DAFARN NEWYDD, LLANGEFNI, ANGLESEY

DRAINAGE ASSESSMENT
FINAL REPORT V1.4

December 2021

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Report Title	**Dafarn Newydd, Llangefni, Anglesey** Drainage Assessment Final Report v1.4
Client	Anglesey Lodge and Caravan Park Ltd
Date of issue	23 December 2021

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1 INTRODUCTION

1.1 Purpose of Report

Weetwood Services Ltd ('Weetwood') has been instructed by Anglesey Lodge and Caravan Park Ltd to prepare a Drainage Assessment (DA) report to accompany a detailed planning application for the proposed development of land at Dafarn Newydd, located off Penymyndd Road (B5420), Llangefni, Anglesey.

This report provides an overview of the existing surface water drainage arrangements at the site and presents a strategy for managing this following development.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15).

1.2 Structure of the Report

The report is structured as follows:

Section 1 Introduction and report structure
Section 2 Provides background information relating to the development site, the development proposals, ground conditions, existing site access arrangements and the flood zone designation
Section 3 Presents national and local drainage planning policy
Section 4 Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere
Section 5 Presents an illustrative foul water drainage scheme
Section 6 Presents a summary of key findings and the recommendations

2 SITE DETAILS AND PROPOSED DEVELOPMENT

2.1 Site Location

The approximately 3.01 ha site is located on land off Penmynydd Road, Llangefni, Anglesey at Ordnance Survey National Grid Reference SH 474 756, as shown in **Figure 1**.

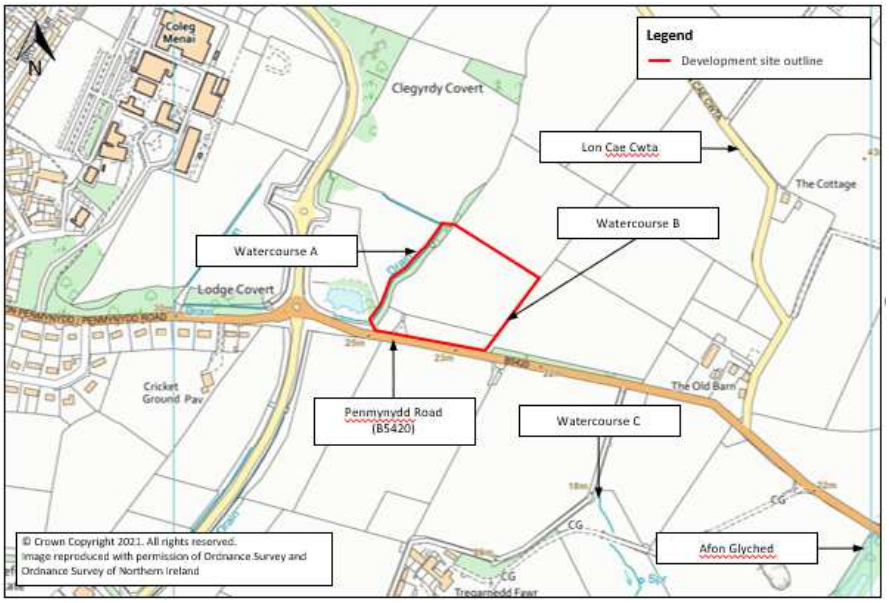

Figure 1: Site Location

2.2 Existing and Proposed Development

The site currently comprises of undeveloped grassland used for agricultural purposes.

The development proposals are for the construction of a new holiday complex comprising 34 static caravans, associated infrastructure and landscaping (**Appendix A**).

TAN15 classifies residential development (including holiday/caravan parks) as Highly Vulnerable to flood risk.

2.3 Waterbodies in the Vicinity of the Site

The locations of waterbodies within the vicinity of the siteare shown in **Figure 1**.

Watercourse A forms the sites western boundary and Watercourse B is located on the eastern boundary of the site whilst Watercourse C is located approximately 170 (m) metres south of the site. Watercourses A, B and C flow in a southerly direction.

Afon Glyched is located approximately 400 m south-east of the site and flows in a southerly direction.

According to Natural Resources Wales Main River Map[1]the Afon Glyched is a main river. Watercourses A, B and C are designated as an ordinary watercourses..

Natural Resources Wales carries out maintenance, improvement and construction work on main rivers to manage flood risk. Lead local flood authorities and district councils carry out flood risk management work on ordinary watercourses.

[1] https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

2.4 Ground Conditions

Soakaway testing (**Appendix B**) was undertaken by Groundsolve Ltd on 22 April 2020. A series of trial pits were positioned across the wider site and dug to a maximum depth of 2.5 m. TP3 was undertaken in the centre of the development site. The findings indicate a thin layer of topsoil overlying glacial till comprising firm becoming stiff, sandy gravelly clay. Three test pits were filled with water and water levels were monitored over a five hour period. The water levels in the pits remained unchanged over the period which indicates that ground conditions are unsuitable for infiltration. No groundwater was encountered in any of the trial pits at the time of the investigation.

2.5 Site Levels

A topographic survey of the site has been undertaken by NRG Engineering Services Ltd and is provided in **Appendix C.** Site levels are generally shown to be in the region of 21.96 to 24.97 metres Above Ordnance Datum (m AOD). The west part of the site drains north/north-east to flat central portion circa 22.70m. Land to the north drains south to centre with lowest part of the site along the eastern boundary. LiDAR data has been used to develop a digital terrain model of the site and surrounding area as illustrated in **Figure 2.**

Figure 2: Digital Terrain Model from LiDAR Data

2.6 Access and Egress

Access and egress to the site is provided via Penmynydd Road which runs parallel to the southern boundary of the site and will be retained post-development.

2.7 Flood Zone Designation

The Development Advice Map (**Figure 3**) indicates that the site is located in zone A. Figure 1 of TAN15 defines three development advice zones as follows:

- Zone A: Considered to be at little or no risk of fluvial or tidal/coastal flooding
- Zone B: Areas known to have been flooded in the past evidenced by sedimentary deposits
- Zone C: Based on [the Natural Resources Wales] flood outline, equal to or greater than 0.1% (river, tidal or coastal). Zone C is subdivided into the following two zones:
    - Zone C1: Areas of the floodplain which are developed and served by significant infrastructure, including flood defences
    - Zone C2: Areas of the floodplain without significant flood defence infrastructure

The development advice zones are shown on the Development Advice Map[2] and are defined by the predicted extent of the 1 in 1,000 (rivers and sea) annual exceedance probability (AEP) event (zone C) and British Geological Survey drift data (zone B).

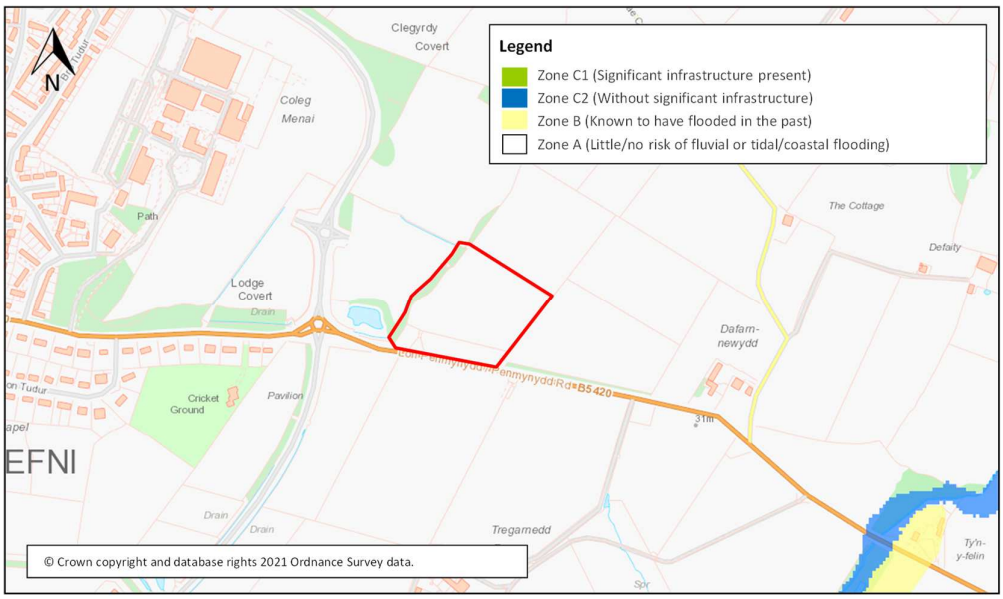

Figure 3: Development Advice Map
Source: Natural Resources Wales website

[2] https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en

3 PLANNING POLICY AND GUIDANCE

3.1 National Planning Policy and Guidance

National policy requires that planning applications for new development proposals should incorporate sustainable drainage systems (SuDS) to appropriate operational standards and with maintenance arrangements in place unless there is clear evidence that this would be inappropriate.

Statutory standards for sustainable drainage were published by Welsh Government in October 2018[3] in relation to the design, construction, operation and maintenance of sustainable drainage systems serving new developments of more than one house or where the construction area is equal to or greater than 100 square metres (m^2). These standards set out how surface water runoff generated during the present day 1 in 1, 1 in 30 and 1 in 100 AEP rainfall events and for events exceeding the present day 1 in 100 AEP event should be managed, how peak runoff rates should be restricted and how runoff volumes should be controlled. Approval is subsequently required from the SuDS Approval Body (SAB) before construction can commence.

3.2 Local Planning Policy and Guidance

3.2.1 Anglesey and Gwynedd Joint Local Development Plan, July 2017

The Isle of Anglesey County Counil (IACC) and Gwynedd Council have prepared a single plan for Anglesey and Gwynedd Planning Authorities to inform the majority of decisions on planning applications. The joint local development plan was adopted in July 2017 and sets out the planning framework for a period of 2011 to 2026.

The following policies are relevant in respect of drainage:

Policy PS 5; Sustainable Development

Development will be supported where it is demonstrated that they are consistent with the principles of sustainable development. All proposals should:

8. Reduce the amount of water used and wasted; reducing the effect on water resources and quality; managing flood risk and maximizing use of sustainable drainage schemes; and progressing the objectives of the Western Wales River Basin Management Plan.

Policy PS 6; Alleviating and Adapting to the Effects of Climate Change

In order to adapt to the effects of climate change, proposals will only be permitted where it is demonstrated with appropriate evidence that they have fully taken account of and responded to the following:

8. Aim for the highest possible standard in terms of water efficiency and implement other measures to withstand drought, maintain the flow of water and maintain or improve the quality of water, including using sustainable drainage systems (in line with Policy PCYFF 6).

Policy PCYFF 2; Development Criteria

Planning permission will be refused where the proposed development would have an unacceptable adverse impact on:

7. The health, safety or amenity of occupiers of local residences, other land and property uses or characteristics of the locality due to increased activity, disturbance, vibration, noise, dust, fumes, litter, drainage, light pollution, or other forms of pollution or nuisance.

Policy PCYFF 3; Design and Place Shaping

[3] Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems (https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf)

All proposals will be expected to demonstrate high quality design which fully takes into account the natural, historic and built environmental context and contributes to the creation of attractive, sustainable places. Innovative and energy efficient design will be particularly encouraged.

Proposal, including extensions and alterations to existing buildings and structures will only be permitted provided they conform to all of the following criteria, where relevant:

6. Its drainage systems are designed to limit surface water run-off and flood risk and prevent pollution.

Policy PCYFF 6; Water Conservation

Proposals should incorporate water conservation measures where practicable, including Sustainable Urban Drainage Systems (SUDS). All proposals should implement flood minimisation or mitigation measures where possible, to reduce surface water run-off and minimise its contribution to flood risk elsewhere.

Proposals greater than 1,000 m² or 10 dwellings should be accompanied by a Water Conservation Statement.

3.3 Legislation Originating from the European Union

The Water Framework Directive (WFD) provides a legal framework for the protection, improvement and sustainable use of inland surface waters, groundwater, transitional waters, and coastal waters across Wales, and seeks to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters
- Achieve at least 'good' status for all waterbodies by 2015
- Promote the sustainable use of water as a natural resource
- Conserve habitats and species that depend directly on water
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants; and
- Contribute to mitigating the effects of floods and droughts.

The WFD applies to any proposed development which has the potential to impact on a waterbody. Where this is the case, Natural Resources Wales may require evidence demonstrating that the proposed development does not compromise the aims of the WFD.

3.4 Land Drainage Consent

Land drainage consent may be required from the lead local flood authority for work to an ordinary watercourse.

If the location of an activity is on an ordinary watercourse that lies within an Internal Drainage District, land drainage consent may be required from Natural Resources Wales.

Undertaking activities controlled by local byelaws also requires the relevant consent.

4 SURFACE WATER MANAGEMENT

4.1 Surface Water Drainage at the Existing Site

Given the greenfield nature of the existing site there is no existing drainage infrastructure located on the site.

An extract of the public sewer records obtained from Dŵr Cymru Welsh Water is provided in **Appendix D**. There is a 150 mm public combined sewer, located approximately 218 m west of site. This sewer appears to serve the residential properties located on the B5420 Penmynydd Road. There are two manholes shown on this sewer with references designated SH47750502 and SH47750501.

Existing surface water runoff will follow the natural topography of the site and discharge to Watercourse B. A drainage survey of Watercourse B undertaken by Tom Austen of Anglesey Lodge and Caravan Park Ltd is provided in **Appendix E**. The survey indicates that Watercourse B is culverted from a point in the south-east corner of the site and runs in a south-easterly direction to the two manholes located within Penmynydd Road.

4.1.1 Existing Runoff Rates

The site has a total area of 3.01 ha. The greenfield surface water runoff rates for the site, calculated using the ICP SUDS method within MicroDrainage are presented in **Table 1**. Details of the input parameters and the output results are provided in **Appendix F**.

Table 1: Greenfield Runoff Rate

AEP of Rainfall Event	Greenfield Runoff Rate (l/s/ha)	Greenfield Runoff Rate for 3.01 ha Site (l/s)
1 in 1	2.4	7.2
QBAR	2.8	8.4
1 in 30	4.9	14.8
1 in 100	6.0	18.1

4.2 Surface Water Drainage at the Developed Site

4.2.1 Disposal of Surface Water (Standard S1)

In accordance with Welsh Government guidance[4], surface water runoff should be disposed of according to the following hierarchy: Rainwater collected for use; Into the ground (infiltration); To a surface water body; To a surface water sewer or highway drain; To a combined sewer.

Given the nature of the development (holiday caravans), it is considered that the installation of water butts on individual units is unlikely to benefit the management of surface water, due to the lack of opportunity for reuse of non-potable water. Therefore, priority level 1 has been discounted as the primary method for disposal of surface water.

As stated in **Section 2.4,** Soakaway testing was undertaken by Groundsolve Ltd on 22 April 2020 in accordance with the guidelines in BRE365[5]. The results indicate that the site is not suitable for soakaways and as such Priority Level 2 has also been discounted.

In light of the above, surface water runoff from the proposed development site will discharge to Watercourse B in accordance with Priority Level 3.

[4] Standard S1 of Statutory Standards for Sustainable Drainage Systems – designing, constructing, operating and maintaining surface water drainage systems (https://gov.wales/sites/default/files/publications/2019-06/statutory-national-standards-for-sustainable-drainage-systems.pdf)

[5] BRE Digest 365 Soakaway Design, Building Research Establishment, 2016

4.2.2 Post Development Impermeable Area

The area of impermeable surfaces within the proposed development has been calculated to be 0.70 ha, based on **Appendix A**.

4.2.3 Peak Flow Control (Standard S2)

It is proposed to restrict surface water runoff from impermeable surfaces of the development to as close as is practicably possible to the existing greenfield QBAR rate of 8.4 l/s. The area of impermeable surfaces within the developed site has been calculated to be 0.70 ha. Accordingly, the peak runoff rate would be restricted to 2.0 l/s.

However, it is proposed to restrict surface water runoff to 5.0 l/s as it is recognised that a flow control with a diameter of less than 100 mm and/or a design discharge rate less than 5.0 l/s may pose a risk of blockage to the drainage system.

4.2.4 Attenuation Storage

Attenuation storage will be provided to restrict surface water runoff generated across roofs and hardstanding.

The attenuation storage facility has been modelled using the Network module of MicroDrainage (**Appendix G**). The required storage volume has been sized to store the 1 in 100 AEP rainfall event including a 40% increase in rainfall intensity to allow for climate change.

Assuming a peak discharge rate of 5.0 l/s and a design depth of 1 m, a total storage volume of 509.5 m^3 would be required. The 1 in 1 AEP event has also been assessed to ensure that the discharge rate does not exceed 5.0 l/s.

The storage volume could be accommodated within an attenuation basin with a base area of 438 m^2, a depth of 0.915 m. The basin would fill to a depth of 0.688 m during the 1 in 1000 AEP plus 40% climate change event, affording a 0.227 m freeboard to top of basin.

A preliminary surface water drainage layout is provided in **Appendix H**.

4.2.5 Exceedance Routes

Flows resulting from rainfall in excess of the 1 in 100 AEP +40% CC rainfall event will be managed in exceedance routes. It is assumed that as the development proposals progress, the design of the site would ensure flood flows are directed towards carriageways, with the site being profiled to ensure that flood flows are directed away from built development.

4.2.6 Water Quality and Pollution Control (Standard S3)

The CIRIA SuDS Manual[6] and Table G3.1 of the Statutory Standards for SuDS identifies individual property driveways, roofs and low traffic roads as having a low pollution hazard level.

Table 26.2 of the CIRIA SuDS Manual 2015 indicates that the pollution hazard indices associated with such uses for total suspended solids, hydrocarbons and metals are 0.70, 0.60 and 0.45 respectively.

Table 26.3 of the CIRIA SuDS Manual 2015 indicates that the SuDS mitigation indices for interceptor drains (filter drains) and an attenuation basin for total suspended solids, hydrocarbons and metals are 0.65, 0.70 and 0.70 respectively. As such, the proposed drainage system would incorporate adequate water quality treatment.

[6] Table 26.2

4.2.7 Amenity and Biodiversity (Standard S4 and Standard S5)

As outlined in **Section 4.2.4**, the required storage volume may be accommodated within the attenuation basin on site.

Attenuation basins are normally dry and in certain situations the land may also function as a recreational facility or a habitat for wildlife[7].

The proposed filter drains can be designed to provide attractive boundary lines or edging. Gravel media can host micro-organisms and provided breeding grounds for insects and amphibians. Adjacent biodiverse planting or overlying grass can also deliver additional opportunities for biodiversity[8].

Furthermore, the proposed layout includes landscaped areas/trees in a number of locations which will provide aesthetic benefits and interception of water surface, thus helping with volume control (via evapotranspiration).

It is generally recommended that native vegetation is used to maximise the biodiversity value of these areas. However, it may be valuable to include some non-native vegetation to support pollinators, such as butterflies and bees.

The implementation of soft landscaping will also help provide users of the site with health and wellbeing benefits.

4.2.8 Adoption and Maintenance of SuDS (Standard S6)

It is anticipated that the proposed pipe network will be maintained by the site owner or a private management company. An indicative maintenance schedule is presented in **Table 2.**

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[7] https://www.susdrain.org/delivering-suds/using-suds/suds-components/retention_and_detention/Detention_basins.html
[8] https://www.susdrain.org/delivering-suds/using-suds/suds-components/filtration/filter-trench.html

Table 2: Maintenance Requirements

Schedule	Required action	Frequency
Attenuation Basin		
Regular maintenance	Remove litter and debris	Monthly
	Cut grass	Monthly during grow season Or as required)
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required.	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly for first year, then annually or as required
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets/outlets	Annually (or as required)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every two years, or as required
	Remove sediments from inlets/outlets and main basin when required	
Remedial actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	
	Repair/rehabilitation of inlets/outlets	
	Relevel uneven surface and reinstate design levels	
Pipework and Inspection chambers		
Regular maintenance	Inspect for silt accumulation and remove as necessary	Monthly for first year, then annually as required
Occasional maintenance	Clean by jetting	Annually or as required
Remedial actions	Inspect for evidence of physical damage and repair accordingly	Every 5 years, or as required
Interceptor Drains		
Regular maintenance	Remove litter and debris	Monthly
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	Every 3-4 months or as required
Remedial actions	Replenish any lost gravel substrate	As required
	Dig out, wash and replace gravel substrate	Every 10 - 15 years or as required
Flow Control Unit		
Routine maintenance	Remove litter and debris and inspect for sediment accumulation	Six Monthly
	Remove sediment from sump	As necessary – Indicated by system inspections
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six Monthly

Schedule	Required action	Frequency
	Inspect flow control unit and establish appropriate replacement frequencies	Six Monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first year of operation, then every six months

5 FOUL WATER MANAGEMENT

5.1 Existing Assets

As previously mentioned in **Section 4.0** an extract of the public sewer records obtained from Dŵr Cymru Welsh Water is provided in **Appendix D**.

This indicates that there is a 225 mm private sewer subject to a Section 104 adoption agreement located approximately 100m west of the site within the newly constructed unnamed “link” road roundabout.

There is also a 150 mm public combined sewer, located approximately 218 m west of site. There are two manholes shown on this sewer and they are designated SH47750502 and SH47750501.

5.2 New Connections

The proposed peak foul discharge generated by the development has been calculated based on an occupancy rate of 3 persons per static caravan, accounting for an additional 10% indicated for future development, plus an additional two people overseeing the reception building which equates to 114 persons. Allowing for a conservative figure of 150 l/person/activity/day with a peak factor of 6, a peak flow of 1.2 l/s is generated.

Under the Water Industry Act (1991), developers have a right to connect foul water flows from new developments to public sewer. The Act places a general duty on sewerage undertakers to provide the additional capacity that may be required to accommodate additional flows and loads arising from new domestic development.

Dwr Cymru Welsh Water have been contacted by the client and have stated: *"Having liaised with our operational colleagues, we can confirm foul flows associated with the proposed new caravan site can be accommodated within the 150mm combined public sewer between chamber refs: SH47750502 and SH47750501".*

Given the relative topographical levels between the site (approx. 23.0 m Above Ordnance Datum (AOD)) and the proposed cover level of the public combined sewer located in Penmynydd Road between chamber refs SH47750502 and SH47750501 (27.0 m AOD), it is necessary to pump foul water from the site to the public combined sewer manhole.

A preliminary foul water drainage layout is provided in **Appendix H**.

5.3 Extent of Adoption

Providing that the system is to serve an individual site (i.e. under one ownership), DCWW would likely only seek to adopt the pipes within Penmynydd Road, from a point immediately outside the curtilage of the site to the existing public combined sewer.

It is likely that the on-site pipe network and Package Pumping Station (PPS) will remain private, providing that the system is to serve an individual site (i.e. under one ownership).

6 SUMMARY AND RECOMMENDATIONS

This report has been prepared on behalf of Anglesey Lodge and Caravan Park Ltd and relates to the proposed development of land at Dafarn Newydd, located off Penymyndd Road (B5420), Llangefni.

Surface water runoff from the developed site can be sustainably managed in accordance with planning policy. The surface water drainage scheme provides a holistic approach to drainage in accordance with and satisfying the requirements of planning policy and as such will enable phased development conditions to be applied in line with this strategy.

It is proposed to discharge foul water to the 150 mm diameter public combined sewer between chamber refs SH47750502 and SH47750501, located approximately 218 m west of the site in B5420 Penmynydd Road

APPENDIX A

Development Proposals

KEY:-

1. - 5 NO 1 BEDROOM UNITS.
2. - 18 NO 2 BEDROOM UNITS.
3. - 10 NO 3 BEDROOM UNITS.
4. - 2 NO 4 BEDROOM UNITS.

N

Peidiwch a chymryd mesuriadau graddfa oddi ar y dyluniad hwn
Os yn amau - gofynnwch
Do not scale from this drawing
If in doubt - ask

Newidiadau - Amendments

Cynllun - Job
LAND AT DAFARN NEWYDD
LLANGEFNI

Dyluniad - Drawing
PROPOSED LAYOUT

Rhif Dyluniad - Drawing No.
2621:21:3B

Graddfa - Scale
1:1000 @ A3

Dyddiad - Date
Nov 2021

russell-hughes cyf
penseiri/architects

56 Bridge Street,
Llangefni,
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LL77 7HH

Tel: 01248 722333
Fax: 01248 750600
E-mail: info@russellhughes.co.uk

APPENDIX B

Soakaway Testing Report

GroundSolve Ltd
Consulting Geotechnical, Engineering Geology and Environmental Engineers.

Unit 1 Charter Court,
Well House Barns,
Chester Road, Bretton,
Flintshire, CH4 0DH
Tel: 01244 661361
Mob: 07944 128137
Email: stefanimiolczyk@groundsolve.com

REF: 2360/DNL/Soakaways/sdi

Tom Austen
Parkfield Homes

By email
tom@parkfieldhomes.com

30th April 2020

Dear Tom,

RE: DAFARN NEWYDD, LLANGEFNI – SOAKAWAY TESTING

As instructed, soakaway testing was carried out at the Dafarn Newydd site, Llangefni, on the 22nd April 2020. The site location is presented on Figure 1.

One test per field was proposed by Parkfield Homes. However, it was only possible to carry out tests at three locations, due to time constraints, and also due to very wet/soft ground preventing access for the water bowser to the northernmost field. The locations tested are shown on Figure 2.

The trial pits were logged by a Geotechnical Engineer from GSL, in general accordance with BS 5930:2015. The trial pit logs are presented in Appendix A.

The trial pits revealed the ground conditions to comprise a thin layer of topsoil overlying glacial till. The till typically comprised firm becoming stiff, grey and brown, sandy gravelly clay.

This is as anticipated from the BGS geological mapping of the area.

The trial pits were typically excavated to 2.5m depth, before being trimmed square ready for the soakaway testing. TP1 was terminated at a slightly shallower depth of 2.1m, to avoid removal of boulders from the pit walls destabilising the excavation.

The trial pits were then rapidly filled with water from a 2000-gallon water bowser, and the rate of fall monitored over a period of time.

The recorded data is presented in the table below. Note that as no infiltration was recorded in any of the trial pits over a monitoring period of up to 5 hours, and therefore no infiltration rates could be calculated.

TP1 (2.1m depth)		TP2 (2.5m depth)		TP3 (2.5m depth)	
Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)	Time (mins)	Depth to Water (m)
0	0.76	0	1.00	0	0.98
2	0.76	2	1.00	2	0.98
3	0.76	3	1.00	3	0.98
4	0.76	4	1.00	4	0.98
5	0.76	5	1.00	5	0.98
10	0.76	10	1.00	10	0.98
15	0.76	15	1.00	15	0.98
20	0.76	20	1.00	20	0.98
25	0.76	25	1.00	25	0.98
30	0.76	30	1.00	30	0.98
45	0.76	45	1.00	45	0.98
60	0.76	60	1.00	60	0.98
90	0.76	90	1.00	90	0.98
120	0.76	120	1.00	120	0.98
180	0.76	180	1.00	180	0.98
240	0.76	240	1.00	240	0.98
300	0.76	300	1.00	300	0.98

The results show that the ground conditions underlying the site are unsuitable for the use of soakaways.

In addition, it was also noted that although much of the site was dry at the time of the investigation, there was significant evidence of water previously ponding on much of the ground surface, showing further evidence of low infiltration rates into the ground.

We trust this is satisfactory, should you have any queries please call Stefan Imiolczyk on 01244 661361.

Yours sincerely,

S. Imiolczyk

Stefan D Imiolczyk

FIGURES

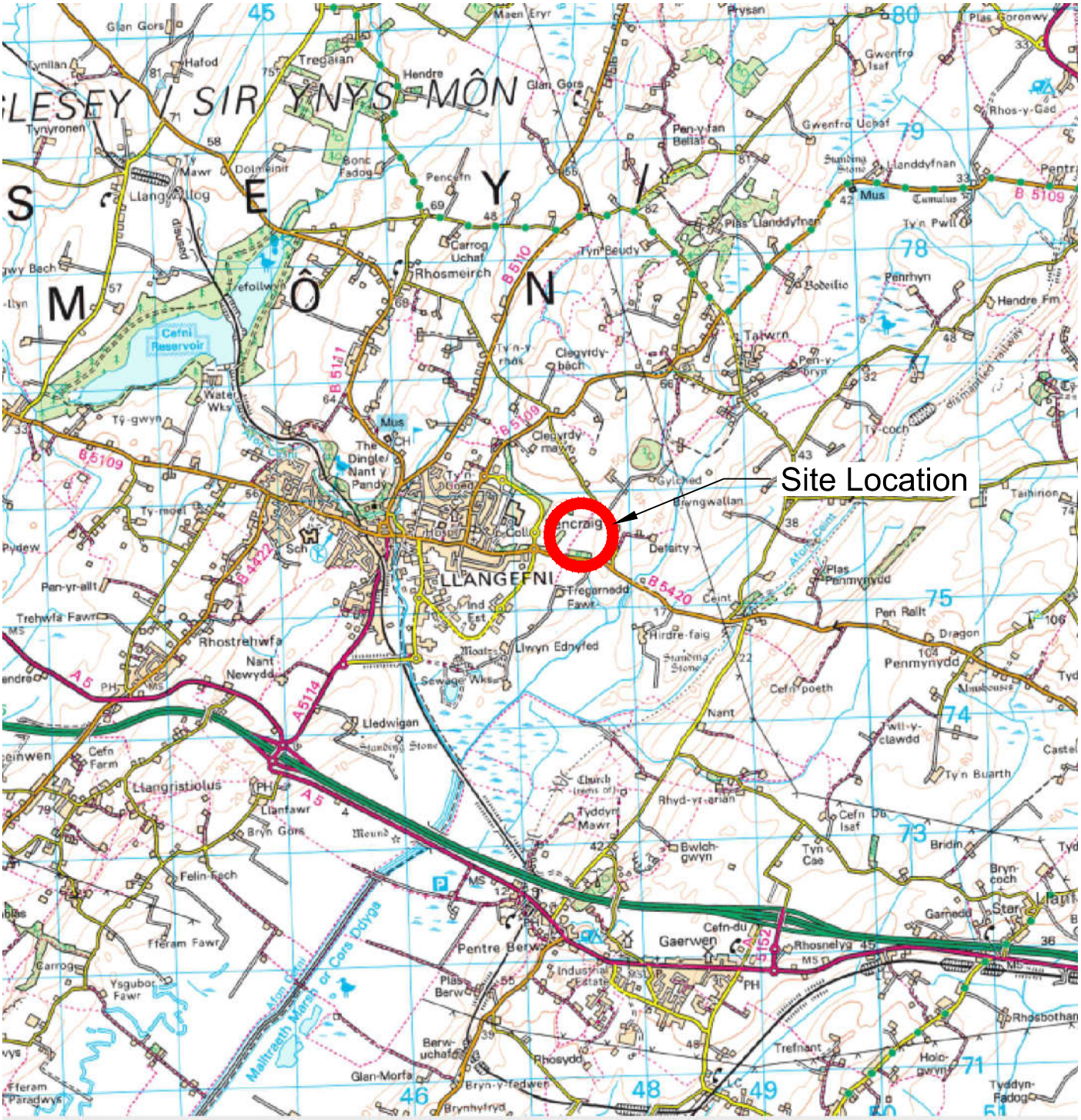

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Figure Title

SITE LOCATION

FIGURE 1

Legend

Trial pit/soakaway test location

TP2

TP3

TP1

Site entrance

Pond

Drain

24.8m

23.4m

Old MS

CR

22.5m

EDGE

Dafarn-newydd

Bod Adair

The Old Barn

LON CAE CWTA

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Figure Title

SOAKAWAY TEST LOCATIONS

FIGURE 2

APPENDIX A

Trial Pit Logs

TRIAL PIT 1

Depth (m)	Strata
0.00 – 0.30	Firm brown slightly gravelly silty CLAY with rootlets. Gravel is subangular to subrounded fine to coarse of sandstone and limestone. (TOPSOIL)
0.30 – 0.70	Firm light greyish brown mottled orange slightly silty slightly sandy CLAY. (GLACIAL TILL)
0.70 – 2.10	Firm to stiff greyish brown to grey sandy very gravelly CLAY. With a high cobble content and medium boulder content of limestone. Gravel is subangular to rounded fine to coarse of limestone. (GLACIAL TILL)

Notes

1. No groundwater encountered,
2. Sides of pit stable,
3. No samples taken,
4. Soakaway test carried out from 0.76m.

Trial Pit 1

Trial Pit 1 Spoil

TRIAL PIT 2

Depth (m)	Strata
0.00 – 0.30	Firm brown slightly gravelly silty CLAY with rootlets. Gravel is subangular to subrounded fine to coarse of sandstone and limestone. (TOPSOIL)
0.30 – 0.50	Firm light greyish brown mottled orange slightly silty slightly sandy CLAY. (GLACIAL TILL)
0.50 – 2.50	Firm to stiff greyish brown to grey sandy very gravelly CLAY. With a high cobble content and medium boulder content of limestone. Gravel is subangular to rounded fine to coarse of limestone. (GLACIAL TILL)

Notes

1. Slow seepage at 2.00m,
2. Sides of pit stable,
3. No samples taken,
4. Soakaway test carried out from 1.00m.

Trial Pit 2

Trial Pit 2 Spoil

TRIAL PIT 3

Depth (m)	Strata
0.00 – 0.30	Firm brown slightly gravelly silty CLAY with rootlets. Gravel is subangular to subrounded fine to coarse of sandstone and limestone. (TOPSOIL)
0.30 – 0.70	Firm light greyish brown mottled orange slightly silty slightly sandy CLAY. (GLACIAL TILL)
0.70 – 2.50	Firm to stiff greyish brown to grey sandy very gravelly CLAY. With a high cobble content and medium boulder content of limestone. Gravel is subangular to rounded fine to coarse of limestone. (GLACIAL TILL)

Notes

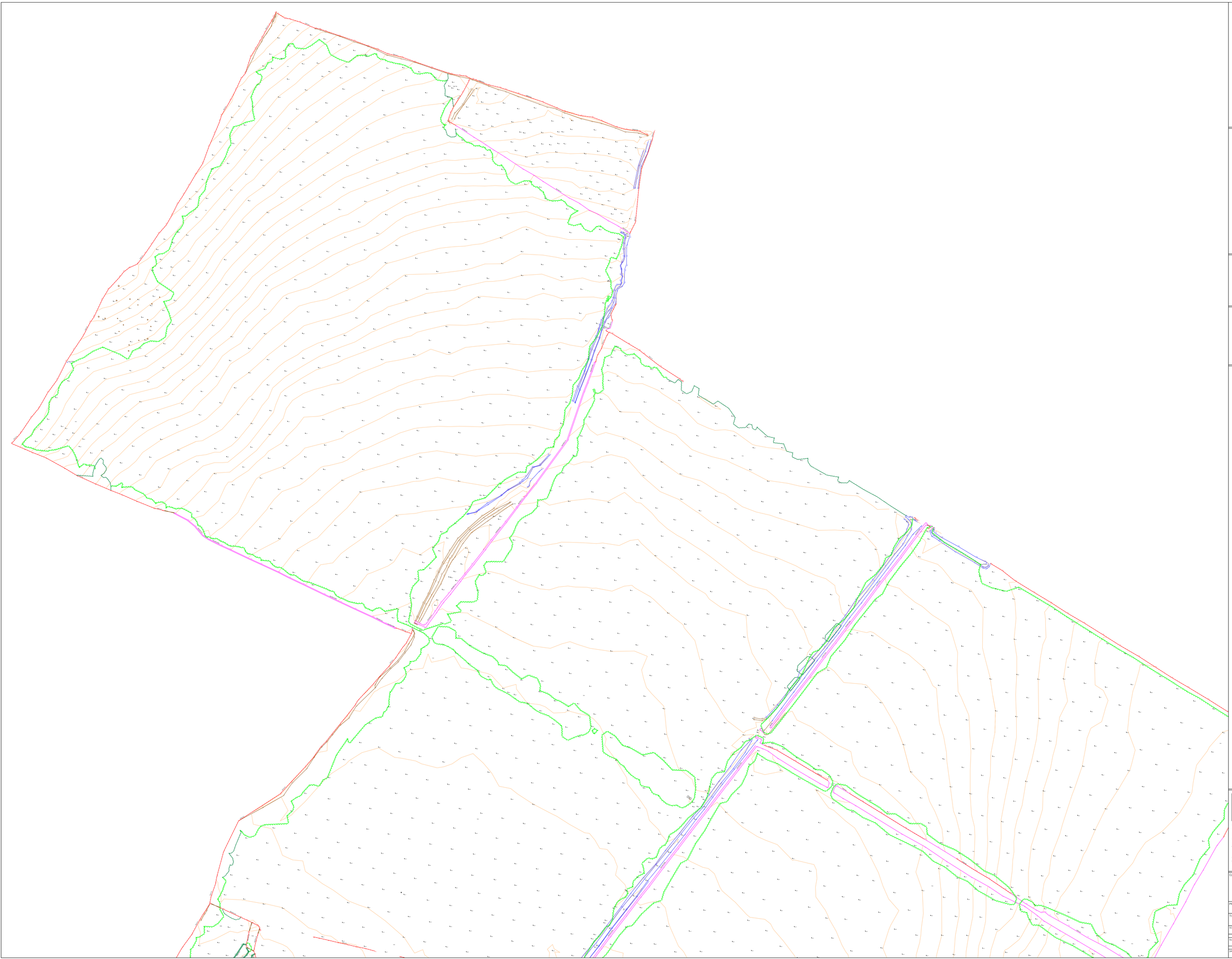
1. No groundwater observed,
2. Sides of pit stable,
3. No samples taken,
4. Excavation difficult from 2.00m,
5. Soakaway test carried out from 0.98m.

Trial Pit 3

Trial Pit 3 Spoil

APPENDIX C

Topographic Survey



Point/Line Features (Where Applicable)

Water Meter	Bollard
Gully	Seat
Fire Hydrant	Post
Rodding Eye	Road Sign
Earth Rod	Post Box
Stop Valve	Reflective Hazard Post
Gas Valve	Traffic Light
Air Valve	Telephone Kiosk
Electricity Cabinet	Fences
Underground Service Marker Post	Safety Fence
Telecom Cover	Wall
Electric Cover	Gate
Inspection Cover (Circular)	Stile
Inspection Cover (Square)	Tree
Inspection Cover (Rectangular)	Tree Bole
Inspection Cover (Triangular)	Tree Canopy
Pylon	Undergrowth
Electricity Pole	Hedge
Telegraph Pole	Permanent Ground Marker
Overhead Cable	Permanent Benchmark
Stay Wire Anchor	Spot Height
Lamp Post	Invert Level
Litter Bin	Water Level

Additional Notes For Fencing

Post and Wire	P/W
Post and Rail	P/R
Chainlink	C/L
Palisade	P/AL
Close Boarded	C/B
Concrete Panel	C/P
Safety Fence	S/F

Building And Floorplan Features

Floor Level	FL
Damp Proof Course Level	DPC
Soffit Level	SOF
Eaves Level	EL
Ridge Level	RL
Threshold Level	THL
Sill Level	SL

Notes

NRG Engineering Services Ltd

Castle View
Station Road
Llanfairfechan
Conwy
LL33 0AN
Tel: 01248 681240

email: nrg@nrgsurveys.co.uk
www.nrgsurveys.co.uk

CLIENT: Parkfield Homes Ltd.

PROJECT: Dafarn Newydd, Llangefni

TITLE: Topographic Survey 1/2

SCALE	DATUM	GRID
1:500 @ A0	Newlyn	OSGB36(15)

SURVEYED BY	DRAWN BY	DATE
DS DJ	DJ	31/07/18

DRAWING REFERENCE # 1348/TP/01.01 — REV: 01

Point/Line Features (Where Applicable)

Water Meter	Bollard
Gully	Seat
Fire Hydrant	Post
Rodding Eye	Road Sign
Earth Rod	Post Box
Stop Valve	Reflective Hazard Post
Gas Valve	Traffic Light
Air Valve	Telephone Kiosk
Electricity Cabinet	Fences
Underground Service Marker Post	Safety Fence
Telecom Cover	Wall
Electric Cover	Gate
Inspection Cover (Circular)	Stile
Inspection Cover (Square)	Tree
Inspection Cover (Rectangular)	Tree Bole
Inspection Cover (Triangular)	Tree Canopy
Pylon	Undergrowth
Electricity Pole	Hedge
Telegraph Pole	Permanent Ground Marker
Overhead Cable	Permanent Benchmark
Stay Wire Anchor	Spot Height
Lamp Post	Invert Level
Litter Bin	Water Level

Additional Notes For Fencing

Post and Wire	P/W
Post and Rail	P/R
Chainlink	C/L
Palisade	P/AL
Close Boarded	C/B
Concrete Panel	C/P
Safety Fence	S/F

Building And Floorplan Features

Floor Level	FL
Damp Proof Course Level	DPC
Soffit Level	SOF
Eaves Level	EL
Ridge Level	RL
Threshold Level	THL
Sill Level	SL

Notes

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www.nrgsurveys.co.uk

CLIENT: Parkfield Homes Ltd.

PROJECT: Dafarn Newydd, Llangefni

TITLE: Topographic Survey 2/2

SCALE	DATUM	GRID
1:500 @ A0	Newlyn	OSGB36(15)

SURVEYED BY	DRAWN BY	DATE
DB DJ	DJ	31/07/18

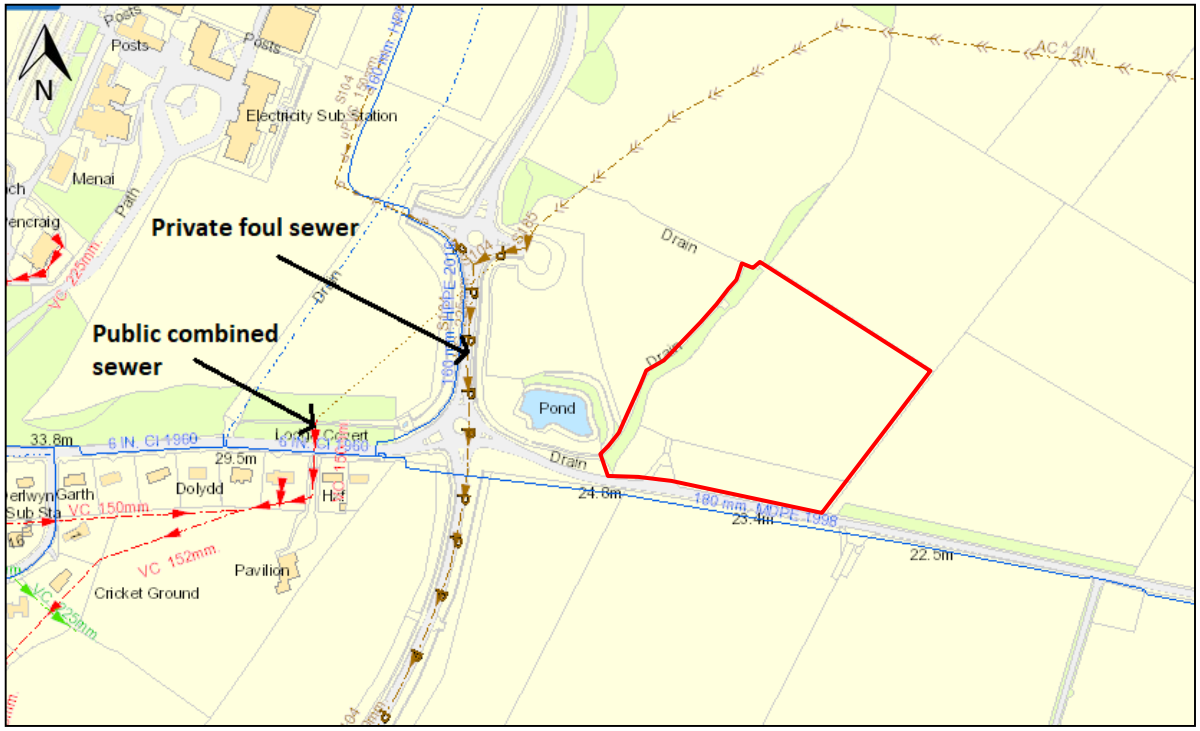
DRAWING REFERENCE #	ISSUE
1348/TP/02:01	01

APPENDIX D

DCWW Sewer Record

DCWW Sewer Records (inc. Site Location) 001

Weetwood
Development • Planning • Environment



NGR: SH 474 756

X: 247444

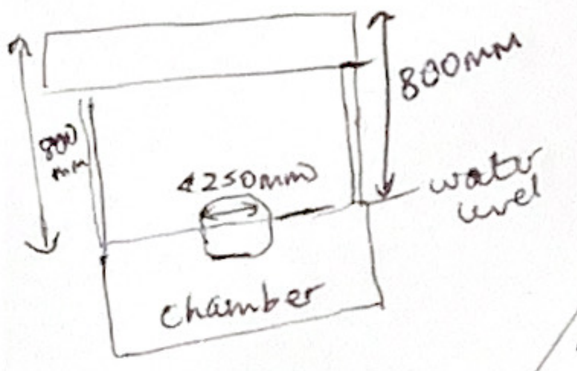
Y: 375628

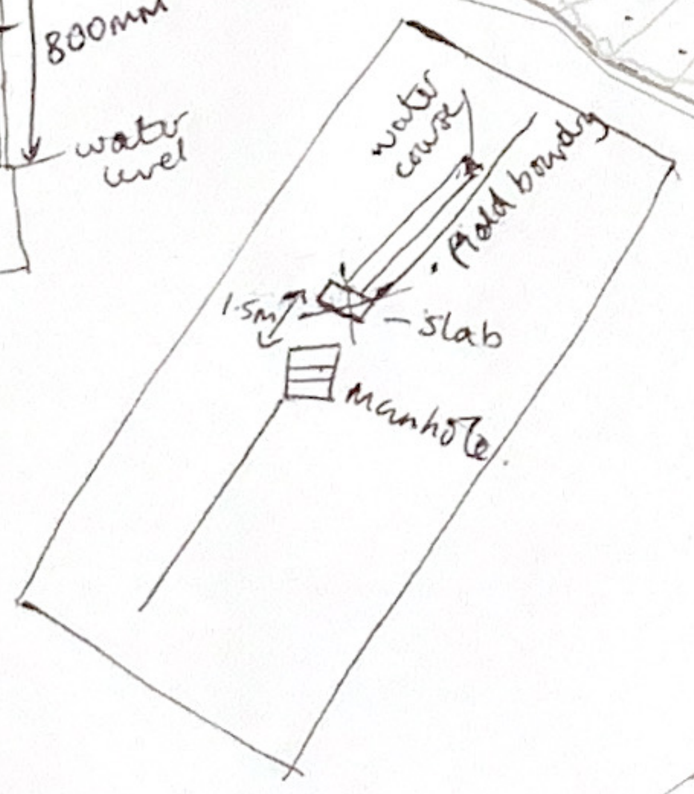
Postcode: LL77 7SG

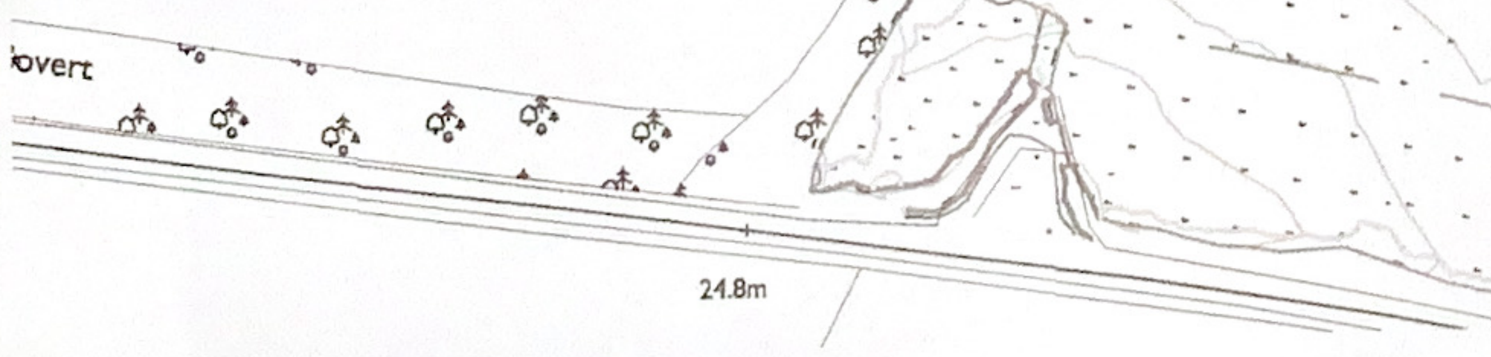
APPENDIX E

Drainage Survey

Key


800mm
900 mm
4250mm
water level
chamber


water course
field boundary
1.5m
slab
manhole


culvert
24.8m

APPENDIX F

Greenfield Runoff Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 1000 Urban 0.000
Area (ha) 1.000 Soil 0.300 Region Number Region 9

Results l/s

QBAR Rural 2.8
QBAR Urban 2.8

Q100 years 6.0

Q1 year 2.4
Q30 years 4.9
Q100 years 6.0

APPENDIX G

MicroDrainage Attenuation Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	17.200	Add Flow / Climate Change (%)	0
Ratio R	0.300	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	0	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.248	4-8	0.372	8-12	0.012

Total Area Contributing (ha) = 0.633

Total Pipe Volume (m³) = 41.740

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	63.387	0.400	158.5	0.080	5.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	17.745	0.115	154.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	25.137	0.165	152.3	0.070	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	62.834	0.395	159.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	52.183	1.300	40.1	0.130	5.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	6.02	23.030	0.080	0.0	0.0	0.0	1.04	41.2	0.0
1.001	0.00	6.30	22.630	0.080	0.0	0.0	0.0	1.05	41.8	0.0
1.002	0.00	6.63	22.440	0.150	0.0	0.0	0.0	1.27	89.9	0.0
1.003	0.00	7.47	22.275	0.150	0.0	0.0	0.0	1.24	87.9	0.0
2.000	0.00	5.42	23.800	0.130	0.0	0.0	0.0	2.07	82.3	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.001	18.994	0.085	223.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	22.631	0.145	156.1	0.037	5.00	0.0	0.600	o	225	Pipe/Conduit	
3.001	11.019	0.070	157.4	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	31.949	0.145	220.3	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	14.839	0.070	212.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.004	36.108	0.165	218.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.005	17.649	0.080	220.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	14.719	0.100	147.2	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.001	20.955	0.130	161.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	40.217	0.315	127.7	0.156	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.003	12.512	0.055	227.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	15.714	0.050	314.3	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	23.503	0.025	940.1	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.000	22.233	0.535	41.6	0.041	5.00	0.0	0.600	o	150	Pipe/Conduit	
5.001	10.378	0.065	159.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.002	51.939	0.350	148.4	0.061	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.003	31.408	0.205	153.2	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.001	0.00	5.72	22.425	0.130	0.0	0.0	0.0	1.05	74.1	0.0
3.000	0.00	5.36	22.630	0.037	0.0	0.0	0.0	1.04	41.5	0.0
3.001	0.00	5.54	22.485	0.037	0.0	0.0	0.0	1.04	41.3	0.0
2.002	0.00	6.23	22.340	0.225	0.0	0.0	0.0	1.06	74.6	0.0
2.003	0.00	6.46	22.195	0.225	0.0	0.0	0.0	1.08	76.1	0.0
2.004	0.00	6.95	22.050	0.225	0.0	0.0	0.0	1.22	134.8	0.0
2.005	0.00	7.19	21.885	0.225	0.0	0.0	0.0	1.22	134.3	0.0
4.000	0.00	5.23	22.555	0.000	0.0	0.0	0.0	1.08	42.8	0.0
4.001	0.00	5.57	22.455	0.000	0.0	0.0	0.0	1.03	40.8	0.0
4.002	0.00	6.05	22.250	0.156	0.0	0.0	0.0	1.39	98.3	0.0
4.003	0.00	6.22	21.860	0.156	0.0	0.0	0.0	1.20	132.2	0.0
1.004	0.00	7.73	21.805	0.531	0.0	0.0	0.0	1.02	112.3	0.0
1.005	0.00	8.40	21.755	0.531	0.0	0.0	0.0	0.58	64.4	0.0
5.000	0.00	5.24	23.110	0.041	0.0	0.0	0.0	1.57	27.7	0.0
5.001	0.00	5.38	22.425	0.041	0.0	0.0	0.0	1.24	87.8	0.0
5.002	0.00	6.05	22.360	0.102	0.0	0.0	0.0	1.29	91.1	0.0
5.003	0.00	6.41	21.935	0.102	0.0	0.0	0.0	1.46	161.4	0.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	3.093	0.020	154.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	0.00	8.47	21.730	0.633	0.0	0.0	0.0	0.81	14.2	0.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1	23.655	0.625	Open Manhole	1200	1.000	23.030	225				
2	23.255	0.625	Open Manhole	1200	1.001	22.630	225	1.000	22.630	225	
3	23.140	0.700	Open Manhole	1200	1.002	22.440	300	1.001	22.515	225	
4	22.975	0.700	Open Manhole	1200	1.003	22.275	300	1.002	22.275	300	
8	24.350	0.550	Open Manhole	1200	2.000	23.800	225				
9	23.225	0.800	Open Manhole	1200	2.001	22.425	300	2.000	22.500	225	
8	23.255	0.625	Open Manhole	1200	3.000	22.630	225				
9	23.120	0.635	Open Manhole	1200	3.001	22.485	225	3.000	22.485	225	
10	23.140	0.800	Open Manhole	1200	2.002	22.340	300	2.001	22.340	300	
								3.001	22.415	225	
11	22.870	0.675	Open Manhole	1200	2.003	22.195	300	2.002	22.195	300	
12	22.870	0.820	Open Manhole	1350	2.004	22.050	375	2.003	22.125	300	
13	22.840	0.955	Open Manhole	1350	2.005	21.885	375	2.004	21.885	375	
13	23.000	0.445	Open Manhole	1200	4.000	22.555	225				
14	23.025	0.570	Open Manhole	1200	4.001	22.455	225	4.000	22.455	225	
14	23.000	0.750	Open Manhole	1200	4.002	22.250	300	4.001	22.325	225	
15	22.800	0.940	Open Manhole	1350	4.003	21.860	375	4.002	21.935	300	
5	22.650	0.845	Open Manhole	1350	1.004	21.805	375	1.003	21.880	300	
								2.005	21.805	375	
								4.003	21.805	375	
6	22.710	0.955	Open Manhole	1350	1.005	21.755	375	1.004	21.755	375	
18	23.610	0.500	Open Manhole	1200	5.000	23.110	150				
19	23.300	0.875	Open Manhole	1200	5.001	22.425	300	5.000	22.575	150	
20	23.250	0.890	Open Manhole	1200	5.002	22.360	300	5.001	22.360	300	
22	22.650	0.715	Open Manhole	1350	5.003	21.935	375	5.002	22.010	300	
7	22.650	0.920	Open Manhole	1350	1.006	21.730	150	1.005	21.730	375	
								5.003	21.730	375	
	22.650	0.940	Open Manhole	0		OUTFALL		1.006	21.710	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	247409.623	375652.804	247409.623	375652.804	Required	
2	247372.524	375601.408	247372.524	375601.408	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
3	247376.413	375584.094	247376.413	375584.094	Required	
4	247400.313	375576.306	247400.313	375576.306	Required	
8	247321.502	375510.643	247321.502	375510.643	Required	
9	247329.369	375562.230	247329.369	375562.230	Required	
8	247358.950	375582.689	247358.950	375582.689	Required	
9	247341.252	375568.582	247341.252	375568.582	Required	
10	247348.240	375560.063	247348.240	375560.063	Required	
11	247373.488	375540.485	247373.488	375540.485	Required	
12	247386.073	375532.622	247386.073	375532.622	Required	
13	247420.950	375523.277	247420.950	375523.277	Required	
13	247406.505	375576.364	247406.505	375576.364	Required	
14	247421.224	375576.402	247421.224	375576.402	Required	
14	247442.178	375576.570	247442.178	375576.570	Required	
15	247445.573	375536.497	247445.573	375536.497	Required	
5	247438.341	375526.286	247438.341	375526.286	Required	

Manhole Schedules for Storm

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
6	247444.495	375511.827	247444.495	375511.827	Required	
18	247351.841	375518.317	247351.841	375518.317	Required	
19	247371.946	375527.810	247371.946	375527.810	Required	
20	247380.845	375522.470	247380.845	375522.470	Required	
22	247427.700	375500.060	247427.700	375500.060	Required	
7	247458.250	375492.770	247458.250	375492.770	Required	
	247460.530	375490.680			No Entry	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	1	23.655	23.030	0.400	Open Manhole	1200
1.001	o	225	2	23.255	22.630	0.400	Open Manhole	1200
1.002	o	300	3	23.140	22.440	0.400	Open Manhole	1200
1.003	o	300	4	22.975	22.275	0.400	Open Manhole	1200
2.000	o	225	8	24.350	23.800	0.325	Open Manhole	1200
2.001	o	300	9	23.225	22.425	0.500	Open Manhole	1200
3.000	o	225	8	23.255	22.630	0.400	Open Manhole	1200
3.001	o	225	9	23.120	22.485	0.410	Open Manhole	1200
2.002	o	300	10	23.140	22.340	0.500	Open Manhole	1200
2.003	o	300	11	22.870	22.195	0.375	Open Manhole	1200
2.004	o	375	12	22.870	22.050	0.445	Open Manhole	1350
2.005	o	375	13	22.840	21.885	0.580	Open Manhole	1350
4.000	o	225	13	23.000	22.555	0.220	Open Manhole	1200
4.001	o	225	14	23.025	22.455	0.345	Open Manhole	1200
4.002	o	300	14	23.000	22.250	0.450	Open Manhole	1200
4.003	o	375	15	22.800	21.860	0.565	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	63.387	158.5	2	23.255	22.630	0.400	Open Manhole	1200
1.001	17.745	154.3	3	23.140	22.515	0.400	Open Manhole	1200
1.002	25.137	152.3	4	22.975	22.275	0.400	Open Manhole	1200
1.003	62.834	159.1	5	22.650	21.880	0.470	Open Manhole	1350
2.000	52.183	40.1	9	23.225	22.500	0.500	Open Manhole	1200
2.001	18.994	223.5	10	23.140	22.340	0.500	Open Manhole	1200
3.000	22.631	156.1	9	23.120	22.485	0.410	Open Manhole	1200
3.001	11.019	157.4	10	23.140	22.415	0.500	Open Manhole	1200
2.002	31.949	220.3	11	22.870	22.195	0.375	Open Manhole	1200
2.003	14.839	212.0	12	22.870	22.125	0.445	Open Manhole	1350
2.004	36.108	218.8	13	22.840	21.885	0.580	Open Manhole	1350
2.005	17.649	220.6	5	22.650	21.805	0.470	Open Manhole	1350
4.000	14.719	147.2	14	23.025	22.455	0.345	Open Manhole	1200
4.001	20.955	161.2	14	23.000	22.325	0.450	Open Manhole	1200
4.002	40.217	127.7	15	22.800	21.935	0.565	Open Manhole	1350
4.003	12.512	227.5	5	22.650	21.805	0.470	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.004	o	375	5	22.650	21.805	0.470	Open Manhole	1350
1.005	o	375	6	22.710	21.755	0.580	Open Manhole	1350
5.000	o	150	18	23.610	23.110	0.350	Open Manhole	1200
5.001	o	300	19	23.300	22.425	0.575	Open Manhole	1200
5.002	o	300	20	23.250	22.360	0.590	Open Manhole	1200
5.003	o	375	22	22.650	21.935	0.340	Open Manhole	1350
1.006	o	150	7	22.650	21.730	0.770	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.004	15.714	314.3	6	22.710	21.755	0.580	Open Manhole	1350
1.005	23.503	940.1	7	22.650	21.730	0.545	Open Manhole	1350
5.000	22.233	41.6	19	23.300	22.575	0.575	Open Manhole	1200
5.001	10.378	159.7	20	23.250	22.360	0.590	Open Manhole	1200
5.002	51.939	148.4	22	22.650	22.010	0.340	Open Manhole	1350
5.003	31.408	153.2	7	22.650	21.730	0.545	Open Manhole	1350
1.006	3.093	154.7		22.650	21.710	0.790	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.080	0.080	0.080
1.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.070	0.070	0.070
1.003	-	-	100	0.000	0.000	0.000
2.000	-	-	100	0.130	0.130	0.130
2.001	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.037	0.037	0.037
3.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.058	0.058	0.058
2.003	-	-	100	0.000	0.000	0.000
2.004	-	-	100	0.000	0.000	0.000
2.005	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.156	0.156	0.156
4.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.041	0.041	0.041
5.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.061	0.061	0.061
5.003	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.633	0.633	0.633

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.006		22.650	21.710	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.200	Storm Duration (mins)	30
Ratio R	0.300		

Online Controls for Storm

Hydro-Brake® Optimum Manhole: 7, DS/PN: 1.006, Volume (m³): 7.1

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	21.730
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0
Flush-Flo™	0.296	5.0
Kick-Flo®	0.637	4.1
Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Storage Structures for Storm

Tank or Pond Manhole: 7, DS/PN: 1.006

Invert Level (m) 21.745

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	438.0	0.905	698.0

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	0.707	2.520	0.000	3.227
1.001	2	0.707	0.706	0.000	1.412
1.002	3	0.792	1.777	0.000	2.569
1.003	4	0.792	4.441	0.000	5.233
2.000	8	0.622	2.075	0.000	2.697
2.001	9	0.905	1.343	0.000	2.247
3.000	8	0.707	0.900	0.000	1.607
3.001	9	0.718	0.438	0.000	1.156
2.002	10	0.905	2.258	0.000	3.163
2.003	11	0.763	1.049	0.000	1.812
2.004	12	1.174	3.988	0.000	5.162
2.005	13	1.367	1.949	0.000	3.316
4.000	13	0.503	0.585	0.000	1.089
4.001	14	0.645	0.833	0.000	1.478
4.002	14	0.848	2.843	0.000	3.691
4.003	15	1.346	1.382	0.000	2.727
1.004	5	1.210	1.736	0.000	2.945
1.005	6	1.367	2.596	0.000	3.963
5.000	18	0.565	0.393	0.000	0.958
5.001	19	0.990	0.734	0.000	1.723
5.002	20	1.007	3.671	0.000	4.678
5.003	22	1.023	3.469	0.000	4.492
1.006	7	1.317	0.055	509.492	510.863
Total		20.978	41.740	509.492	572.210

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	1	0.707	2.473	0.000	3.179
1.001	2	0.707	0.658	0.000	1.365
1.002	3	0.792	1.692	0.000	2.484
1.003	4	0.792	4.351	0.000	5.143
2.000	8	0.622	2.027	0.000	2.649
2.001	9	0.905	1.258	0.000	2.163
3.000	8	0.707	0.852	0.000	1.559
3.001	9	0.718	0.390	0.000	1.109
2.002	10	0.905	2.174	0.000	3.078
2.003	11	0.763	0.959	0.000	1.722
2.004	12	1.174	3.839	0.000	5.013
2.005	13	1.367	1.800	0.000	3.167
4.000	13	0.503	0.538	0.000	1.041
4.001	14	0.645	0.785	0.000	1.430
4.002	14	0.848	2.753	0.000	3.601
4.003	15	1.346	1.233	0.000	2.578
1.004	5	1.210	1.586	0.000	2.796
1.005	6	1.367	2.447	0.000	3.814
5.000	18	0.565	0.372	0.000	0.937
5.001	19	0.990	0.649	0.000	1.638
5.002	20	1.007	3.581	0.000	4.588
5.003	22	1.023	3.320	0.000	4.343
1.006	7	1.317	0.043	509.492	510.851
Total		20.978	39.778	509.492	570.248

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal 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 Coeffiecient	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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 minute 1 year Winter I+0%	23.655	23.101	-0.154	0.000	0.21
1.001	2	15 minute 1 year Winter I+0%	23.255	22.701	-0.154	0.000	0.22
1.002	3	15 minute 1 year Winter I+0%	23.140	22.526	-0.214	0.000	0.18
1.003	4	15 minute 1 year Winter I+0%	22.975	22.357	-0.218	0.000	0.17
2.000	8	15 minute 1 year Winter I+0%	24.350	23.864	-0.161	0.000	0.18
2.001	9	15 minute 1 year Winter I+0%	23.225	22.520	-0.205	0.000	0.22
3.000	8	15 minute 1 year Winter I+0%	23.255	22.679	-0.176	0.000	0.10
3.001	9	15 minute 1 year Winter I+0%	23.120	22.536	-0.174	0.000	0.11
2.002	10	15 minute 1 year Winter I+0%	23.140	22.460	-0.180	0.000	0.33
2.003	11	15 minute 1 year Winter I+0%	22.870	22.318	-0.177	0.000	0.35
2.004	12	15 minute 1 year Winter I+0%	22.870	22.159	-0.266	0.000	0.18
2.005	13	15 minute 1 year Winter I+0%	22.840	22.093	-0.167	0.000	0.17
4.000	13	15 minute 1 year Summer I+0%	23.000	22.555	-0.225	0.000	0.00
4.001	14	15 minute 1 year Summer I+0%	23.025	22.455	-0.225	0.000	0.00
4.002	14	15 minute 1 year Winter I+0%	23.000	22.330	-0.220	0.000	0.16
4.003	15	15 minute 1 year Winter I+0%	22.800	22.083	-0.152	0.000	0.13

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	1		0.075	0.8	8.2	OK
1.001	2		0.149	0.8	8.2	OK
1.002	3		0.094	0.9	14.2	OK
1.003	4		0.184	0.9	13.8	OK
2.000	8		0.067	1.5	14.0	OK
2.001	9		0.103	0.7	14.0	OK
3.000	8		0.050	0.6	4.0	OK
3.001	9		0.100	0.6	4.0	OK
2.002	10		0.409	0.9	22.8	OK
2.003	11		0.445	0.8	22.4	OK
2.004	12		0.163	0.8	22.3	OK
2.005	13		1.389	0.5	19.0	OK
4.000	13		0.000	0.0	0.0	OK
4.001	14		0.000	0.0	0.0	OK
4.002	14		0.087	1.0	14.3	OK
4.003	15		0.585	0.5	12.9	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.004	5	15 minute 1 year Winter I+0%	22.650	22.079	-0.101	0.000	0.42
1.005	6	15 minute 1 year Winter I+0%	22.710	22.048	-0.082	0.000	0.96
5.000	18	15 minute 1 year Winter I+0%	23.610	23.152	-0.108	0.000	0.17
5.001	19	15 minute 1 year Winter I+0%	23.300	22.477	-0.248	0.000	0.07
5.002	20	15 minute 1 year Winter I+0%	23.250	22.428	-0.232	0.000	0.12
5.003	22	15 minute 1 year Winter I+0%	22.650	22.000	-0.310	0.000	0.07
1.006	7	360 minute 1 year Winter I+0%	22.650	21.889	0.009	0.000	0.42

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.004	5		3.009	0.6	38.0	OK
1.005	6		1.534	0.4	37.7	OK
5.000	18		0.042	1.1	4.4	OK
5.001	19		0.053	0.5	4.4	OK
5.002	20		0.142	0.8	10.0	OK
5.003	22		0.088	0.8	10.0	OK
1.006	7		66.881	0.7	4.4	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal 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 Coeffiecient	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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 minute 30 year Winter I+0%	23.655	23.148	-0.107	0.000	0.51
1.001	2	15 minute 30 year Winter I+0%	23.255	22.748	-0.107	0.000	0.54
1.002	3	15 minute 30 year Winter I+0%	23.140	22.585	-0.155	0.000	0.46
1.003	4	15 minute 30 year Winter I+0%	22.975	22.413	-0.162	0.000	0.42
2.000	8	15 minute 30 year Winter I+0%	24.350	23.905	-0.120	0.000	0.43
2.001	9	15 minute 30 year Winter I+0%	23.225	22.598	-0.127	0.000	0.53
3.000	8	15 minute 30 year Winter I+0%	23.255	22.708	-0.147	0.000	0.25
3.001	9	15 minute 30 year Winter I+0%	23.120	22.586	-0.124	0.000	0.28
2.002	10	15 minute 30 year Winter I+0%	23.140	22.581	-0.059	0.000	0.83
2.003	11	15 minute 30 year Winter I+0%	22.870	22.529	0.034	0.000	0.83
2.004	12	15 minute 30 year Winter I+0%	22.870	22.449	0.024	0.000	0.38
2.005	13	15 minute 30 year Winter I+0%	22.840	22.345	0.085	0.000	0.37
4.000	13	15 minute 30 year Summer I+0%	23.000	22.555	-0.225	0.000	0.00
4.001	14	15 minute 30 year Summer I+0%	23.025	22.455	-0.225	0.000	0.00
4.002	14	15 minute 30 year Winter I+0%	23.000	22.397	-0.153	0.000	0.48
4.003	15	30 minute 30 year Winter I+0%	22.800	22.320	0.085	0.000	0.29

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	1		0.128	1.0	20.2	OK
1.001	2		0.295	1.0	20.0	OK
1.002	3		0.229	1.1	36.7	OK
1.003	4		0.442	1.2	35.6	OK
2.000	8		0.113	1.9	34.0	OK
2.001	9		0.222	0.8	34.0	OK
3.000	8		0.082	0.8	9.7	OK
3.001	9		0.211	0.7	9.7	OK
2.002	10		1.321	1.1	56.4	OK
2.003	11		2.227	1.0	52.5	SURCHARGED
2.004	12		1.479	0.9	46.4	SURCHARGED
2.005	13		4.270	0.4	40.7	SURCHARGED
4.000	13		0.000	0.0	0.0	OK
4.001	14		0.000	0.0	0.0	OK
4.002	14		0.242	1.3	43.4	OK
4.003	15		2.585	0.5	30.0	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.004	5	15 minute 30 year Winter I+0%	22.650	22.249	0.069	0.000	1.13
1.005	6	15 minute 30 year Winter I+0%	22.710	22.173	0.043	0.000	2.56
5.000	18	15 minute 30 year Winter I+0%	23.610	23.178	-0.082	0.000	0.41
5.001	19	15 minute 30 year Winter I+0%	23.300	22.510	-0.215	0.000	0.17
5.002	20	15 minute 30 year Winter I+0%	23.250	22.478	-0.182	0.000	0.32
5.003	22	480 minute 30 year Winter I+0%	22.650	22.091	-0.219	0.000	0.03
1.006	7	480 minute 30 year Winter I+0%	22.650	22.091	0.211	0.000	0.47

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.004	5		5.969	0.9	102.8	SURCHARGED
1.005	6		2.148	0.9	100.1	SURCHARGED
5.000	18		0.071	1.4	10.8	OK
5.001	19		0.091	0.7	10.8	OK
5.002	20		0.273	1.1	27.2	OK
5.003	22		0.327	0.7	3.9	OK
1.006	7		172.338	0.7	5.0	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal 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 Coeffiecient	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 Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.300
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	17.300	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.000	1	15 minute 100 year Winter I+40%	23.655	23.206	-0.049	0.000	0.91
1.001	2	15 minute 100 year Winter I+40%	23.255	22.814	-0.041	0.000	0.96
1.002	3	15 minute 100 year Winter I+40%	23.140	22.741	0.001	0.000	0.80
1.003	4	15 minute 100 year Winter I+40%	22.975	22.651	0.076	0.000	0.63
2.000	8	15 minute 100 year Winter I+40%	24.350	23.952	-0.073	0.000	0.77
2.001	9	15 minute 100 year Winter I+40%	23.225	23.092	0.367	0.000	0.85
3.000	8	15 minute 100 year Winter I+40%	23.255	23.053	0.198	0.000	0.40
3.001	9	15 minute 100 year Winter I+40%	23.120	23.024	0.314	0.000	0.40
2.002	10	15 minute 100 year Winter I+40%	23.140	23.007	0.367	0.000	1.19
2.003	11	15 minute 100 year Winter I+40%	22.870	22.816	0.321	0.000	1.22
2.004	12	15 minute 100 year Winter I+40%	22.870	22.708	0.283	0.000	0.63
2.005	13	15 minute 100 year Winter I+40%	22.840	22.600	0.340	0.000	0.71
4.000	13	30 minute 100 year Winter I+40%	23.000	22.656	-0.124	0.000	0.02
4.001	14	30 minute 100 year Winter I+40%	23.025	22.656	-0.024	0.000	0.10
4.002	14	30 minute 100 year Winter I+40%	23.000	22.677	0.127	0.000	0.59
4.003	15	30 minute 100 year Winter I+40%	22.800	22.555	0.320	0.000	0.48

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.000	1		0.194	1.2	36.4	OK
1.001	2		0.659	1.1	35.7	OK
1.002	3		0.837	1.3	64.0	SURCHARGED
1.003	4		1.961	1.2	53.0	SURCHARGED
2.000	8		0.167	2.2	61.1	OK
2.001	9		1.487	0.9	54.3	FLOOD RISK
3.000	8		0.472	0.9	15.4	FLOOD RISK
3.001	9		1.457	0.7	14.0	FLOOD RISK
2.002	10		2.397	1.2	81.2	FLOOD RISK
2.003	11		2.870	1.1	77.9	FLOOD RISK
2.004	12		1.894	0.9	77.0	FLOOD RISK
2.005	13		4.856	0.7	78.0	FLOOD RISK
4.000	13		0.109	0.3	0.8	OK
4.001	14		0.587	0.4	3.5	OK
4.002	14		1.258	1.3	54.2	SURCHARGED
4.003	15		3.732	0.6	49.1	FLOOD RISK

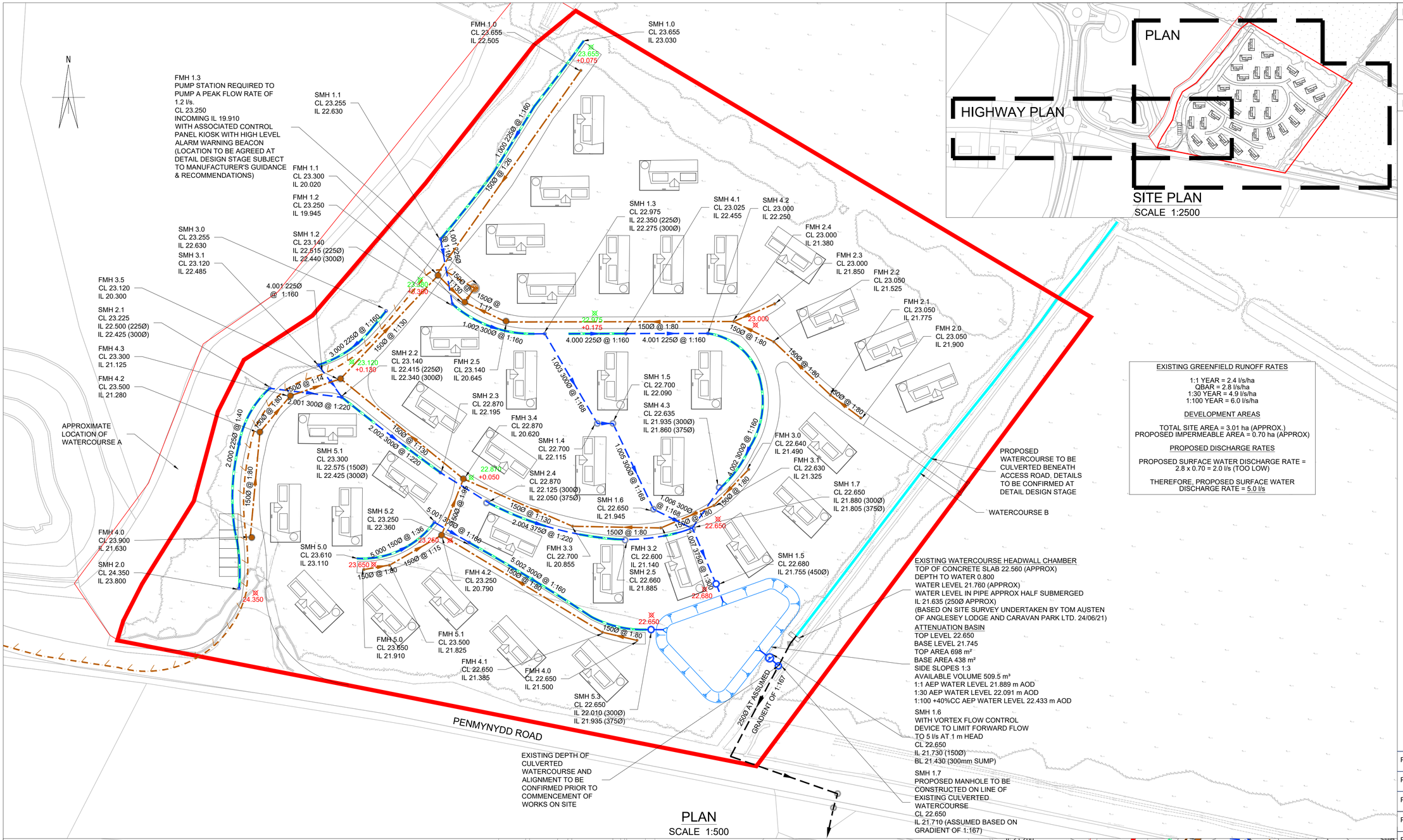
100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
1.004	5	15 minute 100 year Winter I+40%	22.650	22.502	0.322	0.000	1.86
1.005	6	720 minute 100 year Winter I+40%	22.710	22.435	0.305	0.000	0.67
5.000	18	15 minute 100 year Winter I+40%	23.610	23.208	-0.052	0.000	0.75
5.001	19	15 minute 100 year Winter I+40%	23.300	22.551	-0.174	0.000	0.30
5.002	20	15 minute 100 year Winter I+40%	23.250	22.526	-0.134	0.000	0.57
5.003	22	720 minute 100 year Winter I+40%	22.650	22.433	0.123	0.000	0.04
1.006	7	720 minute 100 year Winter I+40%	22.650	22.433	0.553	0.000	0.47

PN	US/MH Name	Overflow (l/s)	Maximum Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
1.004	5		8.287	1.5	168.2	FLOOD RISK
1.005	6		2.553	0.3	26.4	FLOOD RISK
5.000	18		0.106	1.6	19.5	OK
5.001	19		0.138	0.7	19.4	OK
5.002	20		0.454	1.3	48.6	OK
5.003	22		3.391	0.7	5.1	FLOOD RISK
1.006	7		372.254	0.7	5.0	FLOOD RISK

APPENDIX H

Preliminary Foul and Surface Water Drainage Layout



NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT WEETWOOD DRAWINGS
2. PIPE GRADIENTS, LENGTHS AND SIZES AND MANHOLE LEVELS SUBJECT TO DETAILED DESIGN FOLLOWING PLANNING APPROVAL AND A FIXED SITE LAYOUT INCLUDING PROPOSED GROUND LEVELS.
3. ALL LEVELS ARE IN METERS (AOD)
4. ALL PIPE DIAMETERS ARE IN MILLIMETERS

DRAINAGE NOTES

EXISTING WATERCOURSE LEVELS ARE BASED ON INFORMATION PROVIDED WITHIN TOPOGRAPHIC SURVEY UNDERTAKEN BY NRG ENGINEERING SERVICES LTD 31/07/18 AND FURTHER SITE SURVEY UNDERTAKEN BY TOM AUSTEN OF ANGLESEY LODGE AND CARAVAN PARK LTD. 24/06/21)

THE LOCATION LINE & LEVEL OF THE EXISTING CULVERTED WATERCOURSE INDICATED ON THE DRAWING IS APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY.

THE LOCATION, LINE & LEVEL OF EXISTING COMBINED DRAINAGE INDICATED ON THE DRAWING IS APPROXIMATE AND FOR GUIDANCE PURPOSES ONLY. IT IS THE CONTRACTORS RESPONSIBILITY TO DETERMINE THEIR EXACT LINE & LEVEL, BY WAY OF HAND EXCAVATED TRIAL PITS, PRIOR TO THE COMMENCEMENT OF ANY EXCAVATION WORKS ON SITE. THE CONTRACTOR SHALL TAKE ALL NECESSARY PRECAUTIONS TO MAINTAIN THE STRUCTURAL INTEGRITY OF ALL ABOVE AND BELOW GROUND SERVICE MAINS / DRAINAGE INSTALLATIONS.

EXISTING PUBLIC COMBINED WATER SEWER
EXISTING CULVERTED WATERCOURSE
EXISTING WATERCOURSE
PROPOSED FOUL WATER SEWER
PROPOSED FOUL WATER RISING MAIN
PROPOSED SURFACE WATER SEWER
EXISTING COMBINED WATER MANHOLE
EXISTING SURFACE WATER MANHOLE
PROPOSED FOUL WATER MANHOLE / INSPECTION CHAMBER
PROPOSED SURFACE WATER MANHOLE / INSPECTION CHAMBER
PROPOSED ATTENUATION BASIN
PROPOSED INTERCEPTOR DRAIN
22.710 +0.100 PROPOSED GROUND LEVEL AND ASSOCIATED DIFFERENCE BETWEEN EXISTING GROUND LEVEL
22.650 PROPOSED GROUND LEVEL THAT REQUIRED NO INCREASE
SITE BOUNDARY

EXISTING GREENFIELD RUNOFF RATES

1:1 YEAR = 2.4 l/s/ha
QBAR = 2.8 l/s/ha
1:30 YEAR = 4.9 l/s/ha
1:100 YEAR = 6.0 l/s/ha

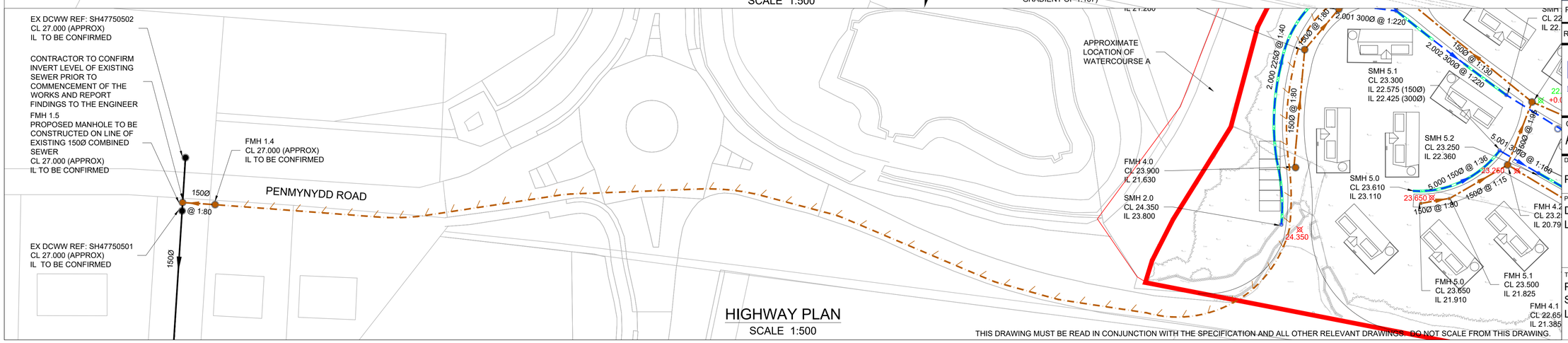
DEVELOPMENT AREAS

TOTAL SITE AREA = 3.01 ha (APPROX.)
PROPOSED IMPERMEABLE AREA = 0.70 ha (APPROX)

PROPOSED DISCHARGE RATES

PROPOSED SURFACE WATER DISCHARGE RATE =
2.8 x 0.70 = 2.0 l/s (TOO LOW)

THEREFORE, PROPOSED SURFACE WATER
DISCHARGE RATE = 5.0 l/s



Rev	Date	Description	Drawn	Check
P5	23/12/21	Site layout amended	JR	TB
P4	06/12/21	Site layout amended	JR	TB
P3	03/12/21	Site layout amended	JR	TB
P2	23/11/21	Foul drainage layout added	JR	TB
P1	14/07/21	Issued for Information	JR	TB

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Date
JULY 2021

Scale (A1)
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Drawn
JR

Checked
TB

Project
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Project No
4683

Title
PROPOSED FOUL AND
SURFACE WATER DRAINAGE
LAYOUT

Drawing No
C100

Revision
P5

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