



COLE EASDON  
CONSULTANTS

## Technical Note - 8036/01

|                |                                     |             |                           |                |                                |
|----------------|-------------------------------------|-------------|---------------------------|----------------|--------------------------------|
| Project Title: | 51A The Drive, Ickenham, Hillingdon |             |                           |                |                                |
| Client:        | Eye Construction                    |             |                           |                |                                |
| Project No.:   | 8036                                | Date:       | September 2021            | Issue No.:     | 1                              |
| Title:         | Surface Water Drainage Design       |             |                           |                |                                |
| Written By:    | S. Starr<br>BSc (Hons)              | Checked By: | J. Pockett<br>MEng (Hons) | Authorised By: | D. Frosoni<br>CEng MICE MCIWEM |

### 1.0 Introduction

1.1 This *Technical Note* has been prepared by Cole Easdon Consultants Limited (CEC) on behalf of Eye Construction in respect of a proposed residential development comprising the construction of a building containing 3 No. residential units with access and parking at 51A The Drive, Ickenham, Hillingdon. The existing house and garage at the site will be demolished. Refer to the Drawing No. PP-DR-0001(A) [*Topographical Survey*] provided by Eye Construction Limited, enclosed with this *Technical Note*.

1.2 This *Technical Note* provides the information required to address the Planning Condition 9 (excluding grey water recycling and a timetable of implementation), as below:

*‘9. No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy SI5 of the London Plan and will: i. provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters; ii. include a timetable for its implementation; and iii. provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime. The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will: iv. provide details of water collection facilities to capture excess rainwater; v. provide details of how rain and grey water will be recycled and reused in the development. Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence’.*

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### 2.0 The Existing Site

Refer to CEC Figure 8036/500 Figure 1 [*Site Location Plan*] enclosed with this *Technical Note*

- 2.1 The site is located at 51A the Drive, approximately 1km west of Ickenham centre. It currently comprises an existing house, rear garden, garage and access/driveway off The Drive.
- 2.2 The site is bounded to the north and south by neighbouring properties on The Drive; to the east by The Drive; and to the west by greenfield land.

#### Site Topography

- 2.3 The site falls to the south and west. Existing ground levels within the site vary from 64.50m to 59.50m Above Ordnance Datum (AOD).

#### Existing Ground Conditions

- 2.4 British Geological Survey (BGS) records indicate that the site is underlain by London Clay overlain by gravels.
- 2.5 A site investigation was undertaken in June 2021. The works comprised 3 No. boreholes established to a maximum depth of 6m, and 1 No. 1m deep trial pit. The works confirm that beneath a thin layer of topsoil or made ground, the site is underlain by London Clay to depth.
- 2.6 Groundwater was not encountered during the site works.
- 2.7 BRE365 infiltration compliant testing was undertaken within the trial pit at the site frontage. The fall in water level was negligible due to impermeable clay strata.
- 2.8 A falling head infiltration test was carried out with a borehole to rear of the property. Again, the fall in water level was negligible. Refer to the test results and borehole logs enclosed with this *Technical Note*.

#### Existing Drainage

- 2.9 Fray's River, a Main River and a tributary of the River Colne, drains the local catchment. It is located approximately 400m west of the site.

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2.10 Thames Water records confirm that 225mm diameter public foul water sewer flows in a southerly direction within The Drive. There are no public surface water sewers in the site vicinity. Refer to the public sewer records enclosed with this *Technical Note*.

2.11 Surface water runoff from the existing house and drive is currently drained to soakaway. On site infiltration testing demonstrates that any existing soakaway would not perform to current design standards.

### 3.0 Proposed Surface Water Drainage Design

Refer to CEC Plans 8036/501 [*Proposed Surface Water Drainage Layout*] & 8036/502 [*Proposed Surface Water Drainage Details*] enclosed with this *Technical Note*.

3.1 A hard area catchment of 610m<sup>2</sup> will be introduced under the proposals. Without suitable mitigation, water from this catchment could increase the rate of surface water runoff from the site, thereby increasing flood risk to the locality.

#### Drainage Hierarchy

3.2 The drainage design for the site has been prepared according to the drainage discharge hierarchy from *CIRIA C753 The SuDS Manual*, as follows:

1. Store rainwater for re use
2. Infiltration to the maximum extent that is practical.
3. Discharge to surface waters.
4. Discharge to surface water sewer.
5. Discharge to combined sewer
6. Discharge to foul sewer

### 3.3 Rainwater Harvesting

A rainwater harvesting tank will be provided to the rear of the proposed building, allowing runoff from the rear roof area to be retained and re used for irrigation and car washing. The tank will overflow into the proposed SuDS, which is discussed below. Refer to the rainwater harvesting tank specification enclosed with this *Technical Note*.

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### *Infiltration Potential*

- 3.4 On site BRE365 compliant infiltration testing confirms that the soils at the site are impermeable and would prevent the effective operation of infiltration-based SuDS. Refer to the infiltration test results enclosed with this *Technical Note*.

### *Discharge Location*

- 3.5 There is no watercourse or surface water sewer in the vicinity of the site. Surface water runoff will therefore be discharged to the existing public foul sewer in The Drive, at the site frontage.
- 3.6 Discharge will be restricted to the QBAR greenfield runoff rate of 0.1l/s. This represents significant betterment over the existing situation, whereby runoff is drained into soakaways founded in clay strata. The existing soakaways would not have capacity to accommodate and dispose of runoff due to the low permeability of the clay material, and would overflow, discharging at an uncontrolled rate. Refer to the greenfield runoff calculations enclosed with this *Technical Note*.
- 3.7 Thames Water advise that connection to the foul sewer is acceptable, subject to LLFA agreement that there is no preferable solution. This *Technical Note* and its enclosures demonstrate that there is no alternative means of surface water runoff disposal. Refer to the Thames Water correspondence enclosed with this *Technical Note*. A non-return valve will be required on the proposed outlet pipe from the development site so as to prevent surcharged foul flow from backing up into the SuDS system.

### Sustainable Urban Drainage Systems (SuDS)

- 3.8 A permeable paving SuDS facility will be installed in the proposed parking and access area. The system will comprise a stone sub base storage medium beneath a permeable block paving surface. Runoff from the parking and access areas will percolate directly into the system, and roof water from the proposed house will be piped into the sub base, which will act as a tank, with controlled discharge to sewer.
- 3.9 Although testing indicates that soil permeability is negligible, the Lead Local Flood Authority request that the paving sub base is unlined in order to utilise any potential for infiltration, however limited it may be. A permeable liner is therefore proposed at the base of the system.
- 3.10 The network design calculations, enclosed with this *Technical Note*, demonstrate that the proposed SuDS and pipework have the capacity required to accommodate the 1 in 100 year + 40% design storm event. The permeable paving has been modelled as a sealed system, with no infiltration. Therefore, any infiltration

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through the base of the system would increase its capacity. Refer to CEC Plans 8036/501 [*Proposed Surface Water Drainage Layout*] & 8036/502 [*Proposed Surface Water Drainage Details*], enclosed with this *Technical Note*, for the details and dimension of the proposed system.

### Design Exceedance

- 3.11 The proposed SuDS has been designed to accommodate the extreme 1 in 100-year storm including a 40% allowance for climate change. Design exceedance is therefore unlikely. In the event of blockage or an exceedance storm event, overflow from the proposed SuDS would flow away from the site in a southerly direction onto the adjacent landscaped front garden areas of the neighbouring houses where it would be absorbed, or turn to flow west towards Fray's River, through rear gardens, without impacting upon the site or neighbouring dwellings. Refer to CEC Plan 8036/501 [*Proposed Surface Water Drainage Layout*] enclosed with this *Technical Note*.

### Water Quality

- 3.12 Water quality has been assessed in line with the Simple Index approach from Chapter 26 of CIRIA C753 *The SuDS Manual*:
1. Step 1 - Allocate suitable pollution hazard indices for the proposed land use.
  2. Step 2 - Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index.
- 3.13 The highest pollution hazard level for the proposed land use is Low (residential car parks and low trafficked roads). The pollution hazard indices for this land use are shown in Table 3.1 below.

**Table 3.1: Pollution Hazard Indices for the Proposed Site (from Table 26.2 of CIRIA C753 The SuDS Manual)**

| Total suspended solids (TSS) | Metals | Hydrocarbons |
|------------------------------|--------|--------------|
| 0.5                          | 0.4    | 0.4          |

- 3.14 All SuDS components to be used in the development have been assessed for their effectiveness in pollutant removal prior to discharge to surface waters in Table 26.3 in CIRIA C753 *The SuDS Manual*. The pollution mitigation indices are shown in Table 3.2 below. The pollution mitigation indices for Permeable Surfacing exceed the pollution hazard indices. Therefore, the proposed system will provide adequate pollutant removal.

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Table 3.2: Pollution Mitigation Indices for Permeable Pavement (from Table 26.3 of CIRIA C753 The SuDS Manual)

| Attenuation Device | Total suspended solids (TSS) | Metals | Hydrocarbons |
|--------------------|------------------------------|--------|--------------|
| Permeable Paving   | 0.7                          | 0.6    | 0.7          |

### Adoption & Maintenance

- 3.15 The on-site surface water drainage system will be maintained by the site owner, as part of the site's overall maintenance programme. SuDS maintenance should be carried out in accordance with CIRIA SuDS Manual guidance, as discussed below. A draft Maintenance Schedule is outlined in Table 3.3 below.

### *Permeable Surfacing*

- 3.16 Permeable surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. A brush and suction cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:
1. End of winter (April) - to collect winter debris.
  2. Mid-summer (July/August) - to collect dust, flower and grass-type deposits.
  3. After autumn leaf fall (November).
- 3.17 If reconstruction is necessary, the following procedure should be followed:
1. Lift surface layer and laying course.
  2. Remove any geotextile filter layer.
  3. Inspect sub-base and remove, wash and replace if required.
  4. Renew any geotextile layer.
  5. Renew laying course, jointing material and concrete block paving.
- 3.18 Materials removed from the voids or the layers below the surface of the paving may contain hazardous substances such as heavy metals and hydrocarbons which may need to be disposed of as controlled waste.

### *Pipework, Catchpits & Flow Control*

- 3.19 Catchpits, pipework and the flow control should be inspected every six months and silt should be removed as necessary.

### *Rainwater Harvesting System*

- 3.20 The system should be managed and regularly serviced in accordance with the manufacturer's guidance.

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**Table 3.3: Maintenance Schedule for Proposed Drainage Elements**

| Drainage Element                   | Schedule   | Maintenance Requirement                                                                                                                                                     | Frequency                                                      |
|------------------------------------|------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------|
| Permeable Paving                   | Regular    | Brushing and vacuuming over whole surface                                                                                                                                   | Once a year, after autumn leaf fall                            |
|                                    | Occasional | Removal of weeds                                                                                                                                                            | As required                                                    |
|                                    | Remedial   | Remedial work to any depressions or damage considered a hazard to end users or detrimental to performance                                                                   | As required                                                    |
|                                    |            | Rehabilitation of surface and upper sub-structure by remedial clearance                                                                                                     | Every 10 - 15 years, or as required                            |
|                                    | Monitoring | Initial inspection                                                                                                                                                          | Monthly for 3 months after installation                        |
|                                    |            | Inspect for evidence of weed growth or poor operation                                                                                                                       | Three monthly, 48 hours after large storms in first six months |
|                                    |            | <ul style="list-style-type: none"> <li>Inspect silt accumulation rates</li> <li>Monitor inspection chambers</li> </ul>                                                      | Annually                                                       |
| Pipework, catchpits & Flow Control | Regular    | <ul style="list-style-type: none"> <li>Inspect for accumulation of silt</li> <li>Inspect for debris and litter</li> <li>Inspect inlets and outlets for blockages</li> </ul> | Every six months                                               |
|                                    | Occasional | <ul style="list-style-type: none"> <li>Remove debris and litter</li> <li>Remove silt</li> </ul>                                                                             | As required                                                    |
| Rainwater Harvesting Tank          | Regular    | <ul style="list-style-type: none"> <li>In accordance with manufacturers guidance</li> </ul>                                                                                 | As specified by manufacturer                                   |

Note: In addition to the above maintenance requirements, it is recommended that all drainage elements are inspected:

- Following the first storm event
- Monthly for the first 3 months following commissioning

### 4.0 Summary & Conclusions

- 4.1 The approved development proposals comprise a single building containing 3No flats, with access and parking.
- 4.2 On site BRE365 infiltration testing demonstrates that drainage by infiltration is not feasible at the site. There is no watercourse or surface water sewer in the vicinity of the site. Surface water runoff will therefore be discharged to the existing public foul sewer in The Drive, at the site frontage. Thames Water advise that connection to the foul sewer at a rate of 0.1l/s is acceptable, subject to LLFA agreement that there is no preferable solution. This report and its enclosures demonstrate that there is no alternative means of surface water runoff disposal available. A non-return valve will be required on the proposed

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outlet pipe from the development site so as to prevent surcharged foul flow from backing up into the SuDS system.

- 4.3 A permeable paving driveway SuDS will be installed to manage runoff from the 1 in 100 year +40% storm, and to provide water quality treatment or runoff prior to discharge.
- 4.4 A rainwater harvesting system is proposed, with overflow into the proposed SuDS.
- 4.5 All SuDS and surface water drainage systems will be managed privately, by the site owner.
- 4.6 Exceedance flows from the proposed SuDS would flow away from the site in a southerly direction, onto the adjacent landscaped front garden areas of the neighbouring houses where it would be absorbed, or turn to flow west towards Fray's River, through rear gardens, without impacting upon the site or neighbouring dwellings.

Cole Easdon Consultants Limited  
September 2021

### Enclosures

CEC Figure 8036/500 Figure 1 Site Location Plan  
 CEC Plan 8036/501 Proposed Surface Water Drainage Layout  
 CEC Plan 8036/502 Proposed Surface Water Drainage Details  
 Drawing No. PP-DR-0001(A) Topographical Survey (by Eye Construction Limited)  
 Infiltration Test Results  
 Thames Water Records  
 Thames Water Correspondence  
 Rainwater Harvesting System Specification  
 Greenfield Runoff Calculations  
 MicroDrainage Design Calculations

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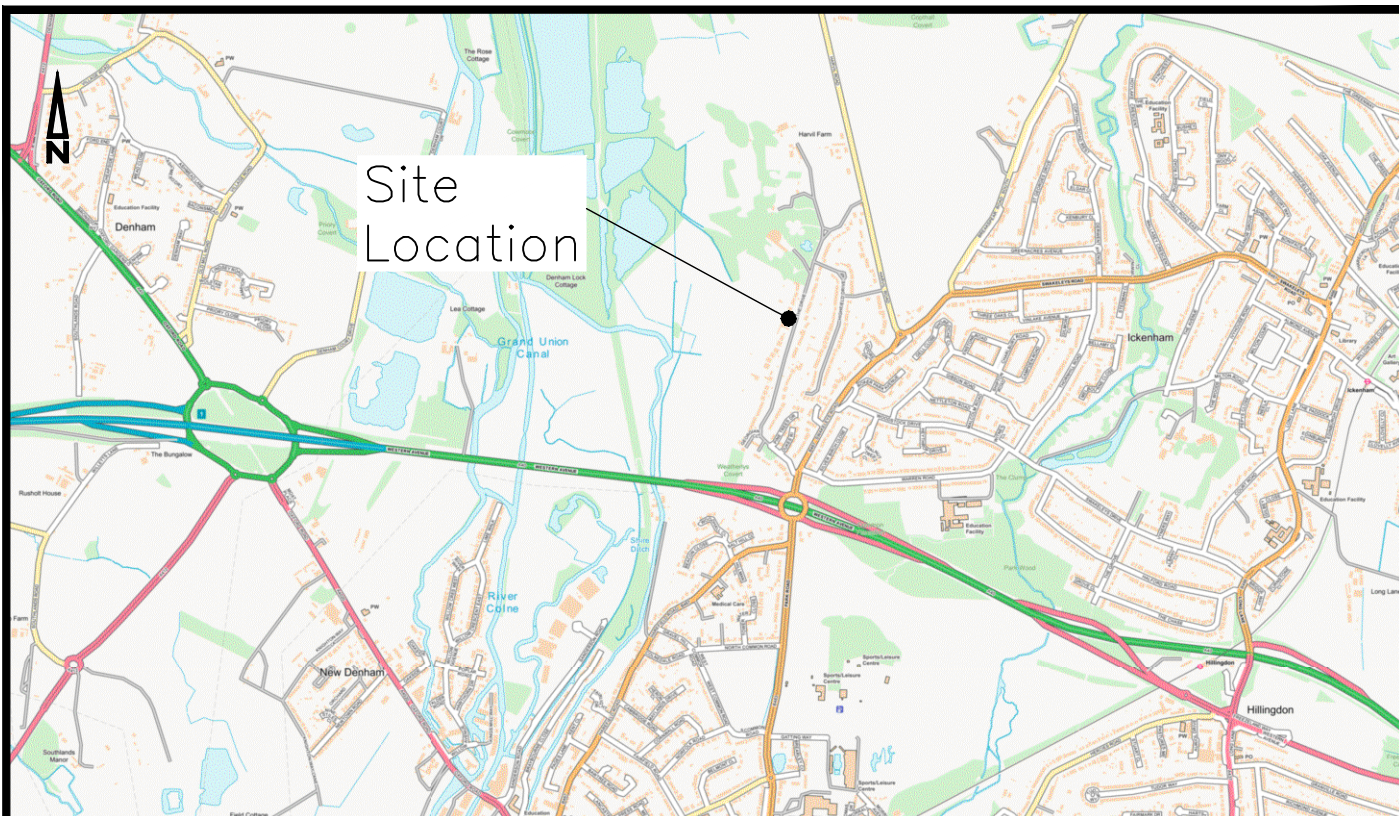
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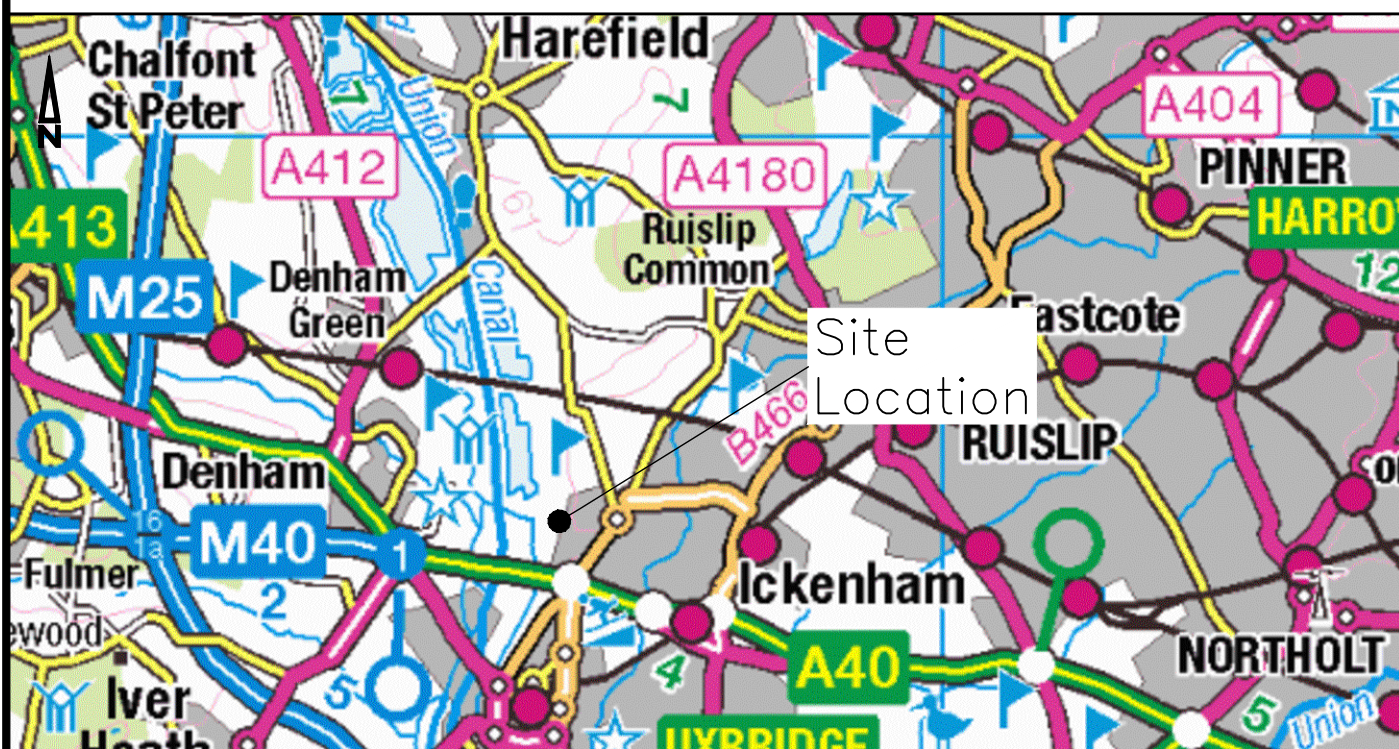
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# Enclosures





Scale 1:20,000



Scale NTS

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Job Title:

51A The Drive  
Ickenham  
Hillingdon

Drawing Title:

Site Location Plan

Client:

Eye Construction Ltd

Drawn By

SS

Checked By

DF

Date Drawn

May 2021

Drawing No.

8036 - 500 Figure 1

Drawing Status:

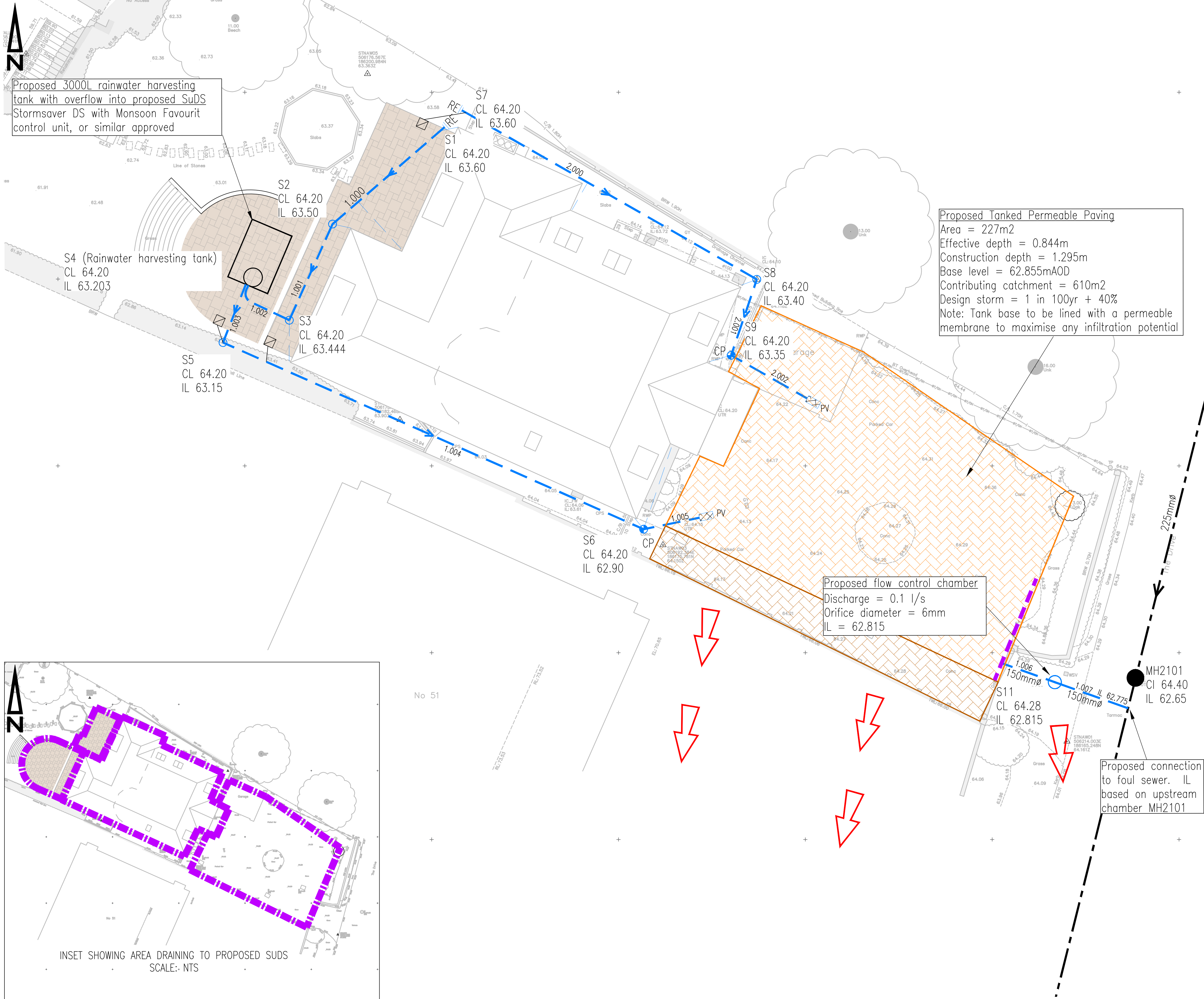
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| CONSTRUCTION<br>AT CLIENT AND/OR<br>CONTRACTOR<br>RISK | FOR COMMENT      |  |
|                                                        | FOR PLANNING     |  |
|                                                        | FOR TENDER       |  |
|                                                        | FOR APPROVAL     |  |
|                                                        | FOR CONSTRUCTION |  |
|                                                        | AS BUILT         |  |

Scale

As shown (A4)

Revision





- Key:
- Area draining to proposed SuDS: 610m²
  - Proposed surface water drain (100mm  $\varnothing$  unless noted otherwise) and inspection chamber
  - CP Proposed catch pit
  - Proposed tanked permeable paving
  - Proposed impermeable paving to accommodate service strip
  - Proposed fin drain
  - RE Proposed rodding eye
  - PV Permeavoids distribution tank
  - Design exceedance route
  - Existing ground level
  - Existing public foul sewer

- GENERAL NOTES
- All levels are in metres above Ordnance datum
  - Refer to Drawing 8036 - 502 - Surface Water Drainage Details for drainage notes

| REFERENCE DRAWINGS: |               |          |           |                      |
|---------------------|---------------|----------|-----------|----------------------|
| Drawing No.         | Drawing Title | Revision | Date      | Company              |
| PP-08-001           |               |          | July 2021 | Eye Construction Ltd |

| No.                                                                                   | By | Date                                                                                             | Revision Details   |
|---------------------------------------------------------------------------------------|----|--------------------------------------------------------------------------------------------------|--------------------|
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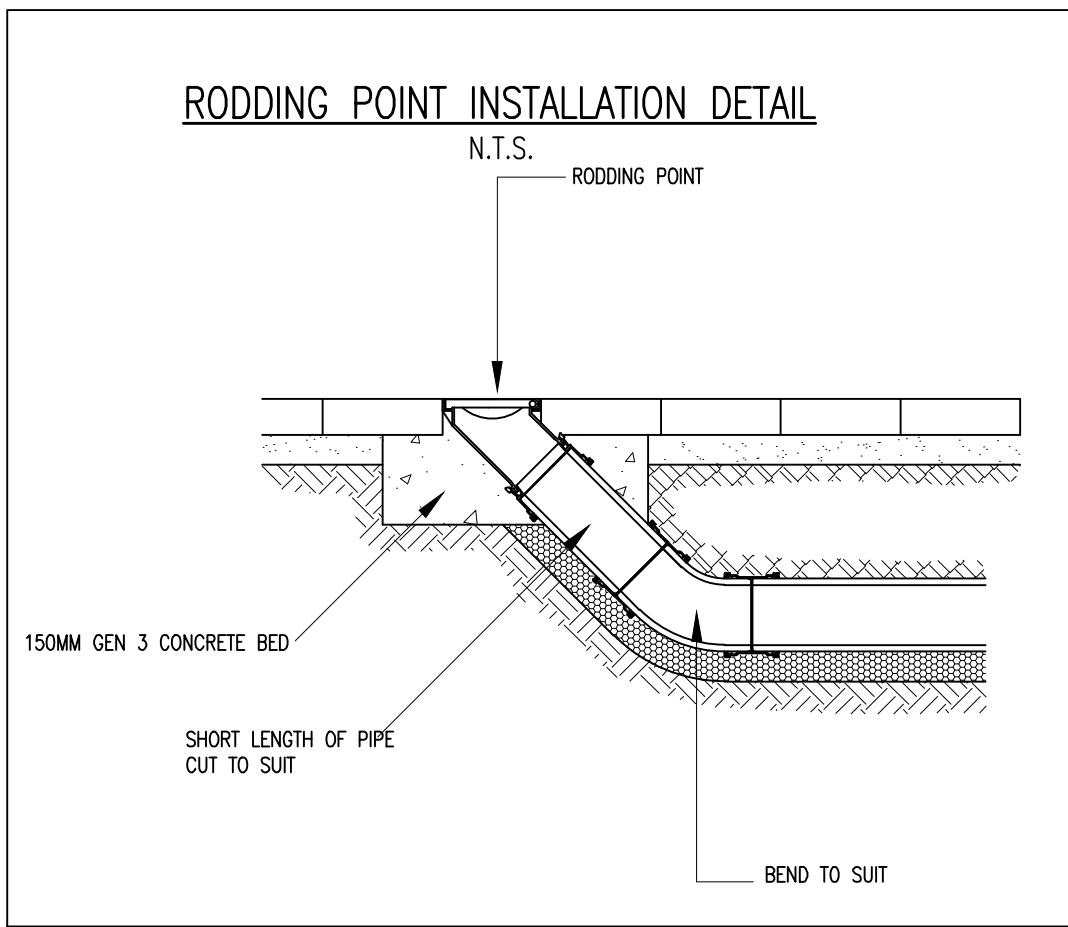
Client  
**Eye Construction Ltd**

Job Title  
**51A The Drive  
Ickenham  
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Drawing Title  
**Proposed Surface Water Drainage Layout**

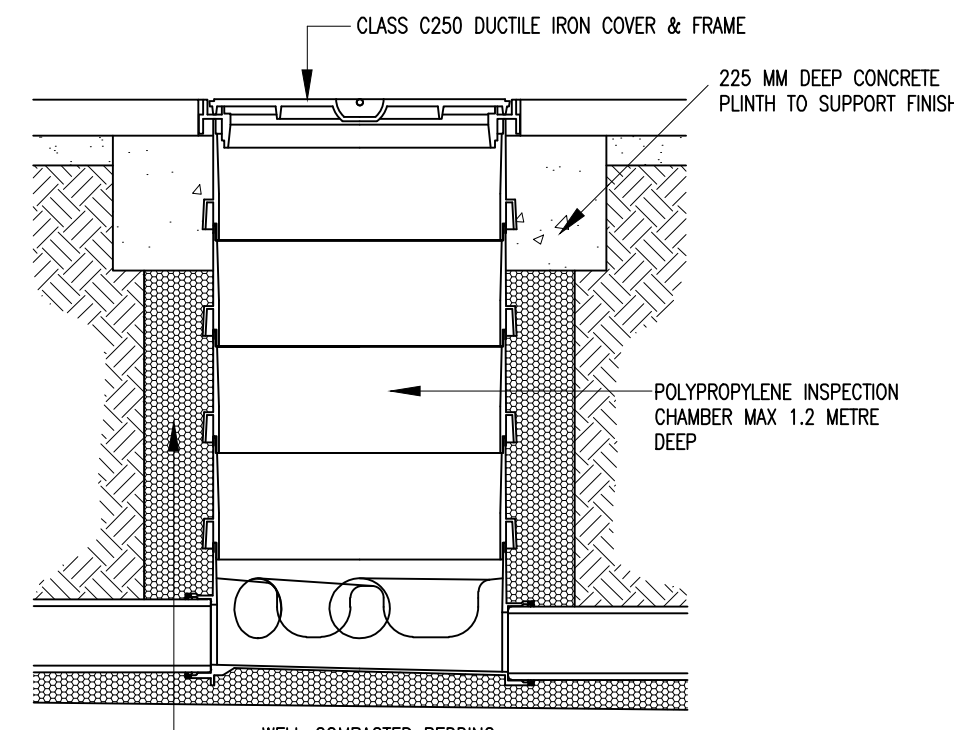
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| FOR COMMENT                                  | FOR PLANNING | FOR TENDER  | FOR APPROVAL | FOR CONSTRUCTION AS BUILT |
|                                              |              |             |              |                           |
| **CONSTRUCTION AT CLIENT / CONTRACTOR RISK** |              |             |              |                           |
| Designed by:                                 | Drawn by:    | Checked by: |              |                           |
| SS                                           | SS           | DF          |              |                           |
| Date                                         | Scale        |             |              |                           |
| July 2021                                    | 1:100 @ A1   |             |              |                           |
| Dwg. No.                                     |              |             |              | Rev.                      |
| 8036/501                                     |              |             |              | -                         |



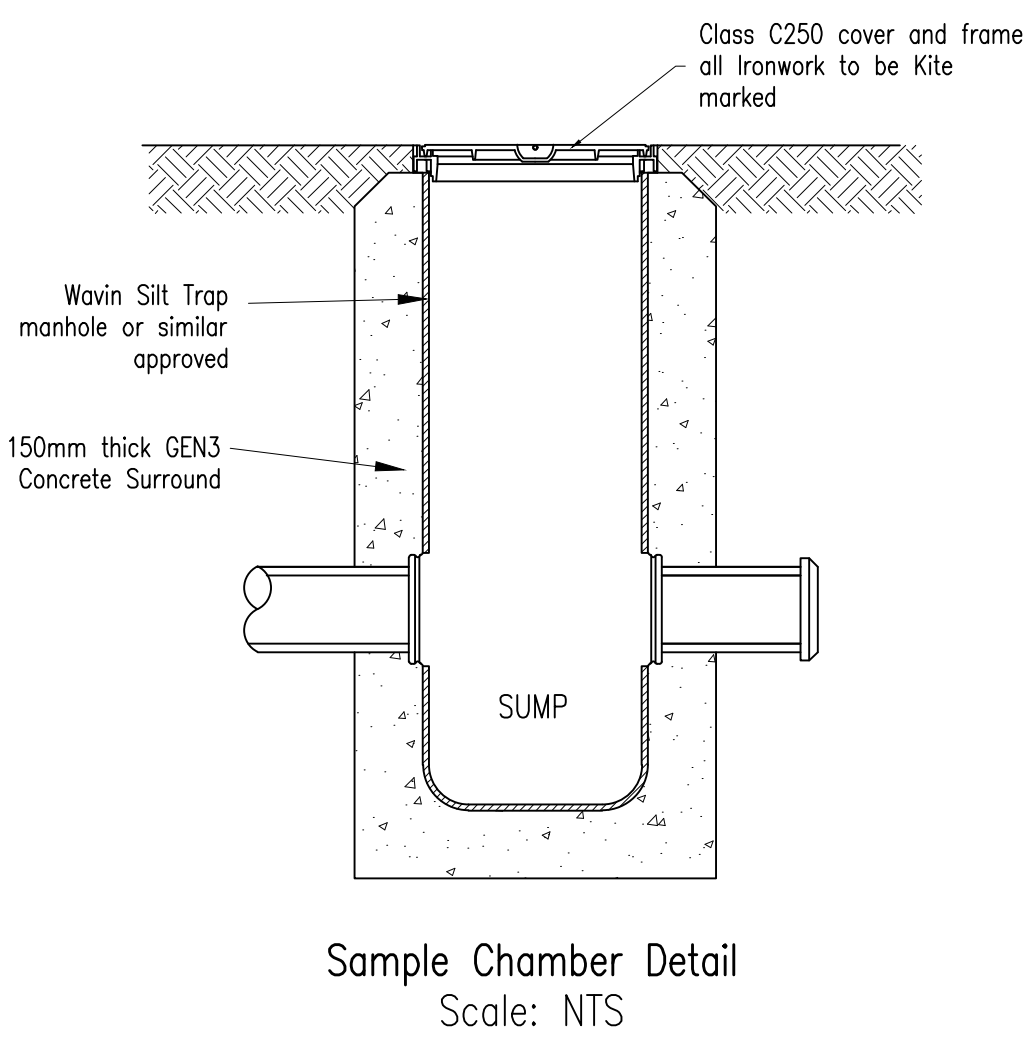
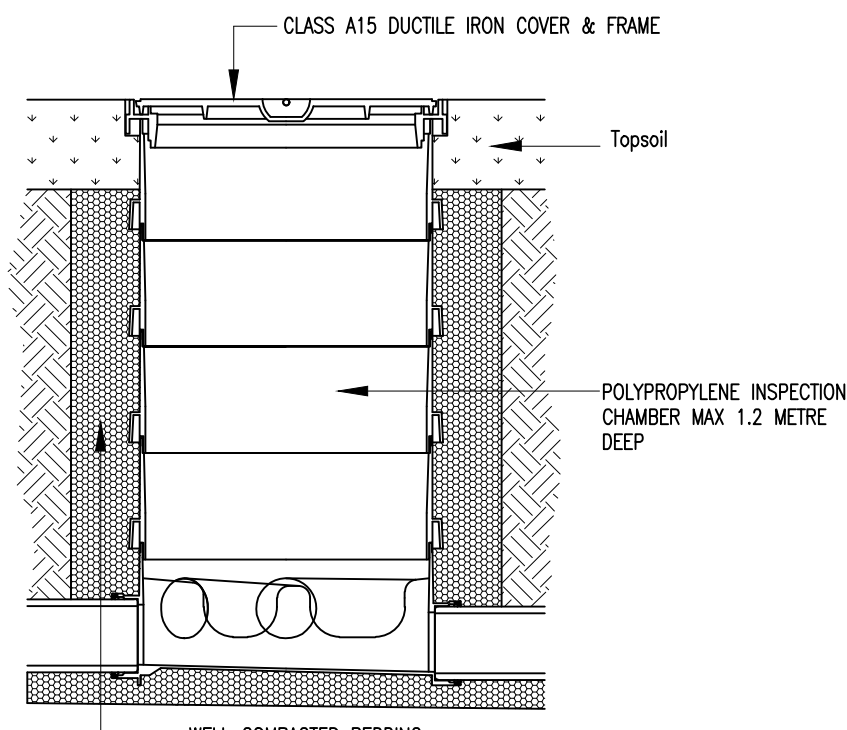


## POLYPROPYLENE INSPECTION CHAMBER INSTALLATION DETAIL N.T.S.

SITED IN DRIVEWAYS / HARD LANDSCAPED AREAS



SITED IN SOFT LANDSCAPED AREAS



## DOMESTIC DRAINAGE NOTES

All Domestic Drainage to comply with the British Standard BS EN 752:2008 'Drain and Sewer Systems Outside Buildings' and Part H of the Building Regulations 2000.

Underground drainage components shall be one of the following: i) Wavin Osma ii) Hepworth clay or iii) Polypipe and installed in accordance with the manufacturers recommendations.

Domestic drainage to be 100mm dia. laid at a minimum gradient of 1 in 80 unless stated otherwise on the drawings. All spur connections to be laid at 1 in 80 unless otherwise stated on the drawings. Minimum cover to be 350mm (600mm for UpVC) unless concrete bed and surround is provided.

Pipe bedding as specified by the drainage manufacturer. All pipes that pass under buildings to have a minimum 100mm granular surround. Where drains pass through external walls the pipe is to be lintelled over with a minimum 50mm clear space around the pipe. Rigid pipes to be fixed to the wall externally and internally to prevent movement within the granular material.

Types of access to be as follows :-

- 0 to 0.6m deep: - Type A Inspection Chamber
- 0.6m to 1m deep: - Type B Inspection Chamber
- 1m to 1.8m deep:- Type C Inspection Chamber

Where required, Step Irons to be built into the inspection chamber in accordance with the requirements of the aforementioned British Standard and Building Regulations. The top step iron shall be fixed not more than 750mm below the surface and the lowest step to be fixed not more than 300mm above the benching.

Manhole Covers and Frames to comply with BS EN 124.

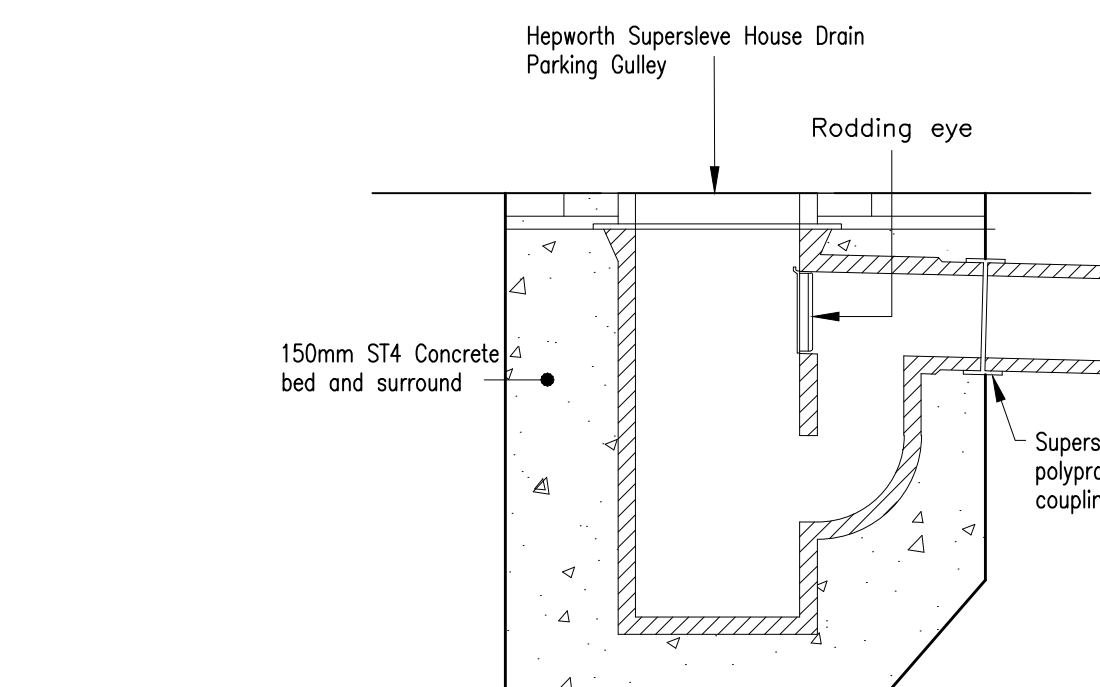
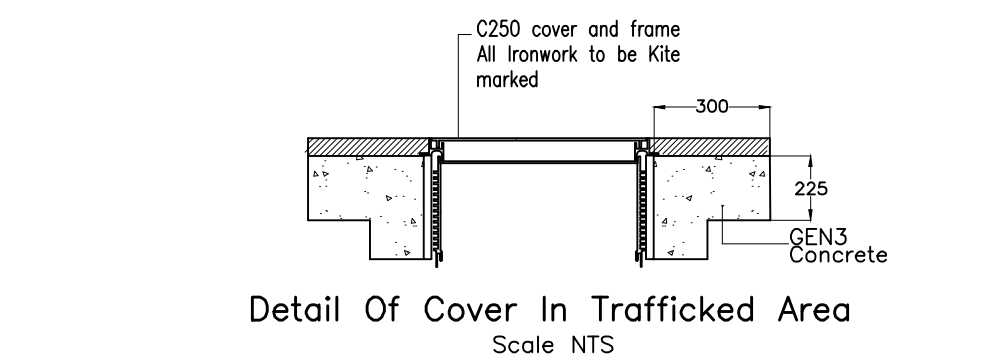
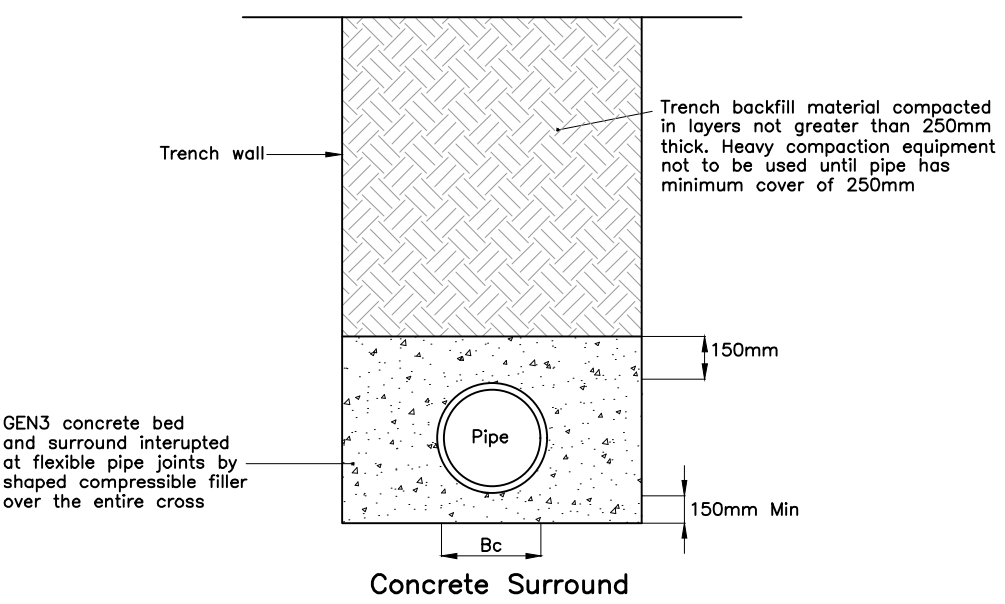
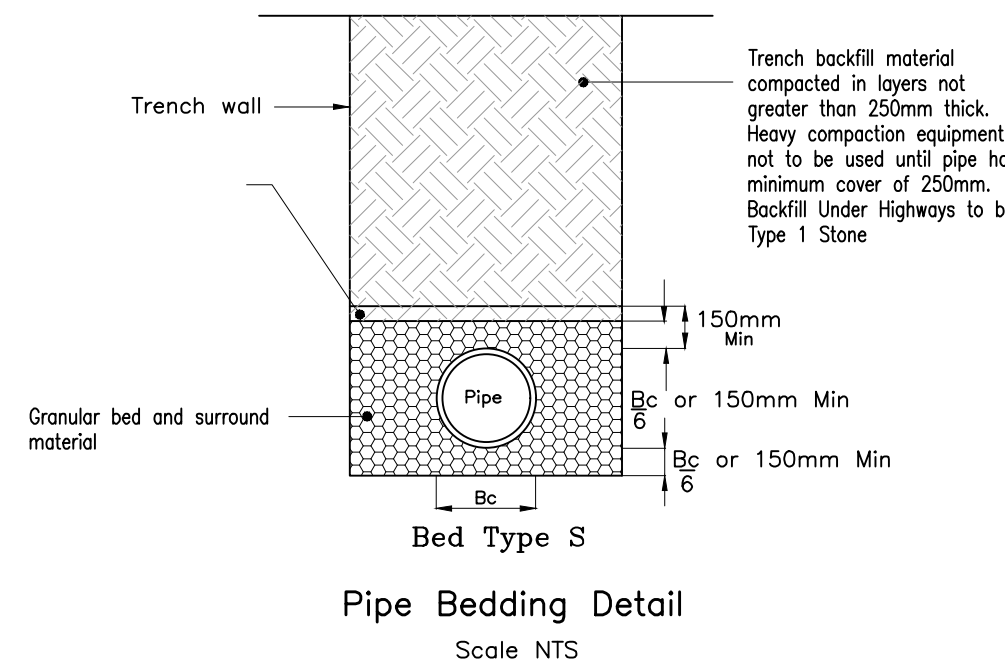
Class D400 for areas with frequent vehicular usage such as roads.  
Class C250 for areas with light vehicular usage such as car parks.  
Class B125 for pavements and pedestrian areas.  
Class A15 for areas inaccessible to motor vehicles.

| Pipe nominal size (DN) | Nominal maximum particle size (mm) See note (c) | Class of bedding See note (d) | ETHER: Maximum CF value for acceptability See note (b) | Suitable Materials<br>OR: Materials specified in British Standards See note (a)               |
|------------------------|-------------------------------------------------|-------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| 100                    | 10                                              | S<br>B<br>F<br>N              | 0.15<br>0.30<br>0.15<br>0.30                           | 10mm nominal single-size                                                                      |
| Over 100 to 150        | 16                                              | S<br>B<br>F<br>N              | 0.15<br>0.30<br>0.15<br>0.30                           | Fine aggregate                                                                                |
| Over 150 to 300        | 20                                              | S<br>B<br>F<br>N              | 0.15<br>0.30<br>0.15<br>0.30                           | 10mm or 14mm nominal single-size or 14mm to 5mm graded                                        |
| Over 300 to 550        | 20                                              | S<br>B<br>F<br>N              | 0.15<br>0.30<br>0.15<br>0.30                           | 10, 14 or 20mm nominal single-size or 14mm to 5mm graded or 20 to 5mm graded                  |
| Over 550               | 40                                              | S<br>B<br>F<br>N              | 0.15<br>0.30<br>0.15<br>0.30                           | 14, 20 or 40mm nominal single-size crushed rock or 14mm to 5mm, 20 to 5mm or 40 to 5mm graded |

Notes:  
(a) Processed granular materials to include aggregates to BS EN 12324.  
(b) Compaction Fraction value (CF), see Appendix B of WIS IG No. 4-08-02.  
(c) The nominal maximum particle sizes apply both to processed and as-dug materials (See Section of IG No. 4-08-01-Issue 4 and No.4-08-01 Amendment [Nov 2008]).  
(d) Bedding classes are defined in:-  
BS EN 1295-1:1987 Structural Design of Buried Pipelines under various conditions of loading.  
TRRL - Simplified Table of External Loads on Buried Pipelines.  
(e) The sulphate content of bedding and sidefill materials for use with cementitious pipe should not be greater than 0.3% as sulphur trioxide.

| Pipe nominal bore (mm) See note (d) | Nominal maximum particle size (mm) | ETHER: Maximum CF value for acceptability See note (b) | Suitable Materials<br>OR: Materials specified in British Standards See note (a)            |
|-------------------------------------|------------------------------------|--------------------------------------------------------|--------------------------------------------------------------------------------------------|
| 100                                 | 10                                 | 0.15                                                   | 10mm nominal single-size                                                                   |
| Over 100 to 150                     | 16                                 | 0.15                                                   | 10 or 14mm nominal single-size or 14mm to 5mm graded                                       |
| Over 150 to 300                     | 20                                 | 0.15                                                   | 10, 14 or 20mm nominal single-size or 14mm to 5mm graded or 20mm to 5mm graded             |
| Over 300 to 550                     | 20                                 | 0.15                                                   | 14mm or 20mm nominal single-size or 14mm to 5mm graded or 20 to 5mm graded                 |
| Over 550                            | 40                                 | 0.15                                                   | 14, 20 or 40mm single-size or 14mm to 5mm graded or 20mm to 5mm graded or 40 to 5mm graded |

Notes:  
(a) Processed granular materials to include aggregates to BS EN 12324.  
(b) Compaction Fraction value (CF), see Appendix B of WIS IG No. 4-08-02.  
(c) For the purpose of this table, PE pipes of 630mm OD can be regarded as having nominal bo of over 550mm, irrespective of wall thickness.  
(d) Nominal bore is used in preference to DN because of the different nominal size classification flexible pipes.  
(e) For PE80 and PE100 polyethylene pipe complying with current relevant Water Industry Specification the maximum sidefill particle size may be increased to 10% of the pipe nominal size.  
(f) For E' values for processed granular materials reference should be made to Table A.3 of WIS IG No. 4-08-02 where specific site tests have not been performed.  
(g) For ferrous cementitious pipeline materials, the sulphate content of bedding and sidefill material should not be greater than 0.3% as sulphur trioxide.



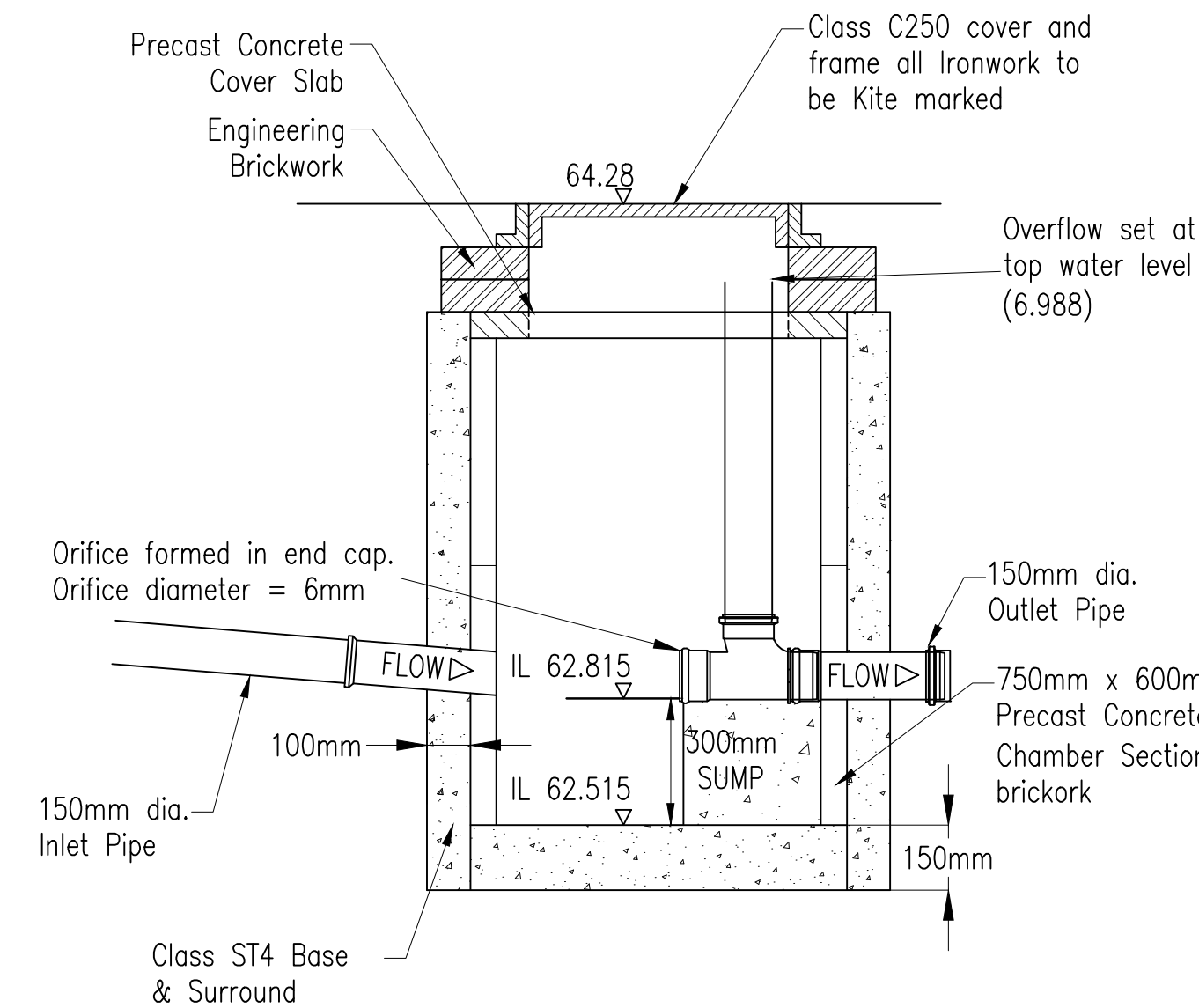
## Bedding and Sidefill Material

Bedding, sidefill and surround materials shall comply with Water Industry Specification No. 4-08-02. Bedding and sidefill material may be selected as-dug granular material or processed granular material complying with Tables 1 and 2 for rigid and flexible pipes respectively. Material excavated from trenches dug through land contaminated with domestic, building or industrial waste should not be used as bedding and sidefill material. Selected excavated material should be readily compactable and be free from organic matter and combustible materials. Frozen soil should not be used. During selection, soil containing clay lumps larger than 75mm and stones larger than those permitted in Tables 1 or 2 as appropriate should be discarded. All selected as-dug granular bedding and sidefill material should be evaluated using the Compaction Fraction Test detailed in Appendix B of the WIS No. 4-08-02. Materials are suitable if the values obtained do not exceed those given in Table 1 and 2 as appropriate.

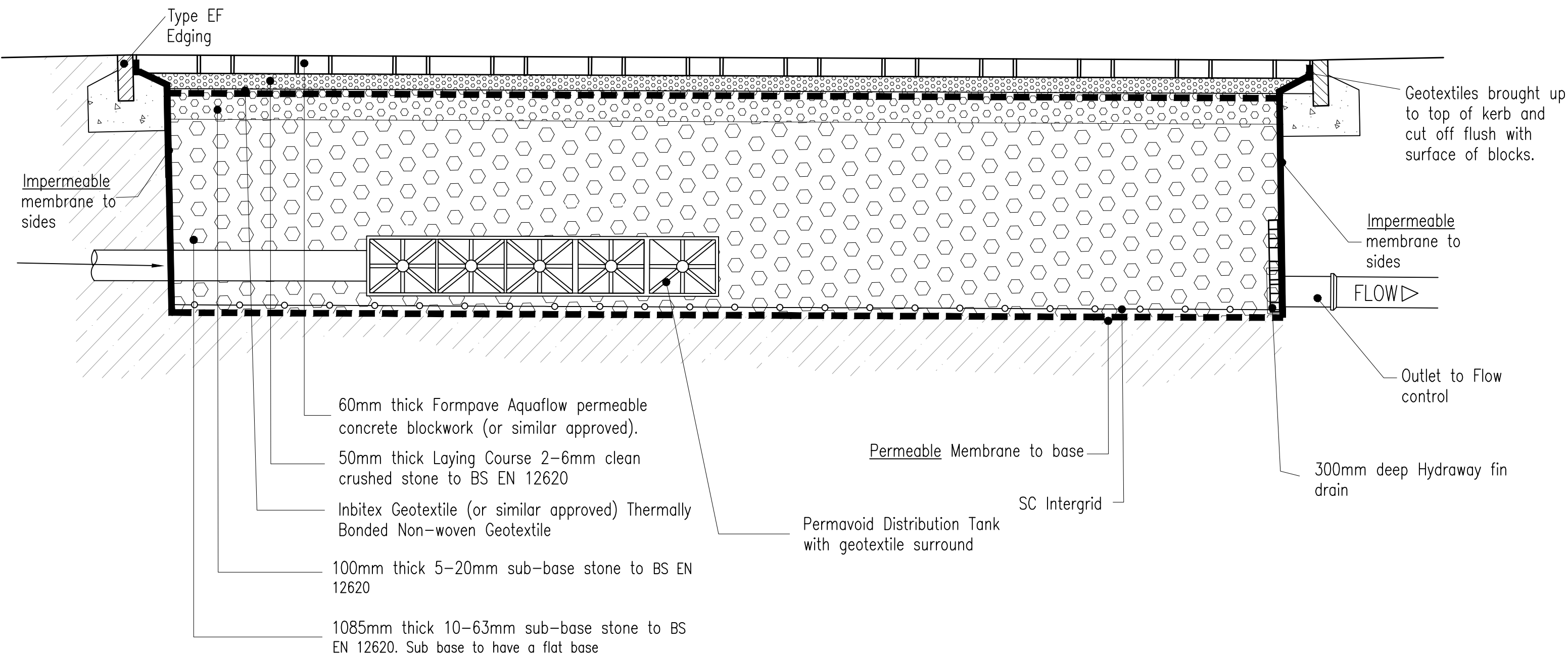
## Trench Backfill Material

Where pipe trenches lie beneath road, footway and parking areas trench backfill material shall be type 1 up to formation level.

Trench backfill material, whether selected from locally excavated material or imported, shall consist of uniform, readily compactable material, free from vegetable matter, building rubbish and frozen material, or materials susceptible to spontaneous combustion, and excluding clay of liquid limit greater than 80 and/or plastic limit greater than 55 and materials of excessively high moisture content. Clay lumps and stones shall be retained on 75mm and 37.5mm sieves



## Permeable Driveway Flow Control Outlet Manhole Detail Scale NTS



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Client

Eye Construction Ltd

Job Title

51A The Drive  
Ickenham  
Hillingdon

Drawing Title

Proposed Surface Water Drainage Details

Drawing Status

FOR COMMENT FOR PLANNING FOR TENDER FOR APPROVAL FOR CONSTRUCTION AS BUILT

"CONSTRUCTION AT CLIENT / CONTRACTOR RISK"

Designed by: SS Drawn by: SS Checked by: DF

Date: September 2021 Scale: NTS @ A1

Dwg. No. 8036/502 Rev. -



[illegible]



# Falling Head Permeability Test - WS1 Test 1

## Field Data

| Time | Time Elapsed minutes | Depth of Water Below Casing ( $d_t$ ) | $h_t = (d_1 - d_t)$ | $\frac{h_t}{h_0}$ |
|------|----------------------|---------------------------------------|---------------------|-------------------|
|      | 0                    | 0.00                                  | 5.000               | 1.000             |
|      | 0.5                  | 0.05                                  | 4.950               | 0.990             |
|      | 1                    | 0.09                                  | 4.910               | 0.982             |
|      | 2                    | 0.15                                  | 4.850               | 0.970             |
|      | 5                    | 0.19                                  | 4.810               | 0.962             |
|      | 12                   | 0.19                                  | 4.810               | 0.962             |
|      | 46                   | 0.19                                  | 4.810               | 0.962             |
|      | 89                   | 0.19                                  | 4.810               | 0.962             |
|      | 103                  | 0.19                                  | 4.810               | 0.962             |

Linear extrapolated value

Borehole: WS1

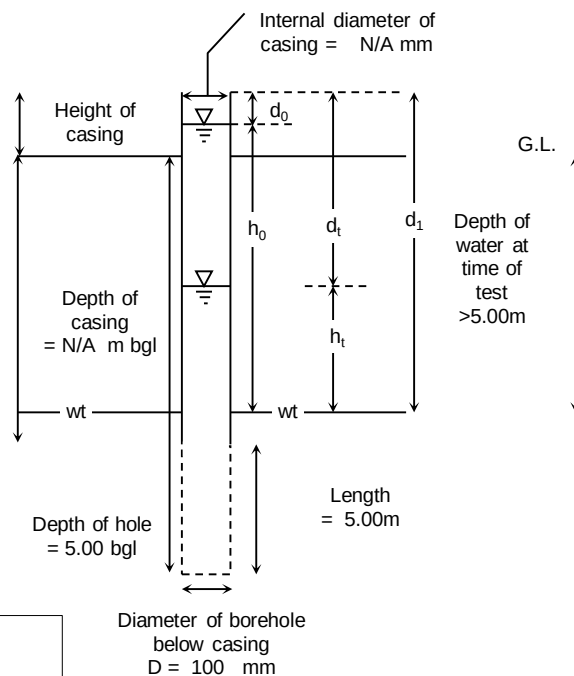
Test: 1

Weather: Sunny and warm

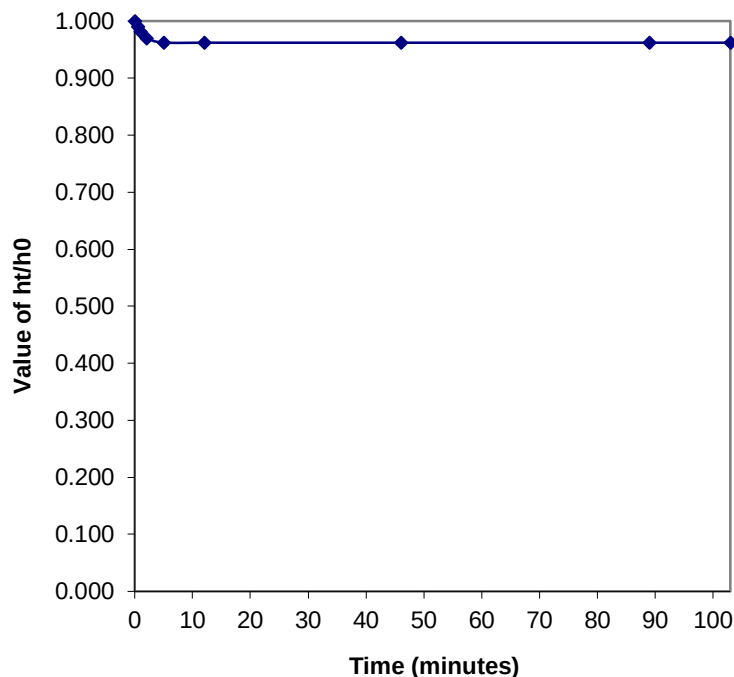
Engineer: SF

Date: 09/06/2021

Strata Tested London Clay Formation



DRAFT



## Calculations

$$K = \frac{A}{FT}$$

Where :

$$A = \pi(r^2) = 0.008$$

$$F = 2.75$$

$$T = \text{N/A min} \quad \text{N/A}$$

(based upon  $h_t/h_0 = 0.370$ )

Therefore :

$$K = \frac{A}{FT} = \frac{0.008}{2.75 \times 1400}$$

<<<10<sup>-7</sup> Insufficient infiltration in 103 minutes.

ms-1