Treated Effluent Drainage Strategy Report

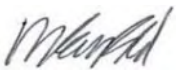
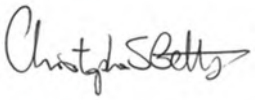
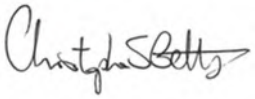
Proposed Conversion of Redundant Agricultural Building into Care Home

Llanellen Court, Llanellen

On behalf of

Morspan Holdings Ltd

Quality Management

Prepared by:	Matt Ganfield BSc	
Reviewed by:	Chris Betts BSc MSc CGeol	
Authorised by:	Chris Betts BSc MSc CGeol	
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1 Introduction

1.1 Background

Hydrogeo Limited (Hydrogeo) has been instructed by Morspan Holdings Ltd (the Client) to develop a treated effluent drainage strategy for a conversion of redundant agricultural building into a proposed care home, Llanellen Court, Llanellen, Abergavenny (the Site).

This report has been progressed to outline the viability of a drainage field which discharges to ground.

1.2 Planning

Llanellen Court comprises numerous residential and agricultural buildings including houses, cottages and former poultry sheds.

A planning application was submitted to Monmouthshire County Council on the 18th November 2008 under reference DC/2008/01305 for the '*Proposed conversion of redundant agricultural buildings into care home for elderly. (Use class C2)*. This application was approved but since expired in 2014. The application was resubmitted on 1st October 2021 under reference DM/2021/01644 for the '*Re-submission of planning application for conversion of redundant agricultural buildings into care home for elderly (use class C2)'*

Percolation testing is required to demonstrate the suitability of the site for a drainage field in accordance with the Environment Agency Advice for local authorities on non mains drainage from non-major development.

1.3 Site Setting

The Site is located at Llanellen Court, Abergavenny, NP7 9HT. The grid reference for the centre of the Site is 330180, 210572.

The location of the Site has been shown in Figure 1-1. The boundary of the Site has been shown in Figure 1-2.

Figure 1-1 Site location

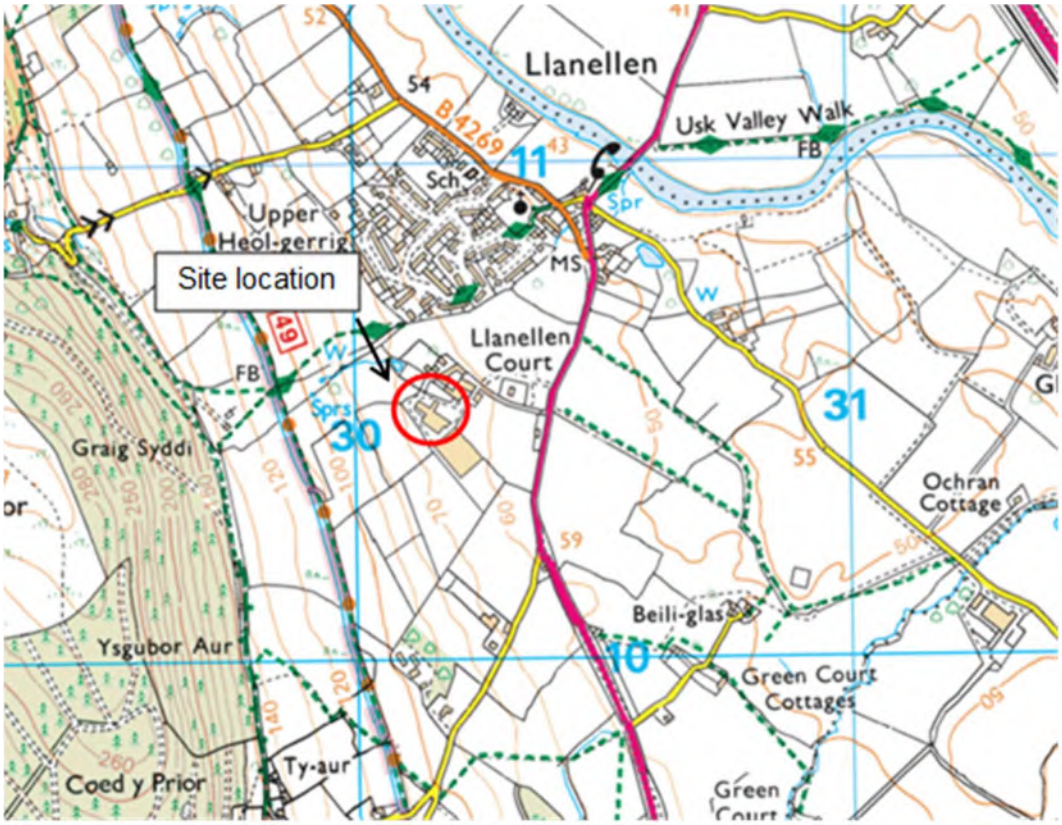


Figure 1-2 Site boundary

The Site comprises a disused agricultural poultry unit and a section of a field to the south across an access road. The Site is located in a rural setting surrounded by agricultural

land to the west and east, residential farmhouses to the north and disused poultry sheds to the south.

The Site slopes gently southeast from 68mAOD (Above ordnance datum) in the northwest to 62mAOD in the southeast.

The Site contains 2no. disused poultry sheds with a compacted gravel track around the perimeter. A large area of soft landscaping is present in the northeast of the site. The southeast of the site is a section of grass field separated from the poultry sheds by a private access road.

An external topographic survey was carried out and the site drawings have been attached in Appendix A.

1.4 Proposed Development

The proposed development comprises of conversion of a redundant agricultural building into a 40 bed care home, with associated car park, soft landscaping areas and gardens.

The Site layout plan has been attached at Appendix B.

1.5 Current Drainage

The client provided information of the existing foul drainage on-site attached in Appendix C. The plan shows the northern poultry shed is served by a septic tank likely discharging to the adjacent land. No other foul drainage is shown within the Site boundary.

Welsh Water sewage plans attached in Appendix D show there are no foul or combined sewers in the vicinity of the Site.

2 Site Investigation

2.1 Introduction

Site investigation has been undertaken to assess the viability of a treated effluent discharge to ground.

Hydrogeo attended site on the 21st - 22nd March 2023 to conduct percolation testing for treated effluent discharge.

Reference is made to trial pits in this report in order to discuss the presence (or otherwise) of groundwater.

Percolation testing was undertaken at the proposed location of a drainage field in the southeast corner of the Site

2.2 Site Investigation

A total of 3 no. percolation pits and 3 no. surface level percolation pits were advanced in 3no. locations 8m apart. 1no. deeper percolation pit and an adjacent shallow pit at each location.

The test locations have been marked on Drawing 1.

Percolation tests were carried out in general accordance with the guidance document BS 6297:2007+A1:2008 *Code of practice for the installation of drainage fields for use in wastewater treatment* (2008). All test pits were excavated to dimensions of 0.3m length x 0.3m width, with the deeper pits excavated at the base of a 0.3m deep hole to a maximum depth of 0.6m below ground level (mBGL). The shallower pits excavated to a maximum depth of 0.3mBGL. All testing was undertaken with a maximum water depth of 0.3m.

The purpose for the shallower pits was to assess the suitability of the upper soil layer for a raised drainage mound system if the deeper tests proved that the soil at depth was unsuitable for a traditional treated effluent drainage field.

1 no. deeper investigation trial pit (TP01) was excavated, with TP01 located in the lawn northeast of the poultry sheds. TP01 was excavated in order to discuss the presence (or otherwise) of groundwater and made ground on-site.

2.3 Geology and Ground Conditions

Published Geology

The British Geological Survey (BGS) geology map for the Site (Sheet 232, Abergavenny, 1:50,000 scale, Solid and Drift, 2000) and online BGS resources have been used to determine the geology below the Site.

Superficial Geology

Based on BGS geological mapping the site is underlain by Glaciofluvial Sand and Gravel from the Devensian period. A small section along the western Site boundary is underlain by Devensian Till deposits.

Bedrock Geology

The bedrock underlying the Site comprises the St Maughans Formation: Interbedded Purple, Brown and green sandstones and red mudstones.

Ground Conditions

Ground conditions recorded during the site investigation generally comprised the following:

- 0.0m - 0.3m – brown sandy gravelly CLAY with rootlets. [TOPSOIL]
- 0.3m – 0.6m – light brown sandy CLAY with rounded cobbles [Glaciofluviall deposits]
- 0.6 – 1.5m - Light brown CLAY [Weathered St Maughans Formation]
- 1.5 – 1.8m - Light brown CLAY with subangular cobbles [Weathered St Maughans Formation]

TP01 was excavated down to a maximum depth of 1.8mBGL to check the presence (or otherwise) of groundwater. No groundwater was encountered in TP01 therefore, a minimum of 1m unsaturated zone has been proven to be present.

2.4 Testing Results

The results of percolation testing have been shown in Table 2-1 and the full test results are attached in Appendix E.

Table 2-1 Percolation test results

Test ID	Vp (s/mm)			Average Vp (s/mm)
	Test 1	Test 2	Test 3	
PP01	13	29	48	30
PP02	14	44	66	41
PP03	11	36	29	25
PPS01	9	18	24	17
PPS02	16	43	53	37
PPS03	43	65	62	57

The guidance document BS 6297:2007+A1:2008 indicates that a Vp of between 15 and 100s/mm is required for a drainage field to be viable.

Deeper pits

The 3 no. deeper tests PP01, PP02 and PP03 are within the 15-100s/mm range showing the field to the east of the poultry sheds is suitable to a drainage field.

Shallow pits

The 3no PPS01, PPS02 and PPS03 are within the 15-100s/mm range showing the field to the east of the poultry sheds is suitable to a drainage mound. Based on the fall of the land it is expected that treated effluent will flow from the property under gravity to the field in the east

3 Drainage Field Design

3.1 Drainage Field Sizing

Based on guidance in the British Water Code of Practice document *Flows and Loads – 4 Sizing Criteria, Treatment Capacity for Sewage Treatment Systems* (2013) and the guidance document BS 6297:2007+A1:2008 - *Code of practice for the design and installation of drainage fields for use in wastewater treatment* (2008) a layout design has been formulated for a drainage field for the proposed development.

Expected water use at the development has been calculated using the Flows and Loads 4 guidance. Each development falls under the 'Residential Care Homes' category, as 'Residential old people/nursing'. The guidance states that the flow from such developments would be 350l/day per person.

The provision of loading from staff and visitors at a care home is not included for this category of development in Flows and Loads 4, however provision is made for other categories. A figure of 90l/day for full time staff and 45l/day for part-time staff is indicated for an industrial setting, and a figure of 90l/day is indicated for day staff at a school.

Based on all of the above the number of persons at the proposed care home for the purposes of the treated effluent drainage design has summarised in Table 3-1.

Table 3-1 Daily loading

Person type	Number	Number per full-day	Loading (l/person/day)	Total loading (m^3/day)
Resident	40	40	350	14.00
Staff (full-time)	15	5	90	1.35
Staff (part-time)	10	2.5*	45	0.45
Visitor	n/a	1.5*	n/a	0.20**
Total				16.00

*Reduction applied to take into account time spent at care home per day for the purposes of the BS 6297:2007+A1:2008 effluent drainage field calculations

**Total allowance per day made for visitors

Sizing of the drainage field has been completed with reference to BS 6297:2007+A1:2008. The trench length for discharging the effluent from a Package Treatment Plant (PTP) should be calculated as follows:

A = p x Vp x 0.2

Where;

A = the area required for the drainage field (m^2)

p = the number of people served by the treatment plant

Vp = the percolation value (s/mm)

0.2 = factor applied for effluents which have received secondary treatment (in a PTP)

It should be noted that some of the persons counted in Table 3-1 are expected to represent a full-day loading, such as residents, whereas some persons are only expected to represent part of a day, such as part-time staff and visitors.

Flows and Loads 4 takes this into account by providing a reduced effluent volume on a per-day basis. However, when calculating the drainage field size using BS 6297:2007+A1:2008 the total persons per day is required, not an effluent volume. In order to account for this, the total full-day loading has been set at 49 persons as shown in Table 3-1.

The area required for the drainage field has therefore been calculated as follows:

p = 49 persons total

Vp = 32s/mm (average of the deep testing results from PP01 to PP03)

A = 49 x 32 x 0.2

A = 314m^2

The guidance provides lengths of infiltration trenches required to discharge the volume of treated effluent based on 3 no. example trench widths: 0.3m, 0.6m and 0.9m wide.

For a surface area of 314m^2 the following trench widths have been determined, based on the linear width-to-length relationship demonstrated in the guidance:

- 0.3m wide trench: 1,036m trench length
- 0.6m wide trench: 502m trench length
- 0.9m wide trench: 345m trench length

A total trench distance of 345m is proposed comprising 0.9m wide trenches and spacing between each trench set at 1.0m. This design will fit into the northwestern corner of the field in the south east of the Site.

The layout for the proposed drainage field has been shown on Drawing 2.

3.2 Construction Considerations

Part H of the Building Regulations 2010 (Wales) has been referenced when considering the siting of the effluent treatment components.

The location of the package treatment plant has been designed with the following minimum distances:

- ≥10m from a watercourse or ditch (a stream is located 185m to north, up slope).
- ≥10m from any habitable building, and sufficiently distant from any other drainage field or soakaway (30m away from approved care home conversion).
- ≥50m from the River Usk SAC (580m to River Usk).
- ≥2m from a site boundary (140m away from field boundary to A4042).

The drainage field has been designed with the following minimum distances:

- ≥10m from a watercourse or ditch.
- ≥50m from water abstraction points.
- ≥15m from any building, and sufficiently distant from any other drainage field or soakaway.
- 50m from the River Usk SAC.
- ≥2m from a site boundary.

Other regulations have also been followed during the design of the package treatment works:

- The drainage area is downslope of any groundwater sources (if present).
- The drainage area is downslope of any other discharge to ground.
- No water supply pipes or underground services are within the drainage area.
- No access roads, driveways or paved areas are within the drainage area.
- No rainwater will be allowed to enter the system.

The guidance document BS 6297:2007+A1:2008 states that a treated effluent drainage field should be positioned as far away as practical from habitable buildings, with the prevailing wind direction taken into account. Based on Part H of the Building Regulations 2010 (Wales) it is recommended that this distance a minimum of 15m.

The proposed location of the drainage field shown on Drawing 2 is more than 30m south of the proposed care home and more than 30m east of the off-site redundant poultry shed southwest of the Site boundary. Package treatment plants treat effluent to a higher standard than septic tanks. It is understood that the specified package treatment plant, a Klargester BioDisc, has odourless operation meeting BS EN 13725.

4 Water Treatment

It is proposed that a PTP will be installed in the field to the southeast of the Site to receive all effluent. The PTP will be capable of treating at least the calculated volume of wastewater following development: 16m^3/day.

A Klargester BioDisc Commercial Sewage Treatment Plant (or similar) is to be installed at the Site.

The Klargester BioDisc Commercial Sewage Treatment Plant BJ model has capacity for 20m^3/day and therefore is considered to be most suitable. It is noted that other similar PTPs which meet BS EN 12566-3 standards may be used.

5 Environmental Impact

The Site is located within the River Usk catchment. An unnamed stream is located approximately 70m north of the Site which flows northeast via culvert to the River Usk which is the predicted discharge location. The proposed drainage field and PTP are located downslope from the unnamed stream and culvert.

The NRW advice states that developments should first be screened to determine whether they are likely to have a significant effect.

Phosphate neutrality

The proposals for the Site involve taking existing agricultural land out of commission, thereby reducing the P loading which would have originated from this land. The most recent land use at the Site was indoor poultry farming which has a comparatively high P load compared to other types of farming land use.

In order to increase the P offset beyond that achieved by taking land out of commission it is proposed that a high level of sewage treatment is employed within the proposal, a package treatment plant, in the event that a detailed risk assessment is required for the drainage field.

A recent study of phosphorus attenuation at 24 no. septic systems over a 30 year period (Robertson *et al,* 2019)[1] has been reviewed. The study reports an average 90% retention of phosphorus concentration in the drainage fields for non-calcareous sediment. When taking into account the unsaturated and saturated zones, the reduction of phosphorus was found to average 97% at a 10m distance down hydraulic gradient under the same soil conditions.

The phosphate load in groundwater discharging ultimately to the Usk SAC is therefore expected to be neutral / unchanged as a result of the proposed treated effluent discharge to ground.

[1] Robertson, W. D., Van Stempvoort, D, R. and Schiff, S. L. (2019). Review of phosphorus attenuation in groundwater plumes from 24 septic systems. Science of the total Environment, 662. pp 640-652.

6 Conclusions

6.1 Introduction

This Treated Effluent Drainage Strategy Report presents sizing calculations and layout proposals for treated effluent drainage at the proposed conversion of redundant agricultural buildings into a care home at Llanellen Court, Llanellen, Abergavenny, Monmouthshire, NP7 9HT.

6.2 Foul Water Drainage

Following construction, it is proposed that foul water from the proposed care home is drained via a package treatment plant with a flow of 16m^3/day.

The treated effluent will then flow under gravity to a shallow drainage field sized with reference to BS 6297:2007+A1:2008. The drainage field will be located at the northwestern part of the field in the southeast of the Site. The field is under the ownership of the Client.

The proposed treated effluent drainage components have been shown on Drawing 2.

The location of the package treatment plant has been designed with the following minimum distances:

- ≥10m from a watercourse or ditch.
- ≥10m from any habitable building, and sufficiently distant from any other drainage field or soakaway.
- ≥50m from the River Usk SAC.
- ≥2m from a site boundary.

The drainage field has been designed with the following minimum distances:

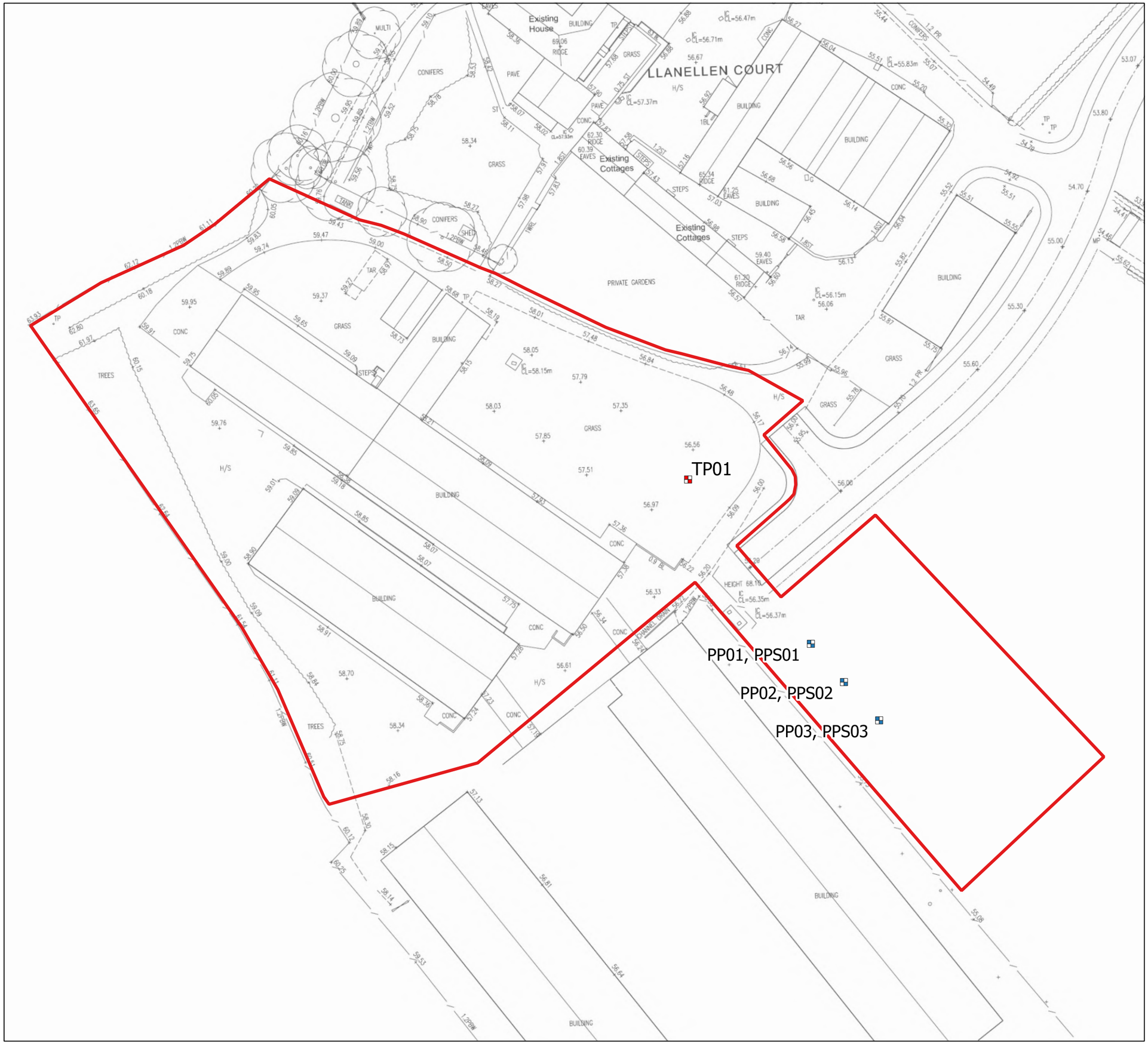
- ≥10m from a watercourse or ditch.
- ≥50m from water abstraction points.
- ≥15m from any building, and sufficiently distant from any other drainage field or soakaway.
- 50m from the River Usk SAC.
- ≥2m from a site boundary.

The proposed features will provide sufficient treatment for the foul water generated at the Site, and are not expected to have a significant detrimental impact on the River Usk SAC.

Drawings

Drawing 1

Site investigation location plan



HYDROGEO

HYG1135 Llanellen Care Home

DRAWING 01

Site Investigation Locations

KEY

- Site Boundary
- Trial pit
- Percolation test pits

Drawing modified from 'Topographic Survey', Job: BC\LCF\001C, PM Consultants Limited, 12/06/2007

20 0 20 m

N

Date	By	Paper	Scale	Rev
08 2023	MG	A3	1:600	2

Drawing 2

Treated effluent drainage layout

HYDROGEO

HYG1135 Llanellen Care Home

DRAWING 02

Treated effluent drainage layout

KEY

Site Boundary

Site investigation locations

Percolation test pit

Trial pit

Treated effluent drainage features

Drainage field

Package treatment plant

Pipe

TP01

PP01, PPS01

PP02, PPS02

PP03, PPS03

Drawing modified from 'Topographic Survey', Job: BC\LCF\001C, PM Consultants Limited, 12/06/2007

10 0 10 m

N

Date	By	Paper	Scale	Rev
08 2023	MG	A3	1:600	2

Appendices

Appendix A

Topographic survey

KEY

58.32	SPOT LEVEL	TS	TRAFFIC SIGNAL	G	GULLY	1.0BR	BRICK WALL
TAR	TARMAC	TSC	TRAFFIC SIGNAL CONTROLLER	WM	WATER METER	1.0BL	BLOCK WALL
GR	GRASS	IC	INSPECTION COVER	SV	SLUICE VALVE	1.0ST	STONE WALL
H/S	HARDSTANDING	MH	MANHOLE	ST	STOP TAP		HEDGEROW/TREE CANOPY
BL	BOLLARD	MH	MANHOLE	FH	FIRE HYDRANT		FENCE
BB	BELISHA BEACON	MP	MARKER POST	BT	BRITISH TELECOM	2.0 P+W	
RS	ROAD SIGN	TP	TELEGRAPH POLE	CATV	CABLE TV	DK	DROPPED KERB
SIGN	SIGN	LC	LIGHTING COLUMN	TV	CABLE TV		
NP	STREET NAMEPLATE			GV	GAS VALVE		

APPROX N

NOTES:

LEVELS ARE RELATED TO AN ARBITRARY DATUM

SITE GRID IS BASED ON ARBITRARY CO-ORDINATES

ISSUE	REVISION	DATE
A	*Existing dwellings Oaklands & Ty Ceirios indicated by BCP*	Nov'08
B	*Overlay showing new access*	Aug'18
C	*Access Road As Built indicated by BCP*	Sep'21

Job: TOPOGRAPHICAL SURVEY
LLANELLEN COURT FARM
LLANELLEN

Scale:	Date:	Drawn By:	Checked By:	Job Ref.
1:500	12/06/07	NM	SR	BC\LCF\001C

Client: Buckle Chamberlain
Llancayo Court
Llancayo

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Appendix B

Proposed site layout plan

PROPOSED SITE PLAN

Scale 1:200

BAT MITIGATION NOTES

An Ecological Survey Report has been provided by Just Mammals Ltd ref: JM8421 dated: September 2021.

The Ecological report confirms that Evidence of a single roost for a common pipistrelle bat was found in 'shed A'.

Because all Bats are protected species a European Protected Species (EPS) Licence will be needed from NRW (Natural Resources Wales) before any roof work can start.

An ecological Method Statement and supervision by qualified ecologist will be required.

Refer to Just Mammals Ltd report ref: JM8421 dated: September 2021 for details of Mitigation measures as follows:-

A minimum of 3no. Bat boxes suitable for crevice roosting bats ref: Schwegler 1FF will be provided in different positions and orientations, in a suitable position on an existing mature tree. The bat boxes will be installed prior to the start of work, and will remain in-situ following the completion of the conversion works. The location for the bat boxes will be determined in consultation with the ecologist appointed to the project to ensure a suitable position which considers links to adjacent habitat.

Long term provision for crevice roosting bats to be provided to 'shed A' as part of the conversion. Bat access points to be provided at high level to the space behind the gable end timber cladding boards at roof level on the South East facing gable end. The Bat access points size to be 18x50mm located 750mm from the apex.

All external lighting will face downwards and be set on timers.
The External Lighting will be limited so that Bats are not disturbed. Subtle low output downlights wall mounted alongside entrance door and recessed downlights to be used in the soffit of the canopy over the doors. Low level bollard lights to the parking area. shown on plan as • B High level Security/flood lights must not be installed.

EXISTING HEDGEROW AND TREES

In accordance with the Ecology Survey Report by Just Mammals ref: JM8421 dated: Sept 2021 the existing hedgerow and trees around the site perimeter to the North & West boundaries will remain. Temporary Heras fencing will be erected to provide an exclusion zone and keep personnel, machinery & building materials away from the hedges & trees during the proposed conversion works.

In accordance with paragraph 10.12 on page 9 of Just Mammals Ecology Report there will be a one in three year management programme for hedge trimming, as well as a 3 year rotation plan with all other similar hedgerows under the same ownership. The management programme to retain the existing hedgerows in a tall and bushy condition.

ECOLOGICAL ENHANCEMENT

The proposals will Include Bat and Bird nesting boxes 3no. Schwegler 1FF Bat boxes and 1no. Schwegler 1B bird nest box to provide ecological enhancement.

Woodcrete boxes are specified as these have a much longer life span than timber. Woodcrete nest boxes are made from a breathable blend of wood, concrete and clay which will not rot, leak, crack or warp, whilst preventing condensation and maintaining more constant temperatures inside than wooden bird boxes.

New planting will include native species trees and plants with berries to attract birds, and flowers to attract pollinators. New planting will be chosen from The Royal Horticultural Society publication 'Plants for Pollinators'.

THIS DRAWING Revision A HAS ALREADY BEEN APPROVED. PLANNING PERMISSION Ref DC/2008/01305 dated 22 Dec 2009. Expired Dec 2014

Rev	Description	Date
B	Notes to confirm ecology mitigation. Biodiversity Enhancements.	29.06.22
A	Additional parking spaces & Mini bus/ambulance space enlarged. Additional dedicated staff parking area, Enclosed garden for elderly mentally infirm	27.03.09

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Client	Morspan Holdings Ltd.
Project	Proposed Conversion of Redundant Agricultural Buildings into Care Home at Llanellen Court, Llanellen, Abergavenny.
Drawing	Care Home Site Layout Plan
Date	July 2008
Scale	1:200 @ A1
Drawn by	GaG
Checked by	RAC
Status	
Drawing No	339 [BD] 04 B

Appendix C

Existing foul drainage layout

packaged treatment plant

septic tank

septic tank

septic tank

Existing 1.8m wide footpath

Access Road Complete. Extant Planning Permission DC/2008/01304 27 Aug 2009.

Existing 1.8m wide footpath

Access Road Junction already constructed inspected & approved by Welsh Government. Extant Planning Permission DC/2008/01304 27 Aug 2009.

Existing access to 'Oaklands'

Old access to Llanellen Court already Closed

Existing access to 'Ty Ceirios'

Planning Permission for Conversion of Existing Buildings into Care Home DC/2008/01305 22 Dec 2009. Expired Dec 2014

Planning Permission already granted for Conversion to Close Care Apartments DC/2015/00983 26 April 2017

Extant Planning Permission for Conversion Close Care Apartments DC/2010/00981 4 May 2012

LLANELLEN COURT

OAKLANDS

TY CEIRIOS

TO ABERGAVENNY

TO PONTYPOOL

EXISTING ROAD A4042

NORTH

METRES 0 5 10 15 20

KEY

38.32	SPOT LEVEL	TS	TRAFFIC SIGNAL	G	GULLY	1.0BR	BRICK WALL
TAR	TARMAC	TSC	TRAFFIC SIGNAL CONTROLLER	WM	WATER METER	1.0BL	BLOCK WALL
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Appendix D

Welsh Water sewer plans

Dŵr Cymru
Welsh Water

PPA0005955 Sewer Plan

N
W E
S

LEGEND(Representative of most common features)

Waste network:

- Foul chamber
- Surface water chamber
- Combined chamber
- Combined sewer overflow
- Special purpose chamber
- Treatment works
- Pumping station
- Outfall
- Lamphole
- Storm Overflow
- Rising main
- Gravity sewer
- Private sewer
- Private sewer subject to Sect. 104 adoption agreement
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

NB: Sewer symbol colour indicates the type.

RED - Combined
GREEN - Surface Water
BROWN - Foul
Purple - Former S24 sewers (for indicative purposes only)

Notes:

Whilst every reasonable effort has been taken to correctly record the pipe material of DCWW assets, there is a possibility that in some cases pipe material (other than Asbestos Cement or Pitch Fibre) may be found to be asbestos cement (AC) or Pitch Fibre (PF). It is therefore advisable that the possible presence of AC or PF pipes be anticipated and considered as part of any risk assessment prior to excavation

Map Ref:	330250,210575
Map scale:	1:1250
Printed by:	Jonathan Hobson
Printed on:	20 Aug 2021

Appendix E

Percolation test results

PPS01

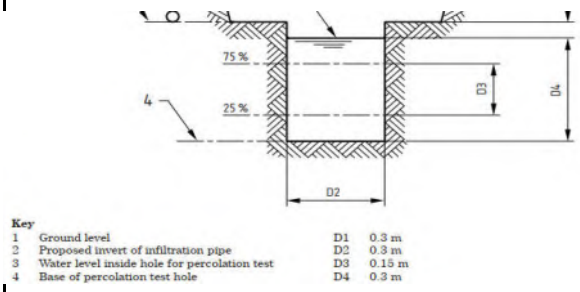
Date	21/03/2023	**Length (cm)**	30.00
Site	Llanellen Court	**Width (cm)**	30.00
Job Number	HYG1135	**Depth (cm)**	30.00
		Groundwater Level (mbgl)	0.00

HYDROGEO

PERCOLATION TEST

See BS 6297:2007+A1:2008 Section 6.2.

Remarks -

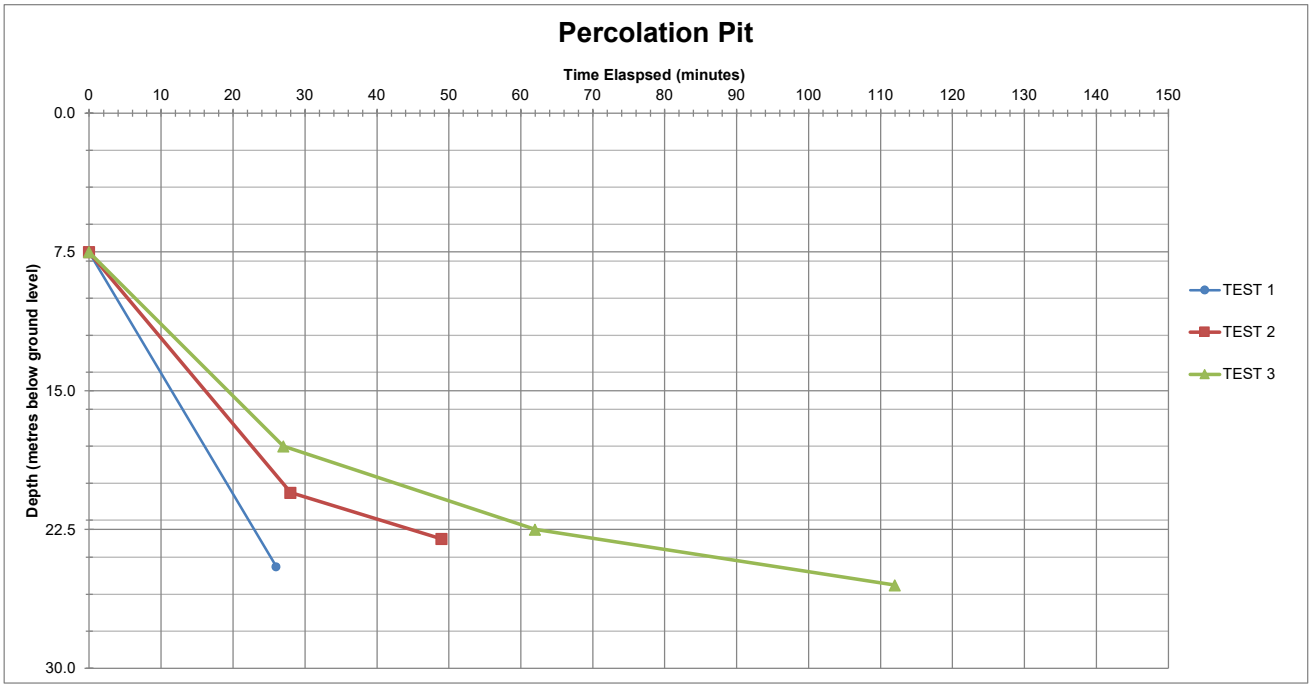


Key

1	Ground level	D1	0.3 m
2	Proposed invert of infiltration pipe	D2	0.3 m
3	Water level inside hole for percolation test	D3	0.15 m
4	Base of percolation test hole	D4	0.3 m

TEST 1		**TEST 2**		**TEST 3**	
Time(min)	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**
0	7.50	0	7.50	0	7.50
26	24.50	28	20.50	27	18.00
		49	23.00	62	22.50
				112	25.50

Effective Storage Depth	**cm**	22.50	22.50	22.50
75% Effective Storage Depth	**cm**	16.88	16.88	16.88
(i.e. depth below GL)	**cm**	13.13	13.13	13.13
25% Effective Storage Depth	**cm**	5.63	5.63	5.63
(i.e. depth below GL)	**cm**	24.38	24.38	24.38
Effective Storage Depth 75%-25%	**cm**	11.25	11.25	11.25
Time to fall to 75% effective depth	**mins**	0	0	0
Time to fall to 25% effective depth	**mins**	22	44	59
Time (75%-25%) - min	**mins**	22.0	44.0	59.0
Time (75%-25%) - sec	**seconds**	1320	2640	3540
Vp	**sec/mm**	**9**	**18**	**24**
Design Vp	**sec/mm**	**17**		



PPS02

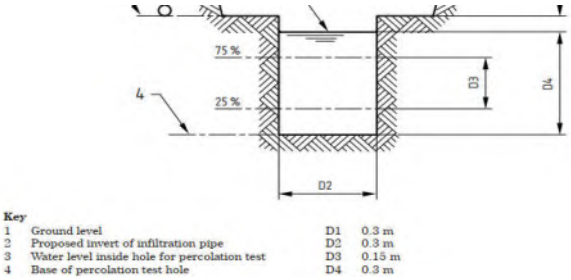
Date	21-22/03/2023	**Length (cm)**	30.00
Site	Llanellen Court	**Width (cm)**	30.00
Job Number	HYG1135	**Depth (cm)**	30.00
		Groundwater Level (mbgl)	0.00

HYDROGEO

PERCOLATION TEST

See BS 6297:2007+A1:2008 Section 6.2.

Remarks -

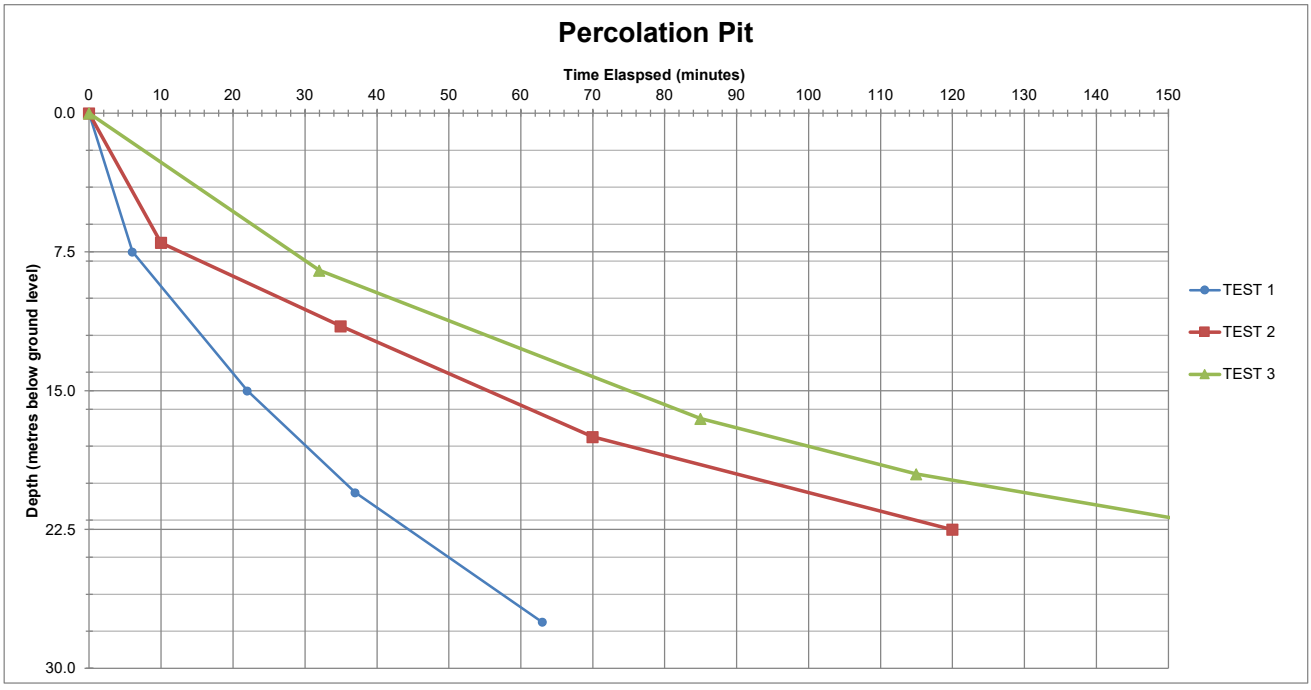


Key

1	Ground level	D1	0.3 m
2	Proposed invert of infiltration pipe	D2	0.3 m
3	Water level inside hole for percolation test	D3	0.15 m
4	Base of percolation test hole	D4	0.3 m

TEST 1		TEST 2		TEST 3	
Time(min)	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**
0	0.00	0	0.00	0	0.00
6	7.50	10	7.00	32	8.50
22	15.00	35	11.50	85	16.50
37	20.50	70	17.50	115	19.50
63	27.50	120	22.50	160	22.50

		TEST 1	TEST 2	TEST 3
Effective Storage Depth	**cm**	30.00	30.00	30.00
75% Effective Storage Depth	**cm**	22.50	22.50	22.50
(i.e. depth below GL)	**cm**	7.50	7.50	7.50
25% Effective Storage Depth	**cm**	7.50	7.50	7.50
(i.e. depth below GL)	**cm**	22.50	22.50	22.50
Effective Storage Depth 75%-25%	**cm**	15.00	15.00	15.00
Time to fall to 75% effective depth	**mins**	6	13	28
Time to fall to 25% effective depth	**mins**	45	120	160
Time (75%-25%) - min	**mins**	39.0	107.0	132.0
Time (75%-25%) - sec	**seconds**	2340	6420	7920
Vp	**sec/mm**	**16**	**43**	**53**
Design Vp	**sec/mm**	**37**		



PPS03

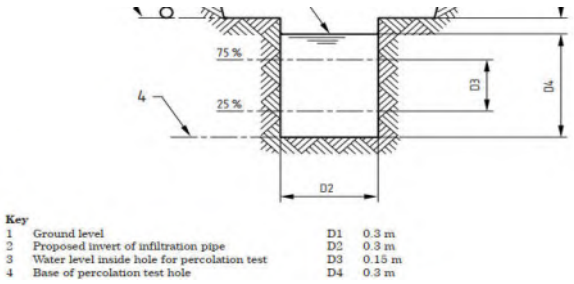
Date	21-22/03/2023	**Length (cm)**	30.00
Site	Llanellen Court	**Width (cm)**	30.00
Job Number	HYG1135	**Depth (cm)**	30.00
		Groundwater Level (mbgl)	0.00

HYDROGEO

PERCOLATION TEST

See BS 6297:2007+A1:2008 Section 6.2.

Remarks -



Key

1	Ground level	D1	0.3 m
2	Proposed invert of infiltration pipe	D2	0.3 m
3	Water level inside hole for percolation test	D3	0.15 m
4	Base of percolation test hole	D4	0.3 m

TEST 1		TEST 2		TEST 3	
Time(min)	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**	**Time(min)**	**Depth to Water (cm)**
0	7.50	0	0.00	0	0.00
14	11.50	10	7.50	39	9.50
29	13.50	44	11.50	91	14.00
54	16.50	79	15.50	121	17.50
82	20.00	128	19.50	161	22.00
107	22.50	173	22.50	186	22.50

Effective Storage Depth	**cm**	22.50	30.00	30.00
75% Effective Storage Depth	**cm**	16.88	22.50	22.50
(i.e. depth below GL)	**cm**	13.13	7.50	7.50
25% Effective Storage Depth	**cm**	5.63	7.50	7.50
(i.e. depth below GL)	**cm**	24.38	22.50	22.50
Effective Storage Depth 75%-25%	**cm**	11.25	15.00	15.00
Time to fall to 75% effective depth	**mins**	0	10	31
Time to fall to 25% effective depth	**mins**	107	173	186
Time (75%-25%) - min	**mins**	107.0	163.0	155.0
Time (75%-25%) - sec	**seconds**	6420	9780	9300
Vp	**sec/mm**	**43**	**65**	**62**
Design Vp	**sec/mm**	**57**