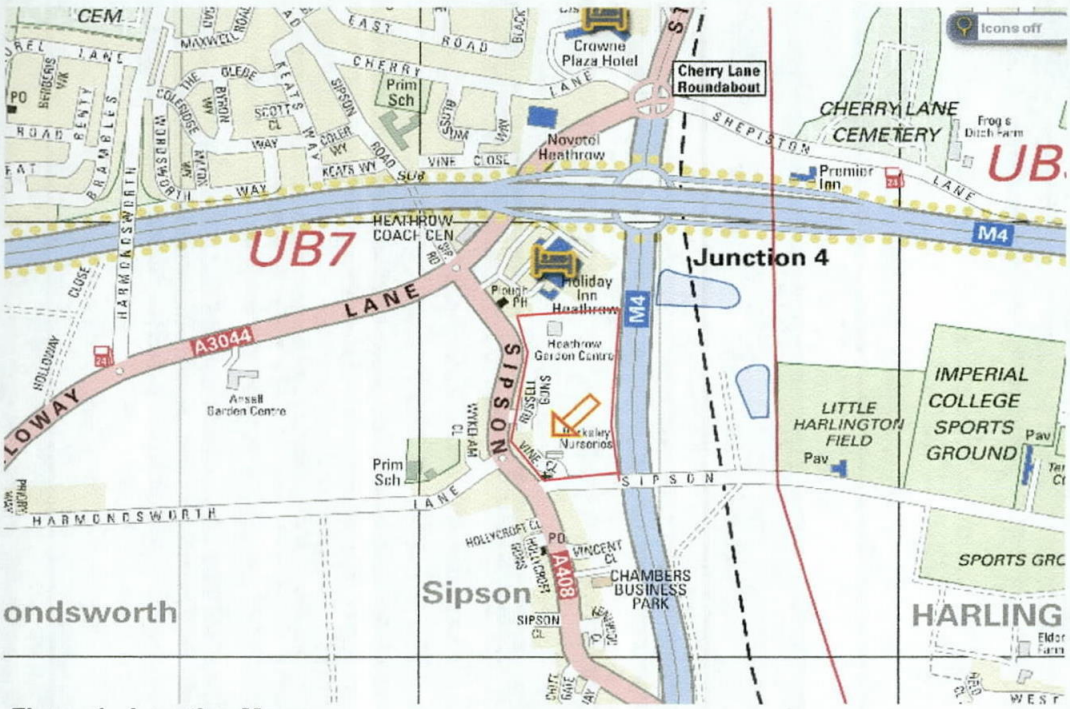


**Figure 1 - Location Map**

2.1.2 The proposed development is approximately 1.5km away from London Heathrow Airport. The site is surrounded by commercial, residential and open fields.

## 2.2 Regional Geology

2.2.1 The area surrounding the site is known to be London Clay Formation - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 34 to 55 million years ago in the Palaeogene Period. Overlaid by clay and silt superficial deposits of the Langley silt member.

2.2.2 The existing ground is considered to have poor permeability. The site is not in or near a groundwater source protection zone identified by the EA. Although the site is not shown to be on an aquifer, some of the surrounding areas are also indicated to contain aquifers within the superficial deposits. Further investigation will be required to establish if they extend as far as the site.

### 2.3 Existing Drainage Network

2.3.1 There are no surface water sewers within the site. There is a watercourse running along the south western boundary of the site. There are no known foul networks within the site.

2.3.2 The nearest adopted sewer is in Sipson Road to the west of the site. The sewer is a 525mm diameter foul sewer; maintain by Thames Water, there are no surface water or other sewers in vicinity of the site.

## 3 DEVELOPMENT PROPOSAL

3.1.1 The development proposal will comprise of a 140 bed hotel development, 66 residential dwellings, 2,400m$^2$ of light industrial and retention of the existing garden centre.

3.1.2 The residential element will be partly concentrated around the circular open space to the south west of the site with the remainder directly north. There will be 6x1bed, 16x2bed, 36x3bed and 8x4bed. Master plan showing indicative locations is included in appendix A.

3.1.3 Access to the site will be from the west by Sipson Road Within the site the internal estate roads loop round with a link east/west through the middle of the site to connect to the hotel, community hall, residential dwellings and the communal open space.

3.1.4 The drainage strategy for the proposed development has been broken down into separate networks for each different use.

# 4 DRIANGAE STRATEGY

## 4.1 Summary

4.1.1 No foul drains have been identified on site. The proposed discharge for the site will be via a new network of pipes to the adopted foul sewer in Sipson Road.

4.1.2 Ground conditions on site are likely to provide a suitable infiltration rate to satisfy the runoff requirements from the development. It is therefore likely that attenuation will be needed on site prior to discharge to the local sewer or water course. Methods for attenuating surface water on site will take the form of swales, underground storage and open basins.

4.1.3 Swales will be used to convey surface water runoff to the discharge points and will provide some attenuation. Soakaways and permeable paving for driveways will be employed where possible and ground conditions permit. The development also includes for 2 water features which will also be used to provide some attenuation and the remainder of the surface water runoff will be attenuated in under ground storage areas.

## 4.2 Foul Sewers

4.2.1 The estimated foul flows from the development have been estimated using current industrial guidelines. There is evidence of some building on site but appear to have been derelict for many years. Therefore it is assumed that there are no current foul connections to the adopted sewers in the surrounding area.

4.2.2 Based on sewers for adoptions the 66 residential properties will generate a peak foul discharge rate of 3.3 l/s. BS 12056 "gravity drainage systems inside building" gives a slightly higher peak rate flow of 10 l/s for the benefit of this strategy the higher flow rate has been assumed.

4.2.3 The hotel has been estimated to generate a peak flow of 5.3l/s and the light industrial units a peak flow of 1.54l/s.

4.2.4 The total flow for all the combined foul discharges equals to 16.8l/s.

**4.3 Surface Water Sewers**

4.3.1 The strategy for discharging surface water runoff from dwellings, hotel, industrial units, hardstanding and roads is to use SUD's techniques where possible and where ground conditions allow for it. Ground conditions within the site are known to be largely of London Clay or Silt, which will limit the amount of surface water runoff that can be discharged to ground using infiltration techniques.

4.3.2 Where ground conditions do not permit the infiltration of runoff into the ground, a combination of swale's, permeable paving and underground storage will be employed to attenuate flows to the receiving water course or sewer. Silt traps and petrol inceptors will be incorporated into the SUDs management train upstream of any discharge agreed from the site.

4.3.3 Permeable paving will be used for driveways, car parks and hardstanding where infiltration is not possible because of the ground conditions, the permeable paving will act as attenuation to slow discharge rates to the equivalent Greenfield run off rate. Roads which are to be adopted, have for this strategy been assumed to be impermeable. If Highway Authority were prepared to accept permeable paving this would reduce storage volumes and is something that will be investigated further with the Highway Authority.

4.3.4 To determine the storage requirements for the surface water runoff from the different areas of the site, the following areas have been based on the illustrative master plan. The total site area is 73,255m$^2$ and the table below shows the breakdown of the different areas used to assess the storage requirements.

| ***Description*** | ***Area*** |
|---|---|
| **Hotel** | 14,821m$^2$ |
| **Public Open Space** | 11,332m$^2$ |
| **Public Open Space R'bout** | 2,629m$^2$ |
| **Light Industrial** | 7,178m$^2$ |
| **Residential 1 & 2** | 19,303m$^2$ |
| **Garden Centre** | 7,550m$^2$ |
| **Community** | 2,703m$^2$ |
| **Carriageway** | 7,705m$^2$ |
| **Total Area** | **73,225m$^2$** |

**Table 1 - Land Areas**

4.3.5 Rainfall intensities will increase as a result of climate change, NPPF (National Planning Policy Framework) states that an additional 30% increase in rainfall intensities should be allowed for new developments which have a potential life expectancy of 100years (residential use). The assessment of the storage requirements for runoff in this drainage strategy has factored in changes in rainfall due to climate change.

4.3.6 To establish the existing Greenfield run-off from the site the institution of Hydrology: Report Number 124 (IH 124) was used to calculate the annual peak flow.

IH 124 provides the following equation to estimate the Greenfield runoff rate from small catchment areas.

$$Qbar_{rural} = 0.00108 \times Area^{0.89} \times SAAR^{1.17} \times Soil^{2.17}$$

4.3.7 Based on the above formula the total Greenfield runoff rate for this site is calculated to be **11.44l/s.**

4.3.8 The drainage arrangement and water storage requirements for the development are based on a maximum discharge rate equivalent to the existing Greenfield runoff rate of 11.44l/s. Appendix B shows a full calculation for the Greenfield runoff rate.

# 5 FOUL DRAINAGE DESIGN

## 5.1 General

5.1.1 Thames Water has indicated that the adopted drainage in the area and is located on Sipson Road. Thames Water currently has a 525mm sewer running along south of Sipson Road.

5.1.2 There is currently no foul drainage on site or connections from it to the adopted network. The on-site foul drainage will consist of networks of pipes collecting foul discharges from the dwellings, hotel, Light Industrial Units, Garden Centre and the Community Hall. The foul sewer network will discharge to the east of the site under gravitation. The adopted Thames Water foul network manhole is 6.02m deep, however if this is not achievable a pump will be required and can be located near the proposed entrance to the site.

5.1.3 The foul drainage layout is indicated on drawing number 120406-DS-01 in appendix A. The piped network from each dwelling will be collected by a main distributor sewers running under the carriageways. These will join in the north east of the site and depending on the final drainage solution.

### 5.2 Future Maintenance

5.2.1 The proposed drainage strategy for the site may involve the use of a private drainage system beneath adopted highways to drain the properties within the development. If this is the case a section 50 licence will be required for the installation of private apparatus within a public highway. Any drainage subject to such an agreement will be maintained by the development through a management company that will also be responsible for the general running and maintenance of the site. There will be no additional cost on the highway authority for the maintenance of these private services.

## 6 SURFACE WATER DRAINAGE DESIGN

### 6.1 General

6.1.1 The limiting discharge rate from the site of 11.44 l/s has been split between the development areas on a pro-rata basis, this gives the following discharges:-

| ***Land Use*** | ***Maximum Discharge Rate*** |
|---|---|
| **Hotel** | 3.16 l/s |
| **Public Open Space** | N/A |
| **Public Open Space R'bout** | N/A |
| **Light Industrial** | 1.53 l/s |
| **Residential 1 & 2** | 4.11 l/s |
| **Garden Centre** | 1.61 l/s |
| **Community** | 0.58 l/s |
| **Carriageway** | 1.49 l/s |

**Table 2 - Maximum Discharge rate**

6.1.2 As explained previously the ground conditions across the majority of the site will not allow infiltration techniques for the discharge of runoff from the site. Therefore it is intended to provide storage were as possible. The total surface water runoff from the site is 11.44l/s. The total runoff rate has been divided according to areas of uses as stated in table 2. All storage calculations for the relevant areas are included in appendix B.

### 6.2 Residential Areas 1 & 2

6.2.1 For this area the maximum discharge rate was set at 4.11l/s for the discharge to the underground tank in the public open space for the runoff from the residential properties. The attenuation of runoff will be accommodated in a storage tank for rainfall events up to the 1 in 100 year return period plus climate change. The maximum storage requirement has been based on the runoff for all roof areas in the residential area and the section of the carriageway.

6.2.2 The total volume needed for attenuation is 209m$^3$ which will be catered by an underground storage facility which will be located next to the pond within the circular open space. The tank of the size 43m in length by 16m in width and 1m deep would be adequate.

6.2.3 The surface water runoff will be generated by gravitational feed from the properties to the storage tank and to be discharged via a hydrobrake to the new surface water network to be provided in the estate roads and ultimately discharging to the adopted Thames Water sewer in Sipson Road.

6.2.4 The driveways will have permeable paving; in order to achieve the required attenuation / storage paving shall have a minimum 350mm gravel layer.

### 6.3 Carriageway/Pond 2

6.3.1 The second pond (2) in the open space area to the south will attenuate runoff from the internal estate roads. The pond will be a wet pond and will cater for runoff from a 1 in 100 year return period storm plus climate change above the permanent water level. The storage volume required is 138m$^3$. Waters will be collected by gullies on the carriageway. Drawing 120406-DS-01 shows colour hatching distinguishing the various areas and method of drainage.

### 6.4 Hotel

6.4.1 The hotel has a gross area of 14,821m$^2$, which consists of 5,921m$^2$ of the hotel building and the carriageway and 8,034m$^2$ of car parking, the remaining areas will be grassed.

6.4.2 Within the grassed area, the surface water runoff from hotel building will be discharge to a SWALE, located to the rear of the hotel. The total amount of volume required to be attenuated is 95.19m$^3$. The swale will be approximately 24m long and 8m in width. The SWALE will be fitted with a restricted discharge to limit the rate to the surface water network to 3.16/s. The car park and access paths will be constructed of permeable paving with a minimum of 350mm gravel base.

### 6.5 Light Industrial & Community Area

6.5.1 The light industrial area comprises of 3,230m$^2$ of buildings and 910m$^2$ of carriageway. The community facility has a roof area of 460m$^2$ and 1,270m$^2$ for carriageway and parking. The carriageway and parking bays will be formed of permeable paving. With a minimum of 350mm gravel base.

6.5.2 The surface water will be discharged at a rate of 1.53l/s for the light industrial units and 0.41l/s for the community facility to the northern pond (1), which can accommodate up to 281.25m$^3$ at a depth of 750mm sufficient to attenuate for 1 in 100 years return period. A restriction from the outflow from the pond will be provided to limit flows to 1.54l/s into the new surface water network. The outfall will be fitted with a trash screen to stop debris or any large unwanted items reaching the network.

### 6.6 Garden Centre

6.6.1 Swales will used to convey surface water runoff for the garden centre. A Swale has been introduced through the eastern part of the open space within the area of the garden centre. Discharge from the Swale will be restricted to the equivalent Greenfield runoff rate of 1.61l/s.

6.6.2 The swale will cater for a 1 in 100 year return period plus climate change providing 134.33m$^3$ of storage with a nominal length of 40m, depth of 0.5m and a width of 7m.

## 7 SUMMARY:

7.1.1 The proposed development will consist of a new development for residential units, hotel, community centre, garden centre and small industrial units; the total site area is 7.33ha and has a Greenfield surface water discharge estimated at 11.44 l/s. All storage requirements have been based on a restricted discharge rate of 11.44 l/s. SUDs drainage techniques will be employed where possible for the discharge of runoff, permeable paving will be used on car parks and carriageways where possible. Storage will be provided for each land use and is shown in the table 3.

| ***Zones*** | *Surface Water Area (m$^2$)* | *Storage (m$^3$)* | *Type* |
|---|---|---|---|
| Hotel | 1737.673 | 95.19 | Swale |
| Public Open Space | - | - | - |
| Light Industrial | 3229.087 | 250.58 | Pond 1 |
| Community | 459.469 | 28.56 | Pond 1 |
| Public Open Space r'bout | - | - | - |
| Residential | 3602.001 | 208.87 | Storage Tank |
| Garden Centre | 2076.654 | 134.33 | Swale |
| Carriageway S1 | 2010.834 | 137.40 | Pond 2 |
| Carriageway S2 | 4964.280 | 429.93 | Storage Tank |

**Table 3 - Summary of Storage**

7.1.2 The storage facilities will be discharge to the main surface water network on site which will retain the existing runoff rate. The storage facilities will include a restrict discharges into the surface water network to limit discharge back to Greenfield rates.

7.1.3 The site will contain a foul water network which will discharge to the Thames Water network located in Sipson Road. The existing sewer on Sipson Road is 525mm diameter pipe. The proposed discharge from the site is calculated to be 16.8l/s.

7.1.4 In conclusion sufficient storage of surface water run-off can be provided on site in accordance with National Planning Policy Framework (NPPF) and foul will be discharged to the local sewers.

# APPENDIX A

DWG No. 120406/DS/01

SWALE

Hotel Zone
Area: 14821.18m²
Accommodation: 140Bedroom

Public Open Space
Area: 11332.99m²

Light Industrial Zone
Area: 7178.69m²

Community Zone
Area: 2703.18m²

Pond 1

Garden Centre
Area: 7550.68m²

Residential Zone
Area: 19303.92m²

Public Open Space
Area: 2629.28m²

Pond 2

UNDERGROUND
STORAGE TANK

SWALE

RUSSELL GARDENS

VINEGROVE CLOSE

SIPSON ROAD

NOTES

Foul drainage network

Surface water network to attenuation facility

Surface water network to discharge into Thames Water network

| Rev | Amendment | Drawn | Checked | Approved | Date |
|---|---|---|---|---|---|


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Sipson

Indicative Drainage Layout

| | | | |
|---|---|---|---|
| DRAWN KTP | CHECKED KBL | APPROVED KBL | |
| DATE AUG 12 | DATE AUG 12 | DATE AUG 12 | |
| SCALE NTS | JOB No. 120406 | SIZE A1 | REV |
| DWG No. 120406/DS/01 | | | |