



Proposed Alterations & Extensions at Midlake House Off Hillock Lane, Gresford, LL12 8YL

Foul and Surface Water Drainage Strategy

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Revision History

Rev	Date	Purpose/Status	Comments

1. INTRODUCTION

- 1.1. WARD Associates Consulting Engineers Limited have been commissioned by M J Russell to prepare a Foul and Surface Water Drainage strategy report for a proposed residential development at Midlake House Hillock Lane, Gresford, Wrexham, LL12 8YL.
- 1.2. This report will detail proposals for the disposal of foul and surface water from the site. It will also include surface water calculations. The purpose of this report is to provide sufficient information as required to discharge associated planning conditions on the proposed development site.
- 1.3. This report has been prepared for the sole use of M J Russell. No other third party may rely upon or reproduce the contents of this report without the written approval of WARD Associates (Consulting Engineers) Ltd. If any unauthorised third party comes into the possession of this report, they rely on it entirely at their own risk and WARD do not owe them any Duty of Care or Skill.

2. EXISTING SITE

- 2.1. The existing site is in a residential area of Gresford, is approximately 5km North of Central Wrexham. The site is located at Midlake House Hillock Lane, Gresford, Wrexham, LL12 8YL.
- 2.2. The existing site is occupied by a residential dwelling. A copy of the existing site plan is shown in Appendix A.
- 2.3. The surrounding area is predominantly residential to the North of site and land used for farming to South of the property.
- 2.4. Data for the ground conditions can be sourced from the British Geological Survey (BGS) website, which shows the superficial deposits and bedrock strata at the site, and borehole logs taken at areas near to the development site.
- 2.5. BGS Data identifies the ground at the site to have superficial deposit and bedrock of sands and gravels, with the borehole logs taken approximately 100m south of the site in the fields, and 250m to the west of the site at Bodwyn Crescent, also indicating the ground consists of sands and gravels.
- 2.6. As both the borehole logs are consistent with the strata data, the soakaway trial pits undertaken to the property also found sands and gravels.

2.7. The BGS Natural Environmental Research Council (extract in Figure 1 below) have found that the hydraulic conductivity (infiltration rate) for sands and gravels to be between 5 m/day (0.208 m/hr) to 1000 m/day (41.7 m/hr).

Lithology	Hydraulic conductivity (m/day)
Clay*	5×10^{-7} to 10^{-3}
Loess	10^{-2} to 1
Silt	10^{-3} to 10^{-1}
Sand	10^{-1} to 5×10^2
Gravel	5×10^1 to 5×10^4
Sand and gravel	5 to 10^2
Till	10^{-7} to 5×10^{-1}
Halite	5×10^{-6} to 5×10^{-3}
Limestone, dolomite	5×10^{-6} to 10^0
Karstic limestone	10^{-1} to 10^3
Chalk	Up to 5
Sandstone	5×10^{-5} to 2×10^1
Shale	5×10^{-8} to 10^{-4}
Lignite	10^{-1} to 10
Friable tuff	2×10^{-2} to 2
Welded tuff, ignimbrite	5×10^{-5} to 2×10^{-1}
Dense basalt	10^{-6} to 10^{-3}
Fractured basalt	10^{-4} to 1
Vesicular lava	10^{-4} to 10^{-3}
Lava	Less than 5×10^{-9} to 10^3
Slate	5×10^{-9} to 5×10^{-6}
Schist	10^{-7} to 10^{-4}
Dense crystalline rock	5×10^{-8} to 10^{-5}
Fractured crystalline rock	10^{-3} to 10

Figure 1 – BGS Natural Environmental Research Council – Table 1.1



Figure 2 – Site Location Plan (via. - google maps)

3. PROPOSED DEVELOPMENT

- 3.1. The existing drainage network for the exiting house is to remain unchanged.
- 3.2. The proposed development is a single storey extension onto existing dwelling.
- 3.3. The proposed development layout is shown in Appendix A. Vehicular access is via Hillock Lane.
- 3.4. The proposed extension comprises impermeable areas including:

Single Storey Extension	290 m ²
Total Impermeable Area	290 m²

- 3.5. A copy of the proposed site plan indicating impermeable areas is shown in Appendix B.
- 3.6. Infiltration testing to BRE365 has been undertaken at the location of the proposed soakaway to the rear of the proposed property. A copy of the results and infiltration rate calculations is contained within Appendix C.
- 3.7. The testing recorded a worst-case rate of 6.6×10^{-5} m/s

4. SURFACE WATER DRAINAGE STRATEGY

4.1. SUDS mimic the natural drainage system and provide a method of surface water drainage which can decrease the quantity of water discharged, and hence reduce the risk of flooding. In addition to reducing flood risk, these features can improve water quality and provide biodiversity and amenity benefits.

4.2. The SUDS management train incorporates a hierarchy of techniques and considers all three SUDS criteria of flood reduction, pollution reduction, and landscape and wildlife benefit. In decreasing order of preference, the preferred means of disposal of surface water runoff is:

- Discharge to ground.
- Discharge to a surface water body.
- Discharge to a surface water sewer.
- Discharge to a combined sewer.

4.3. The philosophy of SUDS is to replicate as closely as possible the natural drainage from a site predevelopment and to treat runoff to remove pollutants, resulting in a reduced impact on the receiving watercourses. The benefits of this approach are as follows:

- Reducing runoff rates, thus reducing the flood risk downstream.
- Reducing pollutant concentrations, thus protecting the quality of the receiving water body.
- Groundwater recharge.
- Contributing to the enhanced amenity and aesthetic value of development areas.
- Providing habitats for wildlife in developed areas, and opportunity for biodiversity enhancement.

4.4. The proposed single storey extension is to be added to existing dwelling. Refer to Appendix B for proposed site plan indicating impermeable areas.

4.5. The proposed development comprises impermeable areas including:

Single Storey Extension	290 m ²
Total Impermeable Area	290 m²

4.6. The various SUDS methods need to be considered in relation to site-specific constraints. Several SUDS options are available to reduce or temporarily hold back the discharge of surface water runoff. Table 1 outlines the constraints and opportunities to each of the SUDS devices in accordance with the hierarchical approach outlined in The SUDS Manual CIRIA C697i. It also indicates what could and could not be incorporated within the development, based upon site-specific criteria.

Device	Description	Constraints / Comments	Appropriate
Living roofs (source control)	Provide soft landscaping at roof level which reduces surface water runoff.	Not suitable due to residential use, pitch of roof and maintenance issues.	No
Infiltration devices & Soakaways (source control)	Store runoff and allow water to percolate into the ground via natural infiltration.	Infiltration rate confirmed as suitable.	Yes
Swales (permeable conveyance)	Broad shallow channels that convey / store runoff, and allow infiltration (ground conditions permitting).	Could be incorporated to rear garden areas	Yes
Filter drains & perforated pipes (permeable conveyance)	Trenches filled with granular materials (which are designed to take flows from adjacent impermeable areas) that convey runoff while allowing infiltration.	Infiltration rate confirmed as suitable.	Possibly
Attenuation Underground (end of pipe treatment)	Oversized pipes or geo-cellular tanks designed to store water below ground level.	Unlikely to require underground storage as other options are viable.	No

Table 1 – Assessment of suitable SuDS features

4.7. Based on the table 1 and following the hierarchy for surface water discharge it is proposed to utilise a soakaway to manage surface water runoff from the proposed building.

4.8. Soakaways have been designed to accommodate up to the 1 in 100 year rainfall event with 30% allowance for climate. A copy of the supporting calculations are shown in Appendix D.

4.9. A copy of the proposed surface water drainage layout and construction details is contained within Appendix E.

4.10. To deal with the residual risk of blockage to all onsite drainage features, the homeowner will ensure maintenance of all drainage systems in line with the requirements in Ciria C753 the SuDS Manual.

4.11. All surface water will discharge through a catch pit prior to entering the soakaway.

- 4.12. A copy of the detailed Maintenance Management Plan is shown in Appendix G. This will ensure that over the lifetime of the proposed development the drainage system will be properly maintained to ensure proper functionality. A summary schedule of proposed maintenance is shown below and on the proposed drainage layout in Appendix G.

Maintenance Schedule					
Item	Visual Inspection	Cleanse / De-sludge	CCTV Survey	Responsibility	Comments
Surface Water Drainage System (pipework, chambers etc.)	1 years	10 years	10 years	Building Owner	Cleansing to be carried as necessary
Gullies / Channels / Rainwater Stacks	Monthly	1 years	N/A	Building Owner	Cleansing to be carried as necessary
Soakaway	Yearly	Yearly	5 years	Building Owner	Cleansing to be carried as necessary in lie with manufacturers recommendations
Catch Pit	Monthly	1 years	N/A	Building Owner	Maintenance in accordance with manufacturer's instructions
Foul Packaged Treatment plant	Monthly	Following any blockage event	N/A	Building Owner	Maintenance in accordance with manufacturer's instructions
Swimming Pool	N/A	Empty - as required	N/A	Building Owner	Water to be de-chlorinated prior to discharge into drainage system. Discharge only in dry weather periods.
Foul Drainage System (pipework, chambers etc.)	1 year	10 years	10 years	Building Owner	Cleansing to be carried as necessary

- 4.13. It is recommended that the soakaway and catch pits are constructed early in the construction project to provide a drainage point for any surface water arising during construction.

5. EFFECTS OF DEVELOPMENT ON OTHER SITES

- 5.1. The proposed solution will be designed to ensure all surface water from rainfall events up to 1 in 100 years with 30% allowance for climate change will be retained within the site boundary. The proposed solution will therefore reduce the impact on surrounding sites.
- 5.2. The proposed solution will reduce the surface water discharge from site compared to the existing site.

6. FOUL WATER DRAINAGE STRATEGY

- 6.1. The existing site serves one 5 bed residential dwelling assumed via gravity connection TBC once CCTV survey is completed.
- 6.2. The proposed extension will increase the property to a 6 bed 12 person dwelling. Based on a usage of 150l/p/day this would result in a discharge of 1800l/day.
- 6.3. It is understood the proposed development must limit the discharge from the site to less than 2000l/day.
- 6.4. The proposed extension includes the provision of a swimming pool. To empty the swimming pool the water will discharge via the soakaway. Discharge should only be undertaken following de-chlorination period in dry weather conditions.
- 6.5. Based on the above the discharge to the foul system will be below the required 2000l/day.
- 6.6. The existing waste water treatment plant and drainage field will be upgraded to serve the 12 occupant capacity.

7. CONCLUSIONS AND RECOMMENDATIONS

- 7.1. Based on the results from the intrusive site investigation the use of infiltration devices is considered suitable.
- 7.2. It is proposed to utilise a soakaway to manage surface water runoff from the proposed extension. The soakaway has been designed to accommodate rainfall events up to the 1 in 100 year with 30% allowance for climate. A copy of the supporting calculations is shown in Appendix D.
- 7.3. A copy of the proposed surface water drainage layout and construction details is contained within Appendix E.
- 7.4. The proposed surface water drainage solution should be approved by the local authority prior to commencing any drainage works on site.
- 7.5. It is proposed the existing foul water Treatment plant and drainage field to be upgraded to serve 12 occupants.
- 7.6. The proposed foul discharge should be agreed with the local authority prior to commencing works on site.

APPENDIX G

SURFACE WATER MAINTENANCE MANAGEMENT PLAN

SuDS MAINTENANCE MANAGEMENT PLAN

This document sets out the principles for the long-term management and maintenance of the proposed surface water Sustainable Drainage Systems (SuDS) installed at the residential property at Midlake House off Hillock Lane, Gresford, Wrexham, LL12 8YL.

The purpose of this document is to ensure that the building owner is entrusted with a robust inspection and maintenance programme, ensuring the optimum operation of the surface water drainage network is continually maintained for the lifetime of the development and to prevent the increased risk of flooding both on and off site.

As a private development all SuDS systems will be the responsibility of the building owner to maintain.

SUDS are engineered solutions that aim to mimic natural drainage processes. They help to reduce pollution of watercourses and localised flooding, as well as providing amenity benefit and biodiversity.

Key Factors to be considered during maintenance

- Undesirable plants – all efforts should be made to prevent drains becoming blocked and the growth of unintentional vegetation which could be detrimental to the intentional plant regime, biodiversity aims and the building fabric.
- Regular site attendance for litter collection, grass cutting and checking of inlets, outlets and control structures.
- Occasional visits to brush clean inlet gullies and drainage channels, remove silt from source control features.
- Drain heads and outlets – all drainage points must be checked every year and cleared out if necessary to ensure optimum performance.

The maintenance of all drainage features serving the development will be maintained by the building owner. Ongoing maintenance activities for this infrastructure are detailed below.

All those responsible for the maintenance operations should adhere to the relevant health and safety legislation for the activities listed within this report (including lone working, if relevant). Method statements and risk assessments should always be completed prior to the undertaking of any works.

Soakaway

The ongoing maintenance activities for below ground cellular storage crates are detailed below.

Soakaway	
Regular Maintenance	Frequency
Inspection - Record and clean as required	Monthly
Litter and debris removal	Monthly
Occasional Tasks	Frequency
CCTV survey is blockages identified, jet clean as required. In line with manufacturers recommendations	As required
Remedial Work	Frequency
Jet clean as required. In line with manufacturers recommendations	As required

Catch Pit

The ongoing maintenance activities for the petrol and silt interceptor should be in line with manufacturer recommendations. A summary of the typical expected requirements is detailed below.

Catch Pit	
Regular Maintenance	Frequency
Inspection - Record and empty/clean as required	Monthly
Litter and debris removal	Monthly
Testing alarm system	Annually
Occasional Tasks	Frequency
Service - in line with manufacturers recommendations	As required in line with manufacturers recommendations
Remedial Work	Frequency
Jet clean as required. In line with manufacturers recommendations	As required in line with manufacturers recommendations
Pump replacement/service as required	As required in line with manufacturers recommendations

Conventional Surface Water Drainage Features

The maintenance of all drainage features serving the development will be maintained by the building owner. Ongoing maintenance activities for this infrastructure are detailed below.

Maintenance Activity	Action	Frequency
Check gully pots, linear drainage channels and catchpits	Check, clean and empty gully pots and catchpits as required to remove debris and sediment	Regular - Monthly
Check manholes and inspection chambers	Inspect manholes and inspection chambers for any signs of blockages. Clean, jet and empty as required	Regular - Annually
CCTV survey and jetting of drains	Check the integrity of drains, jet and clean as required. Remove collected debris as required	As necessary Every 5 years
Hydrobrake chambers / Vortex Flow Control – visual inspection	Check and remove any silt build up or blockages in accordance with the Manufacturers recommendations	Typically, annually or as required

Swimming Pool

The maintenance of the swimming pool will be the responsibility of the building owner. The Swimming Pool discharge is via soakaway. No swimming pool water should discharge from the building until water has been de-chlorinated. Water should be tested prior to discharge. Discharge to be undertake in periods of dry weather.

Maintenance Activity	Action	Frequency
Emptying Swimming Pool	De-chlorinate water. Water must be de-chlorinated prior to discharge into drainage network.	As required – only in dry Weather

Records

A service log will be maintained which will include details of all scheduled maintenance required. Logs will be incorporated that record when checks were carried out and whether any actions are deemed necessary. If actions are required, a breakdown of the maintenance measures undertaken or in progress will be logged along with the date when the action was or is to be scheduled.

Records will be maintained by the management company for a minimum period of 5 years.