

Report Title**Drainage Strategy****Property Address**

Plots 1 and 2
Land Adj 15 Gilgarran Park
Gilgarren
Workington

Client

Mr Kevin Wirga

Our Reference

20-321r004B

Date

OCTOBER 2020

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Introduction

The purpose of this report is to provide support for a planning application associated with the construction of two residential dwellings on land adjacent to 15 Gilgarran Park, Gilgarran, Workington.

Research has been undertaken on the site and observations made regarding the existing site and the drainage servicing the site.

Calculations associated with the drainage have been performed by software packages from a recognised resource. Where appropriate copies of calculations are provided in the Appendices of this report.

The Site

Historic Usage

The proposed residential dwellings are located in a small field adjacent to Gilgarran Park, Workington. The land has historically been used as a scrub woodland and the cultivation of trees.

Existing Sewer Network

The site is not serviced by a public sewer and the nearest sewer is approx 500m from the site.

Existing Site Drainage

The existing drainage across the site has been inspected and principally the site drains to the western boundary

Drawing 20-321 DWG001 indicates the existing drainage.

Development Proposals

It is proposed to develop the site for two detached dwellings with large open plots. Plot 1 shall have a detached garage.

The development is presented on drawings 20-321 DWG001.

The development also includes :

- Foul water drainage
- Surface water attenuation and discharge from the impermeable surface of the development.

Drainage Strategy

Foul Drainage

It is proposed that a new foul drainage system shall be installed on the site and discharge to an engineered soakaway system. The mains sewer network is outwith an economical distance for connection.

A detailed foul drainage scheme associated with use of the existing outfalls is presented in later sections of this report.

Surface Water Drainage

Outline Strategy

It is proposed to discharge to ground within the properties of the site.

Following a review of the site conditions and tests undertaken (Percolation Tests), there are limited areas of cohesive materials on the site and areas where there is an abundance of silty gravels. The final location and design of surface water drainage shall be determined on site strip and inspection.

Test results are presented in the Appendices of this report.

Sustainable Urban Drainage Systems (SUDS)

A SUDS report has been obtained from UKSUDS. The process evaluates the historic usages on site, the arrangements available for discharge and provides guidance regarding potential solutions. A copy of the report is appended to this report.

The following recommendations are considered appropriate for the site :

Rainwater Harvesting - Considered suitable for use on site from rooves. Harvested rainwater may be suitable for use in toilet flushing.

Permeable Paving - Suitable for parking areas, and would allow storage within the depth of the paving prior to discharge to the surface water system.

Sub Surface Storage - Suitable on site with appropriate management arrangements for maintenance.

Rooves

It is proposed that the rooves discharge to the surface water network installed on the site. Calculations for the roof areas of each plot entering the surface water network shall be calculated and used in a detailed model to be produced for the site.

All roof drainage and arrangements shall be constructed in accordance with the Building Regulations.

Parking and Paved Surfaces

It is proposed that paved surfaces on the site including parking areas, footways and roads shall have formal drainage present and discharge via the surface water network. An overall reduction in the areas of paved surfaces from the present areas of the site shall be achieved with incorporation of amenity areas on the site.

Gardens

It is proposed that amenity areas on the site shall be created including planting and landscaping.

These areas replace former areas of hardstanding or at locations of buildings. It is proposed that these areas will discharge naturally to the underlying ground conditions.

Hydraulic Design

Foul Drainage

A detailed hydraulic design has been conducted utilising the proposed layouts for the

development. Loads from the proposed residential dwelling is calculated based on the requirements published in Sewers for Adoption 7th Edition.

A total of 150 litres per person per day is considered for the dwellings. This is a design peak flow rate not a daily average water usage, and represents the peak flow rate from a number of appliances. Reducing daily water usage does not necessarily reduce the peak flow rate.

The foul drainage has been modelled in Causeway Flow adopting the standards published in Sewers for Adoption 7th Edition.

Drawing 20-321 DWG001 indicates the proposed arrangements for foul water on the site.

Surface Water Drainage

Principally the surface water drainage has been calculated on the impermeable areas of the site, including roofs, hard surfacing, parking areas and roads. Areas are subdivided into zones and drainage runs, manholes and drains to allow each area to discharge into the system.

Modelling has been conducted on the following rainfall events:

- 1 in 1 year
- 1 in 30 years
- 1 in 100 years plus 40 % increase due to climate change over a 6 hour period

An assessment of the proposed network has been undertaken to identify the requirements of each property and requirements for the soakaway.

The following parameters were adopted in the analysis.

Soil Type	4
SPR	0.3
SAAR (mm)	1241
Hydrological Region	10
M5-60	17

Drawing 20-321 DWG001 indicates the proposed drainage layout for the site, with references made to the manholes and drainage network as modelled. The following summary is offered in relation to the discharge from the site based on the modelled rainfall events.

Detailed Engineering

The detailed model presented in this report adopts the following engineering aspects specific to the site. All arrangements are presented in drawing 20-321 DWG001.

Attenuation

Not considered for the site

Hydrobrakes

Not considered for the site

Outfalls

Not considered for the site

Soakways

Soakaways have been calculated for the use on the site.

Maintenance of Drainage

Operation and Maintenance Requirements

As with all traditional drainage systems, SuDS need to be inspected and maintained regularly to ensure that they operate correctly and efficiently. If SuDS are not properly maintained then there is a risk that the systems will become overloaded during periods of prolonged heavy rainfall, potentially resulting in localised flooding of the development. Recommendations for the SuDS maintenance activities for the privately maintained areas are detailed below.

All maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken in accordance with CDM regulations.

Inlets, Outlets, Controls and Inspection Chambers

- Inlets and outlets structures may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.
- SuDS flow control structures can be protected orifices, slots weirs or other controls at or near the surface to be accessible and easy to maintain. They may be in baskets, in small chambers or in the open.
- Inspection Chambers and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

Inlets, Outlets, Controls and Inspection Chambers	Frequency
Regular Maintenance <ul style="list-style-type: none">• Inspect surface structures removing obstructions and silt as necessary.• Check there is no physical damage.• Strim vegetation 1m min. surround structures and keep hard aprons free from silt and debris.• Remove cover and inspect ensuring water is flowing freely and	Monthly

<p>that the exit route for water is unobstructed.</p> <ul style="list-style-type: none"> • Remove debris and silt. • Undertake inspection after leaf fall in autumn 	
<p>Occasional Tasks</p> <p>Check topsoil levels are 20mm above edges of manholes and chambers to avoid mower damage</p>	Annual
<p>Remedial Works</p> <p>Monitor effectiveness of system and advise / inspect / clean and test if water is standing in system. This may require specialist cleaning.</p>	As Required

Appendices

Trial Pit Records and Percolation Tests

Additional notes: Unable to progress below 0.70m

Trial pit reference TP2				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	100.00			
	99.80	X X X X X X X X	(0.20) 0.20	TOPSOIL AND TURFS
	99.55	- : - : - : : - : - : - - : - : - : : - : - : - - : - : - :	(0.25) 0.45	Soft to firm red brown sandy CLAY with some to many sub angular gravels
	98.65	- : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - :	(0.90) 1.35	Firm brown grey mottled sandy CLAY with many sub angular gravels
				Trial pit ends
Not shown to scale				
Additional notes:				

Trial pit reference TP2a				Sheet 1 of 1
Water	Reduced Level (m)	Legend	Depth (m)	Description
	100.00			
	99.80	X X X X X X X X	(0.20) 0.20	TOPSOIL AND TURFS
	99.55	- : - : - : : - : - : - - : - : - : : - : - : - - : - : - :	(0.25) 0.45	Soft to firm red brown sandy CLAY with some to many sub angular gravels
	98.90	- : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - : : - : - : - - : - : - :	(0.65) 1.10	Firm brown grey mottled sandy CLAY with many sub angular gravels
				Trial pit ends
Not shown to scale				
Additional notes:				

[illegible]

PERCOLATION TESTS



Project : Plot 1

Project No : 20-321

Test Date : 29/9/20

Weather : Damp following period of wet weather.

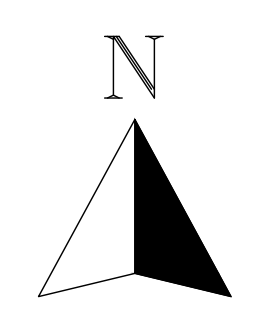
Equipment

Machine Dug

600 mm

[illegible]

Drawings



KEY

- EXISTING FOUL
- PROPOSED SITE FOUL
- PROPOSED SITE SURFACE
- SOAKAWAY

BASIS OF DESIGN - DRAINAGE	
1. DESIGN HAS BEEN CONDUCTED IN CAUSEWAY FLOW AND IS BASED ON THE REQUIREMENTS OF SEWERS FOR ADOPTION 7TH EDITION.	
2. SITE PARAMETERS GENERATED ON SITE BASIS FROM UKSUDS.COM	
3. FOLLOWING DESIGN PARAMETERS ARE CONSIDERED :	
SITE AREA	2330m2
M5-50	17
r	0.3
HYDRO REGION	10
SAAR	1241
SPR	0.47
QBAR	2.5 l/s

PLAN
SCALE 1:150

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CLIENT

PROJECT

NEW DWELLINGS, GILGARREN
WORKINGTON, CUMBRIA

TITLE

PLOTS 1 AND 2
DRAINAGE ARRANGEMENTS

SCALE	AS NOTED	STATUS	FOR XXX
PAPER SIZE	A1	DRAWN BY	C AIMERS
PROJECT PHASE	XXX	DATE	OCT 2020
DRAWING NUMBER	20-321-DWG001		REVISION
			A

Calculations

SOAKAWAY SIZES - FOUL



Project : Plot 1 and 2
Project No : 20-321
Date 1/10/20
Description Foul Soakway

No of Properties :

Occupancy	Bedrooms	Occupancy	Volume (litres per day)
Plot 1	4	8	1200
Unit 2		0	0
Unit 3		0	0
Unit 4		0	0
Unit 5		0	0
Unit 6		0	0
Unit 7		0	0
Unit 8		0	0
Unit 9		0	0
Unit 10		0	0
TOTALS		8	1200 litres

Percolation Value (Secs/mm) 4.8 sec / mm

Soakaway Area 9.6 m2

SOAKAWAY LENGTH

with 300mm TRENCH 32 metres
with 600mm TRENCH 16 metres
with 900mm TRENCH 11 metres

Project Gilgarren, Workington				Job no. 20-321	
Calcs for				Start page no./Revision 1	
Calcs by C Aimers	Calcs date 19/10/2020	Checked by	Checked date	Approved by	Approved date

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Tedds calculation version 2.0.04

Design rainfall intensity

Location of catchment area Carlisle
Impermeable area drained to the system $A = 185.0 \text{ m}^2$
Return period Period = 10 yr
Ratio 60 min to 2 day rainfall of 5 yr return period $r = 0.350$
5-year return period rainfall of 60 minutes duration $M5_{60\text{min}} = 17.0 \text{ mm}$
Increase of rainfall intensity due to global warming $p_{\text{climate}} = 40 \%$

Soakaway / infiltration trench details

Soakaway type Rectangular
Minimum depth of pit (below incoming invert) $d = 1200 \text{ mm}$
Width of pit $w = 4000 \text{ mm}$
Length of pit $l = 2500 \text{ mm}$
Percentage free volume $V_{\text{free}} = 40 \%$
Soil infiltration rate $f = 42.1 \times 10^{-6} \text{ m/s}$
Wetted area of pit 50% full $a_{s50} = l * d + w * d = 7800000 \text{ mm}^2$

Table equations

Inflow (cl.3.3.1) $I = M10 * A$
Outflow (cl.3.3.2) $O = a_{s50} * f * D$
Storage (cl.3.3.3) $S = I - O$

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	10 year rainfall, M10 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.36;	8.5;	1.21;	10.3;	1.90;	0.10;	1.80
10	0.51;	12.1;	1.23;	14.8;	2.74;	0.20;	2.54
15	0.62;	14.7;	1.24;	18.2;	3.36;	0.30;	3.07
30	0.79;	18.7;	1.24;	23.2;	4.29;	0.59;	3.70
60	1.00;	23.8;	1.24;	29.5;	5.46;	1.18;	4.28
120	1.22;	29.1;	1.22;	35.6;	6.59;	2.36;	4.23
240	1.50;	35.6;	1.20;	42.9;	7.93;	4.73;	3.20
360	1.69;	40.2;	1.19;	47.8;	8.85;	7.09;	1.76
600	1.95;	46.3;	1.18;	54.5;	10.09;	11.82;	0.00
1440	2.48;	59.0;	1.16;	68.4;	12.66;	28.37;	0.00

Required storage volume $S_{\text{req}} = 4.28 \text{ m}^3$
Soakaway storage volume $S_{\text{act}} = l * d * w * V_{\text{free}} = 4.80 \text{ m}^3$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume $t_{s50} = S_{\text{req}} * 0.5 / (a_{s50} * f) = 1\text{hr } 48\text{min } 37\text{s}$

PASS - Soakaway discharge time less than or equal to 24 hours