DRAINAGE STRATEGY REPORT

Client: Ateb Group

Project: Residential Development at Ash Lane, Tavernspite
Issue date: 09/07/2026

Job No: C2351

Revision: A

Prepared By:

Dylan Huws
BEng (Hons), MSc, CEng MICE

Approved By

Dylan Gravell
BEng (Hons), PgDIP, CEng, MIStructE, FFB

Issue History

Date	Revision	Revision Notes
09/07/2026	-	Draft Issue
18/09/2026	A	Report Appendix amended with revised plans

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1.0 Introduction

1.1 *Brief and Objectives*

This drainage strategy report has been prepared to support a Full Planning Application for a new residential development at Ash Lane, Tavernspite, Pembrokeshire, SA34 0PR.

The main objectives of this Report are:

- Asses the hydrological issues affecting the site, and to establish whether and to what extent the flood risk can be managed over the lifetime of the development, using the principles and tests set out in TAN 15.
- Identify suitable outfall locations for the Surface Water and Foul Water from the proposed development.
- Undertake hydraulic calculations to identify peak design flows or restrictions to the development and any subsequent attenuation requirements.
- Consult with the Lead Local Flood Authority and Local Drainage Authority regarding the proposals.
- Provide a schematic layout of the proposed foul and surface water drainage proposals.
- Demonstrate compliance with the National SuDS standards.

1.2 *Limitations*

This drainage appraisal report is prepared for Ateb Group for the purposes of supporting a planning application only and should not be used for any other purpose including the feeding of this data into public or private AI tools—is strictly forbidden. The information, views and conclusions drawn concerning the site are based, in part, on information supplied to CB3 Consult Ltd by other parties. CB3 Consult Ltd has proceeded in good faith on the assumption that this information is accurate. CB3 Consult Ltd accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to CB3 Consult Ltd from others.

2.0 General Site Description

2.1 General Description

The development site is situated to the west of Tavernspite as indicated in Figure 1, with the site classified as a greenfield site previously used for agriculture. The site is bound by the B4314 along the northern boundary, Ash Lane along the eastern boundary, agricultural land to the south and western boundary. An aerial view of the site is included in Figure 2.

The site will utilise the B4314 as access into the development site.

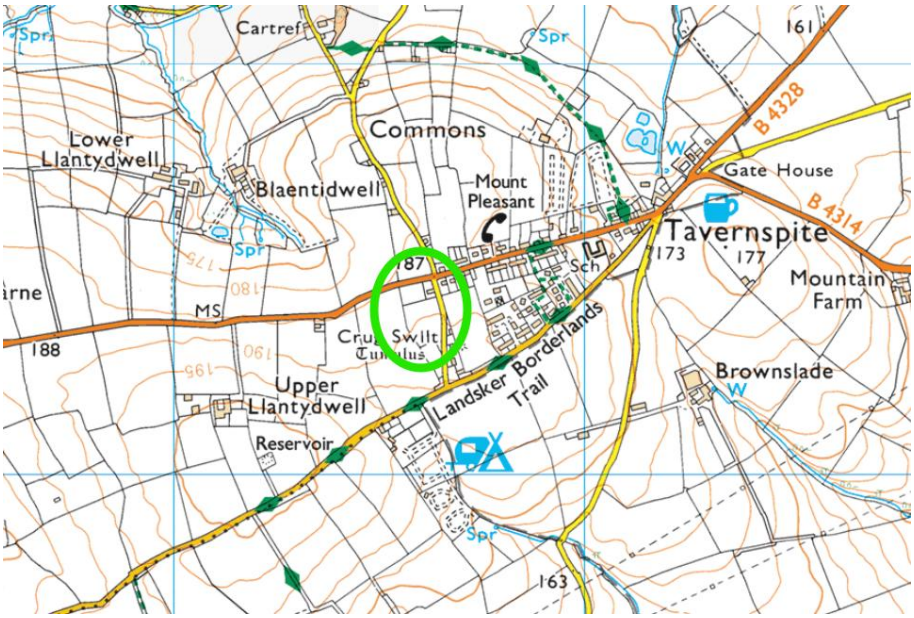


Figure 1: Site Location Plan

2.2 A topographical survey of the site is included in Appendix A. The site is an open greenfield land, generally falling in a northerly direction at a gradient of 1:40 towards the B4314.



Figure 2:Aerial View of Site

2.3 An intrusive site investigation was undertaken by Spencer Quantum in April 2026, reference Q2037/GIR, included in Appendix B. 2 soakaway tests were undertaken across the site in accordance with BRE 365, all of the soakaway tests failed to achieve a suitable infiltration rate as such it is deemed that an infiltration surface water disposal strategy is unviable.

2.4 Flood Risk Assessment

In July 2004 the Welsh Assembly Government published the Technical Advice Note 15: Development and Flood Risk (TAN 15), recently updated in March 2025 and which is a supplement to Planning Policy Wales, 2004. These documents provide guidance on how flood risk arising from rivers, the sea and surface water, and the risk of coastal erosion can be assessed.

2.5 The Flood Map for Planning (FMfP) is the starting point for the consideration of flood risk. The map uses flood zones to indicate the degree to which land is at risk of flooding from rivers, the sea, surface water and small watercourses. The FMfP displays predicted future flood risk with an allowance made for climate change over a 100-year lifetime of development. Proposals for development located partially or wholly in Flood Zone 2 or 3 must be supported by a Flood Consequences Assessment (FCA).

2.6 According to the NRW Flood Map for Planning, indicated in Figure 3, the site is shown to be in Flood Zone 1 - Flood Risk from Rivers and Sea. This represents a less than 0.1% AEP (1 in 1000 year) chance of flooding from fluvial or tidal source in any given year, including the effects

of climate change. Flood Zone 1 is shown as transparent on the FMfP. All forms of development are suitable within Flood Zone 1.

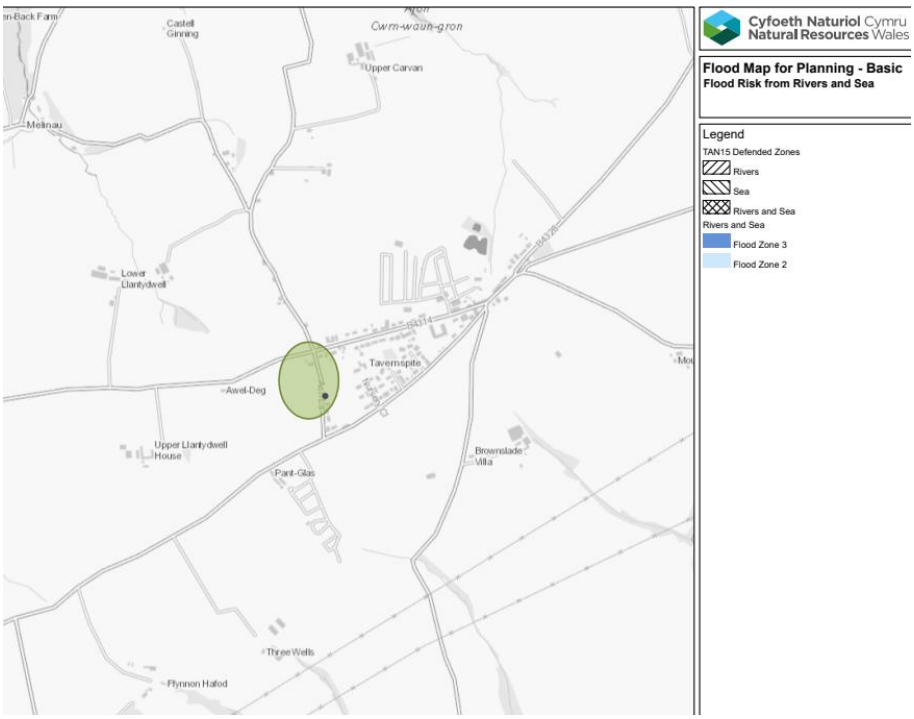


Figure 3:NRW Flood Risk for Planning (Rivers and Sea)

2.7 According to the NRW Flood Map for Planning, indicated in Figure 4, the site is shown to be in Flood Zone 1 - Flood Risk from Surface Water and Minor Watercourses. This represents a less than 0.1% AEP (1 in 1000 year) chance of flooding from surface water sources in any given year, including the effects of climate change. Flood Zone 1 is shown as transparent on the FMfP. All forms of development are suitable within Flood Zone 1.

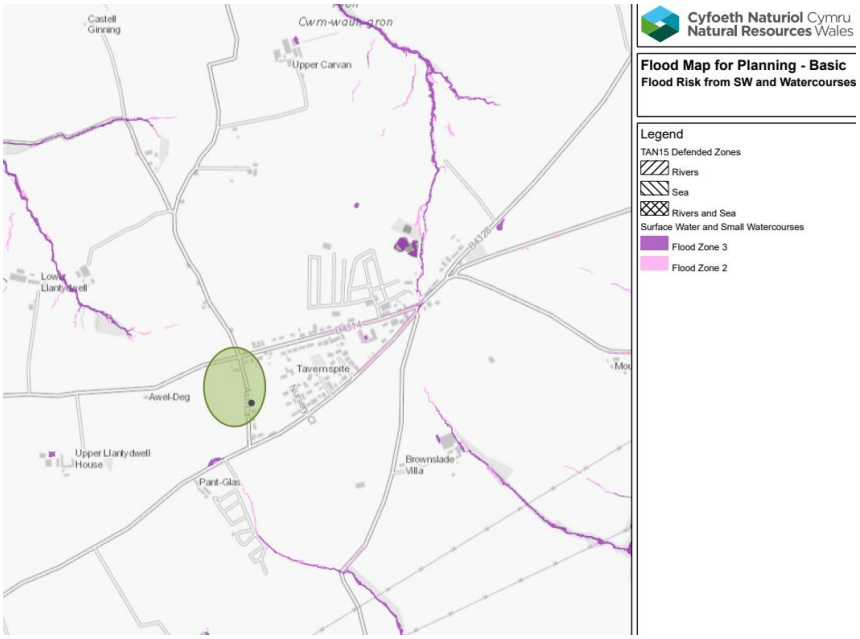


Figure 4:NRW Flood Risk for Planning (Surface Water and Minor Watercourses)

3.0 Existing Site Drainage

3.1 A public Sewer map is presented in Appendix C. This indicates that the area is served by a public foul sewer. The public sewer serving the application site discharges into Tavernspite Wastewater Treatment Works (WwTW).

3.2 Under a pre-application advice reference PPA0009887, DwrCymruWelshWater (DCWW) advised that the proposed development would overload the WwTW and recommended that the developer undertook a Developer Impact Assessment. A fee to undertake the assessment has been paid by the developer and DCWW assessment of the WwTW commenced from June 2026. A copy of DCWW's advice is included in Appendix D.

3.3 CCTV drainage survey of the site and the B4314 was undertaken. The result of the survey is included in Appendix E.

3.4 From the survey it is evident that the highway surface water system discharges into a watercourse to the east of Tavernspite. There is no surface water system located immediately outside the site.

4.0 Proposed Drainage Strategy

4.1 The development site comprises of a new 30 unit residential development with an access road and associated car parking facilities. The architect's proposed development layout is included in Appendix F.

4.2 The Proposed Drainage Strategy plans are included in Appendix G, preliminary surface water calculations are included in Appendix J.

4.3 *Foul Drainage*

It is proposed that all foul flows are to be collected within a gravitational network, proposed for adoption with DCWW subject to S104 approval. To achieve a gravity connection, the proposed discharge point is the public sewer located adjacent to Hillcrest House, referenced SN17126401. This was confirmed as an acceptable point of connection under a DCWW pre-planning application included in Appendix D.

4.4 A S104 drainage adoption and S106 approval will be required.

4.5 *Surface Water Drainage*

The primary objective of any surface water drainage strategy is to comply with The Flood and Water Management Act 2010 (Schedule 3) established in County Councils and requires new developments to include Sustainable Drainage Systems (SuDS) features that comply with national standards.

New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100m^2 require approval before construction can commence from the SuDS Approval Body (SAB).

4.6 The proposed surface water system and associated flows should discharge by one of the following mechanisms, shown below in order of preference;

- Surface water runoff is collected for use
- Surface water runoff is infiltrated to ground
- Surface water runoff is discharged to a surface water body
- Surface water runoff is discharged to a surface water sewer, highway drain or another drainage system
- Surface water runoff is discharged to a combined sewer

4.7 *S1 - Surface Water Runoff Destination*

4.7.1 Collection for use

A number of raingardens have been proposed across the development, with surface water to be reused through the hydration of planting. Further to this, as per the Statutory National Standards for Sustainable Drainage Systems (SNSSuDS) guidance, G1.4, the site displays exemption for further requirements of rainwater harvesting as there is no foreseeable demand for non-potable water on the site throughout its design life.

4.7.2 Infiltration Methods

2 infiltration tests were undertaken onsite in accordance with BRE digest 365 in April 2026. Both trial pits failed to achieve a viable infiltration result, as such an attenuated surface water disposal option is required.

4.7.3 Discharge to Surface Water Body

Based upon a review of the site and surrounding areas, including a drainage survey, there is no viable surface water body connection point available for this development site.

4.7.4 Discharge to Surface Water Sewer

Based upon the above, and following drainage survey of the B4314 a highway system is available to the east of the development site. Due to onsite levels, the onsite gravity sewer will need to chase the highway system downstream to achieve a suitable connection point. As such a positive connection into the highway system is proposed at a greenfield runoff rate of 9.0lit/sec/Ha. The greenfield runoff calculation is presented in Appendix H.

4.7.5 Discharge to Combined Sewer

Based upon the above, the option should not be required.

4.8 S2 – Surface Water Runoff Hydraulic Control

4.8.1 This standard requires surface water to be managed to prevent as far as possible any discharge form the development for rainfall events less than 5mm. The surface water runoff rate and volume for up to a 1 in 100-year return period plus 30% climate change should be managed to protect people, properties, and the receiving water body. Refer to Appendix G for a Drainage Strategy Plan for the proposed development. Initial design calculation to support the sizing of the proposed attenuation system can be seen in Appendix J.

4.8.2 Surface water interception aims to mimic greenfield conditions by preventing runoff from the majority of small rainfall events. This is to be catered for across the site within a variety of SuDS features, including rain gardens, permeable surfaces and the use of a detention basin.

4.8.3 All surface water flows are to be attenuated on site, with final discharge to the existing watercourse located east of the site at a controlled rate of 5.0L/s, based upon the greenfield Q1 runoff rate of 9.0L/s/Ha and a site hard paved area of 0.55Ha.

4.8.4 To assess the exceedance flow from the development site, the drainage system will be stress tested to a 1 in 200-year return period plus 30% climate change to identify possible flooding at the site. The proposed design will ensure that the surface runoff from these flooded areas will be directed away from the proposed facility towards the highway/ boundaries of the development site.

4.8.5 The proposed development site SuDs train will maximise source control through various techniques:

- Raingardens required at each unit to collect roof runoff.
- Porous road and car parking areas.
- Final detention basin to collect the runoff from the development site, attenuating the surface water runoff prior to discharge offsite at greenfield rate.

4.9 S3 – Water Quality

4.9.1 This standard requires treatment of surface water runoff to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems including sewers.

4.9.2 The aim of the surface water management strategy with regards to water quality is to use natural processes that promote biodiversity and long-term sustainability. As such, it employs a SuDS management train approach, providing drainage components in series.

4.9.3 In accordance with Table G3.1 from the Statutory Standards, the level of hazard will typically be classified as Low Hazard. Pollution is to be mitigated across the site, through a SuDS train consisting of on plot treatment within raingardens and permeable surfaces, highway treatment through the use of permeable surfaces, before discharge of all flows from site into a proposed detention basin.

4.10 S4 – Amenity

4.10.1 This standard requires that the design of the surface water management system should maximize amenity benefits.

4.10.2 The primary amenity focus of the SuDS scheme should be to improve the health and well-being of the users. The scheme will need to be based on natural forms that mimic natural landscapes found within the region. Other key amenity benefits should include improving air quality around the development, increasing carbon sequestration, and improving water quality through removal of pollutants.

4.11 S5 – Biodiversity

4.11.1 This standard requires that the surface water management system should maximize biodiversity benefits.

4.11.2 The SuDS scheme biodiversity strategy should revolve around the creation of significant and varied habitat to increase the overall biodiversity of the site and ecological value. The inclusion of plant species that will enhance the general eco system and simultaneously act as a water filtration system to clean pollutants and contaminants should be used and where possible provide meandering swales and a large detention basin to maximize the variety of habitats available.

4.12 S6 – Design of Drainage for Construction and Maintenance and Structural Integrity

4.12.1 The surface water drainage system should be designed with the overriding ethos of simplicity in construction, use and maintenance. This then allows a very simple translation from the principles described within standard S6, namely that all elements of the surface water drainage system should be designed so that they can be constructed, as well as maintained and operated easily, safely and cost-effectively.

4.12.2 Information with regards to the construction methodology and requirements of the proposed system will be developed as part of the detailed design stage of the project, likewise the maintenance requirements and regime of the proposed system will be developed into the full maintenance strategy for the site during the next phase of design development.

5.0 Summary

5.1 The application site is located within areas of Flood Zone 1 as such, it can be concluded that on the grounds of flood risk, the proposed development meets the requirements set out in TAN-15 and the aims of Planning Policy Wales.

5.2 Tavernspite is served by an existing public sewer discharging into Tavernspite Wastewater Treatment Works. Based on current advice from DCWW a Developer Impact Assessment is required.

5.3 All on site sewer systems will be designed and constructed in accordance with the latest edition of “Sewers for Adoption” and any of the adopting authority’s (DwrCymruWelshWater) specific requirements.

5.4 The aim of the surface water drainage strategy is to mimic the natural catchment process as closely as possible, and the proposed system will need to be designed in accordance with the statutory “Sustainable Drainage Systems Standards for Wales” and any local authority’s SAB requirements.

5.5 Based on the site investigation undertaken to date, the site is unsuitable for an infiltration surface water disposal solution as such a positive connection into the Highway system is proposed.

5.6 The site will be served by a flow control device limiting the discharge rate to 5.0L/s, attenuated within an onsite detention basin.

5.7 It can be concluded that the surface water drainage strategy complies with the requirement set out in The Flood and Water Management Act 2010 (Schedule 3), and the development site is subject to a Full SAB Approval.

Appendix A

Topographical Survey



GENERAL NOTES

1. The contractor is to check and verify all buildings and site dimensions and levels, including existing sewer invert levels, before works start on site. The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.
2. Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed excavations are to be checked by the contractor prior to starting work. Utility locations shown are to be verified by the contractor prior to commencement of work.
3. This drawing is to be read in conjunction with and checked against all other drawings, engineering details, specifications and any structural, geotechnical or other specialist document provided.
4. Any anomaly or contradictions between any of the above is to be reported immediately to Corner Point Surveys Ltd.
5. May contain Ordnance Survey data © Crown copyright and database rights 2025 Ordnance Survey AC0000808122. Source: Emapsite. OS mapping is included for reference only and must not be extracted, edited, or reused outside the scope of this project.
6. This survey has been undertaken to OS National Grid & Datum (OSTN15) with a calculated local scale factor for this location.

LEGEND

BUILDING	CANOPY	CPY	EV	EAVES
	DOWNPIPE	DP	GUT	GUTTER
	DOORLINE	DRL	RFL	ROOF LINE
	WINDOW LINE	WDL	VP	VENT PIPE
BOUNDARIES	ARMCO BARRIER	AB	HF	HOARDING / HERAS
	BARRIER	BAR	PRF	POST & RAIL FENCE
	BRICK WALL	BW	PWF	POST & WIRE FENCE
	CLOSE BOARD FENCE	CBF	RW	RETAINING WALL
	HEDGE	HE	SW	STONE WALL
TOPOGRAPHY	BANK BASE	BB	⦿	MULTI-BOLE TREE
	BANK TOP	TB	VEG	VEGETATION
STREET FURNITURE	BOLLARD	BD	TP/S	TELECOM POST/STAY
	LAMP POST	LP	KB	KERB BASE
	TACTILE PAVING	TPV	LP	LAMP POST
	DROP KERB	DKB	PO	POST
	FOOTPATH	FP	RP	REFLECTOR POST
	ROAD SIGN	RS		
UTILITIES	ACO DRAIN	ACO	GV	GAS VALVE
	BT MANHOLE	BT	IC	INSPECTION CHAMBER
	CABLE TV	CATV	MH	MANHOLE
	ELECTRICITY BOX	EB	SDR	SLOT DRAIN
	EARTH ROD	ER	SV	STOP VALVE
	FIRE HYDRANT	FH	W	WATER UTILITY
	GULLY	GU	VM	VIRGIN MEDIA
STRUCTURE	COLUMN	C	CON	CONTAINER
	CONCRETE PLINTH	CP	ST	STEPS
GENERAL	APPROXIMATE	~~	RL	RIDGE LEVEL
	APEX LEVEL	AL	SOF	SOFFIT LEVEL
	BED LEVEL	BL	TOW	TOP OF WALL
	CULVERT	CVT	UTS/L	UNABLE TO SURVEY/LIFT
	EAVES LEVEL	EL	WL	WATER LEVEL
	FLOOR LEVEL	FFL	△	CONTROL STATION
	HEIGHT	H	Ø	DIAMETER
	INVERT LEVEL	IL	⟷	GATE

CONTROL STATIONS

STN1	217629.859	212486.920	187.276
STN2	217743.345	212507.802	185.713
STN3	217661.736	212405.284	188.992

Rev	Date	Description	By

Dimensions to be verified on site.
This drawing should not be scaled. Use figured dimensions only
Any discrepancies should be referred to the Engineer prior to work being put in hand.
This drawing is copyright.

THE SURVEY ASSOCIATION
FULL MEMBER

CornerPoint SURVEYS
Corner Point Surveys Limited
Columbus House, Village Way
Greenmeadow Business Park
Cardiff
CF15 7NE
029 22 800 100
contactus@cornerpointsurveys.co.uk
www.cornerpointsurveys.co.uk

Client: ateb Creating better Living Solutions

Project: ASH LANE, TAVERNSPITE

Title: TOPOGRAPHICAL SURVEY

Drawing Status: INFORMATION

Surveyed by	Processed by	Checked by	Date	Scales @ A1 size
JPW	JPW	ACV	JAN26	1:500

Project No	Drawing No	Revision
S26010	001	0

File name: S26010-TP-001-0-TOPO.dwg

Appendix B

Ground Investigation Report

ASH LANE, TAFARNSPITE,

WHITLAND, SA34 0PR.

Phase II: Ground Investigation Interpretative Report

Report No. Q2037/GIR April 2026

DOCUMENT CONTROL

Contract Name:	**ASH LANE, TAFARNSPITE, WHITLAND, SA34 0PR**
Contract Reference:	**Q2037**
Report Type:	**Phase II – Ground Investigation Interpretative Report**
Report Reference:	**Q2037/GIR**
Date of Report Production:	**April 2026**
Client:	**Ateb Group Ltd**

Version:	Date:	Prepared by:	Checked by:	Approved by:
V01	30-04-26	Luci Draper	P. Darby	J. Stark
				
		Engineering Geologist *B.Sc.(Hons.) Phys Geog&Geol.*	Principal Engineering Geologist *B.Sc.(Hons),M.Sc., C.Geol., F.G.S.*	Technical Manager *B.Sc.(Hons), C.Geol., FGS*

Disclaimer: Spencer Quantum Limited has prepared this report in accordance with the instructions of the above-named Client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

Spencer Quantum Ltd, Plas Newydd Farm, Llanedi, Swansea T: 01554 744880 E: enquiries@spencerquantum.co.uk

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0.0 FOREWORD

The following Conditions and Notes on Site Investigation Procedures should be read in conjunction with this report.

0.1 General

Recommendations made and opinions expressed in the report are based on the strata observed in the excavations, together with the results of site and laboratory tests. No responsibility can be held for conditions which have not been revealed by the Exploratory Holes, or which occur between Exploratory Holes. Whilst the report may suggest the likely configuration of strata, both between Exploratory Holes and below the maximum depth of investigation, this is only indicative, and liability cannot be accepted for its accuracy.

Unless specifically stated, no account has been taken of possible subsidence due to mineral extraction below or close to the site.

0.2 Investigation Procedures

Windowless Borehole Sampling and Machine Excavated Trial Pits techniques for ground investigation have been employed within the project. All Exploratory Hole operations, sampling and logging of soils, rocks and in-situ testing complies with the recommendations of the British Code of Practice BS 5930: 2015+A1 2020 'Site Investigations', British Code of Practice BS 10175: 2011 +A1:2013 'Investigation of Potentially Contaminated Sites' and BS 1377: 1990, 'Methods of Test for Soils for Engineering Purposes'.

0.3 Routine Sampling

Representative bulk disturbed and environmental samples of the different strata are taken following completion of logging. These samples are sealed and labelled in clear plastic bags and 2kg plastic tubs. All samples are returned from site to SQL's facility for controlled storage within 24 hours of sampling to await test scheduling/ requirements.

0.4 In-Situ Testing, Surveying & Instrumentation

In-situ testing comprised:

- Windowless Sample Boreholes
- Dynamic Probe Tests
- LWD for CBR Tests
- Machine Excavated Trial Pits
- Standpipe Installation
- Soakaway Testing

0.5 Groundwater

Where possible, the depth of entry of any influx of groundwater is recorded during the course of excavation or boring operations. The rate of inflow into the excavation or borehole is monitored during the course of the excavation or during boring procedures. Upon encountering any water strikes, work is temporarily halted, and the water levels monitored for a standard twenty-minute period recording the change in water level at the end of the twenty minutes.

Groundwater conditions observed in the excavations are those appertaining to the period of investigation. It should be noted, however, that groundwater levels are subject to diurnal, seasonal and climatic variations and can also be affected by drainage conditions or other causes.

0.6 Retention of Samples

After satisfactory completion of all the scheduled laboratory tests on any sample, the remaining material is discarded. Unless otherwise instructed or detailed within the Contract, all soil and/or rock samples not tested will be discarded 28

days after submission of the approved final report.

1.0 Introduction

1.1 General

Upon the instructions of CB3 Consult Ltd (Project Designer) on behalf of the Client, Ateb Group Ltd, Spencer Quantum Ltd (SQL) has been commissioned to undertake a ground investigation for a proposed residential development at an existing plot of agricultural land off Ash Lane, Tavernspite.

The location and current proposed layout drawings, as supplied by the Client, are presented within Appendix I for reference.

In this interpretative report, a factual account of the fieldwork and in-situ testing, details of the strata encountered, and groundwater and ground gas observations are presented. Guidance and recommendations on geotechnical matters are discussed along with a discussion of potential contamination of the soils.

1.2 Purpose of Ground Investigation

The ground investigation was designed to address the following elements to aid the detailed design of the development:

- Site Investigation for foundation appraisal
- Surface Water Infiltration tests

The intrusive investigation works comprised a series of windowless sampled boreholes and machine excavated trial holes along with in-situ soakaway testing.

1.3 Scope of Works

The general scope of works undertaken in the preparation of this assessment was as follows:

- Conduct an intrusive ground investigation with the aim to identify the underlying ground conditions targeting the issues that could potentially impact the proposed new residential buildings.
- Carry out laboratory testing to gain further geotechnical and geo-environmental data
- Provide an interpretative report presenting an analysis of the available information and offering recommendations on foundations options for the proposed development with regards to geotechnical parameters, ground percolation parameters to inform the drainage strategy for the site, and a baseline contamination assessment of the soils on site.

A preliminary risk assessment was undertaken as part of this commission, referenced Q2037/PRA. The PRA concluded that the risk of the land on-site being contaminated from past land-use on and off-site was considered negligible to very low, as the on-site land use had not changed from 1879 and the off-site land-use consisted of the construction of roadways and residential development. No potential geotechnical

hazards were identified. However, the environmental issues identified included the possibility of off-site Made Ground affecting the development site due to aqueous phase migration of any mobile contaminants. As well as the potential of contaminants associated with agricultural use may be present on-site, although both instances were concluded unlikely. Therefore, an intrusive ground investigation was deemed necessary to confirm the possibilities.

General notes on the techniques employed by Spencer Quantum are described in the Forward together with the limitations inherent in carrying out ground investigation work.

2.0 SITE DETAIL

2.1 Site Description

The site is located immediately south of the B4314 and immediately west of Ash Lane, Tavernspite. The site is situated on a flat field which is presumably used for agricultural purposes. The site is bounded to the west and to the south by fields, with roads bordering both the north and east of the site. A residential property is located at the northeast site boundary. To the knowledge of SQL, there has been no recorded development on the site.

The approximate National Grid reference of the site is 217645E 212272N. The site location is indicated on the Architect's site plan presented in Appendix I which also shows the proposed layout of the development.

An aerial view of the development site from current on-line mapping is presented below with the approximate boundary highlighted.

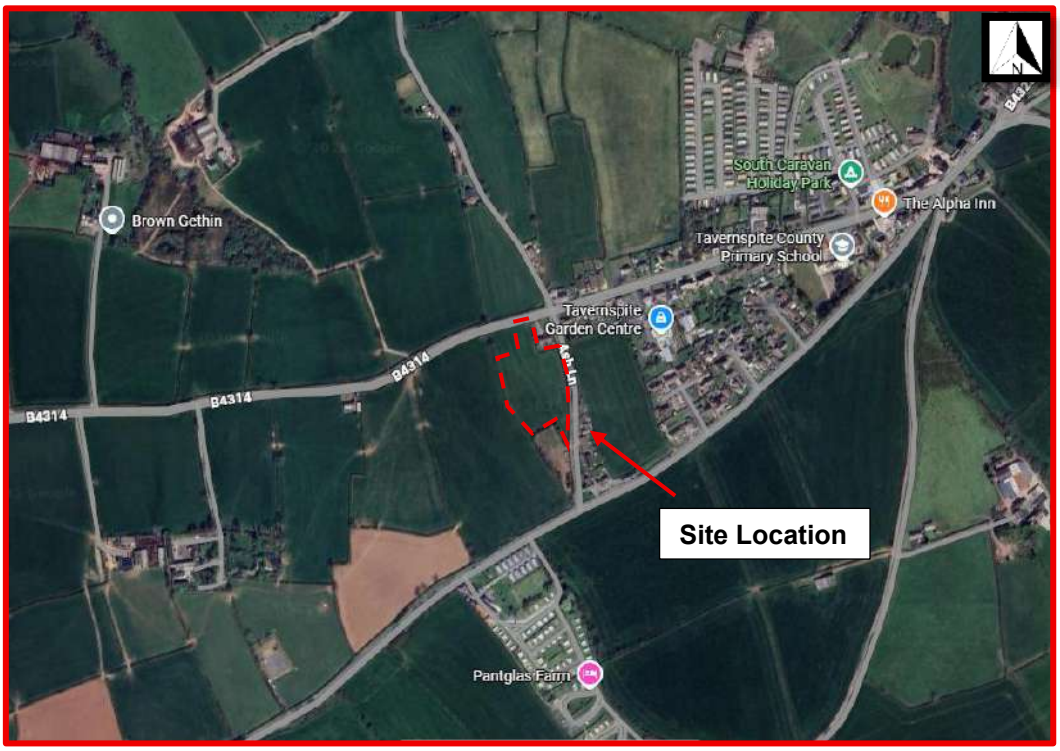


Figure 1: *Current Aerial Mapping of the Site © 2026 GoogleMaps.*

2.2 Published Geology

Details of the geology of the site are provided by BGS's online tool, Geology of Britain Viewer. An extract of the England and Wales 'Sheet 210' 1:50 000 Series is also presented below as Figure 2, with the approximate location of the site highlighted.

Geological records indicate the site is not mantled by Superficial deposits. The closest identified superficial deposits are Glacial Till, approximately 350-400m northwest of the site. Till is unsorted and unstratified drift, generally over-consolidated, deposited directly by and underneath a glacier without subsequent reworking by

water from the glacier. It consists of heterogeneous mixture of clay, sand, gravel and boulders, varying widely in size and shape (diamicton). The thickness of these deposits are not indicated on the mapping.

The Solid geology in the area is mapped as the Milford Haven Subgroup. Its lithological description is described as, hard, red calcareous marls with sporadic red and green sandstones. Basal beds of green marl, conglomerate and breccia are also present. The thickness is recorded as about 1500m, as recorded by the BGS Lexicon of Named Rock Units.

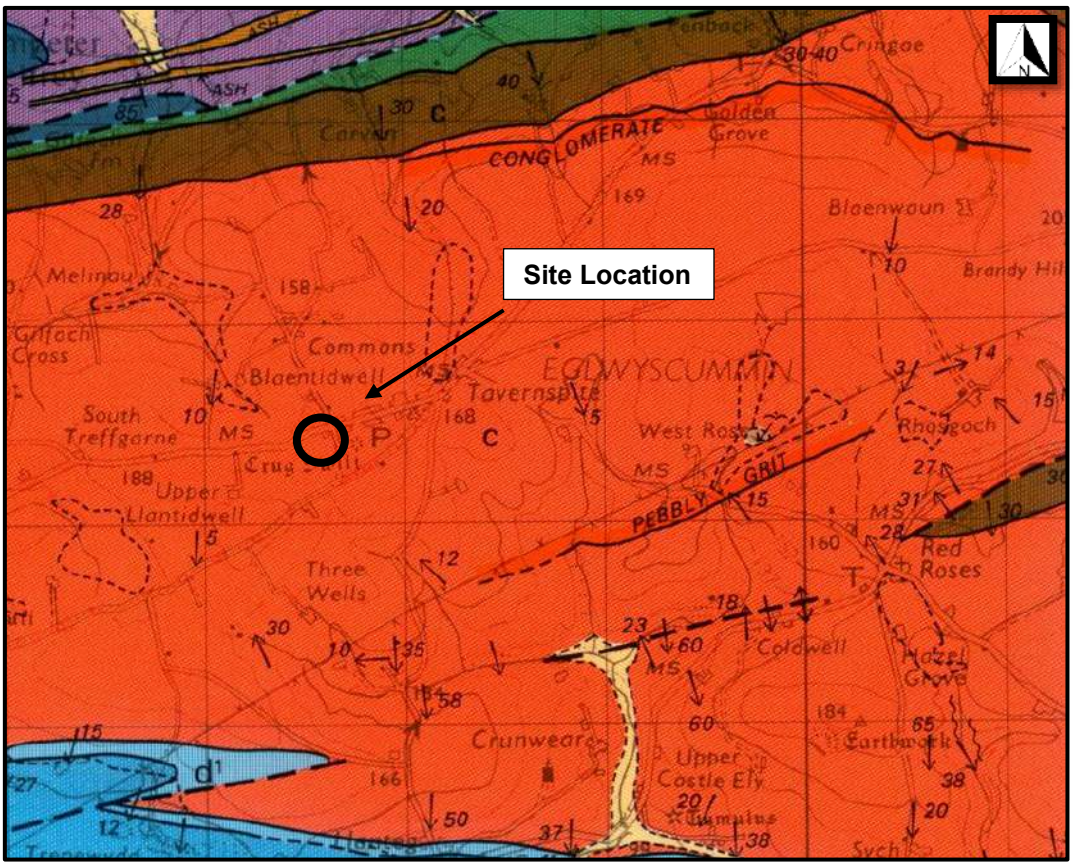


Figure 2: *BGS Sheet Extract: 228 Haverfordwest © NERC*

2.3 Statutory Service Information

A complete set of Service plans were provided by the Client prior to starting the site works. SQL undertook full Cable Avoidance Tool (CAT) scans of each exploratory hole location before breaking the ground. Safe digging practices in accordance with HS(G)47 were employed when breaking and excavating grounds with all traceable services demarcated prior to works commencing.

3.0 Fieldwork

3.1 General

Between the 26th and 27th February 2026, Spencer Quantum undertook a Ground Investigation at Ash Lane, Tavernspite. Site supervision and attendance by an Engineering Geologist from SQL was undertaken on all aspects of the site works and subsequent reinstatement works of all exploratory hole locations. All Site Personnel were inducted by SQL and briefed of the pertinent Risk Assessments and Method Statements relating to the tasks to be undertaken. No incidents or near misses were recorded during the fieldworks, with the works being incident free.

No deviations from the Standards and Procedures adopted for the works were recorded.

The works did not require hand excavations at any exploratory holes prior to any drilling. Each area of the investigation was fully CAT ('Cable Avoidance Tool') scanned prior to breaking ground by a competent SQL Engineer.

A summary of the fieldworks completed is outlined below.

- Three boreholes drilled by window sampling methods
- Ten machine excavated trial pits
- Six California Bearing Ratio tests
- Two shallow infiltration tests
- Installation of gas monitoring standpipes in three of the boreholes, with subsequent monitoring.

3.2 Exploratory Hole Locations

The exploratory hole locations were set out by an SQL Engineering Geologist at positions selected to provide the best possible coverage of the site, while also taking account of access constraints and the limitations of the investigation equipment. On completion the ground investigation, exploratory hole positions were surveyed by SQL to ordnance datum using a Leica GS08 GPS.

An Exploratory Hole Location Plan is presented in Appendix I.

3.3 Windowless Sample Boreholes

A total of three Windowless Sample Boreholes (WS1, WS2, WS3) were drilled by percussive methods using an Archway Dart Competitor Mini-Drill rig, which was owned and operated by GSTL (sub-contractors) and managed by SQL.

The Windowless Sampling technique involves the dynamic driving of sampling tubes—typically starting at 116mm diameter—into the ground, allowing the recovery of relatively undisturbed soil samples in plastic liners

or disturbed samples in jars. This method is suitable for competent granular to cohesive soils but may be limited by ground conditions and equipment robustness. All recovered samples were logged on-site by a Spencer Quantum Engineering Geologist in accordance with BS 5930:2018 and BS EN ISO 14688-1/-2:2018 standards. Each borehole location was reinstated using Bentonite with surface finishes restored to pre-existing conditions.

Table 1: Windowless Sample Borehole Termination Details

Exploratory Hole ID	Termination Depth (mbgl)	Terminating Strata	Notes/Reason for Termination
WS1	1.45	SANDSTONE (Bedrock)	Refusal
WS2	1.45	SANDSTONE (Bedrock)	Refusal
WS3	1.45	SANDSTONE (Bedrock)	Refusal

A complete set of Engineering Geologist's Windowless Sample Borehole logs are presented within Appendix II.

3.4 Trial Pits

Ten trial pits were excavated by machine using a 9-tonne tracked excavator supplied and operated by SQL. Exploratory hole positions are shown on the exploratory hole location plan in Appendix I.

This method of investigation allows direct sampling of the near surface deposits for identification purposes, locating of buried services, as well as assessment of any salient features and Made Ground or disturbed ground. The trial pits were logged in accordance with BS5930:2015+A1:2020; BS EN ISO 14688-1:2017 and BS EN ISO 14688-2:2017 and supervised at all times by an Engineering Geologist from SQL.

All trial pits were backfilled with compacted layers of arisings upon completion.

Copies of the engineering geologist's Trial Pit logs are presented in Appendix III.

Table 2: *Machine Excavated Trial Pit Termination Details*

Exploratory Hole ID	Termination Depth mbgl	Terminating Strata	Notes/Reason for Termination
TP01	2.00	SANDSTONE	Refusal
TP02	2.00	SANDSTONE	Refusal
TP03	1.70	SANDSTONE	Refusal
TP04	1.70	SANDSTONE	Refusal
TP05	1.80	SANDSTONE	Refusal

TP06	2.10	SANDSTONE	Refusal
TP07	2.80	SANDSTONE	Refusal
TP08	2.20	SANDSTONE	Refusal
TP09	2.10	SANDSTONE	Refusal
TP10	2.20	SANDSTONE	Refusal

3.6 In-Situ Testing

3.6.1 Standard Penetration Tests (SPTs)

Standard penetration tests (SPTs) were undertaken at 1.0mbgl within all windowless sampling boreholes.

This is a dynamic test as described in BS1377:1990 - Part 9 and is a measure of the density of the soil or rock. Within fine grained or cohesive soils, the test incorporates a small diameter tube (650mm length, 50mm external diameter and 35mm internal diameter) with a cutting shoe known as the 'split barrel sampler'. The sampler is forced into the soil dynamically using blows from a 63.5kg hammer dropped through 760mm. The sampler is initially advanced 150mm into the soil with seating blows, then the number of blows required to advance the sampler each 75mm increment up to a depth of 300mm is recorded. This cumulative total number of blows over the 300mm test is referred to as the "N" value. For coarse gravels and bedrock, the split barrel is replaced by a solid 60° cone.

SPT results can be found on the corresponding borehole logs in Appendix II.

3.6.2 Infiltration Testing

Infiltration testing was performed in two trial pits. The tests were undertaken in accordance with BRE365. The records of the tests are included in Appendix IV.

3.6.3 Lightweight Deflectometer Testing

The Light-Weight Deflectometer (LWD) is a lightweight portable tool used for measuring the bearing capacity (deflection) of subgrade/subsoils and unbound base layers, granular layers and backfilling materials. A loading plate of 300mm was implemented for the nine test locations. The test depths were at various depths. By understanding the pulse shape/pattern along with the site observations from each test, the LWD can provide an indication of poor compaction and/if excessive water is present within the material. A CBR (California Bearing Ratio) value can be calculated using the mean surface modulus.

A copy of the LWD depths and results can be found in Appendix V.

3.6.4 Sampling – General

Geotechnical bulk and disturbed samples were taken where required within the superficial deposits for strata identification and laboratory testing purposes. In addition, environmental samples were taken for laboratory testing.

All environmental samples were sent to the laboratory within 24-36hrs of having been obtained, whilst geotechnical samples were returned from site to SQL's laboratory for controlled storage to await test scheduling/requirements. For specific details of laboratory testing see section 6.0. Sample type and sample depth are recorded on the Engineering Geologist's Exploratory Hole Logs found within Appendix II.

4.0 LABORATORY TESTING

4.1 General

The laboratory testing was scheduled by SQL and comprised several geotechnical, geo-chemical testing on selected soil samples recovered from the investigation.

4.2 Geotechnical Laboratory Testing

All the geotechnical soil testing work was carried out in accordance with the procedures stipulated in the various sections of BS 1377:1990 Parts 1 - 9 *Methods of test for soils for civil engineering purposes*. Table 3 details the tests undertaken.

Table 3: Geotechnical Tests Undertaken

Type of Test	No of Tests
Moisture Content of Soil	2
4 Point Liquid & Plastic Limit	2
Particle Size Distribution	3

A full set of geotechnical laboratory test certificates are provided within Appendix VI.

4.3 Geo-Environmental Laboratory Testing

Geo-environmental testing was carried out on selected soil and soil leachate derived samples gained from the ground investigation. The purpose of the testing is to gain a holistic view of any raised levels of contaminants that may exist onsite. Table 4 below details Geo-environmental tests undertaken on selected soil samples.

Table 4: Geotechnical Tests Undertaken

Type of Test	No of Tests
ICE Suite E	5
ENV1 Leachate Suite	2
Suite B BRE Suite	4

Table 5 overpage is a breakdown of all the laboratory determinants for the Table 4 testing suites.

Table 5: Geo-environmental tests undertaken on soil and soil leachate samples

Heavy Metals			
• Arsenic	• Barium	• Beryllium	• Boron
• Cadmium	• Chromium (VI)	• Copper	• Lead
• Mercury	• Nickel	• Selenium	• Vanadium
• Zinc			
Inorganics			
• pH	• Total Sulphate	• Soluble Sulphate	• Sulphide
• Sulphur	• Organic Matter (soil only)	• Total Cyanide	• Complex Cyanide
• Free Cyanide	• Asbestos (soil only)		
Poly Aromatic Hydrocarbons			
• Naphthalene	• Acenaphthylene	• Acenaphthene	• Fluorene
• Phenanthrene	• Anthracene	• Fluoranthene	• Pyrene
• Benzo(a)anthracene	• Chrysene	• Benzo(b)fluoranthene	• Benzo(k)fluoranthene
• Benzo(a)pyrene	• Indeno(1,2,3-cd) pyrene	• Dibenz(a,h)anthracene	• Benzo(ghi)perylene
Total Petroleum Hydrocarbons			
TPH-CWG Aliphatic Split:	• EC5 – EC6	• EC6 – EC8	• EC8 – EC10
• EC10 – EC12	• EC12 – EC16	• EC16 – EC21	• EC21 – EC35
TPH-CWG Aromatic Split:	• EC5 – EC7	• EC7 – EC8	• EC8 – EC10
• EC10 – EC12	• EC12 – EC16	• EC16 – EC21	• EC21 – EC35
Aromatic, Monoaromatics & Oxygenates			
• Phenol	• Benzene	• Toluene	• Ethylbenzene
• p & m - xylene	• o - xylene	• MTBE	
Additional Tests for Soil Leachate			
• Hardness			

A full set of geo-environmental laboratory test certificates are provided within Appendix VII.

5.0 Ground Conditions Encountered

5.1 General

The sequence of deposits encountered during the investigation is detailed within the Engineering Geologist's logs presented within Appendix II & III. The following sections summarise the findings of the exploratory holes.

5.2 Ground Conditions

5.2.1 Overview of Strata Encountered

The site study area is mantled by Topsoil over Clay. Bedrock was observed within the trial pits and windowless sample boreholes, where the base of the strata was not proven.

Table 6 summarises ground conditions encountered.

Table 6: Generalised Stratigraphic Sequence Encountered Across Site

Strata	Depth Ranges (m.bgl)	
	From	To
Topsoil	GL	0.25
CLAY	0.25	0.70
SANDSTONE	0.70	2.20+

G.L. = Ground Level

+ = Base of Strata not proven

Made Ground

Made Ground was not encountered within any of the exploratory holes.

Topsoil

A thin surface layer of Topsoil was encountered, typically 0.20m to 0.30m thick, comprising grass over brown, slightly clayey, sandy, slightly gravelly silt with numerous rootlets. This material is organic and highly compressible, with negligible engineering strength, and is therefore unsuitable for use as a founding stratum. It should be stripped prior to construction.

Superficial Deposits

Underlying the topsoil, a layer of orange brown, slightly sandy, gravelly clay was encountered across all exploratory locations, extending to depths of between 0.60m and 0.90mbgl. The gravel fraction comprises sub-angular to sub-rounded sandstone, with sand ranging from fine to coarse. Although no in-situ strength testing was undertaken within this stratum, its composition and structure suggest a firm to stiff consistency with granular influence. The presence of gravel is likely to enhance shear strength but may result in some variability.

Bedrock – Milford Haven Subgroup (Solid Geology)

Beneath the clay, a stratum of reddish grey sandstone, recovered as a slightly silty, slightly sandy gravel with medium cobble content, was encountered at depths of between 0.60m to 0.90mbgl. This material represents highly weathered sandstone (rockhead). The gravel is described as angular fine to coarse sandstone, indicating in-situ weathering with minimal transport. In-situ SPT testing within window sample boreholes recorded 'N' values of 50 at approximately 1.0m depth, indicating a very dense to extremely dense condition. The weathering state of this strata reduced with depth with the Trial Pits and Window Sampling terminating on intact bedrock at depths between 1.0 and 2.20mbgl. This stratum is considered to provide a competent founding horizon with high bearing capacity and low compressibility.

5.2.2 Groundwater Conditions

During the intrusive ground investigation conducted, no groundwater strikes were recorded within all the exploratory holes. However, it should be noted that groundwater levels are subject to tidal, seasonal and climatic conditions or may vary due to other causes.

5.2.3 Buried Structures

No buried structures were observed during the intrusive investigation.

5.2.4 Visual & Olfactory Evidence of Soil Contmination

No visual or olfactory evidence of soil contamination was encountered during the fieldworks.

5.2.5 Visual & Olfactory Evidence of Groundwater & Surface Water Contamination

No visual or olfactory evidence of groundwater contamination was encountered during the fieldworks.

6.0 GEOTECHNICAL ENGINEERING APRAISAL

6.1 General

The purpose of this Ground Investigation and subsequent reporting is to determine and assess the existing ground conditions on-site in preparation for the proposed residential development at Ash Lane, Tavernspite. The assessment aims to provide parameters for foundation design, identify potential geotechnical hazards, and characterise the engineering properties of the underlying strata to support the construction of new residential dwelling with associated infrastructure.

6.2 Engineering Properties of Strata

The site study area is mantled by a thin layer topsoil, overlaying a thin layer of firm to stiff Clay, underlain by Weathered Sandstone Bedrock.

6.2.1 Geotechnical Testing / Engineering Properties

Results of the in situ SPT tests were corrected (to N_{60} values) using the equipment's energy ratio (E_r) found on their corresponding calibration certificates (in accordance with BS EN ISO 22476-3).

***Table 7**: Summary of SPT N values and depth*

Exploratory Hole	Depth (mbgl)	N Value
WS01	1.00	N=50
WS02	1.00	N=50
WS03	1.00	N=50

The results of geotechnical testing undertaken on samples of each stratum is summarised in Table 8:

Table 8: Summary of Laboratory/In-situ Test Results

Parameter	Units	Min.	Max.	Ave.	Characteristic	No. Tests
Moisture Content	%	15.9	25	20.45	20	2
Liquid Limit	%	36	54	45	45	2
Plastic Limit	%	14	22	18	18	2
Plasticity Index	%	22	32	27	27	2
Modified Plasticity Index	%	19.0	29	24	24	2
Standard Penetration Test	N Value	50	50	50	50	3
Particle Size Distribution: Depths between 1.0-2.0mbgl						
Cobbles	%	38	61	49	49	3
Gravel	%	25	49	37	37	3
Sand	%	2	4	3	3	3
Silt/Clay	%	9	12	11	11	3

Note: Oversize material (>75mm) would have been removed as part of the PSD test procedure, prior to sieving, and therefore the presence of any large cobbles or boulders would not be revealed by the test results.

The SPT 'N' values recorded shows the weathered sandstone bedrock to be very dense.

6.2.3 Strata Summary

Superficial Deposits

Atterberg Limit testing on samples of the Superficial Deposits measured the plasticity indices between 22 and 32%, classifying the Clay material as intermediate and high plasticity. The modified plasticity indices ranged between 19.4 and 28.8%, indicating medium volume change potential.

Consistency: Firm
Bearing Capacity: Presumed Allowable Bearing Capacity 50kN/m^2

Weathered Bedrock

The Particle Size Distribution testing undertaken shows the Weathered Sandstone of the Milford Haven Subgroup to be silty/clayey slightly sandy, Gravel & Cobbles. Generally consistent with the Engineers description.

Weathered sandstone bedrock was encountered across the whole site at depths from 0.70mbgl. A total of 3 Standard Penetration Tests (SPTs) were undertaken within this cohesive stratum across three boreholes (WS01–WS03), with "N" values of 50. Additionally, the Super Heavy Dynamic Probes (DP01–DP05) confirmed an increase in density with depth, reaching refusal (N=50) at the underlying rockhead profile.

For foundation design purposes, the following parameters have been derived based on the average "N" values at typical founding depths:

Suggested Soil Design Parameters:

- **SPT 'N' Value Average (1.50m):** 50
- **Density:** Dense to Very Dense
- **Bearing Capacity:** Presumed Allowable Bearing Capacity of 300 kN/m².
- **ø:** 35
- **'c':** 0kN/m^2

6.3 Earthworks

6.3.1 Site Preparation

Earthworks shall be carried out in accordance with BS 6031: 2009 Code of Practice for Earthworks. Workmanship for excavation shall comply with BS 8000: Part 1, sections 3.1, 3.2 and 3.3.

Prior to commencing any earthworks / groundwork for the development, any live services on and in the vicinity of the site should be accurately located and protected, or if required diverted.

Any exposed formations should be protected from the effects of the weather, site traffic, or water in order to prevent deterioration of this surface. It is recommended that any exposed formations be protected with a minimum thickness of up to 200mm of suitable granular material or a thin layer of blinding concrete, which should be placed immediately after excavation and exposure.

6.3.2 Excavation Plant

From observations made during the investigation, it is considered that excavations within the near surface Superficial Deposits (Cohesive) and weathered bedrock should be possible with the correct capacity/size 360 tracked excavators, utilising suitable excavating buckets. If excavations are to extend into the competent Bedrock, depths in excess of 1.70mbgl to 2.20mbgl, rippling or breaking equipment may be required.

6.3.3 Stability of Excavation Sides

Excavations undertaken during the investigation required stable and given the cohesive nature of the shallow deposits and the weathered bedrock encountered across the site, excavations within these deposits are not likely to incur hole instability issues. If excavation sides are to remain open, they should be battered back to a suitably designed safe angle. Where site constraints do not allow this, alternative methods of stabilising the excavations will be required.

Reference should be made to CIRIA Report No. 97 ‘Trenching Practise’ and BS 8004 ‘Foundations’ for guidance on excavation works.

6.3.4 Control of Groundwater

Although the Superficial Deposits were found to be immediate to high plasticity, care should be taken as low plastic soils may still be present and when wet, they can slurry up and become unworkable. Water-bearing granular layers or lenses may be present which assist the slurry up process. All earthworks should be undertaken with the possible presence of water in mind, either as run-off from rainfall or as perched groundwater in the shallow Made Ground and steps taken to minimise its impact.

No groundwater was encountered during the investigation and therefore significant quantities of groundwater are not expected to be encountered during construction. Sump pumping should control any surface water ingress or groundwater that may be encountered. It should be noted that groundwater levels are subject to diurnal, seasonal, and climatic conditions or may vary spatially across the site due to other causes, and it is recommended that groundwater control is undertaken in accordance with appropriate guidance such as CIRIA Report C515 (2000).

6.4 Structural Assessment

6.4.1 Foundation Recommendations

For the purpose of a preliminary appraisal of potential foundation solutions, we would comment as follows:

The weathered bedrock encountered across the site is suitable for structural foundations. Foundations should be formed in the highly weathered bedrock identified at a depth of 1.00mbgl across the site. No groundwater was encountered during the site investigations, and so these deposits will provide an allowable bearing capacity of 300kN/m^2.

Conventional strip foundations will be suitable for the proposed development. If proposed loadings are in excess of the allowable bearing capacity at 1.00mbgl, the required depth of foundation will be dependent upon the proposed loadings.

Given the variability in ground conditions at shallow depths, care should be taken to ensure foundations are placed in consistent strata (the highly weathered bedrock) to reduce the risk of differential settlement. Formation levels should be inspected by a competent person and any soft spots removed and replaced with an engineered fill.

6.4.2 Floor Slab Recommendations

Ground bearing floor slabs will be suitable for the proposed development, on suitable granular fill above the Superficial Deposits or highly weathered bedrock.

6.4.3 Foundation Concrete Class Designation

The Aggressive Chemical Environment for Concrete (ACEC) classification for the site has been assessed according to the guidelines within BRE Special Digest 1 (2005). For classification purposes, based on the BRE guidance, the groundwater must be classed as ‘mobile’ unless proven to be ‘static’ over a 24hr period. The pH values of the Superficial deposit samples taken on the site area are between 5.7 to 5.9, slightly acidic to neutral. The levels of water-soluble sulphate (SO_4) content of the tested Superficial deposits all below <0.01g/l.

Based on the above, the Design Sulphate (DS) class for the site is DS-1, and the Aggressive Chemical Environment for Concrete (ACEC) site classification is AC-1, assuming mobile groundwater conditions.

6.4.4 Road Pavement Design

The TRL DCP tests indicate CBR values range between 6% and 628% (not including measurements within the Topsoil). It is indicated CBR values within the Superficial Deposits ranged 6% and 13%, whilst CBR values in the weathered bedrock were 41% or above.

Based on the TRL DCP results, a CBR value of 5% may be adopted for the site. It is recommended that this is confirmed by additional in-situ testing prior to construction.

6.4.5 Drainage Considerations

Soakaway testing in accordance with BRE 365 was undertaken within the Glacial Till deposits and the underlying weathered Sandstone in selected Trial Pits. The findings of the tests are summarised in Table 9. In summary, very little if any reduction in water levels were observed during the test period indicating extremely low soil infiltration rates.

Table 9: Summary of Soakaway Test Results

Exploratory Hole ID	Test No.	Test Depth (mbgl)	Permeability Result Recorded (m/sec)	Comment
TP02	1	0.2-2.0	Insufficient reduction in water level over test period to calculate soil infiltration rate	No reduction in water level over the 1440 minute test period
TP04	1	0.2-2.0	Insufficient reduction in water level over test period to calculate soil infiltration rate	No reduction in water level over the 1440 minute test period

Based on the above permeability calculations, soakaways are not considered feasible within the shallow soils revealed onsite (i.e. <2.0mbgl). Alternative consideration may need to be given to mains drainage or attenuation cells construction as well as investigation of the deeper lying soils / rock.

The soakaway test certificates are presented within Appendix IV.

7.0 GEO-ENVIRONMENTAL CONSIDERATIONS

7.1 General

The following Section assesses the findings of the geo-environmental laboratory test results from samples obtained during the ground investigation. The risks to human and the environment are both considered herein. The following assessment is solely based on the results of laboratory testing of soil samples obtained Windowless Sample Boreholes and Trial Pits.

7.2 Human Health Risk Assessment Criteria

For the purposes of Spencer Quantum Ltd assessments, the most recent and applicable SGVs, GACs, SU4Ls and C4SLs are used based on site end use and development and overall suitability. These are all referenced within the text. SU4Ls take precedence in SQL assessments. Where these are not available or suitable, C4SLs are adopted.

By adopting the CLEA approach to human health risk assessment as defined in CLR11, a human health risk assessment has been undertaken for the proposed development adopting the most applicable model of Residential threshold values with Plant Uptake.

The assessment criteria used in this assessment is that presented by LQM/CIEH in their publication *The LQM/CIEH S4ULs for Human Health Risk Assessment (2015)*. The *S4ULs* (Suitable for Use Levels) used have been derived in accordance with UK legislation, national as well as Environment Agency policy and using a modified version of the Environment Agency CLEA software and available guidance provided to the contaminated land practitioner community for the purpose of deriving Generic Assessment Criteria (GAC).

The LQM/CIEH S4ULs are intended for use in assessing potential risks posed to human health by contaminants in soil and as transparently derived and cautious 'trigger values' above which further assessment or remedial action may be necessary. By using the LQM/CIEH S4AULs, Spencer Quantum acknowledges *Copyright Land Quality Management Ltd reproduced with permission; Publication Number S4AUL3409. All Rights Reserved.*

7.3 Soil Sample Test Results Comparisons

The results of chemical laboratory testing on selected soil samples from the shallow lying soils are presented and discussed within this Section.

7.3.1 Heavy Metal and Inorganic Compounds

The results of levels of potential contaminants have been compared to generic assessment criteria as described above, for a Residential with Plant Uptake end use. The test certificates are included in Appendix VII. The concentrations of heavy metal and inorganic compounds are summarised in the table 10.

Table 10: *Summary of Heavy Metals and Inorganic Soil Test Results*

Determinant	Results Range (mg/kg)	*LQM/CIEH (2015)* GAC (mg/kg) Residential with Plant Uptake End Use (1% SOM)[1]	Exceedances
Arsenic	2 – 4	37	0
Cadmium	<1.0	11	0
Chromium	25 – 29	910	0
Copper	10 – 13	2400	0
Lead[3]	11 - 12	200	0
Mercury	<0.17	40	0
Nickel	26 – 32	130	0
Zinc	49 – 60	3700	0

Notes:

(1). GAC from LQM/CIEH S4ULs 2019. (2). GAC from LQM/CIEH 2009 & 2015. (3). GAC from DEFRA C4SL. (4). GAC from at Risk adopting most sensitive end use for acute risk.

7.3.2 Polycyclic Aromatic Hydrocarbons

The results of levels of potential Polycyclic Aromatic Hydrocarbon contaminants have been compared to generic assessment criteria as described, for Residential with Plant Uptake End Use. The concentrations of speciated Polycyclic Aromatic Hydrocarbon are summarised and compared in Table 11.

Table 11: *Summary of Polycyclic Aromatic Hydrocarbon Soil Test Results*

Determinant	Site Results Range (mg/kg)	*LQM/CIEH (2015)* GAC [1] Residential with Plant Uptake End Use (1% SOM) (mg/kg)	
		1% SOM	Exceedances
Total Organic Carbon	-		
Acenaphthene	<0.01	210	0
Acenaphthylene	<0.01	170	0
Anthracene	<0.02	2400	0
Benzo(a)anthracene	<0.04	7.2	0
Benzo(a)pyrene	<0.04	2.2	0
Benzo(b)fluoranthene	<0.05	2.6	0
Benzo(ghi)perylene	<0.05	320	0
Benzo(k)fluoranthene	<0.07	77	0
Chrysene	<0.06	15	0
Dibenz(a,h)anthracene	<0.04	0.24	0
Fluoranthene	<0.08	280	0
Fluorene	<0.01	170	0
Indeno(1,2,3-cd)pyrene	<0.03	27	0
Naphthalene	<0.03	2.3	0
Phenanthrene	<0.03	95	0
Pyrene	<0.07	620	0

Notes: (1). GAC from LQM/CIEH S4ULs 2019.

7.3.3 Total Petroleum Hydrocarbons

The results of levels of potential petroleum hydrocarbon contaminants have been compared to generic assessment criteria as described, for Residential with Plant Uptake End Use. The concentrations of speciated Petroleum Hydrocarbons are summarised and compared in Table 12.

Table 12: *Summary of Petroleum Hydrocarbon Soil Test Results*

Determinand	Site Results Range (mg/kg)	*LQM/CIEH (2015)* GAC (mg/kg) Commercial End Use (1)	
		1% SOM	Exceedances
TPH – Aliphatic EC5-6	<0.01	42	0
TPH – Aliphatic >EC6-8	<0.01	100	0
TPH – Aliphatic >EC8-10	<1.0	27	0
TPH – Aliphatic >EC10-12	<1.0	130	0
TPH – Aliphatic >EC12-16	<1.0	1,100	0
TPH – Aliphatic >EC16-21	<1.0	65,000	0
TPH – Aliphatic >EC21-35	<1.0	65,000	0
TPH – Aromatic >EC5-7	<0.01	370	0
TPH – Aromatic >EC7-8	<0.01	860	0
TPH – Aromatic >EC8-10	<1.0	47	0
TPH – Aromatic >EC10-12	<1.0	250	0
TPH – Aromatic >EC12-16	<1.0	1,800	0
TPH – Aromatic >EC16-21	<1.0	1,900	0
TPH – Aromatic >EC21-35	<1.0	1,900	0

Notes: (1). GAC from LQM/CIEH S4ULs 2015. (2).

7.3.3 Total Phenols

Total Phenols (monohydric) recorded values of between <0.1mg/kg.

7.3.4 Asbestos

No Asbestos was recorded.

7.4 Environmental Risk Assessment

The following section presents the findings of the groundwater test results and provides assessment in relation to risks to the environment, particularly controlled waters.

7.4.1 Test Criteria

The risk to controlled waters, i.e., nearby watercourses and groundwater, is defined by the potential for any contaminants present on site to leach from the soils beneath the site and into the groundwater body.

2 No. soil samples obtained from the clay at TP02 (1.50mbgl) and TP04 (1.20mbgl), were tested using the leachate method to determine if any potential contaminants held within the soils are leachable. The result ranges are presented together with the threshold levels given by the Environmental Quality Standards (EQS)

guideline values (coastal & estuarine version) and as a secondary reference, the United Kingdom Drinking Water Standards (UKDWS).

7.4.2 Soil Leachate Test Results Comparisons

Table 13 presents the summarised findings of the soil leachate testing undertaken. The test certificates are included in Appendix VII.

Table 13: *Summary of Soil Leachate Chemical Analysis*

Determinant	Units	Site Results Range (µg/l) Groundwater –	Environmental Quality Standards – Coastal & Estuarine water[1]	UK Drinking Water Standards[2]	Exceedances
Arsenic	µg/l	<1.0	25	10	0
Cadmium	µg/l	<1.0	5	5	0
Chromium	µg/l	<1.0	15[3]	50	0
Copper	µg/l	<4.0	5[3]	2000	0
Lead	µg/l	<1.0	25[3]	10	0
Mercury	µg/l	<0.1	1	1	0
Nickel	µg/l	<2.0	30[3]	20	0
Zinc	µg/l	5 – 9	40[3]	5000	0

[1]Figures for Environmental Quality Standards (EQS) are Annual Average Concentrations derived from the Environment Agency [2]UK Drinking Water Standards taken from; Water Supply (Water Quality) Regulations 1989 (SI 1989/1147) (as amended), and Water Supply (Water Quality) Regulations 2000 (SI 2000/3184) (as amended). [3]Hardness Banding to be applied, average hardness utilised of 25mg$CaCO_3$/l– using Table 2b: EGS for hardness related List 2 dangerous substances, EC Dangerous Substances Directive (76/464/EEC). NT – Not Tested. I/S – Insufficient Sample, NYS – Not Yet Specified

7.5 Recommendations on Contaminated Land Appraisal

7.5.1 Human Health Risk of Site End Users

The soil samples tested during this intrusive investigation did not identify any elevated determinants exceeding the assessment criteria for a Residential with Plant Uptake end-use (based on 1% SOM). Consequently, no significant contaminant "source" has been identified in the shallow soils that would pose a risk to human health. Therefore, the Source-Pathway-Receptor linkage is not considered to be realised for future site users.

If areas of unexpected Made Ground are encountered during construction, it is recommended that SQL and the Local Authority are informed and additional investigation, testing and assessment undertaken.

7.5.2 Human Health Risks during Construction

Operatives working with, or likely to come into contact with made ground with the potential to contain raised concentrations of contaminants, should observe particular precautions concerning personal hygiene. They should be issued with the appropriate personal protective equipment and should be instructed in safe working methods.

Instructions should be issued in the recognition of potentially hazardous materials including oily and odorous soil and water and also any discoloured or fibrous substances for example. Operatives should be warned to avoid contact between hands and mouth before washing. The consumption of food must be confined to

designated clean areas with suitable welfare including washing facilities should be provided.

7.5.3 Risk to the Environment and Controlled Waters

The risk to controlled waters, i.e., nearby water courses, is defined by the potential for any contaminants present on site to either leach from the soil beneath the site onto controlled waterways or indeed historic trapped contaminated waters within the shallow soils migrate to controlled waterways.

Soil leachate testing did not reveal any elevated levels of potential leachate on site. No source has been identified and therefore no risk to controlled waters is considered to exist from on-site contamination.

7.6 Ground Gas Monitoring Results

Post-fieldwork ground gas monitoring visits have been undertaken to enable a preliminary assessment of ground gas conditions. The monitoring records are presented in Appendix VII, with results to date summarised and discussed below.

The monitoring identified a maximum methane (CH_4) concentration of 0% v/v and a maximum carbon dioxide (CO_2) concentration of 6.2% v/v. The maximum measured flow rate was 0.7L/hr, while oxygen (O_2) concentrations ranged between 15.2% and 20.6% v/v. Both Carbon monoxide (CO) w and hydrogen sulphide (H_2S) was below detection (<1 ppm).

The potential risks associated with the recorded ground gas concentrations have been assessed in accordance with CIRIA C665 and BS 8485. The assessment is based on the calculation of a Gas Screening Value (GSV), derived by multiplying the maximum steady-state gas flow rate (L/hr) by the maximum steady-state gas concentration (% v/v ÷ 100). Where no flow is detected, the instrument detection limit may be used to calculate a conservative GSV.

Using this method, a GSV of 0.0434 L/hr has been derived, which corresponds to a Characteristic Situation (CS) 1 classification. Accordingly, the site is classified as Characteristic Situation 1 (CS1).

Table 14: *Gas Screening Value and Characteristic Situation Classification*

Characteristic Situation	Risk Classification	Gas Screening Value (l/hr) - GSV
1	**Very low**	**<0.07**
2	Low	>0.07, <0.7
3	Moderate	>0.7, <3.5
4	Moderate to High	>3.5, <15
5	High	>15, <70
6	Very High	>70

Based on the GSV from the current ground gas monitoring results, the site may be classified as Characteristic Situation 1. However, given the CO_2 concentrations in excess of 5% measured in WS01 on 25/03/26, the site is classified as Characteristic Situation 2 indicating basic gas protection measures.

Radon levels as stated within the PRA, dictate that no radon protection measures are required.

For completeness, following the physical investigation, the Gas Risk Assessment can be updated as follows:

Table 15: *Gas Risk Assessment*

Lines of Evidence	Description	Risk
Desk Study	The desk study searches have identified that the site has limited soil cover with bedrock near or at the surface. Unlikelihood for Made Ground to be present. Former land use agriculture. Low potential for spills.	Low
Ground Conditions	Made Ground or organic soils not encountered. Not in an mining area. Low levels of CO_2 present.	Low
Current Risk	The multiple lines of evidence to date indicate a low risk.	Low

Based on the ground gas monitoring at the date and with consideration to the lines of evidence, the site as classified as Characteristic Situation 2, low risk, with the following protective measures recommended:

a) Reinforced concrete cast in-situ floor slab with at least 1200g DPM[2].
b) Beam and block or precast concrete slab and minimum 2000g DPM/reinforced gas membrane.

All joints and penetrations sealed.

The risk associated with ground gas will be reviewed upon completion of the ground gas monitoring programme.

8.0 REFERENCES

British Geological Survey:

- Geological Sheet SN-51-SW 1:10,560
- BGS Lexicon of Named Rock Units (www.bgs.ac.uk/lexicon)
- BGS Geology of Britain Viewer (www.bgs.ac.uk)

Specialist Publications:-

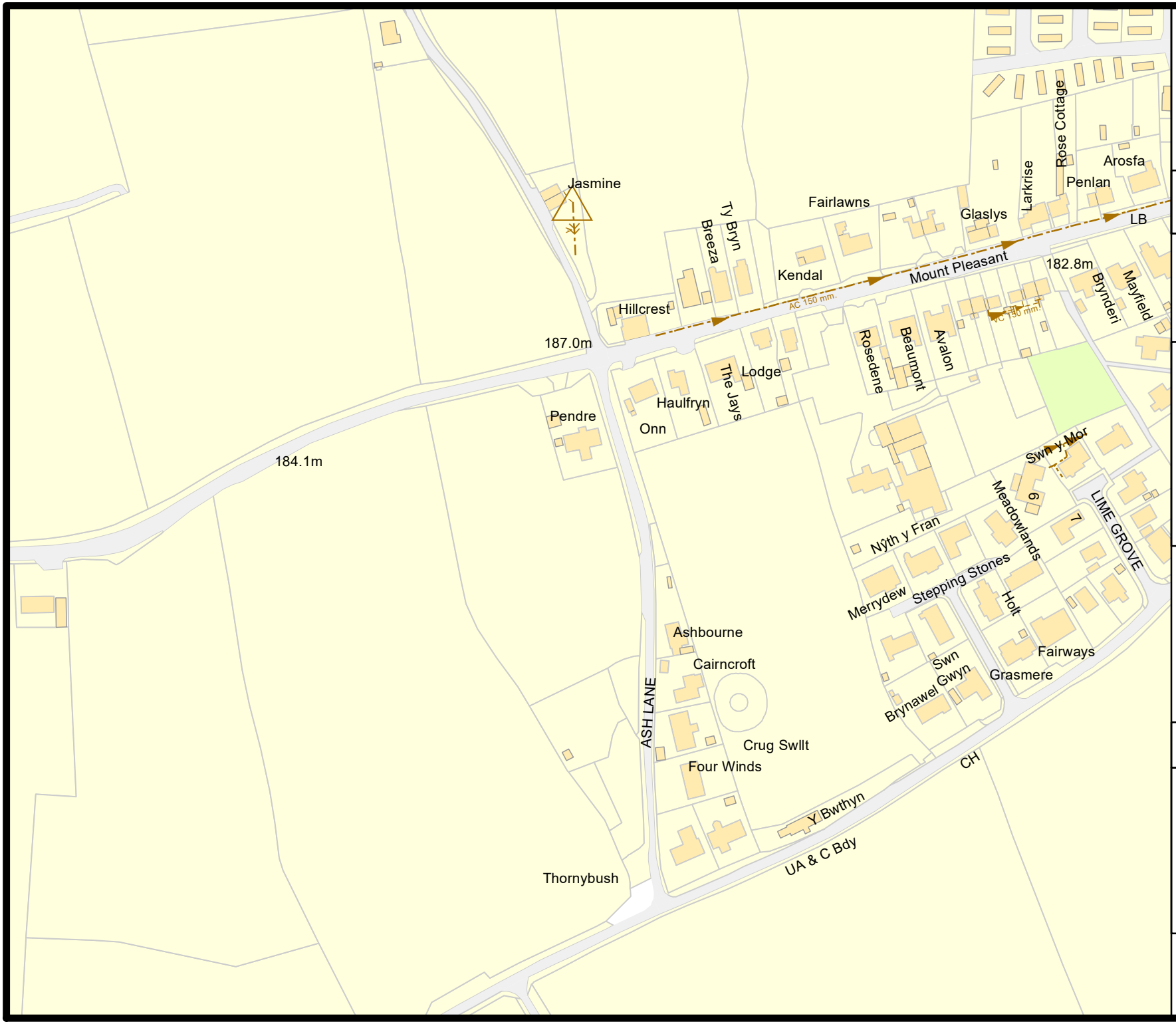
- British Code of Practice BS 5930:2015+A1:2020 *'Code of Practice for Site Investigations'*
- British Code of Practice BS 1377:1990 *'Methods of test for soils for civil engineering purposes'.*
- British Code of Practice BS 10175:2011 *'Code of Practice for Investigation of Potentially Contaminated Sites'*
- British Code of Practice BS EN ISO 14688-1:2018 Geotechnical investigation and testing. Identification and classification of soil. Identification and description
- British Code of Practice BS EN ISO 14688-2:2018 Geotechnical investigation and testing. Identification and classification of soil. Principles for a classification.
- British Code of Practice BS EN ISO 14689-1:2003 Ground Investigation and Testing – Identification and classification of rock
- Health and Safety Executive Guidance Note EH40/90
- BRE (2005) Special Digest 1:2005, 3rd Edition, Concrete in aggressive ground. BRE, Garston.
- BS 6031: 2009 Code of Practice for Earthworks.
- ICE UK Specification for Ground Investigation Second Edition.
- Specification for Highways Works Series 600 Earthworks
- Environment Agency Science Report SC050021/*[various]* (2009) *Soil Guideline Values*
- LQM/CIEH Publication S4UL3409 (2015) *'Generic Assessment Criteria for Human Health Risk Assessment'*
- World Health Organisation (2011) *'Guidelines for drinking-water quality, 4th edition'*
- Statutory Instruments (UK Legislation) 2016 No. 614 *'The Water Supply (Water Quality) Regulations'* retrieved from www.legislation.gov.uk/2016/614
- Statutory Instruments (UK Legislation) 2015 No. 1623 *'The Water Framework Directive (Standards and Classification) Directions (England and Wales)'*
- CIRIA C665 (2007) Assessing risks posed by hazardous ground gases to buildings.

Site Study Area Report:-

- Spencer Quantum Ltd Tier 1 Preliminary Risk Assessment and Coal Mining Risk Assessment – Desk Study Report (Report Ref: *Q1967/PRA-CMRA*)

Appendix C

Public Sewer Map



Dŵr Cymru
Welsh Water

PPA0009887 - Sewer Plan

N
W E
S

LEGEND(Representative of most common features)

Waste network:

	Foul chamber		Outfall
	Surface water chamber	LH	Lamphole
	Combined chamber		Storm Overflow
CO	Combined sewer overflow		Rising main
SPC	Special purpose chamber		Gravity sewer
	Treatment works	P	Private sewer
	Pumping station	S 104 P	Private sewer subject to Sect. 104 adoption agreement
		T	Private Sewer Transfer
		L	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

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Service pipes are not generally shown but their presence should be anticipated.

EXACT LOCATIONS OF ALL APPARATUS TO BE DETERMINED ON SITE.

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Map Ref:	217634,212409
Map scale:	1:2500
Printed by:	Helen Dartnell
Printed on:	03 Feb 2026

Appendix D

DCWW Pre-application Advice

Dŵr Cymru
Welsh Water

Developer Services
PO Box 3146
Cardiff
CF30 0EH

Tel: +44 (0)800 917 2652
Fax: +44 (0)2920 740472
E.mail: developer.services@dwrcymru.com

Gwasanaethau Datblygu
Blwch Post 3146
Caerdydd
CF30 0EH

Ffôn: +44 (0)800 917 2652
Ffacs: +44 (0)2920 740472
E.bost: developer.services@dwrcymru.com

Mr Danny Hughes
CB3 Consult Ltd
7 St James Crescent
Swansea
SA1 6DP

Date: 03/02/2026
Our Ref: PPA0009887

Dear Mr Hughes

Grid Ref: 217609 212390
Site Address: 28 Ash Lane, Tavernspite, SA34 0PR
Development: C2351 - Ash Lane, Tavernspite

I refer to your pre-planning enquiry received relating to the above site, seeking our views on the capacity of our network of assets and infrastructure to accommodate your proposed development. Having reviewed the details submitted I can provide the following comments which should be taken into account within any future planning application for the development.

Firstly, we note that the proposal relates to the development of 28 dwellings and comprises of a potential windfall development with no allocated status in the Local Development Plan (LDP). Accordingly, whilst it does not appear an assessment has been previously undertaken of the public sewerage and watermains systems, we offer the following comments as part of our appraisal of this development.

Public Sewerage Network

The proposed development site is located in the immediate vicinity of a foul sewerage system, which drains to Tavernspite Wastewater Treatment Works (WwTW).

You are advised that some public sewers and lateral drains may not be recorded on our maps of public sewers because they were originally privately owned and were transferred into public ownership by nature of the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011. The presence of such assets may affect the proposal. In order to assist you may contact Dwr Cymru Welsh Water on 0800 085 3968 to establish the location and status of the apparatus in and around your site. Please be mindful that under the Water Industry Act 1991 Dwr Cymru Welsh Water has rights of access to its apparatus at all times.

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Glas Cymru Cyfyngedig

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Mae Dŵr Cymru yn eiddo i Glas Cymru – cwmni 'nid-er-elw'.

We welcome correspondence in Welsh and English

Dŵr Cymru Cyf, a limited company registered in Wales no 2366777. Registered office: Pentwyn Road, Nelson, Treharris, Mid Glamorgan CF46 6LY

Rydym yn croesawu gohebiaeth yn y Gymraeg neu yn Saesneg

Dŵr Cymru Cyf, cwmni cyfyngedig wedi'i gofrestru yng Nghymru rhif 2366777. Swyddfa gofrestredig: Heol Pentwyn Nelson, Treharris, Morgannwg Ganol CF46 6LY.

This site is crossed by a public watermain with the approximate position being marked on the attached Statutory Public Sewer Record. In accordance with the Water Industry Act 1991, Dwr Cymru Welsh Water requires access to its apparatus at all times in order to carry out maintenance and repairs. However, having regard to Drawing No 101 Rev B it appears the proposed development would be situated outside the protection zone of the public watermain measured 3 metres either side of the centreline and therefore acceptable in principle. Please note, the distance specified for this protection zone is indicative and based on industry standard guidelines. However, the depth of the asset will need to be verified on site which may infer a greater protection zone.

For completeness, we recommend the developer refer to their title deeds to confirm if there are any covenants or restrictions associated with the asset(s) crossing the proposed development site.

Accordingly, it is recommended that the developer contact our Plan and Protect team (PlanandProtect@dwrcymru.com) to carry out a survey to verify the location of this asset and establish its relationship to the proposed development, which should be referred to in the [Drawing], for the purposes of any forthcoming planning application. Further information regarding Asset Protection is provided in the attached Advice & Guidance note as well as our Developer Services website, which offers guidance on building SuDS features over or near to our assets at https://developers.dwrcymru.com/en/help-advice/regulation-to-be-aware-of/sustainable-drainage-systems.

Surface Water Drainage

As of 7th January 2019, this proposed development is subject to Schedule 3 of the Flood and Water Management Act 2010. The development therefore requires approval of Sustainable Drainage Systems (SuDS) features, in accordance with the 'Statutory standards for sustainable drainage systems – designing, constructing, operating and maintaining surface water drainage systems'. As highlighted in these standards, the developer is required to explore and fully exhaust all surface water drainage options in accordance with a hierarchy preferring infiltration (PL2) and, where infiltration is not possible, disposal to a surface water body (PL3), in liaison with the Lead Local Flood Authority and/or Natural Resources Wales, or surface water sewer or highway drain (PL4) in liaison with the riparian owner and/or Local Highways Authority.

Please note, DCWW is a statutory consultee to the SAB application process and will provide comments to any SuDS proposals by response to SAB consultation. Please refer to further detailed advice relating to surface water management included in our attached Advice & Guidance note and our Developer Services website at https://developers.dwrcymru.com/en/help-advice/regulation-to-be-aware-of/sustainable-drainage-systems.

Foul Water Drainage – Sewerage Network

We have considered the impact of foul flows generated by the proposed development and concluded that flows can be accommodated within the public foul sewerage system. We advise that the flows should be connected to the foul sewer at manhole SN17126401 located in Mount Pleasant.

You may need to apply to Dwr Cymru Welsh Water for any connection to the public sewer under Section 106 of the Water industry Act 1991. However, if the connection to the public sewer network is either via a lateral drain (i.e. a drain which extends beyond the connecting property boundary) or via a new sewer (i.e. serves more than one property), it is now a mandatory requirement to first enter into a Section 104 Adoption Agreement (Water Industry Act 1991). The design of the sewers and lateral drains must also conform to the Welsh Ministers Standards for Foul Sewers and Lateral Drains, and conform with the publication "Sewers for Adoption"- 7th Edition. Further information can be obtained via the Developer Services pages of www.dwrcymru.com

Sewerage Treatment

The proposed development would overload the Waste Water Treatment Works. No improvements are planned within Dwr Cymru Welsh Water's Capital Investment Programme.

If you wish to progress this development then it will be necessary for a Developer Impact Assessment to be undertaken on the Wastewater Treatment Works at the developer's expense. The conclusion of this assessment will determine any improvement works required.

The costs for undertaking this assessment must be paid for by the developer. For you to obtain a quotation for the Developer Impact Assessment, we will require a fee of £250 + VAT to engage our consultants, this fee is non refundable.

Potable Water Supply

Capacity is currently available in the water supply system to accommodate the development. We reserve the right however to reassess our position as part of the formal application for the provision of new water mains under Section 41 and Section 51 of the Water Industry Act (1991) to ensure there is sufficient capacity available to serve the development without causing detriment to existing customers' supply as demands upon our water systems change continually.

I trust the above information is helpful and will assist you in forming water and drainage strategies that should accompany any future planning application. I also attach copies of our water and sewer extract plans for the area, and a copy of our Planning Guidance Note which provides further information on our approach to the planning process, making connections to our systems and ensuring any existing public assets or infrastructure located within new development sites are protected.

If you have any questions about the above response, please contact Clare Powell who is the Development Planning Officer for Pembrokeshire at developer.services@dwrcymru.com or on 0800 917 2652. They will be happy to assist you further.

Please quote our reference number in all communications and correspondence.

Yours faithfully,

Matthew Lord
Planning Liaison Manager
Developer Services

***Please Note** that demands upon the water and sewerage systems change continually; consequently the information given above should be regarded as reliable for a maximum period of 12 months from the date of this letter.*

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Appendix E

CCTV Drainage Survey

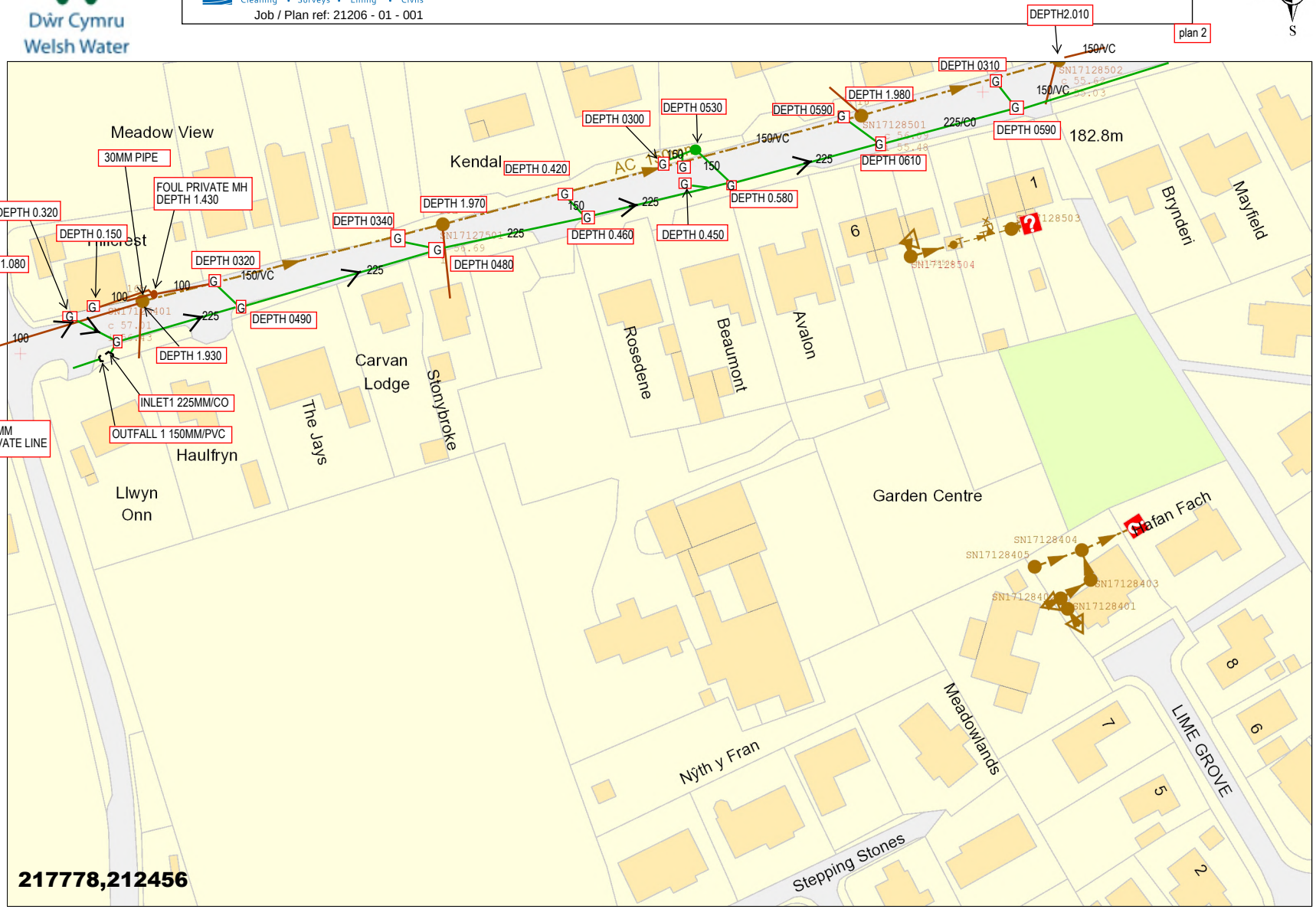
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Welsh Water

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Job / Plan ref: 21206 - 01 - 001

Ashlane 1

13/04/2026

Scale: 1: 1250



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

- Foul
- Surface Water
- Combined
- Rising Main
- Private
- Treatment Works
- Pumping Station
- Special Purpose
- Unknown End
- Change, Combined Overflow
- Outfall, FOUL
- Lamp Hole, Foul
- Private Sewer Transfer
- Lateral Drain
- Inspection Chamber

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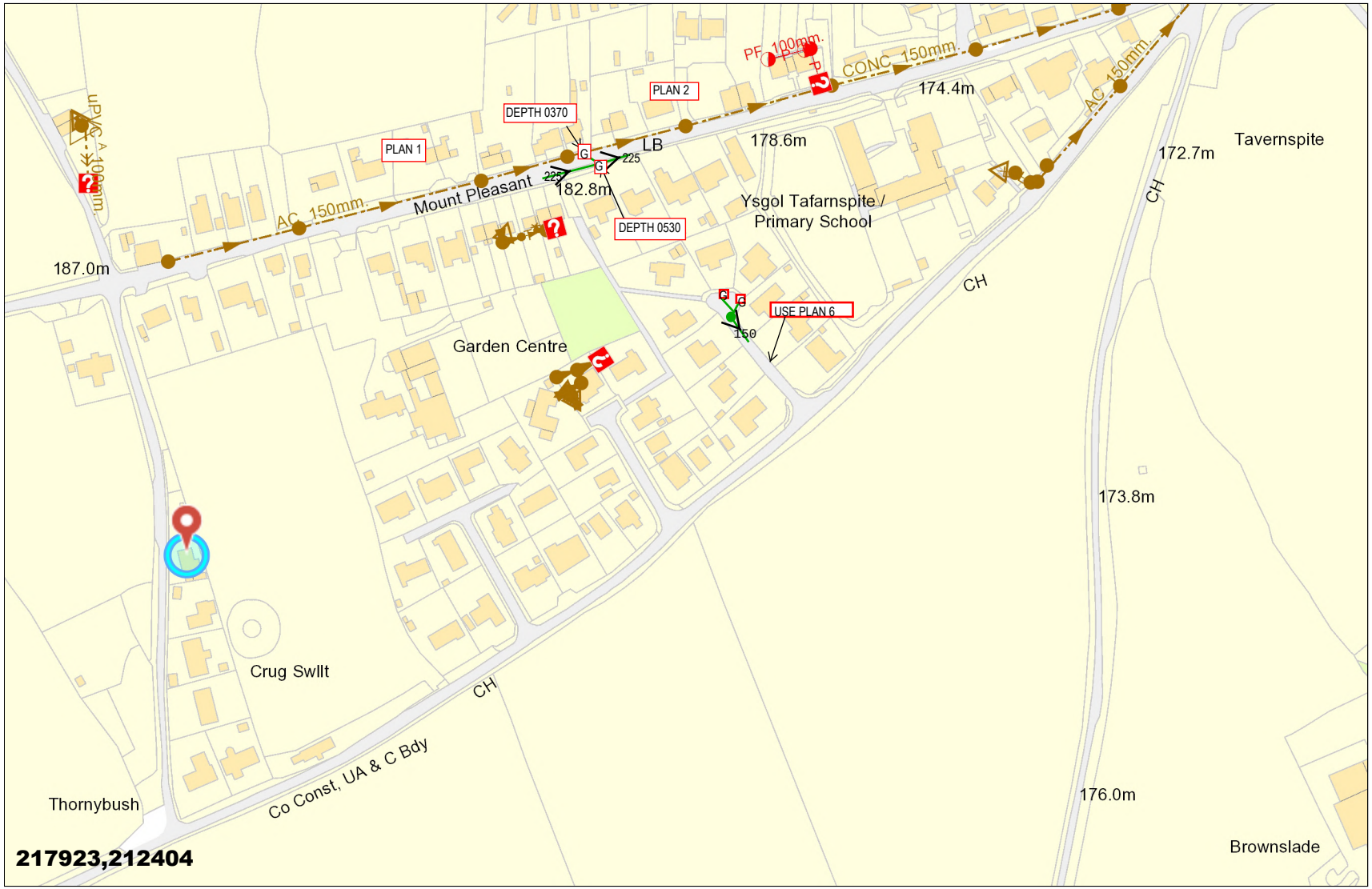
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Welsh Water

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Ash lane

13/04/2026

Scale: 1: 3000



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

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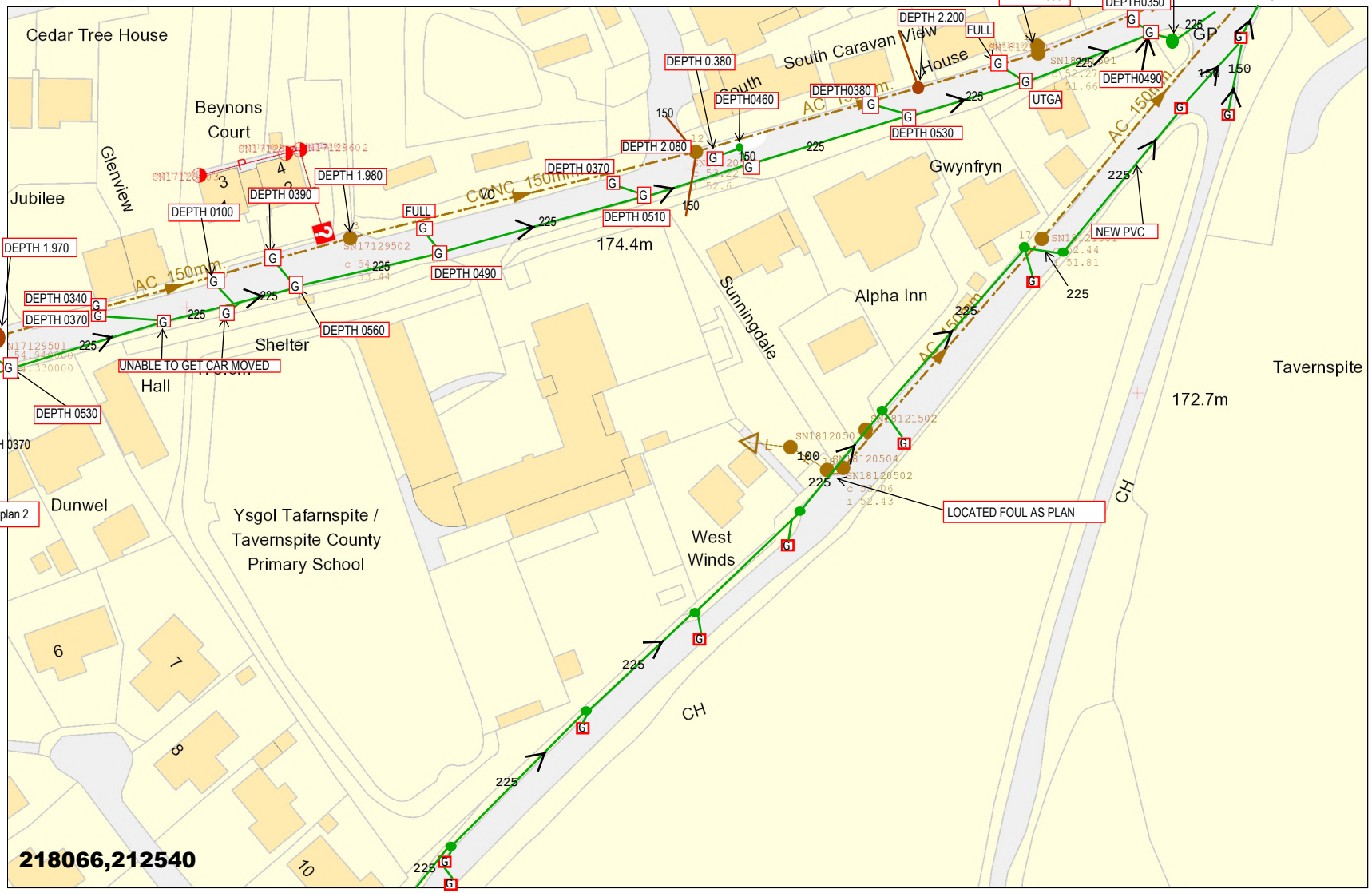
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Ashlane

13/04/2026

Scale: 1: 1250



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

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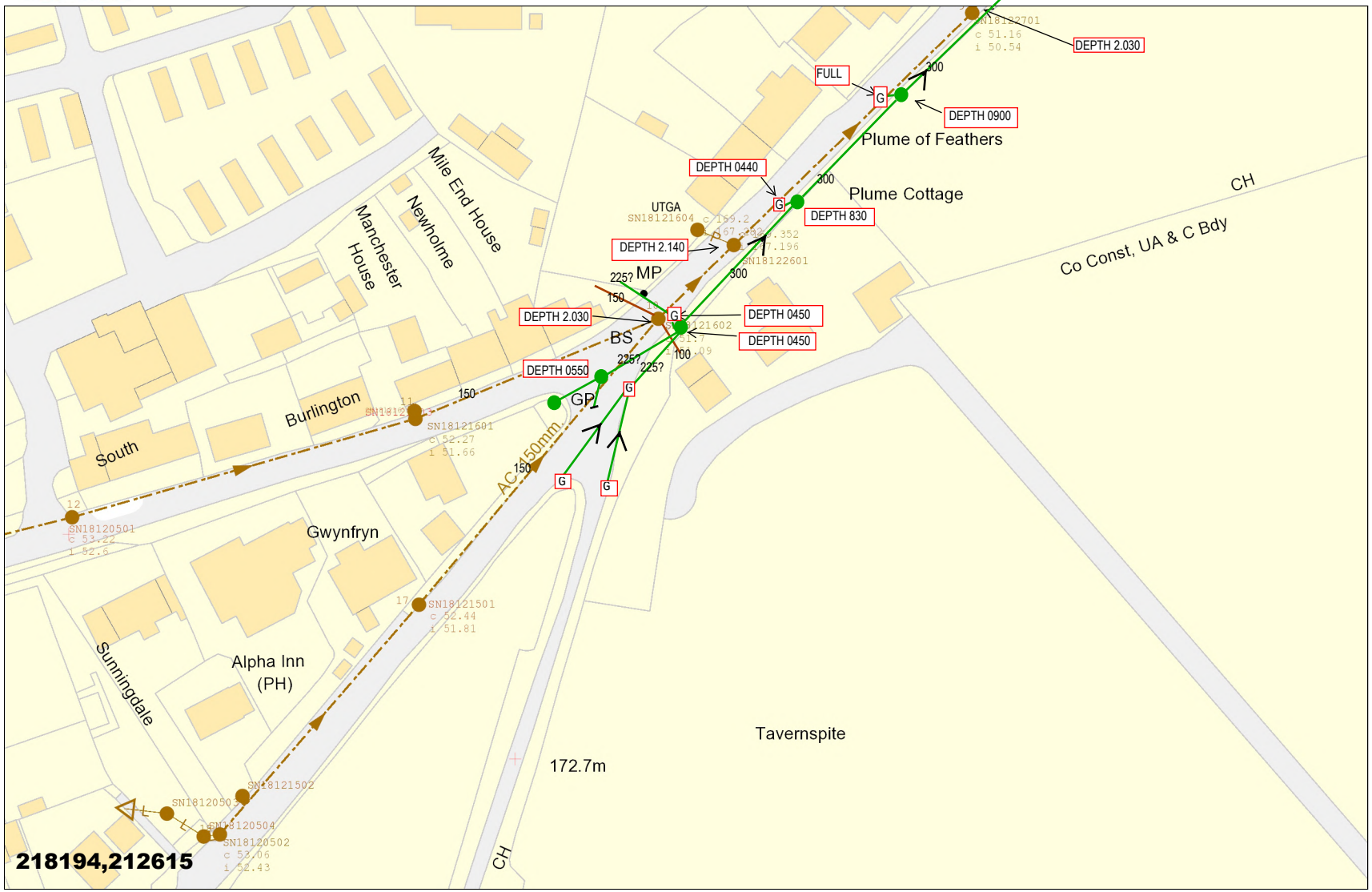
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AShlane

PLAN 6

13/04/2026

Scale: 1: 1250



LEGEND

Clean Water

- Sluice Val
- Air Val, SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- BULK Meter
- FH
- Cap
- Existing Main
- NON COMPANY

Sewerage External

- Foul
- Surface Water
- Combined
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- Inspection Chamber

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EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE

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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



DRAINTECH
Cleaning • Surveys • Lining • Civils
Job / Plan ref: 21206 - 01 - 005

Scale: 1:1250

14/04/2026

EXACT LOCATION OF ALL APPARATUS TO BE DETERMINED ON SITE

Dŵr Cymru Welsh Water

N W E S

LEGEND

- Sluice Valve
- Air Valve SINGLE
- Tap
- Pressure Reducing Valve
- Meter
- Bulk Meter
- Fire Hydrant
- Cap
- Non Dwr Cymru
- Existing Distribution Main
- Inspection Chamber
- Gravity Sewer
- Rising Main
- Outfall
- Pumping Station
- Lamphole
- Combined Sewer Overflow
- Special Purpose Chamber
- Treatment Works
- Private Sewer Transfer
- Lateral Drain

NB:
Sewer symbol colour indicates the sewer type.
RED - Combined
GREEN - Surface Water
BROWN - Foul

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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

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Appendix F

Architects Layout

Accomodation Schedule

House Name	Code	Beds	(NIA) ft²	No of Units	Total Area
Affordable Units					
WDQR Social Rented Units					
1 Bed Bungalow	1B2PBU	1	526	4	2104
1 Bed Walk-Up Flat [GF]	1B2PWU	1	552	3	1656
1 Bed Walk-Up Flat [FF]	1B2PWU	1	607	3	1821
2 Bed Bungalow	2B3PBU	2	649	3	1947
2 Bed House	2B4P	2	894	4	3576
3 Bed House	3B5P	3	1025	2	2050
3 Bed Corner House	3B5PCT	3	1025	5	5125
3 Bed House	3B6P	3	1220	4	4880
4 Bed House	4B7P	4	1268	2	2536
Total				**30**	**25695**



SITE KEY

Boundary Treatments

- Site Boundary
- 1.8m High Hit & Miss Fence
- 1.8m High Close Board Fence
- 1m High Hoop Top Railings
- 0.45m High Timber Knee Rail
- Proposed retaining wall location *(refer to Engineering drawing for further details)*

Access Points

- Primary door to dwelling *(Part M)*
- Secondary door(s) to dwelling
- 1.8m High close board personnel gate
- 1.2m High metal gate
- Parking Space

Hard Surfacing

- Highway - *Tarmacadam Finish*
- Highway - *Permeable Tarmacadam Finish*
- Highway Footpath - *Tarmacadam Finish*
- Shared Private Driveway - *Tarmacadam Finish*
- Shared Private Driveway - *Permeable Tarmacadam Finish*
- Shared Private Driveway - *Block paving*
- Shared Private Driveway - *Permeable Block paving*
- Bin Collection Point - *PCC Slab Finish* *(For Plots accessed off of a shared private drive)*
- Private Footpath - *PCC slabs*
- POS Footpath - *Dust / Self-binding Gravel*

Soft Surfacing

- Front Garden
- Rear Garden
- Amenity Space / Green Infrastructure / POS
- Bio-retention System Feature / Attenuation System
- Private Rain Garden
- Local Area of Play
- Maintenance Footpath
- Proposed Hedgerow
- Proposed Tree / Landscaping
- Existing Tree / Vegetation *(Taken from Treescene drawing)*

Site Features

- Dual Aspect Units
- Shed Storage - *1.35m x 2.1m*
- Bin Store Slab - *1.8x0.9m PCC Slab Finish*
- Rotary Line
- Air Source Heat Pump *(Locations to be confirmed by site contractor)*
- Additional Side Window Symbol
- Water Main Easement

Scale 1:500

0 10 20 50

Rev.	Note.	Date.
3	Latest Engineering drainage strategy and landscpaing information added to layout.	29.06.26
4	Layout replanned following a red line boundary title dispute issue with the neighbouring Pendre bungalow.	06.08.26
5	Latest Engineering information added to layout. Extended length of parking bays for Plots 1,11 & 12.	02.09.26

CLIENT: ATEB	SCALE @ A2: 1:500	DATE: May '26	DRAWN BY: KE
JOB TITLE: Tavernspite, Whitland.	JOB NO.: 2551	DRAWING NO.: PL-01	REVISION: 5
DRAWING TITLE: Planning Layout			

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Figured dimensions must be taken in preference to scaled dimensions and any discrepancies are to be referred to Hammond Architectural Ltd. Contractors, subcontractors and suppliers must verify all dimensions on site before commencing any work or making any workshop drawings.

hammond Architectural Ltd
10 Gold Tops
Newport
NP20 4PH
t. 01633 844970
e. info@hammond-ltd.co.uk
www.hammond-ltd.co.uk

Appendix G

Drainage Strategy Plan

PROPOSED CONNECTION INTO EXISTING FOUL CHAMBER. EXISTING CHAMBER TO BE RECONSTRUCTED.

38.100m EXTENT OF EXISTING 100mmø PIPE TO BE REPLACED WITH 150mmø

FOR CONTINUATION REFER TO C-SK05

PROPOSED HYDRO-BRAKE DESIGN FLOW: 5L/s

MAINTENANCE PATH LEVEL: 187.00

BASE LEVEL: 186.10

OUTLET IL: 186.10

RAINGARDEN FOREBAY WITHIN BASIN TO RECEIVE STORM INLET

IL: 186.36

IL: 185.97

IL: 185.92

IL: 186.53

IL: 186.05

IL: 186.82

0.00

20.0

26.08

20.09

23.07

40.0

56.26

60.0

74.0

80.0

92.36

100.0

103.59

20.0

40.0

60.0

65.91

68.61

71.31

78.01

17.83

0.00

FFL: 188.20

FFL: 188.40

FFL: 188.40

FFL: 188.40

FFL: 188.40

FFL: 189.15

FFL: 189.15

FFL: 189.20

FFL: 189.20

FFL: 189.20

FFL: 189.20

FFL: 189.35

FFL: 189.80

FFL: 190.20

FFL: 190.20

FFL: 190.45

FFL: 190.45

FFL: 189.60

FFL: 189.60

FFL: 189.85

FFL: 189.85

FFL: 190.30

FFL: 190.30

FFL: 190.50

FFL: 190.35

FFL: 190.35

FFL: 190.65

LOCATION OF EXISTING WATER MAIN WHICH RUNS THROUGH SITE

PROPOSED ORIFICE ORIFICE DIAMETER 39mm

PROPOSED ORIFICE ORIFICE DIAMETER 30mm

POROUS SURFACE USED FOR UPSTREAM STORAGE SUBBASE DEPTH 700mm

POROUS SURFACE USED FOR UPSTREAM STORAGE SUBBASE DEPTH 400mm

POROUS SURFACE SUBBASE DEPTH 350mm

WATER

B4314

ASH LANE

Llwyn Onn

Pendre

Bungalow

Shed

Car Port

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING.
2. CONTRACTOR TO CHECK ALL DIMENSIONS AND REPORT ALL ERRORS AND OMISSIONS TO THE ENGINEER.
3. ANY DISCREPANCY TO BE REPORTED IMMEDIATELY TO THE ENGINEER.
4. THIS DRAWING TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTS, SUBCONTRACTORS AND SPECIALISTS DRAWINGS AND SPECIFICATIONS.

KEY

- DCWW ADOPTABLE FOUL DRAINAGE SYSTEM
- LA ADOPTABLE STORM DRAINAGE
- LA ADOPTABLE PERFORATED STORM DRAINAGE
- STORM DRAINAGE SERVING PRIVATE PROPERTIES
- PERFORATE PIPEWORK SERVING PRIVATE PROPERTIES
- ACO LINEAR CHANNEL
- OG PRIVATE RAINGARDEN OVERFLOW GULLY
- RE ON PLOT RODDING EYE MAINTAINED BY RESIDENT 100mmø UNLESS STATED
- PRIVATE POROUS ASPHALT PARKING BAY WITH PERFORATED PIPE UNDERDRAIN.
- SHARED POROUS BLOCKWORK SURFACE
- LA ADOPTABLE POROUS ASPHALT SURFACE
- SAB ADOPTABLE DETENTION BASIN
- SAB ADOPTABLE DETENTION BASIN MAINTENANCE PATH
- PRIVATE RAINGARDENS
- FOREBAY RAINGARDEN WITHIN BASIN
- G EXISTING GULLY AND STORM WATER DRAINAGE
- EXISTING COMBINED WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE

DRAINAGE STRATEGY

SURFACE WATER

SURFACE WATER RUNOFF WILL BE COLLECTED WITHIN A POSITIVE SYSTEM AND DISCHARGED INTO THE EXISTING STORM WATER SYSTEM LOCATED TO THE EAST OF SITE INFRONT OF THE STONYBROKE PROPTERY, AT A GREENFIELD DISCHARGE RATE OF 9.0lit/sec/ha. MULTIPLE SuDS FEATURES HAVE BEEN PROPOSED ACROSS SITE, INCLUDING RAINGARDENS TO CAPTURE ROOF RUNOFF, POROUS SURFACES TO COLLECT HIGHWAY RUNOFF AND A FINAL DETENTION BASIN.

IN ACCORDANCE WITH THE SAB STANDARDS

STANDARD 1

- REUSE – WATER RE-USE VIA THE HYDRATION OF PLANTING WITH RAINWATER BUTTS TO BE PROVIDED PER PLOT
- INFILTRATION – GI REPORT 'TF-25-045-CA – TIER 2' HAS SHOWN THAT INFILTRATION IS NOT VIABLE FOR THIS SITE.
- WATER BODY – THERE ARE NO WATER BODIES NEAR THE DEVELOPMENT SITE, THEREFORE DISCHARGE INTO A WATER BODY IS NOT POSSIBLE
- SURFACE WATER NETWORK – A CONNECTION IS PROPOSED INTO AN EXISTING SURFACE WATER SEWER EAST OF THE DEVELOPMENT
- PRIVATE COMBINED SEWER – NOT REQUIRED FOR THIS DEVELOPMENT

STANDARD 2

- FIRST 5mm OF RAINFALL FROM ALL IMPERMEABLE AREAS WILL BE INTERCEPTED AND STORED WITHIN A VARIETY OF SuDS FEATURES, INCLUDING RAINGARDENS, DETENTION BASIN AND POROUS SUBBASE
- SURFACE WATER SYSTEM TO BE DESIGNED FOR A RETURN PERIOD OF 100 YEARS +30% CLIMATE CHANGE
- GIVEN THE SITE TOPOGRAPHY, ANY EXCEEDANCE WILL DISCHARGE ONTO THE HIGHWAY.

STANDARD 3

- WATER QUALITY WILL BE ACHIEVED THROUGH THE USE OF VARIOUS SUDS TECHNIQUES INCLUDING RAINGARDENS, POROUS SURFACING AND A DETENTION BASIN

STANDARD 4

- VARIOUS SuDS FEATURES ACROSS THE SITE WILL HELP TO PROVIDE VALUABLE AMENITY CONTRIBUTION AND WILL FORM A KEY PART OF LANDSCAPING PROPOSALS FOR THE SITE. THE PROPOSED RAINGARDENS AND DETENTION BASIN WILL AID IN PROVIDING VISUAL AMENITY ACROSS THE SITE IN THE FORM OF PLANTED SOFT LANDSCAPED AREAS.

STANDARD 5

- THE DETENTION BASIN ALONG WITH THE RAINGARDENS WILL MAKE A POSITIVE CONTRIBUTION TO URBAN BIO-DIVERSITY, PROVIDING HABITAT AND FOOD FOR INVERTEBRATES AND BIRDS. RAINGARDENS WILL BE PLANTED WITH NATIVE PLANT SPECIES TO PROVIDE DENSE AND DURABLE COVER OF VEGETATION THAT CREATES APPROPRIATE HABITAT FOR INDIGENOUS SPECIES.

STANDARD 6

- SLOW GROWING VEGETATION TO BE PLANTED IN THE SOFT LANDSCAPED AREAS TO REDUCE THE NEED FOR MAINTENANCE AND REPLACEMENT.

FOUL DRAINAGE

- A GRAVITY FOUL SYSTEM IS PROPOSED FOR THE DEVELOPMENT DISCHARGING INTO THE EXISTING LINE LOCATED WITHIN THE B4314, INFRONT OF THE PENDRE PROPERTY.
- FOUL DRAINAGE ARRANGEMENT SUBJECT TO DCWW APPROVAL UNDER S104.

Rev.	Detail	By	Date
B	DRAINAGE STRATEGY AMENDED TO SUIT LATEST ARCHITECTS LAYOUT	DH	17.09.26
A	DRAINAGE STRATEGY ADDED TO PLAN; OFF-SITE DRAINAGE STRATEGY REFERRED	DH	25.06.26

Revisions

Reinforcement schedules nos.

CB3 CONSULT
Structural & Civil Engineering Consultants
First Floor
7 St James Crescent
Swansea
SA16DP
Telephone +44 1792 473 182
e-mail admin@cb3consult.co.uk
web www.cb3consult.co.uk

Client: ateb

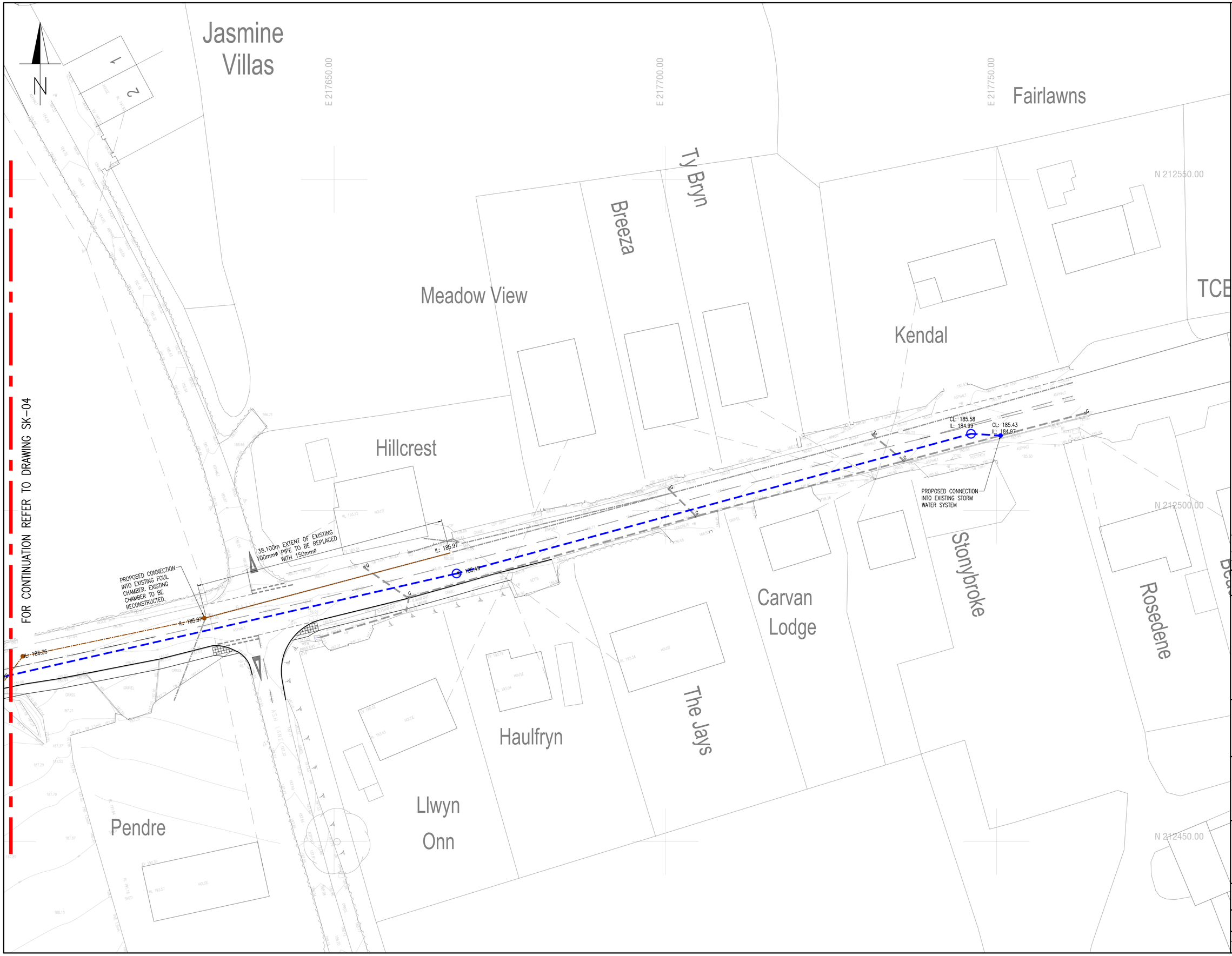
Project: RESIDENTIAL DEVELOPMENT AT ASH LANE, TAVERNSPITE

Drawing Title: DRAINAGE STRATEGY PLAN

PRELIMINARY

Project No.	Drawing No.	
C2351	C-SK04	
Scales 1:250	Date 24.06.26	Revision B
Drawn DH / Checked TE	Sheet Size A1	

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KEY

- DCWW ADOPTABLE FOUL DRAINAGE SYSTEM
- LA ADOPTABLE STORM DRAINAGE
- EXISTING GULLY AND STORM WATER DRAINAGE
- EXISTING COMBINED WATER DRAINAGE
- EXISTING FOUL WATER DRAINAGE

Rev.	Detail	By	Date
A	OFFSITE DRAINAGE STRATEGY PLAN UPDATED TO SUIT UPDATED INVERTS	DH	17.09.26

Revisions

Reinforcement schedules nos.

CB3 CONSULT
Structural & Civil Engineering Consultants

First Floor
7 St James Crescent
Swansea
SA16DP

Telephone +44 1792 473 182
e-mail admin@cb3consult.co.uk
web www.cb3consult.co.uk

Client

ateb

Project

RESIDENTIAL DEVELOPMENT AT ASH LANE, TAVERNSPITE

Drawing Title

OFF-SITE DRAINAGE STRATEGY PLAN

PRELIMINARY

Project No.	Drawing No.	
C2351	C-SK05	
Scales 1:250	Date 25.05.26	Revision A
Drawn DH / Checked TE	Sheet Size A1	

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Appendix H

Greenfield Runoff Calculations

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

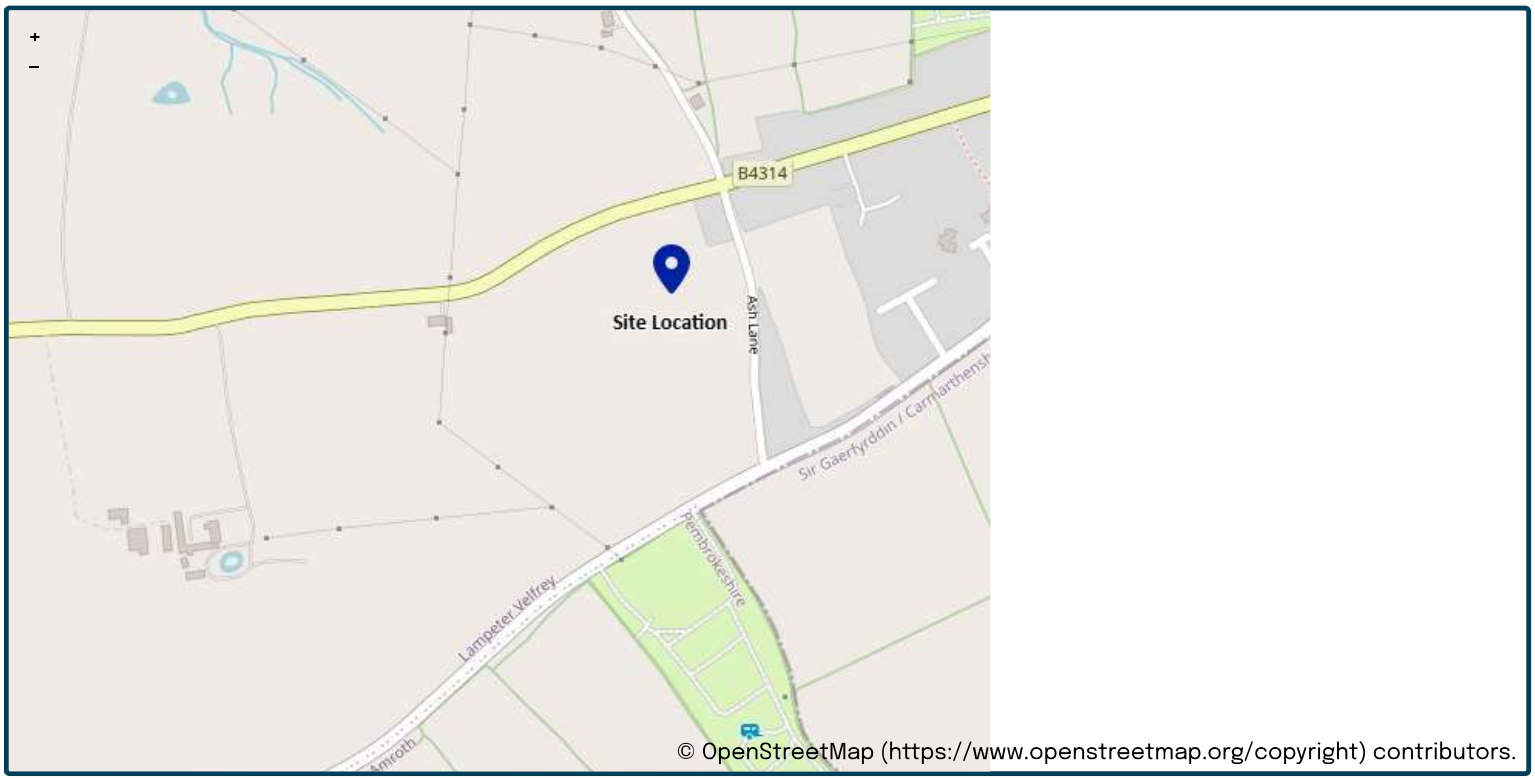
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	29/06/2026
Calculated by	
Reference	
Model version	2.2.3

Location

Site name	
Site location	Tavernspite



Site easting (British National Grid)	217583
Site northing (British National Grid)	212360

Site details

Total site area (ha)	1 ha

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Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1325 mm		1325
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		2
SPR	0.47		
QBar (IH124) (l/s)	10.2 l/s		

Growth curve factors

	My value		Map value
Hydrological region	9		9
1 year growth factor	0.88		
2 year growth factor	0.93		
10 year growth factor	1.42		
30 year growth factor	1.78		
100 year growth factor	2.18		
200 year growth factor	2.46		

Results

Method	IH124
Flow rate 1 year (l/s)	9.0 l/s
Flow rate 2 year (l/s)	9.5 l/s
Flow rate 10 years (l/s)	14.5 l/s
Flow rate 30 years (l/s)	18.1 l/s
Flow rate 100 years (l/s)	22.2 l/s
Flow rate 200 years (l/s)	25.1 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

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Appendix J

Preliminary Drainage Calculations

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Stormwater Controls Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Pond

Type : Pond

Dimensions

Exceedance Level (m)	187.000
Depth (m)	0.900
Base Level (m)	186.100
Freeboard (mm)	300
Initial Depth (m)	0.000
Porosity (%)	100
Average Slope (1:X)	3.258
Total Volume (m³)	150.169

Depth (m)	Area (m²)	Volume (m³)
0.000	197.586	0.000
0.900	370.676	251.667

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Pipe (11)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (12)
Outlet Type	Free Discharge

Advanced

Perimeter	Circular
Length (m)	25.589
Friction Scheme	Manning's n
n	0.03

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Stormwater Controls Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		



Porous Paving (Shared Drive)

Type : Porous Paving

Dimensions

Exceedance Level (m)	188.800
Depth (m)	0.490
Base Level (m)	188.310
Paving Layer Depth (mm)	200
Membrane Percolation (m/hr)	1.0
Porosity (%)	30
Length (m)	25.325
Long. Slope (1:X)	10000.00
Width (m)	7.646
Total Volume (m³)	17.160

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	150
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet (1)

Inlet Type	Lateral Inflow
Incoming Item(s)	Catchment Area (10)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	350.0



Porous Paving (Non-Storage)

Type : Porous Paving

Dimensions

Exceedance Level (m)	189.900
Depth (m)	0.440
Base Level (m)	189.460
Paving Layer Depth (mm)	200
Membrane Percolation (m/hr)	1.0
Porosity (%)	30
Length (m)	39.516
Long. Slope (1:X)	61.00
Width (m)	7.807
Total Volume (m³)	22.428

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Inlet

Inlet Type	Point Inflow
Incoming Item(s)	Catchment Area (23)
Bypass Destination	(None)
Capacity Type	No Restriction

Outlets

Outlet

Outgoing Connection	Pipe (15)
Outlet Type	Under Drain

Advanced

Conductivity (m/hr)	350.0



Porous Paving (Storage)

Type : Porous Paving

Dimensions

Exceedance Level (m)	189.300
Depth (m)	0.790
Base Level (m)	188.510
Paving Layer Depth (mm)	200
Membrane Percolation (m/hr)	1.0
Porosity (%)	30
Length (m)	30.000
Long. Slope (1:X)	10000.00
Width (m)	5.500
Total Volume (m³)	30.040

Under Drain

Height Above Base (m)	0.000
Diameter (mm)	225
No. of Barrels	1
Release Height (m)	0.000
Friction Scheme	Manning's n
n	0.015

Inlets

Outlets

Outlet

Outgoing Connection	Pipe (16)
Outlet Type	Free Discharge

Advanced

Conductivity (m/hr)	350.0

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Inflow Summary Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Inflow Label	Connected To	Flow (L/s)	Runoff Method	Area (ha)	Percentage Impervious (%)	Urban Creep (%)	Adjusted Percentage Impervious (%)	Area Analysed (ha)
Catchment Area	Manhole (10)		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (1)	Manhole (9)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (2)	Manhole (10)		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (3)	Manhole (9)		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (4)	Manhole (8)		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (5)	Manhole (9)		Time of Concentration	0.002	100	0	100	0.002
Catchment Area (6)	Manhole (10)		Time of Concentration	0.006	100	0	100	0.006
Catchment Area (7)	Manhole (10)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (8)	Manhole (10)		Time of Concentration	0.093	100	0	100	0.093
Catchment Area (9)	Manhole (9)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (10)	Porous Paving (Shared Drive)		Time of Concentration	0.024	100	0	100	0.024
Catchment Area (11)	Manhole (6)		Time of Concentration	0.011	100	0	100	0.011
Catchment Area (12)	Manhole (6)		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (13)	Manhole Flow Control 2		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (14)	Manhole Flow Control 2		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (15)	Manhole (8)		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (16)	Manhole (3)		Time of Concentration	0.015	100	0	100	0.015
Catchment Area (17)	Manhole		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (18)	Manhole		Time of Concentration	0.014	100	0	100	0.014
Catchment Area (19)	Manhole		Time of Concentration	0.010	100	0	100	0.010
Catchment Area (20)	Manhole (1)		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (21)	Manhole (1)		Time of Concentration	0.007	100	0	100	0.007
Catchment Area (22)	Manhole Flow Control 1		Time of Concentration	0.039	100	0	100	0.039
Catchment Area (23)	Porous Paving (Non-Storage)		Time of Concentration	0.054	100	0	100	0.054
Catchment Area (24)	Manhole		Time of Concentration	0.032	100	0	100	0.032
Catchment Area (25)	Manhole (1)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (26)	Manhole		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (27)	Manhole (2)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (28)	Manhole (2)		Time of Concentration	0.001	100	0	100	0.001

Catchment Area (29)	Manhole (3)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (30)	Manhole (3)		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (31)	Manhole (3)		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (32)	Manhole (6)		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (33)	Manhole (6)		Time of Concentration	0.001	100	0	100	0.001
Catchment Area (34)	Manhole (8)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (35)	Manhole Flow Control 1		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (36)	Manhole (4)		Time of Concentration	0.003	100	0	100	0.003
Catchment Area (37)	Manhole (4)		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (38)	Manhole Flow Control 1		Time of Concentration	0.012	100	0	100	0.012
Catchment Area (39)	Manhole (6)		Time of Concentration	0.007	100	0	100	0.007
TOTAL		**0.0**		**0.466**				**0.466**

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Outfall Details Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Outfalls

Outfall	Outfall Type	Gated	Fixed Surcharged Level (m)	Level Curve
Manhole (12)	Free Discharge			

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Title: Rainfall Analysis Criteria	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Runoff Type	Dynamic
Output Interval (mins)	5
Time Step	Default
Urban Creep	Apply Global Value
Urban Creep Global Value (%)	0
Junction Flood Risk Margin (mm)	300
Perform No Discharge Analysis	☐

Rainfall

FSR

Type: FSR

Region	England And Wales
M5-60 (mm)	17.6
Ratio R	0.267
Summer	☑
Winter	☑

Return Period

Return Period (years)	Increase Rainfall (%)
100.0	30.000

Storm Durations

Duration (mins)	Run Time (mins)
15	30
30	60
60	120
120	240
180	360
240	480
360	720
480	960
600	1200
720	1440
960	1920
1440	2880
2160	4320
2880	5760
4320	8640
5760	11520
7200	14400
8640	17280
10080	20160

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Inflows Summary Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Critical Storm Per Item: Rank By: Max. Inflow

Inflow	Storm Event	Inflow Area (ha)	Max. Inflow (L/s)	Total Inflow Volume (m^3)
Catchment Area	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.1	0.509
Catchment Area (1)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.1	0.509
Catchment Area (2)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	2.7	1.235
Catchment Area (3)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	4.5	2.104
Catchment Area (4)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	2.7	1.235
Catchment Area (5)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.1	0.509
Catchment Area (6)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	2.7	1.235
Catchment Area (7)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.2	0.569
Catchment Area (8)	FSR: 100 years: +30 %: 15 mins: Winter	0.09	40.9	18.928
Catchment Area (9)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.1	0.509
Catchment Area (10)	FSR: 100 years: +30 %: 15 mins: Winter	0.02	10.3	4.792
Catchment Area (11)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	4.7	2.176
Catchment Area (12)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	5.1	2.379
Catchment Area (13)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	6.0	2.787

Catchment Area (14)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	3.1	1.441
Catchment Area (15)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	5.1	2.379
Catchment Area (16)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	6.4	2.949
Catchment Area (17)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	6.2	2.847
Catchment Area (18)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	6.0	2.787
Catchment Area (19)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	4.5	2.104
Catchment Area (20)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	3.2	1.474
Catchment Area (21)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	3.3	1.519
Catchment Area (22)	FSR: 100 years: +30 %: 15 mins: Winter	0.04	17.1	7.899
Catchment Area (23)	FSR: 100 years: +30 %: 15 mins: Winter	0.05	23.6	10.923
Catchment Area (24)	FSR: 100 years: +30 %: 15 mins: Winter	0.03	14.1	6.554
Catchment Area (25)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.1	0.509
Catchment Area (26)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.4	0.668
Catchment Area (27)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.4	0.668
Catchment Area (28)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	0.6	0.258
Catchment Area (29)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.4	0.668
Catchment Area (30)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	0.5	0.255

Catchment Area (31)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	0.5	0.255
Catchment Area (32)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	0.5	0.240
Catchment Area (33)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	0.6	0.261
Catchment Area (34)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.5	0.683
Catchment Area (35)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.4	0.668
Catchment Area (36)	FSR: 100 years: +30 %: 15 mins: Winter	0.00	1.4	0.668
Catchment Area (37)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	5.3	2.436
Catchment Area (38)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	5.3	2.436
Catchment Area (39)	FSR: 100 years: +30 %: 15 mins: Winter	0.01	3.1	1.441

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Junctions Summary Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Critical Storm Per Item: Rank By: Max. Outflow

Junction	Storm Event	Cover Level (m)	Invert Level (m)	Max. Level (m)	Max. Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Status
Manhole	FSR: 100 years: +30 %: 15 mins: Winter	190.470	188.860	189.360	0.500	32.3	0.566	0.000	27.8	14.966	Surcharged
Manhole (2)	FSR: 100 years: +30 %: 15 mins: Winter	190.150	188.540	189.242	0.702	33.3	0.794	0.000	29.5	18.834	Surcharged
Manhole (1)	FSR: 100 years: +30 %: 15 mins: Winter	190.350	188.740	189.307	0.567	35.4	0.641	0.000	31.3	18.470	Surcharged
Manhole (3)	FSR: 100 years: +30 %: 30 mins: Winter	189.850	188.240	189.260	1.020	44.5	1.154	0.000	43.6	44.560	Surcharged
Manhole (4)	FSR: 100 years: +30 %: 30 mins: Winter	189.620	188.010	189.148	1.138	48.3	1.287	0.000	47.7	47.584	Surcharged
Manhole Flow Control 1	FSR: 100 years: +30 %: 480 mins: Winter	189.500	187.890	189.066	1.176	15.8	1.330	0.000	3.4	214.120	Surcharged
Manhole (6)	FSR: 100 years: +30 %: 15 mins: Winter	189.090	187.480	187.545	0.065	17.3	0.074	0.000	17.0	11.037	OK
Manhole (7)	FSR: 100 years: +30 %: 15 mins: Winter	188.500	187.000	187.103	0.103	18.9	0.116	0.000	18.2	13.727	OK
Manhole (8)	FSR: 100 years: +30 %: 15 mins: Winter	188.480	186.870	186.975	0.105	27.5	0.118	0.000	26.9	17.922	OK
Manhole (9)	FSR: 100 years: +30 %: 15 mins: Winter	188.300	186.690	186.789	0.099	34.8	0.112	0.000	34.2	21.448	OK
Manhole (10)	FSR: 100 years: +30 %: 15 mins: Winter	187.900	186.290	186.617	0.327	82.7	0.369	0.000	79.6	43.803	Surcharged
Basin HB	FSR: 100 years: +30 %: 30 mins: Summer	187.100	186.030	186.317	0.287	5.4	0.325	0.000	5.0	13.802	Surcharged
Manhole (12)	FSR: 100 years: +30 %: 60 mins: Winter	186.870	185.890	185.943	0.053	5.0	0.000	0.000	5.0	29.236	OK
Manhole Flow Control 2	FSR: 100 years: +30 %: 60 mins: Winter	188.800	187.300	188.581	1.281	5.2	1.449	0.000	2.1	14.917	Flood Risk

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Stormwater Controls Summary Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Critical Storm Per Item: Rank By: Max. Avg. Depth

Stormwater Control	Storm Event	Max. US Level (m)	Max. DS Level (m)	Max. US Depth (m)	Max. DS Depth (m)	Max. Inflow (L/s)	Max. Resident Volume (m³)	Max. Flooded Volume (m³)	Total Lost Volume (m³)	Max. Outflow (L/s)	Total Discharge Volume (m³)	Percentage Available (%)	Status
Pond	FSR: 100 years: +30 %: 600 mins: Winter	186.673	186.673	0.573	0.573	15.4	141.954	0.000	0.000	5.1	304.530	5.471	OK
Porous Paving (Shared Drive)	FSR: 100 years: +30 %: 60 mins: Winter	188.582	188.582	0.269	0.272	8.5	15.717	0.000	0.000	2.0	8.310	8.408	OK
Porous Paving (Non-Storage)	FSR: 100 years: +30 %: 30 mins: Winter	190.197	189.594	0.089	0.134	16.7	8.647	0.000	0.000	14.8	13.966	61.445	OK
Porous Paving (Storage)	FSR: 100 years: +30 %: 480 mins: Winter	189.066	189.066	0.553	0.556	12.7	27.458	0.000	0.000	2.5	27.153	8.596	OK

C2351 - Tavernspite: Storm Drainage Preliminary Calculations 100yrs + 30% CC	Date: 17/09/2026		
	Designed by: DH	Checked by: DH	Approved By: DH
Report Details: Type: Connections Summary Storm Phase: Phase	CB3 Consult Ltd: 7 St James Cresent Swansea SA1 6DP		

Critical Storm Per Item: Rank By: Max. Flow

Connection	Storm Event	Connection Type	From	To	Upstream Cover Level (m)	Max. US Water Level (m)	Max. Flow Depth (m)	Discharge Volume (m³)	Max. Velocity (m/s)	Flow / Capacity	Max. Flow (L/s)	Status
Pipe	FSR: 100 years: +30 %: 60 mins: Winter	Pipe	Porous Paving (Shared Drive)	Manhole Flow Control 2	188.803	188.581	0.225	6.232	0.1	0.01	2.0	Surcharged
Pipe (15)	FSR: 100 years: +30 %: 30 mins: Winter	Pipe	Porous Paving (Non-Storage)	Manhole (3)	190.548	189.554	0.225	13.945	0.4	0.1	14.9	OK
Pipe (3)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (2)	Manhole (3)	190.150	189.242	0.225	18.794	1.1	0.45	29.5	Surcharged
Pipe (1)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole	Manhole (1)	190.470	189.360	0.225	14.966	0.9	0.57	27.8	Surcharged
Pipe (4)	FSR: 100 years: +30 %: 30 mins: Winter	Pipe	Manhole (3)	Manhole (4)	189.850	189.260	0.225	44.425	1.1	0.62	43.6	Surcharged
Pipe (5)	FSR: 100 years: +30 %: 30 mins: Winter	Pipe	Manhole (4)	Manhole Flow Control 1	189.620	189.148	0.225	47.395	1.2	0.84	47.7	Surcharged
Pipe (6)	FSR: 100 years: +30 %: 480 mins: Winter	Pipe	Manhole Flow Control 1	Manhole (6)	189.500	189.066	0.033	111.509	1.0	0.04	3.4	Surcharged
Pipe (7)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (6)	Manhole (7)	189.090	187.545	0.084	11.037	1.3	0.18	17.0	OK
Pipe (8)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (7)	Manhole (8)	188.500	187.103	0.104	13.727	1.0	0.37	18.2	OK
Pipe (9)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (8)	Manhole (9)	188.480	186.975	0.102	17.922	1.5	0.36	26.9	OK
Pipe (10)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (9)	Manhole (10)	188.300	186.789	0.213	21.448	1.1	0.41	34.2	OK
Pipe (11)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (10)	Pond	187.900	186.617	0.205	43.803	2.2	1.3	79.6	Surcharged
Pipe (12)	FSR: 100 years: +30 %: 360 mins: Winter	Pipe	Pond	Basin HB	187.000	186.645	0.225	180.552	0.3	0.13	5.7	Surcharged
Pipe (13)	FSR: 100 years: +30 %: 60 mins: Winter	Pipe	Basin HB	Manhole (12)	187.100	186.421	0.054	29.236	0.7	0.12	5.0	Surcharged

Pipe (14)	FSR: 100 years: +30 %: 60 mins: Winter	Pipe	Manhole Flow Control 2	Manhole (7)	188.800	188.581	0.053	12.738	0.5	0.02	2.1	Flood Risk
Pipe (2)	FSR: 100 years: +30 %: 15 mins: Winter	Pipe	Manhole (1)	Manhole (2)	190.350	189.307	0.225	18.470	1.1	0.49	31.3	Surch arged
Pipe (16)	FSR: 100 years: +30 %: 480 mins: Winter	Pipe	Porous Paving (Storage)	Manhole Flow Control 1	189.303	189.065	0.225	0.000	0.1	0.03	2.5	Surch arged