William Stokes
Consulting

Ground Water Risk Assessment

For

Proposed Sewage Treatment system

at

Fir View Tan y Ffridd Holiday Home Park

Llangyniew, Welshpool,

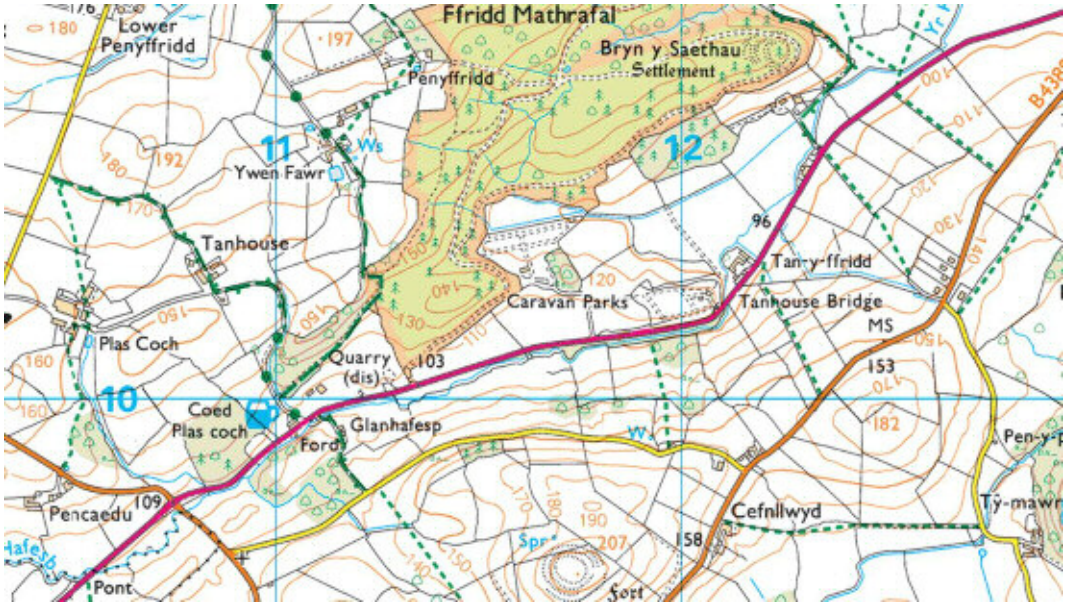
Powys, SY21 0LT

14th December 2021

1. Conceptual Model

a. Proposal

The proposed development site is at Fir View Holiday Home park, Llangyniew, Welshpool, Powys, SY21 0LT. The Grid Reference for the site is SJ116102



The new development will consist of 54 statics caravans with individual foul connections. These will consist of 45 caravans with 2 bedrooms (so max accommodation is 4 people per caravan) and 7 caravans with 3 bedrooms (so max accommodation of 6 people). This will be from the months of 15th Feb to 15th Nov pa. Statics will be mostly weekend use as we are not a residential site and owners will have a main home elsewhere.

The proposal includes no touring caravans, no toilet blocks, and no permanent domestic dwellings.

The system design should be capable of dealing with the maximum design load which would be 45 x 4 people in each 2 bed caravan, and 7 x 6 people in each 3 bed caravan. Hence a population equivalent of 222 people is proposed.

It has been proposed that the sewerage discharge from the above be via a package treatment plant and then via ground infiltration.

Proposed System

Mayglothling Waste Limited have obtained a proposal (Appendix C) from specialist package treatment plant manufacturer Environmental Wastewater Solutions for a unit based upon the following parameters:

Input Material – Domestic Sewage,

Max Inlet Flow:	33.3m^3/d	
Peak flow rate:	4.16m^3/hr	
BOD Load:	13.32 kg BOD/day	(400mg/l @ DWF)
NH4-N load:	1.77 kg NH_4-N/day	(53mg/l @ DWF)

The above is confirmed via Flows and Loads -4 calculations as per Appendix A

However, it should be noted that the above is designed on the maximum theoretical occupancy of the site. However, the nature of the site is a holiday camp which does not have any permanent occupancy and is closed in the winter.

A calculation has been undertaken based upon typical occupancy levels from the existing site (Appendix B), which shows a typical average occupancy across the year of 42.2%.

Therefore, the average input levels across the whole year will be:

Max Inlet Flow:	14.06 m^3/d	
BOD Load:	5.63 kg BOD/day	(400mg/l @ DWF)
NH4-N load:	0.75 kg NH_4-N/day	(53mg/l @ DWF)

This is noted as being below the threshold of a discharge permit if the flow was continually at this rate.

Nature of the discharge

The Final Effluent Standard from EWwS is stated as:

Max Outlet Flow:	33.3m^3/d	
BOD:	< 20mg/l	(0.666 kg BOD/day)
TSS:	< 30mg/l	(0.999 kg TSS/day)
NH_4-N:	< 20mg/l	(0.666 kg NH_4-N/day)

It is proposed that the discharge from the Package Treatment plant will then enter an infiltration field. This will be designed in accordance with Building Regulations Approved Document H.

Percolation testing has taken place in order to inform this calculation, and a copy of this test report is included in Appendix D. The calculations that have then determined the size of the infiltration field is also included in Appendix D.

Existing Development

To the north of the proposed development there is already a static Caravan Site. This consists of 114 static Caravans. To the east there is also a further 60 static caravans. The current foul water is retained in cess pits which are regularly emptied via HGV vacuum tank and taken away for disposal. This will remain separate from the proposed system.

To the immediate south of the development is the A495 public highway, and to the immediate south of that is the Yr Hafesb water course, flowing from west to east. This subsequently joins the River Vyrnwy approximately 2.6km north-east of the site.

The location of the development is approx. 110m AOD with the ground falling to the south. The A495 is approximately 100m AOD.

b. Desktop Review of the Site

Historic Use of the site

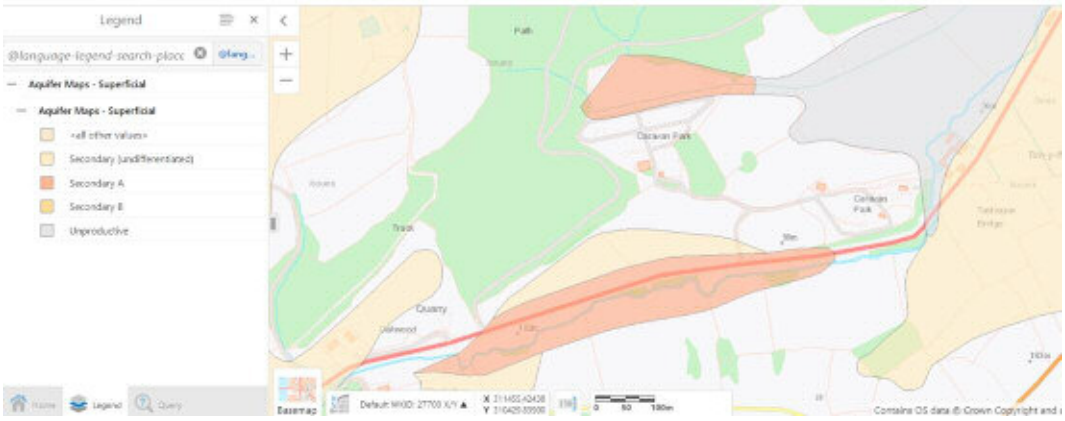
The existing holiday park has been present since the 1970s. The location of the proposed new development is currently an agricultural field and has had no previous development on it.

Nature of the Aquifer

Using NRW Mapping the following can be determined for the site location:

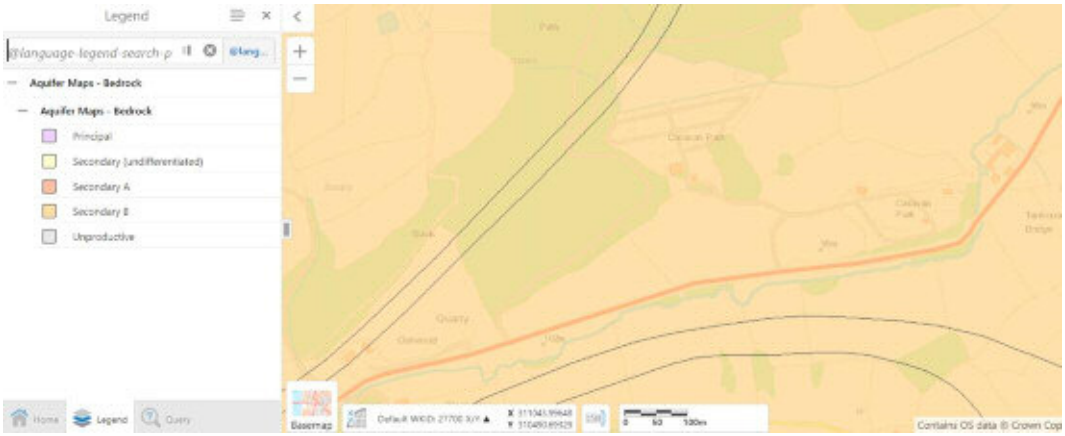
Aquifer Maps – Superficial

To the north of the site there is a Secondary A aquifer which flows to the east. To the south of the site there is a Secondary B aquifer leading to a Secondary A aquifer along the line of the watercourse.



Aquifer Maps – Bedrock

The Whole area is covered by a Secondary B Bedrock Aquifer

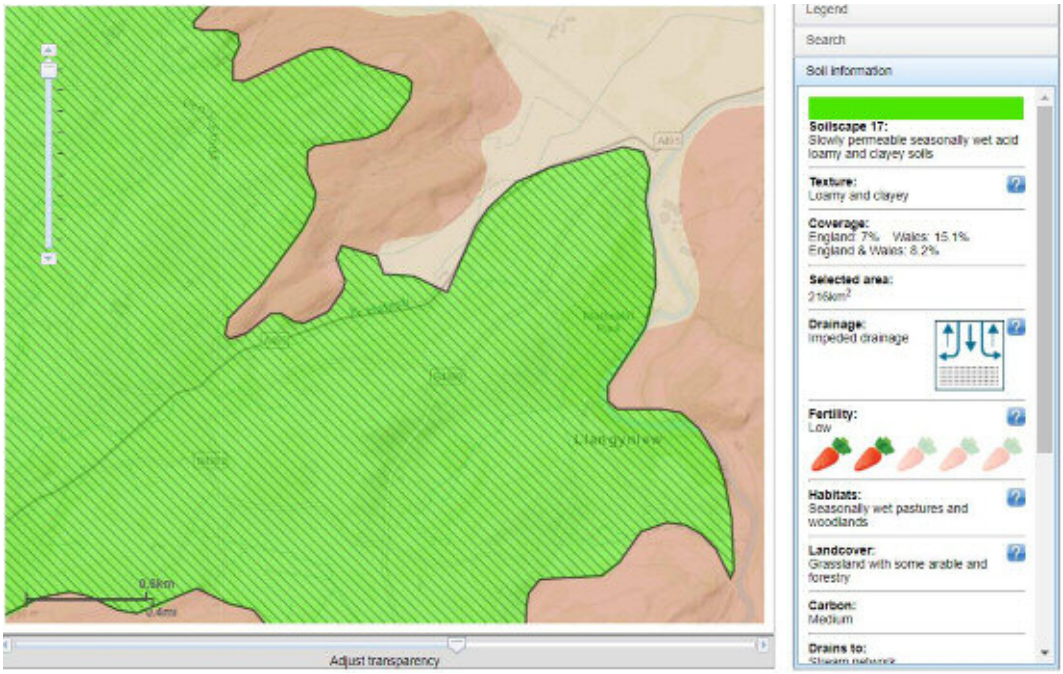


Source Protection Zones / Simplified Groundwater / Groundwater Safeguard Zones

The mapping shows no Source Protection Zones or Groundwater Safeguard Zones in the surrounding areas.

Soil Characteristics

Investigation via the Soilscapes Website revelated that the site subsoil is a slowly permeable seasonally wet acid loamy and clayey soil.



Nearest Receptors

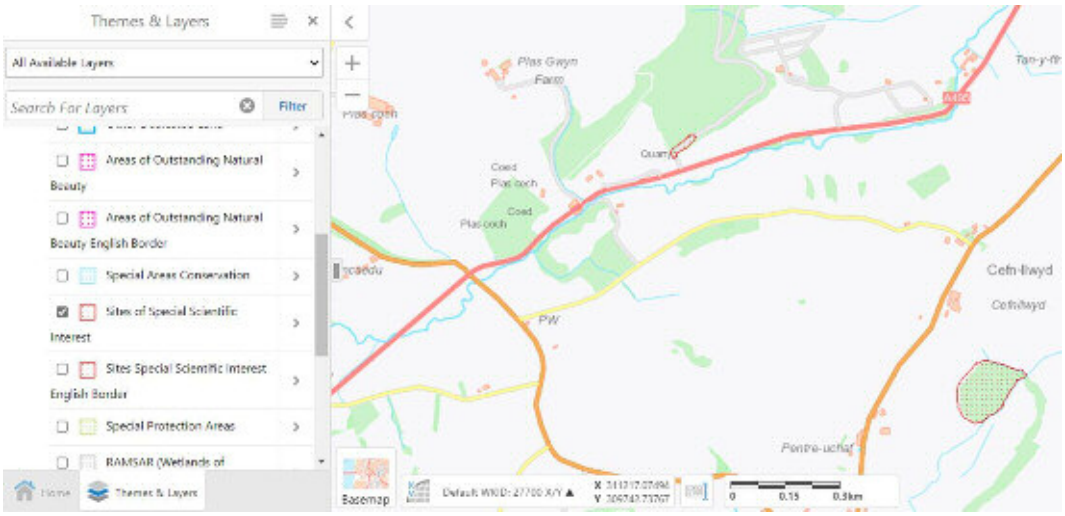
The nearest above ground receptor to the proposed soakaway disposal point is the water course to the south of the main road. The proposed infiltration field will run parallel to the main road and will be at least 50m from it. Therefore, the infiltration field will be circa 70m+ from the watercourse.

There are no other ponds, ditches etc downstream of the infiltration field closer than the watercourse.

Below ground, the nearest receptor is groundwater. As part of on-site testing, the ground water level was determined to be below the excavated level of 2m below surface level. From this it can be determined that the infiltration field should be installed no deeper than 0.8m below ground level (i.e. 1.2m above the recorded ground water level).

There are no wells, springs, boreholes or other sources of water intended for human consumption within 50m of the proposed drainage field location. There are also no other water abstraction activities in close proximity, and so it is not expected that there any likelihood of a sudden rise in ground water levels.

The nearest SSSI to the site is the Ffridd Mathrafal Track which is a geological feature 280m to the west of the site. The nearest biological SSSI is at Cors Cefn Llwyd which is 900m to the southeast. Neither of these features will be affected by the infiltration field.



Historic Borehole Records.

British Geological Survey records show a borehole was drilled approximately 800m to the east in 1950. This showed a resting water level approximately 4m (12ft) below the surface. No records are available closer to the site. The borehole was sunk to a total

depth of 114ft, inferring that a sustained source for water abstraction was at a lower level.

Summary of Risk

The proposal is for the discharge of treated effluent from Domestic Sewage into the ground. Whilst the installation has a throughput capacity of 33m3 per day (and hence requires a permit), the average flow over the course of a year will be less than 50% of that and would be at a level that could comply with Form B6.5 alone.

Furthermore, with the exception of flow volume, the proposal would be fully compliant with the requirements of General Binding Rules.

Therefore it is considered that the risk posed by the discharge material is very low.

Regarding the location of the discharge, the site is not in close proximity to any SSSI, wells, boreholes, springs (or other sources of water for human consumption.

An acceptable percolation test has been undertaken on site with a Vp of between 15 and 100, hence proving the ground having acceptable characteristics for a drainage field.

Whilst groundwater was not found as part of the infiltration testing, the topography of the site would infer the groundwater flow would be towards the adjacent water course, and then down the valley to the east.

c. Compliance

It is proposed to have 2 sampling points associated with this installation.

Compliance Point 1.

This will be a sample point between the package treatment plant and the infiltration field. This will be able to provide levels of the BOD & NH4-N. These should be lower than the levels identified below, and so within the design parameters of the Package Treatment Plant.

BOD:	< 20mg/l	(0.666 kg BOD/day)
TSS:	< 30mg/l	(0.999 kg TSS/day)
NH_4-N:	< 20mg/l	(0.666 kg NH_4-N/day)

If they exceed these levels, this should trigger immediate maintenance activity in order to investigate the fault and bring the plant discharge back within acceptable limits.

Compliance Point 2

It is proposed a sample point is installed into the ground water at the lowest point of the site, which will be to the southwest of the proposed infiltration field, near to the site entrance This will be between the infiltration field and the watercourse. The sample point should be at least 2m into ground water, or 2m below the level of the infiltration field, whichever is the deeper. This will be sampled before the installation first goes into operation, and then periodically sampled to identify any increases in BOD & NH4-N. This can also be used to set an agreed trigger level, at which point investigative action can be initiated.

Appendix A – Flows and Loads Calculations

William Stokes Consulting	**Foul Flows & Loads**		Test Hole No. N/A
Project: Fir View Caravan Expansion	Client: Fir View		Logged by: BS
Job No: FVC/01	Date: 26th Nov 2021	Ground Lvl (m): 110 AOD	Checked By:

Treatment System Enquiry Sizing Sheet

Source of Waste					FLOW LITRE / DAY		BOD GRAMS / DAY		NH_3	
Description	**No Houses**	**No Bedrooms**	**P Eq**	**No.**	**Per Head**	**TOTAL**	**Per Head**	**TOTAL**	**Per Head**	**TOTAL**
Amenity Sites										
Static Fully Serviced	45	2	4	180	150	27000	60	10800	8	1440
Static Fully Serviced	7	3	6	42	150	6300	60	2520	8	336
Static Not Serviced	0	2	4	0	100	0	44	0	8	0
Touring not serviced	0	2	4	0	100	0	44	0	8	0
TOTAL FOR PROJECT						**33300**		**13320**		**1776**
Population Equivelent (Based upon Domestic Values)						222		222		222

P Value to be used for Soakaway Sizing **222**

Proposed Domestic Sewage Treatment Plant

Manufacturer:	EWwS
Range:	
Model:	E-100 SHR RBC

Appendix B – Average Annual Loading Calculation

William Stokes Consulting	**Occupancy Calculation**		Test Hole No. N/A	
Project: Fir View Caravan Expansion	Client: Fir View		Logged by: BS	
Job No: FVC/01	Date: 26th Nov 2021	Ground Lvl (m): 110 AOD	Checked By:	

Site Occupancy Calculation

Month	Comment	Weeks		Week Day 5 days	Week End 2 days	Total
Jan	Closed	4		0%	0%	0
Feb	Closed	2		0%	0%	0
Feb		2		15%	50%	3.5
Mar		5		15%	50%	8.75
Apr		2		30%	60%	5.4
Apr	Easter Holidays	2		75%	90%	11.1
May		3		45%	70%	10.95
May	Whit Holidays	1		90%	100%	6.5
Jun		5		60%	80%	23
Jul		2		60%	90%	9.6
Jul	Summer Holiday	2		90%	100%	13
Aug	Summer Holiday	4		90%	100%	26
Sep		5		50%	70%	19.5
Oct		3		25%	50%	6.75
Oct	Half Term Holida	1		75%	90%	5.55
Nov		2		25%	50%	4.5
Nov	Closed	2		0%	0%	0
Dec	Closed	5		0%	0%	0
		52				

Total equivelent days of full occupancy	97.5	56.6	**154.1**
Total days in 1 year	261	104	**365**
%age occupancy	37.4%	54.4%	**42.2%**

Therefore Average Daily Discharge over whole year

33.3 m3 x 42.2% = 14.05 m3/d

Appendix C – Proposed Treatment Plant

Environmental Wastewater Solutions

Environmental Wastewater Solutions (EWwS) Ltd
The Maylands Building, Maylands Avenue,
Hemel Hempstead, Hertfordshire, HP2 7TG.
Tel No: +44 (0) 1442 957 874 or +44 (0) 1442 957 875
Website: www.ewwsltd.com

Quote Ref: SNQ 2192

23rd September 2021

Molly Jones
Mayglothling Waste Limited
By Email

Dear Molly

Re: Sewage Treatment Plant for Fir View Caravan Park

Thank you for giving EWwS this opportunity to offer our proposal for the wastewater treatment plant. We now enclose our proposal and comments for process related issues which we hope are useful.

We have sized the plants as per design parameters we derived from British Water Code of Practice Flows & Loads – 4

We have assumed that:-

1. Surface water will be excluded from the foul water drainage
2. Grease will be dealt with prior to entering the treatment plant.

Design Parameters

Temperature	12^0C – 20^0C (assumed wastewater temperature)
Flow (DWF)	33.3m^3/d (Dry weather)
Peak Flow rate	4.16m^3/hr (Dry weather)
BOD load	13.32kgBOD_5/day (400mg/l @ DWF)
NH_4-N load	1.77kgNH_4-N/day (53mg/l @ DWF)

Final Effluent Standard

BOD	< 20mg/l
TSS	< 30mg/l
NH_4-N	< 20mg/l

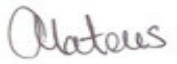
1 x RBC packaged plant 100 SHR as per drawing No GA0030 – 3

We offer our 100 SHR packaged RBC treatment plants in GRP casing with covers. The RBC will be driven by a 0.37 Kw close coupled shaft mounted geared motor.

The delivered units would be ready to be installed on a concrete slab for levelling and concrete backfilling. For this a suitable crane will be required to offload the unit from the lorry. EWwS have not included for a crane for offloading at site.

We trust the above meets with your requirements. Should you need to discuss any details above, please do not hesitate to contact us on +44 (0) 756 555 3944 or +44 (0) 1442 957 875

Yours sincerely



Carlos Mateus

Sales

EWwS Ltd

Environmental Wastewater Solutions

Environmental Wastewater Solutions (EWwS) Limited

Quotation

Client: Mayglothling Waste Limited Date: 23.09.2021

Site: Fir View Caravan Park Ref: SNQ 2192

Plant Selection – E-100 SHR RBC packaged plant – as per drawing No GA0030 – 3

1 No. E-100 SHR packaged sewage treatment plant in GRP casing with single skin sectional interlinked GRP covers and including a weatherproof control panel.

Price for 1 No. E-100 packaged plant = £26,991.00 ex-works

Delivery cost: **£800.00**

Terms and Conditions

Availability:	12-14 Weeks from date confirming order and/or clarification and finalisation of all technical and financial details and receipt of the non-refundable deposit by EWwS. Delivery period to be confirmed and adjusted to suit the site requirements at the time of order.
Validity of Quotation:	This quotation is open for 30 days from the quotation date.
Terms of payment:	30% non-refundable deposit with order. 70% balance is payable on notification that the equipment is ready for delivery at the agreed delivery date unless agreed otherwise. Please note that changes to the payment terms shall have an impact on the prices quoted.
VAT:	VAT is excluded from the prices quoted and will be charged if applicable at the rate current at the time.
Support:	We strongly advise that the Packaged Plants and RBCs are process optimised after the plant has been fully process commissioned. EWwS will be available to offer office-based support as necessary. Site based support can also be offered. Our normal day rate is £500.00 per man day or part man day spent away from EWwS offices.
Documentation:	We will provide all reasonable technical support and documentation to ensure that the equipment is optimised to be fit for purpose.
Terms & Conditions:	Please note that this quotation is subject to EWwS Ltd standard terms of sales.
Covid 19:	Whilst our factory is taking every precaution against the Coronavirus, we are unable to guarantee delivery dates during this pandemic. We are making every effort to achieve the given delivery dates and will keep you updated throughout the build.

Appendix D – Percolation Testing Results

Foul Water Drainage Field Percolation Test and Groundwater Assessment

Test to be carried out at least **3 times** in **two holes**

Job number:	**289327**
Date:	**23-Nov-21**
Customer:	Sheehan Holdings Ltd
Address:	Fir View Caravan Park
	Welshpool
	SY21 0LT

Population (plant):	250	
Plant Type	STP	
Planned Invert Depth		M

Weather conditions	Dry+Frost
Ground conditions	Stoney Clay
Engineers on Site	Mike Wood

Standing Groundwater Assessment

Hole Depth	2	m
Hole Area	0.6 x 1.9=1.14	m2
Estimated Groundwater Table Depth Below ground	>2	m
Estimated Groundwater Table Depth Below Invert		m

Percolation Test

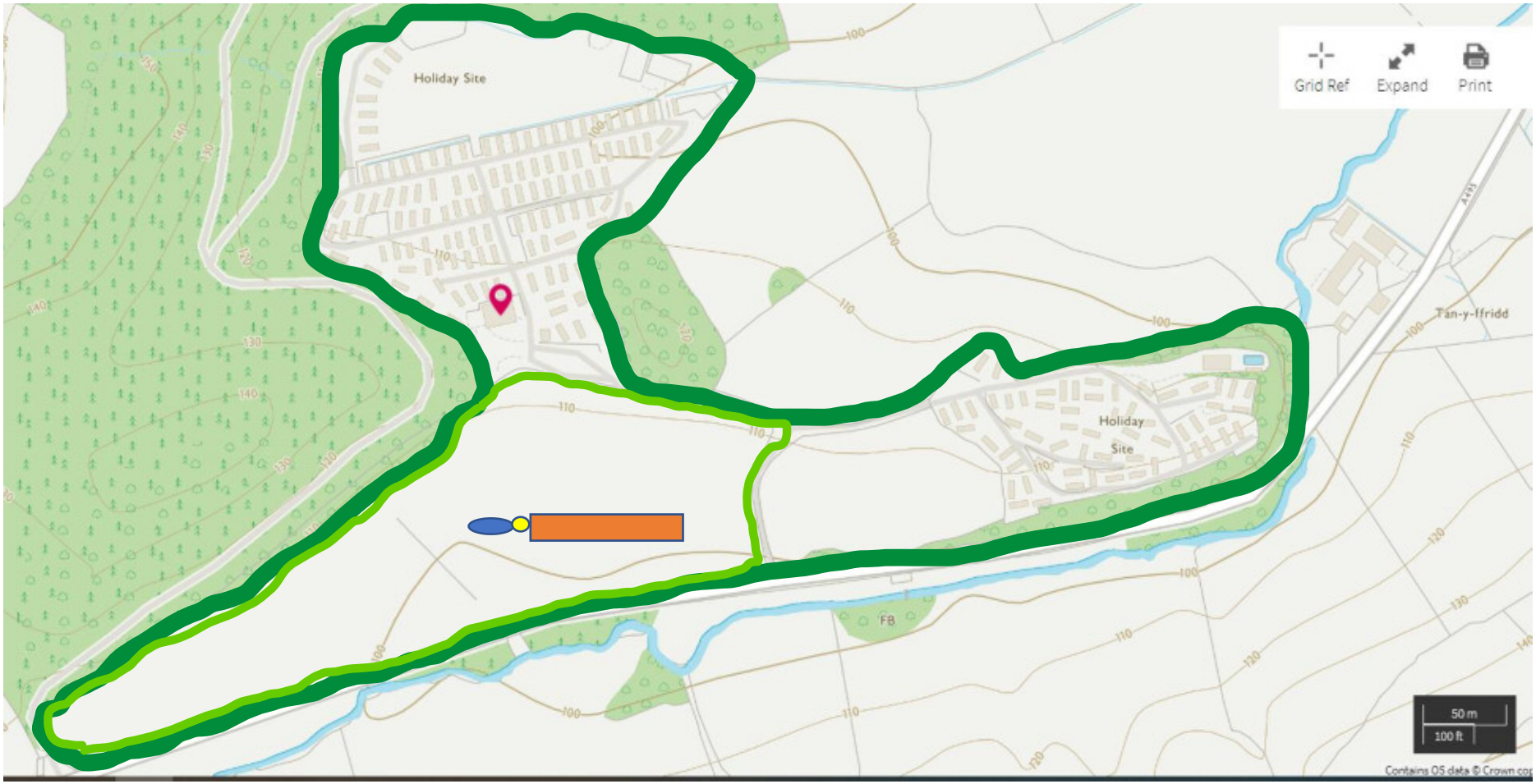
	Time	Time	Drop	Time of Drop	Time to Drop
Hole Three	**Start**	**Finish**	**mm**	**Sec**	**Sec/mm**
1	8:33	9:25	150	3,120	21
2	10:00	11:02	150	3,720	25
3	11:54	13:04	150	4,200	28
Hole Four					
1	8:33	9:29	150	3,360	22
2	10:05	11:11	150	3,960	26
3	11:55	13:12	150	4,620	31
Hole Five					
1	8:34	9:53	150	4,740	32
2	10:07	11:31	150	5,040	34
3	12:01	13:29	150	5,280	35
Hole Six					
1	8:35	9:27	150	3,120	21
2	9:57	10:57	150	3,600	24
3	11:25	12:38	150	4,380	29
				Average	27.3

Average time of drop Vp		28	**sec/mm**
Vp >12 and <100 sec/mm		Yes	
Area of infiltration field for Septic Tank installed to BS6297	**Vp x 0.25 x Number of People**	N/A	**m2**
Area of infiltration field for Sewage Treatment Plant installed to BS6297	**Vp x 0.2 x Number of people**	1400	**m2**

Michael Attwood

Appendix E – Drawings of Proposed Development

Fir View Caravan Park – Sheehan Holdings Ltd



Site boundary

Proposed new caravan site location where new discharge will take place

Proposed location of new sewage treatment plant

Proposed new drainage field location

Proposed new sampling point