



**40 SILVER STREET, READING, RG1 2ST**



**SILVER STREET DEVELOPMENTS LTD**

## **DRAINAGE STRATEGY**

Report Reference: 1227-002-003

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## Document Verification

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**Job Number****Report Reference****Date**

1227

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## **1 Introduction**

### **1.1 Project Background**

- 1.1.1 Westlakes Engineering Ltd. has been commissioned by Silver Street Developments to prepare a Drainage Strategy summary for a development site at 40 - 68 Silver Street, Reading.

### **1.2 Site Description**

- 1.2.1 The site, which is located at 40-68 Silver Street, Reading, Berkshire, RG1 2SU near National Grid ref 471896, 172730, currently comprises two disused commercial buildings with surrounding hardstanding and vegetation. The approximate total area of the site is 0.13 ha which is noted as being 100% impermeable
- 1.2.2 The site is accessed from Silver Street, which is adjacent to the eastern boundary of the site.
- 1.2.3 The site is located within a mix of commercial and residential property in an area lying south east of the centre of Reading.
- 1.2.4 The nearest surface water feature is the River Kennet which is located approximately 450m west of the site.

### **1.3 Proposed Future Use**

- 1.3.1 The site is intended to be developed with a multi-story building for 79 beds of student accommodation use.
- 1.3.2 Post-development there will be a sunken central courtyard giving access to the common room, cinema room and plant room (-1 level). See drawings in Appendix 3 and Appendix 4

### **1.4 Topography**

- 1.4.1 It is assumed that post-development external site surface levels will be similar to those pre-development, however the internal levels in the courtyard will reflect basement levels.

### **1.5 Geology**

- 1.5.1 For details of ground conditions refer to the Combined Phase 1 & 2 Ground Investigation Report by Westlakes Environmental dated February 2019 (reference 1227-003-001).
- 1.5.2 Made Ground is present beneath previously developed areas of the site. The site is underlain by Taplow Gravel (sand and gravel) superficial deposits over bedrock of the Lambeth Group (clay, silt and sand). There are also bedrock outcrops of the London Clay Formation and the Seaford/Newhaven Chalk Formation within the surrounding area, which depending on the local geology may also underlie the site at depth. There are no known records of faults within at least 500m of the site.
- 1.5.3 Groundwater level monitoring was undertaken as part of the Gi works. Following six visits groundwater was recorded in BH1 between 11.2m to 11.6m bgl. BH1 has a maximum drilled depth of 13m bgl.



## **2 Managing Surface Water**

### **2.1 Surface Water Runoff**

2.1.1 In accordance with the National Planning Policy Framework (NPPF) (Achieving sustainable development – Section 10, Meeting the challenge of climate change), the Environment Agency Report ref SC030219 – Rainfall runoff management for Developments, and the local Strategic Flood Risk Assessment (SFRA) issued by Jacobs in 2009, consideration should be given to natural water flows at the site. The development should not adversely affect flow or increase flood risk elsewhere, including increasing run-off rates. The disposal of surface water should be dealt with in a sustainable way and climate change should also be accounted for. The site drainage strategy is discussed in Section 3.

### **2.2 Climate Change**

2.2.1 There is evidence to suggest that the climate is changing with sea levels predicted to continue to rise along with more frequent short-duration, high-intensity rainfall and more frequent periods of long-duration rainfall. The NPPF recommends that the effects of climate change be accounted for in FRA, with consideration of the EA flood maps and local authority SFRA. Increased rainfall or higher intensity short-duration rainfall may increase as a result of climate change. Technical guidance published in March 2012 by the NPPF (Para 13 Table 5) recommends that for developments with a design life beyond 2085, a 30% increase in peak rainfall intensity should be accommodated.

2.2.2 A 30% increase is therefore being allowed for within the new surface water drainage design to take account of climate change as discussed in Section 2. Climate change may also lead to variations in groundwater level which will also be considered during the drainage design.

### **2.3 Critical Drainage Area**

2.3.1 Critical Drainage Areas have been delineated within the SFRA, using a combination of natural catchments, areas with historical sewer flooding and areas susceptible to surface water flooding greater than 0.3 m (as defined by the 1 in 200 chance of occurring in a year Flood Map for Surface Water (FMfSW) map). Specific drainage requirements are recommended in these areas to help reduce local flood risk. The site is located within Character Area 3 Reading South, close to the boundary with Reading Central. The site lies in an area which is identified as Flood Zone 1, having a less than a 1:1000 annual probability of flooding from watercourses or the sea.

2.3.2 In paragraph 6.5.3, the report describes development in areas close to Reading central as being heavily constrained by the availability of brown field and the availability of green field sites and due to this it is anticipated that most developments will take place as infill and/or on brownfield developments. However, the SFRA also states that special considerations will be given to the proposed Green Park Village development which lies in zone 2, 3A and 3B flood zones.

2.3.3 Due to limited potential for development, the site does not appear to be within a Critical Drainage area. The site is a brownfield site and the SFRA states:

- *Development should aim for a minimum reduction in surface water runoff rates of 30% for Brownfield sites, with an aim of reducing runoff to Greenfield rates up to a 1 in 100 year (1% AEP) storm event, considering climate change.*
- *Development should be designed so that there is no flooding to the development in a 1 in 30 year (3.33% AEP) event and so that there is no property flooding in a 1 in 100 year (1% AEP) plus climate change event.*
- *Wherever possible, reductions in surface water should be achieved through the implementation of SUDS with source control considered firstly. There may be opportunities to deliver SUDS through integrated solutions for collections of strategic sites”.*



## 2.4 Sustainable Urban Drainage Systems (SUDS)

2.4.1 SUDS are a desirable way to manage surface water disposal within new developments and SUDS methods for surface water drainage management are discussed further within the CIRIA 753 SUDS Manual, published in 2015. When designing surface water drainage strategies priority should be given to disposal of surface water via infiltration drainage systems over first watercourses and then sewers.

2.4.2 Soakaways may be appropriate for the disposal of site surface water however this depends on several factors:-

- Underlying ground. The site is underlain by a mix of granular deposits, clays and chalk. The granular Taplow Gravel deposits may support the use of soakaways however they also appear to have some fines content and are intermixed with cohesive Taplow Gravel which may hinder use as good infiltration medium. Clays are likely to exhibit poor infiltration rates and therefore soakaway drainage into the superficial clays or the Lambeth clays is likely to be inefficient. Chalk bedrock may support soakaway drainage although it is noted that chalk is vulnerable to dissolution. This potential risk should be considered when designing the site drainage strategy. In principle, soakaways may be feasible, and their success will be location (ground type) dependant.
- Infiltration rates. To assist soakaway design, the infiltration rate of the underlying ground will need to be determined by on site testing either via soakaway testing in accordance with BRE365 or via conducting falling head tests in boreholes. It is preferable to use the BRE365 method as it will test a larger surface area and mimic more closely the behaviour of an in-situ soakaway, although it may not be practical depending on the depth of the soakaway. The rate of infiltration will need to be determined for the strata into which surface waters would discharge (e.g. granular deposits or the chalk bedrock) and should be considered alongside development of the future site layout and drainage strategy.
- Space restrictions. The proposed development includes a courtyard at basement level. Based on the current proposals for future site layout there may be enough space to locate soakaway drainage within the landscaping area towards the middle of the site whilst maintaining BRE365 guidelines which recommend that soakaways should be placed at least 5m away from building foundations. From the layout drawing WL\_1227\_100\_P2 in Appendix 1, it can be seen that there would be sufficient space on site to comply with this recommendation.



### **3 Drainage Strategy**

#### **3.1 Site details**

- 3.1.1 Westlakes have obtained details of Thames Water sewer assets in the area local to the site. The proposed strategy is set out below and is also shown on Drawing WL-1227\_100\_Rev P2 included as Appendix 1.
- 3.1.2 It is proposed that a CCTV survey is undertaken along the existing drainage networks to not only establish the current point of discharge from the site but to also confirm the condition of the existing network for reuse.

#### **3.2 Existing Site Drainage and Connections to the Public Sewer**

- 3.2.1 Assessment of the existing topographical survey has revealed the presence of several chambers across the site, with their individual discharge points anticipated at this time to be the separate surface water and combined networks that reside within Silver Street.

#### **3.3 Existing Flows from Site**

- 3.3.1 The site is approximately 0.13 ha in area and is 100% impermeable in its pre-development state.
- 3.3.2 In order to define the existing flows originating from the current car park, a 2-pipe network has been formed following the guidance contained within Microdrainage modelling software to represent the pre-development impermeable area and simulating the 1 in 100-year storm 360minute duration with results shown below in Figure 1.
- 3.3.3 The current Brownfield run off rate for the critical 1 in 100 year storm of 360min duration has been calculated as 10.6 l/s.
- 3.3.4 In order to provide a significant betterment over the existing discharge rate currently experienced from the site, the generally accepted minimum practical peak discharge rate of 5 l/s is proposed. This represents a 53% reduction from the current brownfield rate.



Figure 1 – Brownfield Flow Rate

|                                                                        |      |                |               |                                     |                |                                                                                     |          |
|------------------------------------------------------------------------|------|----------------|---------------|-------------------------------------|----------------|-------------------------------------------------------------------------------------|----------|
| Westlakes Engineering Ltd                                              |      |                |               |                                     |                | Page 1                                                                              |          |
| 20 Dale Street                                                         |      |                |               |                                     |                |  |          |
| Manchester                                                             |      |                |               |                                     |                |                                                                                     |          |
| M1 1EZ                                                                 |      |                |               |                                     |                |                                                                                     |          |
| Date 25/02/2019 15:49                                                  |      |                |               | Designed by hammp                   |                |                                                                                     |          |
| File BROWNFIELD 2 PIPE NETWORK...                                      |      |                |               | Checked by                          |                |                                                                                     |          |
| Micro Drainage                                                         |      |                |               | Network 2017.1.2                    |                |                                                                                     |          |
| <u>Summary of Critical Results by Maximum Level (Rank 1) for Storm</u> |      |                |               |                                     |                |                                                                                     |          |
| <u>Simulation Criteria</u>                                             |      |                |               |                                     |                |                                                                                     |          |
| Area Reduction Factor                                                  |      | 1.000          |               | Additional Flow - % of Total Flow   |                | 0.000                                                                               |          |
| Hot Start (mins)                                                       |      | 0              |               | MADD Factor * 10m³/ha Storage       |                | 2.000                                                                               |          |
| Hot Start Level (mm)                                                   |      | 0              |               | Inlet Coefficient                   |                | 0.800                                                                               |          |
| Manhole Headloss Coeff (Global)                                        |      | 0.500          |               | Flow per Person per Day (l/per/day) |                | 0.000                                                                               |          |
| Foul Sewage per hectare (l/s)                                          |      | 0.000          |               |                                     |                |                                                                                     |          |
| Number of Input Hydrographs                                            |      | 0              |               | Number of Offline Controls          |                | 0                                                                                   |          |
| Number of Online Controls                                              |      | 0              |               | Number of Storage Structures        |                | 0                                                                                   |          |
| Number of Time/Area Diagrams                                           |      | 0              |               | Number of Real Time Controls        |                | 0                                                                                   |          |
| <u>Synthetic Rainfall Details</u>                                      |      |                |               |                                     |                |                                                                                     |          |
| Rainfall Model                                                         |      | FSR            |               | Ratio R                             |                | 0.400                                                                               |          |
| Region England and Wales Cv (Summer)                                   |      | 0.750          |               |                                     |                |                                                                                     |          |
| M5-60 (mm)                                                             |      | 18.800         |               | Cv (Winter)                         |                | 0.840                                                                               |          |
| Margin for Flood Risk Warning (mm)                                     |      | 300.0          |               | DVD Status                          |                | OFF                                                                                 |          |
| Analysis Timestep                                                      |      | Fine           |               | Inertia Status                      |                | OFF                                                                                 |          |
| DTS Status                                                             |      | ON             |               |                                     |                |                                                                                     |          |
| <u>Profile(s) Summer and Winter</u>                                    |      |                |               |                                     |                |                                                                                     |          |
| Duration(s) (mins)                                                     |      | 360            |               |                                     |                |                                                                                     |          |
| Return Period(s) (years)                                               |      | 100            |               |                                     |                |                                                                                     |          |
| Climate Change (%)                                                     |      | 0              |               |                                     |                |                                                                                     |          |
|                                                                        |      |                |               |                                     |                |                                                                                     |          |
| US/MH                                                                  |      | Return Climate |               | First (X)                           | First (Y)      | First (Z)                                                                           | Water    |
| PN                                                                     | Name | Storm          | Period Change | Surcharge                           | Flood          | Overflow                                                                            | Level    |
|                                                                        |      |                |               |                                     |                | Act.                                                                                | (m)      |
| 1.000                                                                  | MH1  | 360 Summer     | 100           | +0%                                 |                |                                                                                     | 98.090   |
| 1.001                                                                  | MH2  | 360 Summer     | 100           | +0%                                 |                |                                                                                     | 97.515   |
|                                                                        |      |                |               |                                     |                |                                                                                     |          |
| US/MH                                                                  |      | Surcharged     |               | Flooded                             | Pipe           |                                                                                     |          |
| PN                                                                     | Name | Depth (m)      | Volume (m³)   | Flow / Cap.                         | Overflow (l/s) | Pipe Flow (l/s)                                                                     | Level    |
|                                                                        |      |                |               |                                     |                | Status                                                                              | Exceeded |
| 1.000                                                                  | MH1  | -0.060         | 0.000         | 0.67                                |                | 10.6                                                                                | OK       |
| 1.001                                                                  | MH2  | -0.060         | 0.000         | 0.67                                |                | 10.6                                                                                | OK       |
|                                                                        |      |                |               |                                     |                |                                                                                     |          |
| ©1982-2017 XP Solutions                                                |      |                |               |                                     |                |                                                                                     |          |



### **3.4 Surface Water Drainage Strategy**

- 3.4.1 It is proposed that all surface water flows arising from the new development will be collected by a network of pipes before discharging to a surface water infiltration feature located within the proposed courtyard areas. Any additional flows generated by the proposed development not able to be recharged to the ground will be discharged via an overflow to the existing surface water sewer within Silver Street, shown on the drainage strategy drawing WL\_1227\_100\_P2 enclosed in Appendix 1.
- 3.4.2 To further reduce the amount of surface run off, the developer will investigate the possibility of using porous paving and soft landscaping.
- 3.4.3 It is noted that the suitability of infiltration as well as porous paving will be influenced by the permeability of the underlying ground and whether contamination is present. Both of these issues will be considered at the detailed design stage.
- 3.4.4 Should infiltration not be possible, it is proposed that surface water from the site is attenuated and discharged into the 300mm diameter dedicated surface water sewer in Silver Street at the reduced brownfield rate of 5 l/s. The rate of discharge will however need to be confirmed by the local drainage authority and Thames Water who will take into account the capacity of the sewer and check their records for history of surcharging or flooding in the network. The proposed SW drainage strategy is shown on drawing WL\_1227\_100\_P2 enclosed in Appendix 1.
- 3.4.5 The site surface water drainage will be designed in accordance with current best practice to provide adequate capacity not to flood for a 1 in 30year storm event and such that flood water generated from a 1 in 100 year plus climate change storm event (+30%) shall be constrained within the site boundary so not to cause off-site flooding. The risk of flooding elsewhere should therefore not be increased as a result of the development proposals.
- 3.4.6 All redundant drains, sewers and manholes within the site will be removed or filled as part of the site remediation demolition strategy.

### **3.5 Foul Flows**

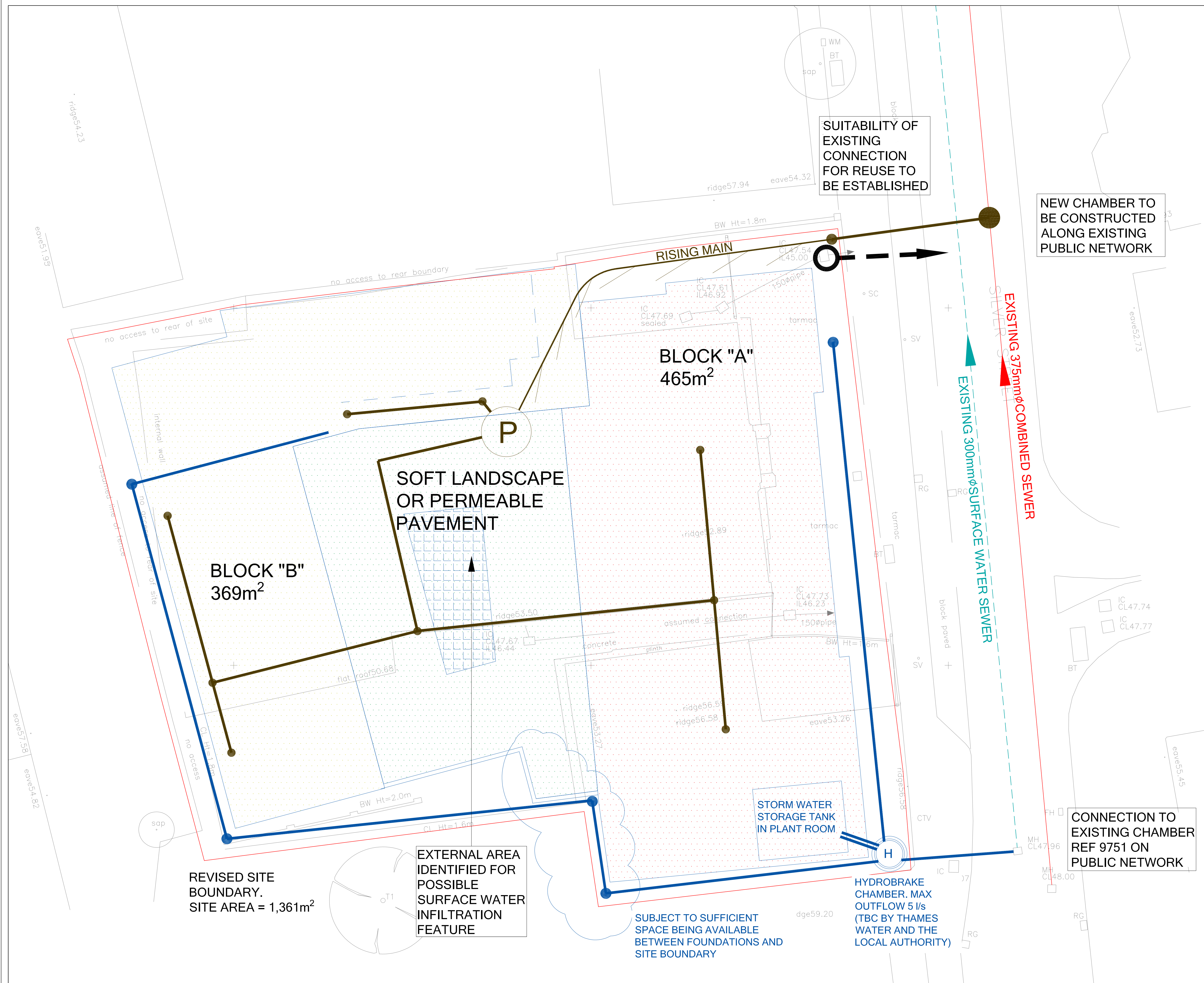
- 3.5.1 The peak flow rate for the development has been calculated using the discharge unit method. The peak foul discharge is estimated as 11.1 l/s based on the assumed development of 79 studio apartments.
- 3.5.2 The foul water drainage flows generated by the proposed development will be collected in a private foul water network before discharging to the existing 375mm diameter combined sewer located within Silver Street. The flow will be pumped in a rising main from below the basement level to the demarcation manhole on the site boundary before discharging to the public foul sewer by gravity. The proposed foul drainage strategy is shown on drawing WL\_1227\_100\_P2 attached as Appendix 1.

### **3.6 Access and Egress**

- 3.6.1 The site has pedestrian access from Silver Street which is located in EA Flood Zone 1 and is therefore at low risk of flooding from rivers and the sea. There may be localized areas of surface water flooding of gullies during heavy rainfall, however this is not considered to be likely to represent a threat to accessibility for vehicles or pedestrians.
- 3.6.2 Safe access and egress should therefore be maintained post-development.



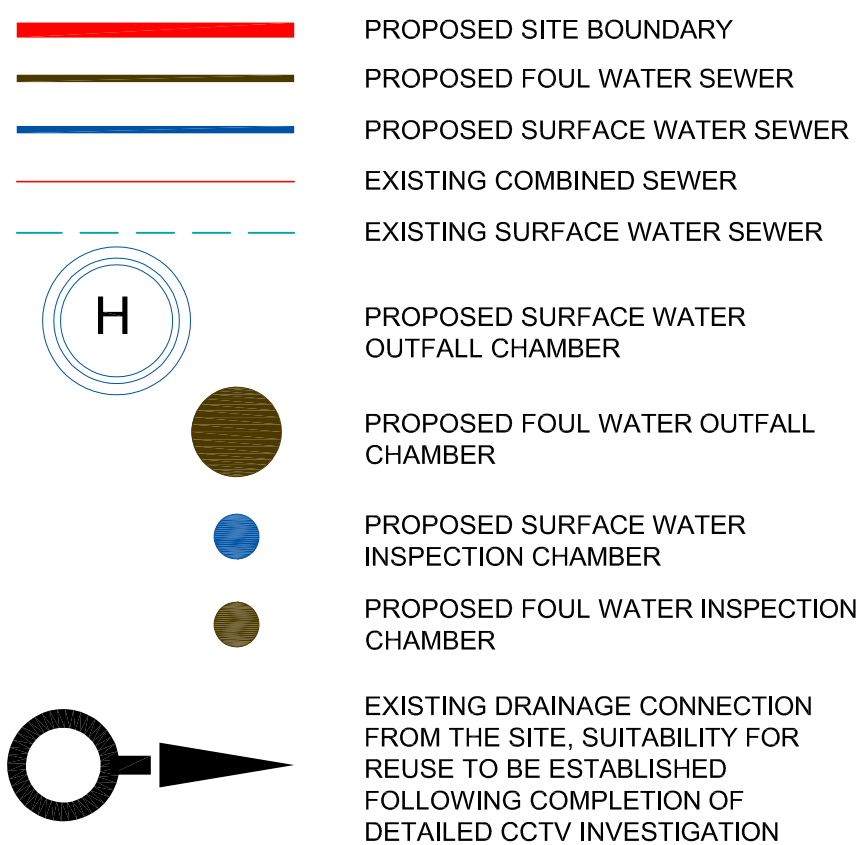
## **Appendix 1 Drawing WL\_1227\_100\_P2\_Drainage Strategy**



## GENERAL NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES.
3. SURVEY GRID IS BASED ON NATIONAL GRID COORDINATES, SURVEY INFORMATION SUPPLIED.
4. ALL DIMENSIONS TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. ANY DISCREPANCIES SHOULD BE REPORTED TO THE ENGINEER IMMEDIATELY.
5. THIS DRAWING TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATIONS. SPECIALIST'S DRAWINGS TOGETHER WITH THEIR SPECIFICATIONS.
6. DO NOT SCALE FROM THIS DRAWING. ONLY WRITTEN OR CALCULATED DIMENSIONS TO BE USED.

## LEGEND



|     |          |                                    |    |      |     |
|-----|----------|------------------------------------|----|------|-----|
| P2  | 19.02.19 | SITE AREA INCREASED-LAYOUT AMENDED | PH | GE   | CP  |
| P1  | 22.11.17 | PRELIMINARY ISSUE                  | GE | PH   | CP  |
| Rev | Date     | Revision Details                   | By | Chkd | App |



|        |                   |
|--------|-------------------|
| Client | MORLET PROPERTIES |
|--------|-------------------|

Project 40 SILVER STREET

|       |                            |
|-------|----------------------------|
| Title | INDICATIVE DRAINAGE LAYOUT |
|-------|----------------------------|

Drawing No. WL\_1227\_100

P2

|       |            |      |            |
|-------|------------|------|------------|
| Scale | 1:100 @ A1 | Date | 22.11.2017 |
|-------|------------|------|------------|

|       |    |     |    |     |    |
|-------|----|-----|----|-----|----|
| Drawn | GE | Chk | PH | App | CP |
|-------|----|-----|----|-----|----|

Unit 2.1, 20 Dale Street  
Manchester.  
M1 1EZ

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## **Appendix 2 Thames Water Sewer Records**



NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

| Manhole Reference                                                                                                                                                                                                                                                                                                                                                                                                      | Manhole Cover Level | Manhole Invert Level |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|----------------------|
| 9601                                                                                                                                                                                                                                                                                                                                                                                                                   | 47.81               | 44.79                |
| 9602                                                                                                                                                                                                                                                                                                                                                                                                                   | 47.76               | 45.97                |
| 961A                                                                                                                                                                                                                                                                                                                                                                                                                   | n/a                 | n/a                  |
| 9603                                                                                                                                                                                                                                                                                                                                                                                                                   | n/a                 | n/a                  |
| 8605                                                                                                                                                                                                                                                                                                                                                                                                                   | 51.106              | 49.346               |
| 9702                                                                                                                                                                                                                                                                                                                                                                                                                   | 47.98               | 44.73                |
| 9751                                                                                                                                                                                                                                                                                                                                                                                                                   | 47.95               | 45.33                |
| 8702                                                                                                                                                                                                                                                                                                                                                                                                                   | 46.49               | 43.59                |
| 9750                                                                                                                                                                                                                                                                                                                                                                                                                   | 46.93               | 44.53                |
| 9701                                                                                                                                                                                                                                                                                                                                                                                                                   | 46.83               | 44.11                |
| The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken. |                     |                      |



## **Appendix 3 Proposed Basement Floor Plan (Level -1)**

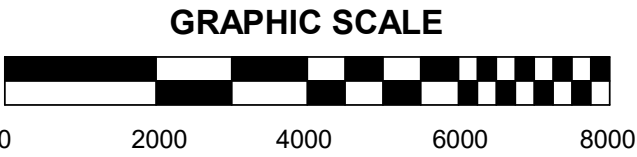
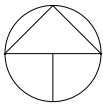
Notes:

All dimensions are in millimetres unless stated otherwise. No dimensions to be scaled from drawings. All dimensions to be checked on site prior to manufacture.

Any discrepancies between drawings and site conditions are to be reported to the contract manager.

This drawing is to be read in conjunction with all relevant Structural Engineers and Mechanical & Electrical Engineers drawings and specification.

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1 Level -1  
1 : 100

dwg status:

| PLANNING |             |      |    |     |
|----------|-------------|------|----|-----|
| Rev      | Description | Date | By | Chk |
|          |             |      |    |     |

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|            |                              |      |              |
|------------|------------------------------|------|--------------|
| dwg title: | Lower Ground Floor Plan      |      |              |
| job title: | 62-68 Silver Street, Reading |      |              |
| scale:     | 1 : 100                      | @ A1 | drawn: PO    |
| date:      | 10/04/17                     |      | job no: 1717 |
| dwg no:    | PL_100                       |      | rev:         |



## **Appendix 4 Proposed Ground Floor Plan (Level 0)**

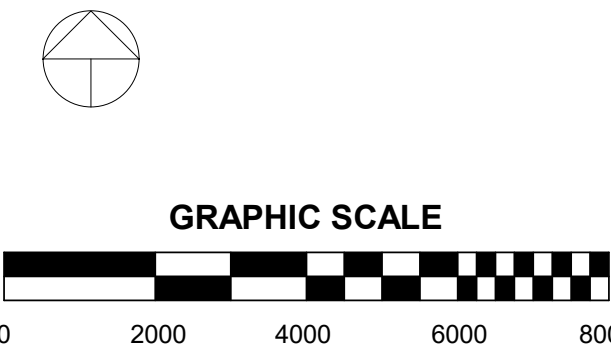
Notes:

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1 Level 0  
1 : 100

dwg status:

| PLANNING |             |      |    |     |
|----------|-------------|------|----|-----|
| Rev      | Description | Date | By | Chk |
|          |             |      |    |     |
|          |             |      |    |     |
|          |             |      |    |     |

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|            |                              |      |              |
|------------|------------------------------|------|--------------|
| dwg title: | Ground Floor Plan            |      |              |
| job title: | 62-68 Silver Street, Reading |      |              |
| scale:     | 1 : 100                      | @ A1 | drawn: PO    |
| date:      | 10/04/17                     |      | job no: 1717 |
| dwg no:    | PL_101                       |      | rev:         |