

DRAINAGE REPORT



Project: Land at Tally Ho Cottage, Bledington

| | | | | | | |
|----------|----------|-------------|-------------|--------------|-------|-----|
| Made by: | Date: | Project No: | Checked by: | Approved by: | Pages | Rev |
| M Taylor | 20/09/23 | 23109 | | MT | 3 | A |

| Item | Details and Design Rationale | References and output |
|--|--|---|
| Method of surface water discharge | <p>It is proposed to build two new detached dwellings in land at Tally Ho Cottage, Bledington.</p> <p>Surface water flows from new developments should be dealt with in the following order of preference:</p> <ol style="list-style-type: none">1. Soakaways (infiltration drainage),2. Discharge to a water course,3. Discharge to a sewer. <p>In line with this protocol an infiltration tests was carried out at the site to BRE365 on 15th September 2023. Infiltration rates were found to be low, but within the useable range.</p> <p>The infiltration test pit was 1000mmx450mmx500mm deep to represent the infiltration structure which is proposed; Infiltration Blanket below permeable paving.</p> <p>Currently the area serves as garden to Tally Ho Cottage, and drains at the greenfield rate.</p> <p>The bellmouth entrance will be constructed in a permeable tarmac system, and will be self draining.</p> <p>Each dwelling will discharge roof water to an infiltration blanket below its permeable driveway. The systems have been designed to accommodate rainfall events well in excess of the 100 year storm plus a 40% allowance for future climate change.</p> <p>All surface water run-off will be dealt with within the site and the area will continue to discharge at greenfield rates after development.</p> | <p>Building Control Hierarchy</p> <p>Infiltration Rate: 8.9×10^{-6} m/s</p> |

| Calculations: Soakaway Design | | RESULTS |
|--|--|--|
| | <p>Contributing Areas</p> <p>PLOT 1</p> <p>House roof = 119.5m²</p> <p>Permeable pavement = 156.0m²</p> <p>TOTAL = 275.5m²</p> <p>Soakaway Dimensions = 9.4m x 16.6m x 0.58m</p> <p>PLOT 2</p> <p>House roof = 119.5m²</p> <p>Permeable pavement = 142.0m²</p> <p>TOTAL = 261.5m²</p> <p>Soakaway Dimensions = 9.0m x 15.8m x 0.58m</p> <p>Storage Void Ratio = 30% (Granular Sub-base)</p> <p><u>Variables</u></p> <p>Infiltration Rate = 8.9×10^{-6} m/s</p> <p>r (rainfall ratio) = 0.4</p> <p>Cv (coefficient of Volumetric Run-off) = 1</p> <p>System has been checked against the 100 year storm event plus 40% for climate change.</p> <p>Infiltration through the bases is reduced by 50% to account for future silting of the system.</p> <p>Due to the natural topography of the site exceedance flows will be contained within the site boundary and cannot run-off to the public highway as is the norm. The utilisation factor has been limited to 0.50, effectively doubling the capacity of the infiltration blankets, and designed to function far beyond the 100 year storm event. Exceedance is further discussed below.</p> <p>The areas of green roof will significantly attenuate flows and allow time for transpiration of water through the plants. This benefit is difficult to quantify, and will be less significant after periods of prolonged wet weather, so it has been ignored in these calculations, giving a conservative approach to the design.</p> <p>Soakaway design spreadsheets, to BRE Digest 365, are attached to this note.</p> | <p>100yr + 40% Utilisation Factor =0.47 <1 – OK</p> <p>Half Drain Time =4.54 hrs < 24 - OK</p> <p>100yr + 40% Utilisation Factor =0.50 <1 – OK</p> <p>Half Drain Time =4.51 hrs < 24 - OK</p> |

| | | |
|---------------------------------------|--|---|
| Groundwater clearance | <p>Soakaways should also be designed to ensure a minimum of 1m of undisturbed ground is provided between the formation level and ground water level.</p> <p>A borehole was drilled about 200m meters to the west (ref SP22 SW23) which records groundwater at a depth of 123 ft (37.5m), this indicates a clearance of over 35m for the soakaway. A Copy of the record is attached.</p> | <p>Minimum groundwater clearance > 1m - OK</p> |
| Exceedance | <p>In any surface water design scenario it is possible that the peak design storm could be exceeded or the system could fail through damage or blockage. The exceedance flow route indicates how water will behave in this event, and must ensure that it is controlled safely, avoiding risk to property or persons.</p> <p>The site is sandwiched between two roads and sits lower than both, so all exceedance will be contained within the site.</p> <p>The infiltration blankets have been designed to a utilisation factor of 0.50, meaning that exceedance will not occur until storm events far greater than the 100 year storm (+ climate change).</p> <p>Ground levels in the gardens of each house will be lowered to provide areas, away from the dwellings, other nearby buildings and their access routes, where exceedance flows can be stored safely above ground. This will create a storage volume of around 60m³, effectively doubling the storage volume of the surface water system.</p> <p>Given the constraints of the site and adjacent land this is the only available safe exceedance plan.</p> | |
| Method of foul water discharge | <p>There is a 150mm diameter public sewer running north along Old Burford Road past the front of the site. The sewer is only about 1.2m deep, with an invert level at about 114.5m AOD.</p> <p>The proposed finished floor level for the houses is lower than the sewer invert level and it will, therefore, be necessary to provide a domestic pumping station to serve each property.</p> <p>The pumping stations will discharge to a common chamber and connect from there, under gravity to the public sewer, under a Section 106 'Consent to Connect' agreement with the Water Authority.</p> | |

Enclosures:
BRE 365 Soakaway Test Log & Design Spreadsheets,
Borehole Record (for Groundwater)
Public Sewer Record
Drawing – Drainage Layout & Details – 23109 / 01

Flow Drainage Design

info@flowdrainagedesign.co.uk
Tel: 07837685280

Tally Ho Cottage

Revision

Job No: **23109**

Page: **C/01**

Section: **PLOT 2 - Permeable Paving**

Prepared By: **MT**

Date: **06/12/2023**

SUMMARY OF CALCULATIONS

| | | |
|--|-------------|------------|
| critical design rainfall duration ' t_{crit} ' = | 120 | min |
| required storage volume ' V_{req} ' = | 12.77 | m^3 |
| provided storage volume ' V_{prov} ' = | 27.15 | m^3 |
| utilisation factor = | 0.47 | .OK |
| required time to discharge 50% ' t_{50} ' = | 4.54 | hours |
| utilisation factor = | 0.19 | .OK |

GENERAL DATA

site location: **England and Wales**
soakaway type: **infilled pit or trench**

| | |
|--|--------------|
| impermeable area drained to soakaway ' A ' [m^2] = | 275.5 |
| 60 min rainfall depth of 5 year return period ' R ' [mm] = | 20 |
| M5-60 to M5-2d rainfall ratio ' r ' = | 0.40 |
| allowance for climate change: | 40% |

SOAKAWAY DATA

soakaway width ' W ' [m] = **9.40**
soakaway length ' L ' [m] = **16.60**

| | |
|---|-------------|
| total depth from ground level ' D_b ' [m] = | 0.58 |
| depth to drain invert level ' D_d ' [m] = | 0.00 |
| soakaway effective depth ' D_{eff} ' [m] = | 0.58 |
| free volume in infill aggregate [%] = | 30 |

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base: **50%**

available on-site infiltration test results:

use soakage trial pit table below

| | |
|--|----------|
| internal surface area of trial pit ' a_{p50} ' [m^2] = | 0.96 |
| storage volume between 75-25% ' V_p ' [m^3] = | 0.08 |
| time for water to fall from 75-25% ' t_p ' [min] = | 153.75 |
| soil infiltration rate ' f ' [m/s] = | 8.92E-06 |

SOAKAGE TRIAL PIT DATA

| | |
|--|-------------|
| soakage trial pit width ' W_t ' [m] = | 0.45 |
| soakage trial pit length ' L_t ' [m] = | 1.00 |
| total depth from ground level ' D_{tb} ' [m] = | 0.50 |
| depth to pipe invert level ' D_{ip} ' [m] = | 0.15 |
| soakage trial pit effective depth ' D_{teff} ' [m] = | 0.35 |
| free volume in infill aggregate [%] = | 100 |

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

| rainfall duration [min] | rainfall factor Z1 | M5-D | | M10-D | | | M30-D | | | M100-D | | | outflow from soakaway [m^3] | required storage [m^3] |
|-------------------------|--------------------|----------------|------|----------------|------------------|------|----------------|------------------|------|----------------|------------------|-------|---------------------------------|----------------------------|
| | | rainfalls [mm] | Z2 | rainfalls [mm] | inflow [m^3] | Z2 | rainfalls [mm] | inflow [m^3] | Z2 | rainfalls [mm] | inflow [m^3] | | | |
| 5 | 0.37 | 7.47 | 1.20 | 12.59 | 3.47 | 1.46 | 15.24 | 4.20 | 1.85 | 19.33 | 5.33 | 0.25 | 5.08 | |
| 10 | 0.52 | 10.47 | 1.22 | 17.90 | 4.93 | 1.49 | 21.88 | 6.03 | 1.92 | 28.10 | 7.74 | 0.50 | 7.24 | |
| 15 | 0.63 | 12.67 | 1.23 | 21.82 | 6.01 | 1.51 | 26.77 | 7.37 | 1.95 | 34.63 | 9.54 | 0.75 | 8.79 | |
| 30 | 0.80 | 16.07 | 1.24 | 27.89 | 7.68 | 1.53 | 34.42 | 9.48 | 2.00 | 44.95 | 12.38 | 1.49 | 10.89 | |
| 60 | 1.00 | 20.00 | 1.24 | 34.72 | 9.57 | 1.54 | 43.21 | 11.91 | 2.03 | 56.84 | 15.66 | 2.99 | 12.67 | |
| 120 | 1.21 | 24.13 | 1.24 | 41.90 | 11.54 | 1.54 | 51.86 | 14.29 | 2.01 | 68.03 | 18.74 | 5.98 | 12.77 | |
| 240 | 1.45 | 28.93 | 1.22 | 49.59 | 13.66 | 1.52 | 61.47 | 16.94 | 1.98 | 80.14 | 22.08 | 11.95 | 10.13 | |
| 360 | 1.60 | 32.07 | 1.21 | 54.49 | 15.01 | 1.50 | 67.51 | 18.60 | 1.95 | 87.70 | 24.16 | 17.93 | 6.23 | |
| 600 | 1.79 | 35.87 | 1.20 | 60.38 | 16.63 | 1.49 | 74.61 | 20.56 | 1.92 | 96.56 | 26.60 | 29.88 | 0.00 | |
| 1440 | 2.24 | 44.80 | 1.18 | 74.03 | 20.40 | 1.44 | 90.58 | 24.96 | 1.85 | 116.13 | 31.99 | 71.71 | 0.00 | |

* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS

| water level measurement N ^o : | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|--|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|----|----|----|----|----|----|
| Soakage | time [min] = | 0 | 2 | 4 | 6 | 8 | 18 | 28 | 48 | 68 | 88 | 108 | 128 | 148 | | | | | | |
| Trial 1 | depth to water [m] = | 0.15 | 0.16 | 0.17 | 0.19 | 0.20 | 0.23 | 0.26 | 0.30 | 0.32 | 0.35 | 0.37 | 0.41 | 0.44 | | | | | | |
| Soakage | time [min] = | 0 | 5 | 10 | 20 | 40 | 60 | 90 | 120 | 150 | 180 | | | | | | | | | |
| Trial 2 | depth to water [m] = | 0.15 | 0.17 | 0.20 | 0.23 | 0.27 | 0.31 | 0.34 | 0.37 | 0.41 | 0.45 | | | | | | | | | |
| Soakage | time [min] = | 0 | 5 | 10 | 20 | 40 | 60 | 90 | 120 | 150 | 180 | 210 | | | | | | | | |
| Trial 3 | depth to water [m] = | 0.15 | 0.16 | 0.18 | 0.20 | 0.24 | 0.28 | 0.32 | 0.35 | 0.38 | 0.40 | 0.43 | | | | | | | | |

Flow Drainage Design

info@flowdrainagedesign.co.uk
Tel: 07837685280

Tally Ho Cottage

Revision

Job No: **23109**

Page: **C/01**

Section: **PLOT 2 - Permeable Paving**

Prepared By: **MT**

Date: **06/12/2023**

SUMMARY OF CALCULATIONS

| | | |
|--|-------------|------------|
| critical design rainfall duration ' t_{crit} ' = | 120 | min |
| required storage volume ' V_{req} ' = | 12.30 | m^3 |
| provided storage volume ' V_{prov} ' = | 24.74 | m^3 |
| utilisation factor = | 0.50 | .OK |
| required time to discharge 50% ' t_{50} ' = | 4.51 | hours |
| utilisation factor = | 0.19 | .OK |

GENERAL DATA

site location: **England and Wales**
soakaway type: **infilled pit or trench**

| | |
|--|--------------|
| impermeable area drained to soakaway ' A ' [m^2] = | 261.5 |
| 60 min rainfall depth of 5 year return period ' R ' [mm] = | 20 |
| M5-60 to M5-2d rainfall ratio ' r ' = | 0.40 |
| allowance for climate change: | 40% |

SOAKAWAY DATA

soakaway width ' W ' [m] = **9.00**
soakaway length ' L ' [m] = **15.80**

| | |
|---|-------------|
| total depth from ground level ' D_b ' [m] = | 0.58 |
| depth to drain invert level ' D_d ' [m] = | 0.00 |
| soakaway effective depth ' D_{eff} ' [m] = | 0.58 |
| free volume in infill aggregate [%] = | 30 |

SOIL INFILTRATION DATA

allowance for infiltration through soakaway base: **50%**

available on-site infiltration test results:

use soakage trial pit table below

| | |
|--|----------|
| internal surface area of trial pit ' a_{p50} ' [m^2] = | 0.96 |
| storage volume between 75-25% ' V_p ' [m^3] = | 0.08 |
| time for water to fall from 75-25% ' t_p ' [min] = | 153.75 |
| soil infiltration rate ' f ' [m/s] = | 8.92E-06 |

SOAKAGE TRIAL PIT DATA

| | |
|--|-------------|
| soakage trial pit width ' W_t ' [m] = | 0.45 |
| soakage trial pit length ' L_t ' [m] = | 1.00 |
| total depth from ground level ' D_{tb} ' [m] = | 0.50 |
| depth to pipe invert level ' D_{ip} ' [m] = | 0.15 |
| soakage trial pit effective depth ' D_{leff} ' [m] = | 0.35 |
| free volume in infill aggregate [%] = | 100 |

NOTE: faces of excavation assumed to be vertical

REQUIRED STORAGE CAPACITY PER RAINFALL DURATION

| rainfall duration [min] | rainfall factor Z1 | M5-D | | M10-D | | | M30-D | | | M100-D | | | outflow from soakaway [m^3] | required storage [m^3] |
|-------------------------|--------------------|----------------|------|----------------|------------------|------|----------------|------------------|------|----------------|------------------|-------|---------------------------------|----------------------------|
| | | rainfalls [mm] | Z2 | rainfalls [mm] | inflow [m^3] | Z2 | rainfalls [mm] | inflow [m^3] | Z2 | rainfalls [mm] | inflow [m^3] | | | |
| 5 | 0.37 | 7.47 | 1.20 | 12.59 | 3.29 | 1.46 | 15.24 | 3.99 | 1.85 | 19.33 | 5.05 | 0.23 | 4.83 | |
| 10 | 0.52 | 10.47 | 1.22 | 17.90 | 4.68 | 1.49 | 21.88 | 5.72 | 1.92 | 28.10 | 7.35 | 0.46 | 6.89 | |
| 15 | 0.63 | 12.67 | 1.23 | 21.82 | 5.71 | 1.51 | 26.77 | 7.00 | 1.95 | 34.63 | 9.06 | 0.69 | 8.37 | |
| 30 | 0.80 | 16.07 | 1.24 | 27.89 | 7.29 | 1.53 | 34.42 | 9.00 | 2.00 | 44.95 | 11.76 | 1.37 | 10.38 | |
| 60 | 1.00 | 20.00 | 1.24 | 34.72 | 9.08 | 1.54 | 43.21 | 11.30 | 2.03 | 56.84 | 14.86 | 2.74 | 12.12 | |
| 120 | 1.21 | 24.13 | 1.24 | 41.90 | 10.96 | 1.54 | 51.86 | 13.56 | 2.01 | 68.03 | 17.79 | 5.49 | 12.30 | |
| 240 | 1.45 | 28.93 | 1.22 | 49.59 | 12.97 | 1.52 | 61.47 | 16.08 | 1.98 | 80.14 | 20.96 | 10.97 | 9.98 | |
| 360 | 1.60 | 32.07 | 1.21 | 54.49 | 14.25 | 1.50 | 67.51 | 17.65 | 1.95 | 87.70 | 22.93 | 16.46 | 6.47 | |
| 600 | 1.79 | 35.87 | 1.20 | 60.38 | 15.79 | 1.49 | 74.61 | 19.51 | 1.92 | 96.56 | 25.25 | 27.44 | 0.00 | |
| 1440 | 2.24 | 44.80 | 1.18 | 74.03 | 19.36 | 1.44 | 90.58 | 23.69 | 1.85 | 116.13 | 30.37 | 65.85 | 0.00 | |

* Z2 is growth factor from M5 rainfalls

SOAKAGE TRIAL PIT INFILTRATION TEST RESULTS

| water level measurement N ^o : | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
|--|----------------------|------|------|------|------|------|------|------|------|------|------|------|------|------|----|----|----|----|----|----|
| Soakage | time [min] = | 0 | 2 | 4 | 6 | 8 | 18 | 28 | 48 | 68 | 88 | 108 | 128 | 148 | | | | | | |
| Trial 1 | depth to water [m] = | 0.15 | 0.16 | 0.17 | 0.19 | 0.20 | 0.23 | 0.26 | 0.30 | 0.32 | 0.35 | 0.37 | 0.41 | 0.44 | | | | | | |
| Soakage | time [min] = | 0 | 5 | 10 | 20 | 40 | 60 | 90 | 120 | 150 | 180 | | | | | | | | | |
| Trial 2 | depth to water [m] = | 0.15 | 0.17 | 0.20 | 0.23 | 0.27 | 0.31 | 0.34 | 0.37 | 0.41 | 0.45 | | | | | | | | | |
| Soakage | time [min] = | 0 | 5 | 10 | 20 | 40 | 60 | 90 | 120 | 150 | 180 | 210 | | | | | | | | |
| Trial 3 | depth to water [m] = | 0.15 | 0.16 | 0.18 | 0.20 | 0.24 | 0.28 | 0.32 | 0.35 | 0.38 | 0.40 | 0.43 | | | | | | | | |



NGRC
BOREHOLE RECORDS
ADJUSTMENT FORM

QUARTER SHEET SP22SW

BH REGISTRATION NUMBER 21-31

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

SP 22/53

218

48

SP 2432 2265

BLEDINGTON.

POINT
INQTS

that

¹ In 1934-5 a boring, 200 ft. deep, was made in Mr. H. Bolter's garden in Bledington village three miles north-north-west of Milton under Wyehood. It is said to be "in clay [Lower Lias] all the way" and two 'springs' ^{and} to have been encountered, the first at 123 ft. and the second at 158 ft. The borehole was lined to 150 ft., the last 20 ft. of tube being perforated. In March, 1935, water was overflowing the top of the tube at the rate of 600 gallons per hour. Analysis ~~is of sample of the water~~ showed the water contained large quantities of sodium chloride (common salt) and sodium sulphate (Glaubers Salt) sufficient to render it unpalatable.

Site marked (17.iii.42) on tracing by F.W. Barnes, who drilled the site. He verified above details, + gives R.W.L. as c. 12' above surface. The boring was made by Lanchbury + Sons, Kingston, Oxon

Lower lias 200 ft
PP BSPM 5/4/82.

Berkley House

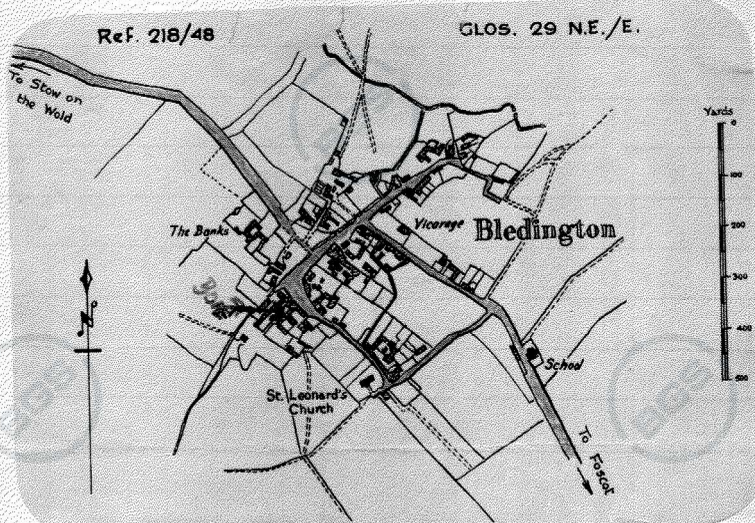
O.D. +356

No. 1 used - overflow & waste.

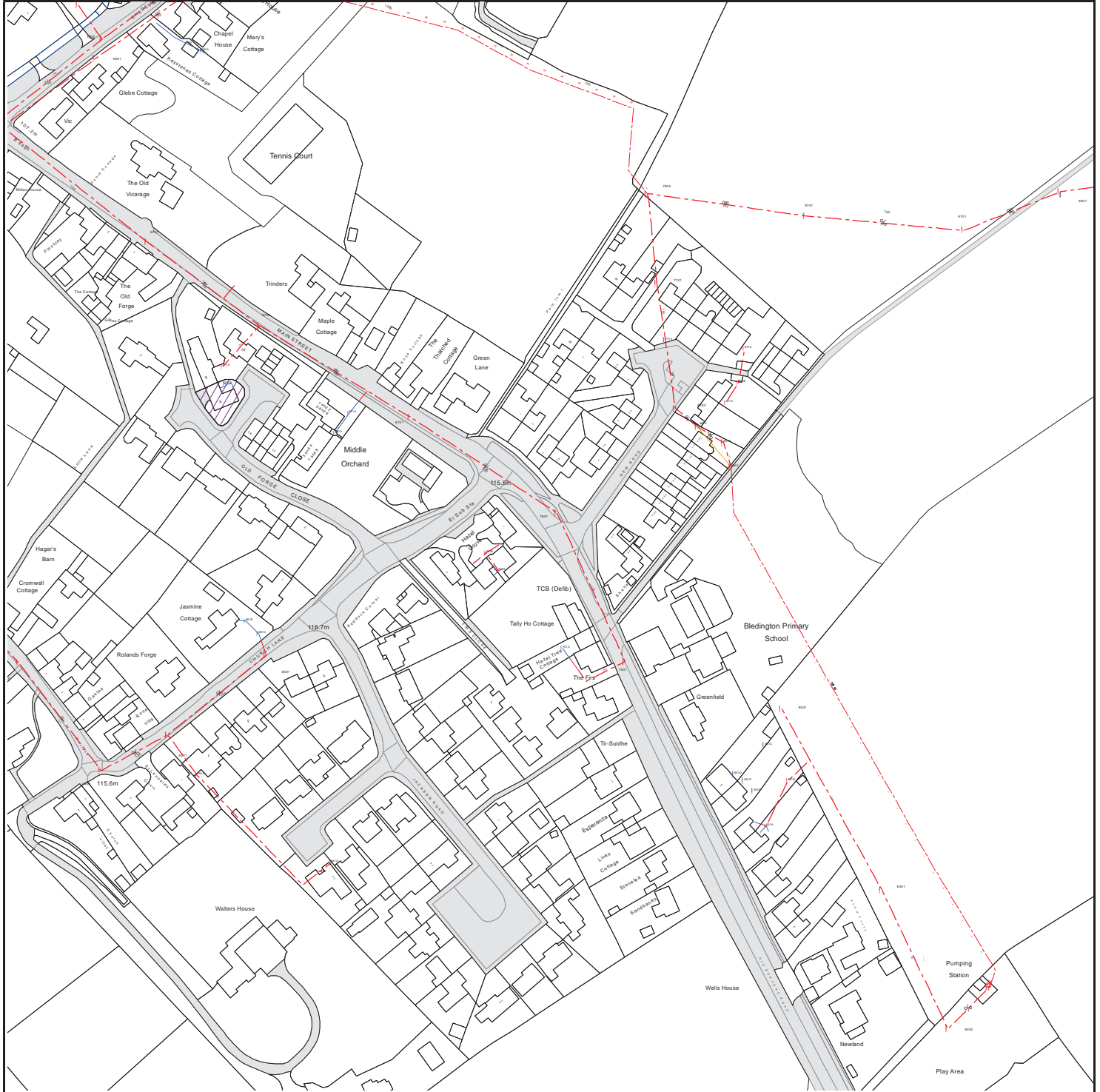
Very soft water but saline & corrosive

Visited & sited on Glos 29 NE-E

29.ii.49



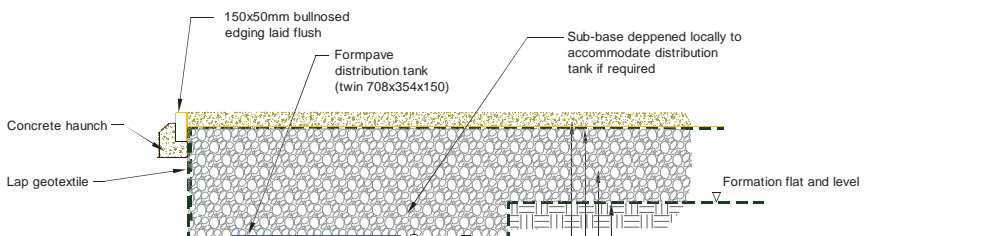
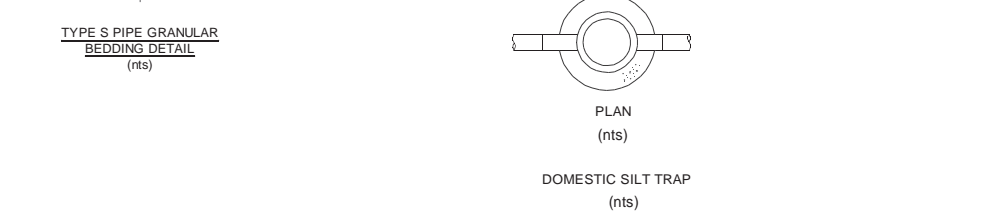
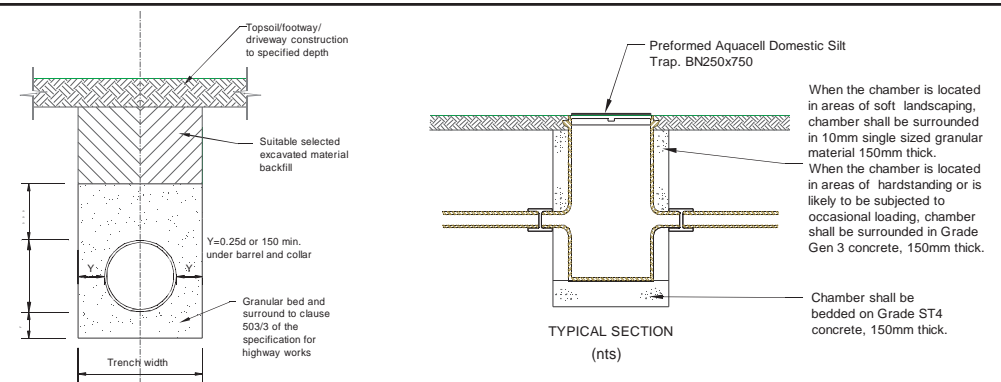
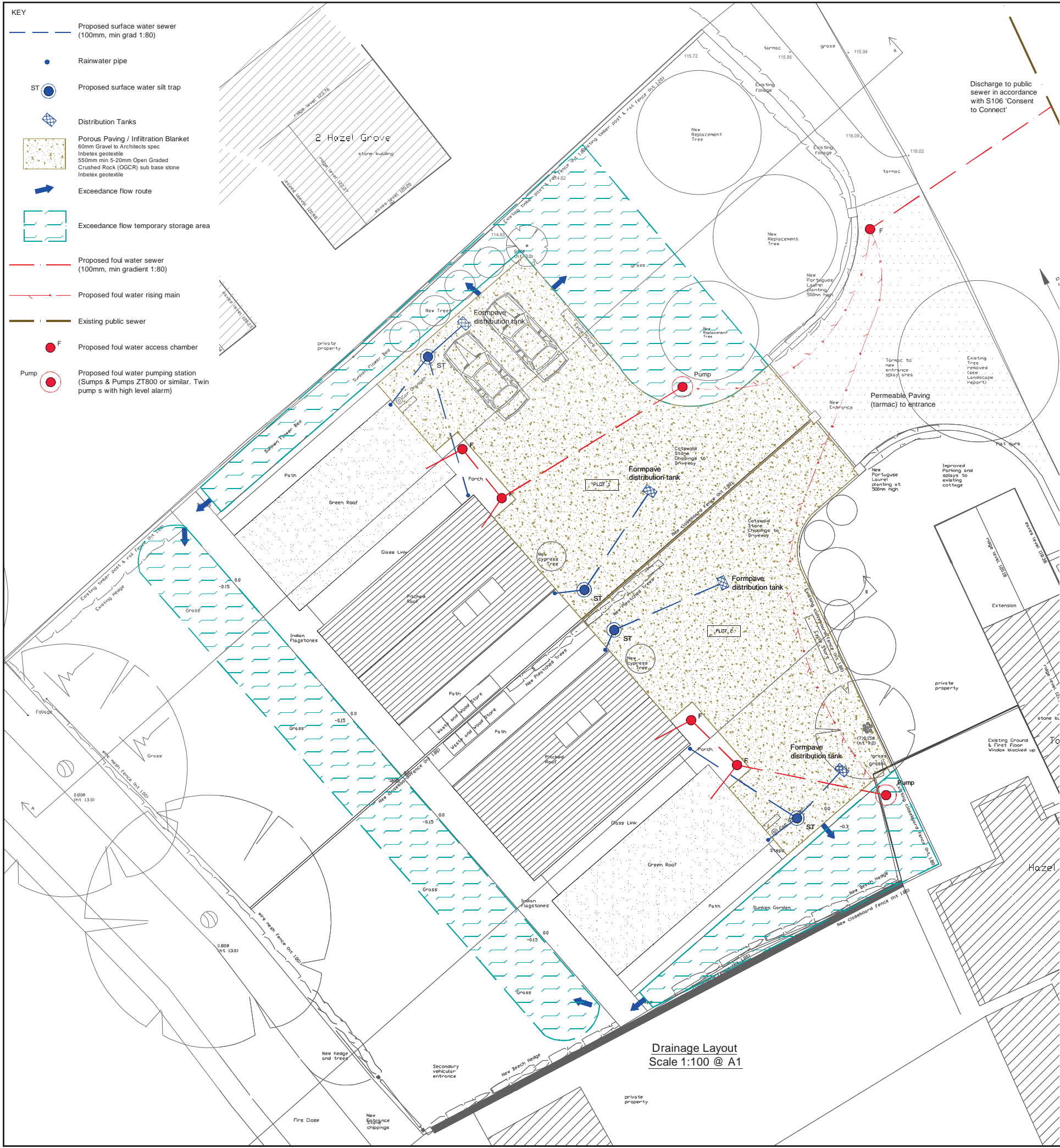
Asset Location Search Sewer Map - ALS/ALS Standard/2023 487715



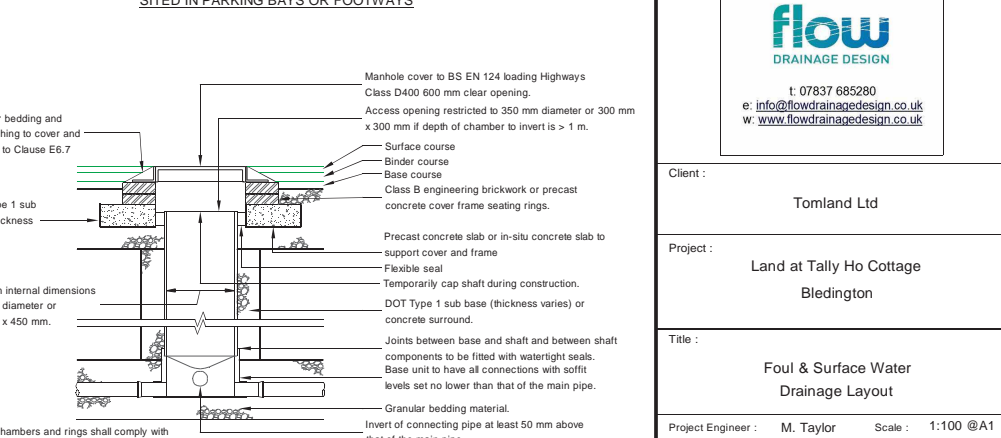
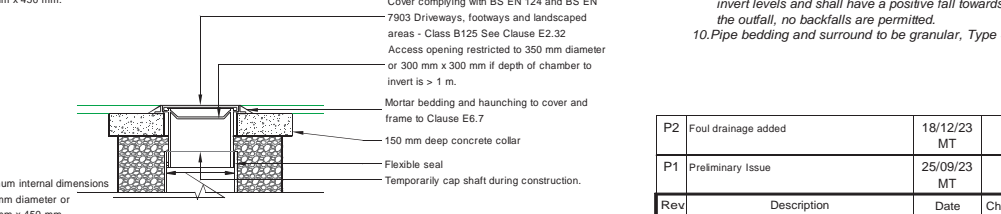
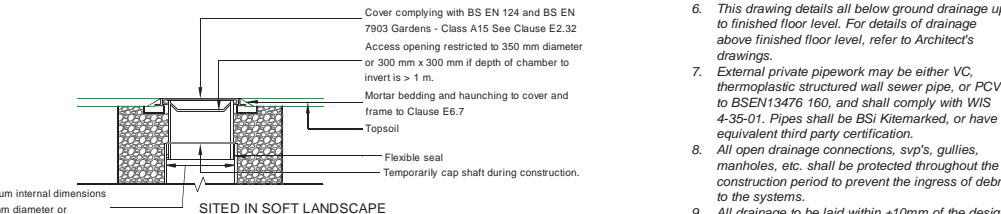
The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 424748,222645

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.

Based on the Ordnance Survey Map (2020) with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.



- NOTES: DRAINAGE**
- This drawing to be read in conjunction with all relevant documents and specifications.
 - Dimensions not to be scaled.
 - The Contractor shall carry out a level check of the existing drainage and confirm the results to the Engineer for confirmation of the design, prior to the laying of any new drainage.
 - Covers & frames to existing chambers to be adjusted to suit new levels.
 - All manhole chamber covers to be installed parallel to final kerbs, edgings, paving joints or building lines.
 - This drawing details all below ground drainage up to finished floor level. For details of drainage above finished floor level, refer to Architect's drawings.
 - External private pipework may be either VC, thermoplastic structured wall sewer pipe, or PCV-U to BSEN13476 160, and shall comply with WIS 4-35-01. Pipes shall be BSi Kitemarked, or have equivalent third party certification.
 - All open drainage connections, sump's, gullies, manholes, etc. shall be protected throughout the construction period to prevent the ingress of debris to the systems.
 - All drainage to be laid within $\pm 10mm$ of the design invert levels and shall have a positive fall towards the outfall, no backfalls are permitted.
 - Pipe bedding and surround to be granular, Type S



| | | | |
|----|---------------------|----------|--|
| P2 | Foul drainage added | 18/12/23 | |
| P1 | Preliminary Issue | 25/09/23 | |

| Rev | Description | Date | Chkd |
|--|-------------|-------------------|------|
| t: 07837 685280 e: info@flowdrainagedesign.co.uk w: www.flowdrainagedesign.co.uk | | | |
| Client : Tomland Ltd | | | |
| Project : Land at Tally Ho Cottage Bledington | | | |
| Title : Foul & Surface Water Drainage Layout | | | |
| Project Engineer : M. Taylor | | Scale : 1:100 @A1 | |
| Project Director : | | Date : Sept 2023 | |
| Status : PRELIMINARY | | | |

| | | | |
|-------------|----------|-----|----|
| Drawing No. | 23109/01 | Rev | P2 |
|-------------|----------|-----|----|