

Project: Whitley Golf Course

Subject: Surface Water Drainage Strategy

Reference: 20036-TUM-TN-XXX-0001 A

Date	Details	Rev	Author	Checked by
13.03.26	First Issue	A	RP	DB

1 Introduction

Tumu Consulting Ltd have been appointed by Artel 31 to undertake a Surface Water Drainage Strategy for a proposed development at Whitley Golf Course, comprising of a new car park extension, new driving range and associated facilities. Wiltshire Council granted full planning permission to the development in October 2025 ref. PL/2025/05424. This technical note has been compiled to discharge the pre development condition 4, which has been outlined below:

Prior to commencement of development, a Surface Water Drainage Strategy & Management Plan, incorporating SuDS Maintenance Plan, shall be submitted to the local planning authority for approval in writing. The Strategy shall include at least the following information and details:

- Confirmation of the impermeable areas proposed and the corresponding surface water runoff rates, demonstrating that the drainage strategy is sized appropriately.
- Evidence and demonstration that:
 - the 1 in 30-year rainfall event is contained within the drainage system without causing flooding to any part of the site.
 - the 1 in 100-year-plus climate change rainfall event does not cause flooding to any building (including a basement) or utility plant.
- Detailed drawings (including cross sections) of the soakaways, conveyance, or infiltration drainage features, to include details of ground and water levels, inlet and outlet structures, and construction details.
- Details demonstrating that the site has been designed to ensure that flows in excess of the 1 in 100-year rainfall event are managed in exceedance routes that minimise the risks to people and property.
- Soakaway sizing calculation based on both runoff rates and infiltration, and confirmation that the design follows the Wiltshire Council's Soakaway Guidance.
- Infiltration testing to BRE 365 Standards, detailed design of the soakaway system, and a calculation demonstrating the sufficient capacity of the proposed roof area. The calculations must demonstrate that the soakaway has been designed for:
 - 1 in 100yr + cc flows
 - Half drain time <24hrs
- Appropriate factor of safety in line with CIRIA C753 (Table 25.2) guidance has been included.
- Confirmation and details of the 'permeable, self-compacting gravel mix' for the extended car park.
- Details regarding the connection to the existing ditch, including its location, and whether any catchment transfer will occur as a result of the proposed discharge.
- Responsibilities and maintenance schedules for all drainage features for the lifetime of the development.

REASON: To ensure appropriate management of surface water and site drainage.

2 Background Information

2.1 Site Location

The site is located at Whitley Golf Club, Corsham Road, Whitley, Melksham, SN12 8EQ. E,N:388880,165970.



Figure 2-1 Site Location Plan

2.2 Topography

A topographic survey was undertaken at the site to Ordance Datum and OS National Grid by D&H Surveys Ltd in January 2024. It found the levels generally fell from the north east, to the north of the existing driving range to the south west, to a low point by the electricity pylon. The levels range from 48.79-44.90m AOD. Refer to Appendix A for the Topographic Survey.

2.3 Hydrology

There is an existing pond located in the western corner of the site, which is understood to overflow into a ditch which borders the western edge of the existing car park. This ditch is culverted beneath the site access road, and local LIDAR data suggests the ditch eventually discharges to the South Brook, located to the south of the site. The South Brook passes through Melksham, and is a tributary of the River Avon, approximately 2.4km south.

2.4 Geology and Hydrogeology

The British Geological Survey (BGS) Geology Viewer shows the site is underlain with a Oxford Clay Formation – Mudstone. The BGS Geology Viewer also confirmed no superficial deposits are anticipated to be found at the site location.

The Natural England MAGIC Maps have been consulted and confirm that the site is not within a Source protection Zone (SPZ) and is above unproductive bedrock and superficial aquifers.

A Ground investigation (GI) was undertaken by Wilson Associates in February 2026 with report reference 5643. Three trial pits were excavated to a depth of 1.6-2.0mbgl. Topsoil was found to a maximum depth of 0.35mbgl within the pits, and below this, clay was found to be present to the base of the pits.

Infiltration testing was carried out in accordance with BRE365 methodology within the three pits. Water did not drain away sufficiently within any of the three test pits, to be able to calculate an infiltration rate. It is therefore deemed that soakaways are not a viable surface water discharge receptor for the development. No perched/groundwater was encountered in any of the three pits.

A sample of soil was acquired from TP1 and TP2 at 0.45m depth and sent to the laboratory for remoulded CBR testing. The lowest CBR value found within the samples was 3.1%, which should be adopted for road and pavement design. Refer to Appendix B for the GI.

2.5 Existing Site

The existing site is currently used as a 9 hole golf club with associated driving range, parking, maintenance shed and club house.

2.6 Development Proposals

It is proposed to develop the existing golf club with a new 16 bay driving range, as well as associate shop/staff/toilet facilities. The car park will be extended to the north, on the existing soft landscaping. Minor alterations to the existing club house and immediate external area surrounding the club house will rationalise and modernise the area. The addition of EV charging points and a bicycle park is incorporated into the proposed layout, as well as a children's play area. Refer to Appendix C for the Proposed Site Plan.

3 Surface Water Drainage Strategy

The surface water drainage strategy has been developed in accordance with the relevant design standard and guidance, including but not limited to; CIRIA C753 The SuDS Manual, The National Planning Policy Framework (NPPF), The Approved Documents: Building Regulations 2010 Part H: Drainage and Waste Disposal, and the National Standards for SuDS (NSS).

The NSS states that for a previously developed site, the rate of discharge should never exceed the rate pre redevelopment. The NSS also states that flooding should not occur to any part of the site in the 1 in 30 year event, and no flooding to buildings or utility plant should occur in the 1 in 100 year event.

3.1 Surface Water Strategy

As discussed in section 2.4 of this note, infiltration testing to BRE365 methodology confirmed that soakaways are not a viable surface water receptor for the scheme.

It is therefore proposed to discharge into the existing ditch located to the west of the site.

The proposed car park extension will be surfaced with a tanked, permeable construction. A gravel grid surfacing will be utilised within the car park, with a clean stone sub-base, used to attenuate surface water. Due to the level change across the car park, it is proposed to implement check dams within the sub base of the permeable surfacing, with each terrace featuring a flat invert level. A 100mm underdrain will link the sections of sub base, allowing draw down between rainfall events. A 150mm perforated pipe in an isolated section of lowered sub base ultimately drains the car park into the flow control device.

Rainwater pipes from the new driving range building and associated shop/welfare, will discharge to the private proposed surface water network. Flows will be limited through a flow control device in more intense storms, the flow will then surcharge into the sub base of the permeable surfacing and geocellular storage.

Refer to Appendix D for the Proposed Drainage Layout and Appendix E for the Drainage Details.

3.2 Climate Change

As a lifespan of 100 years is being considered, the end of life can be estimated as 2125. According to government guidance, a development with a lifespan after 2100 should use the Upper End Allowance for a 2070's epoch when considering peak rainfall climate change allowances. For the Avon Bristol and North Somerset Streams Management Catchment, the peak rainfall shall be subject to a 40% and 45% increase for the 3.3% and 1% AEP rainfall event.

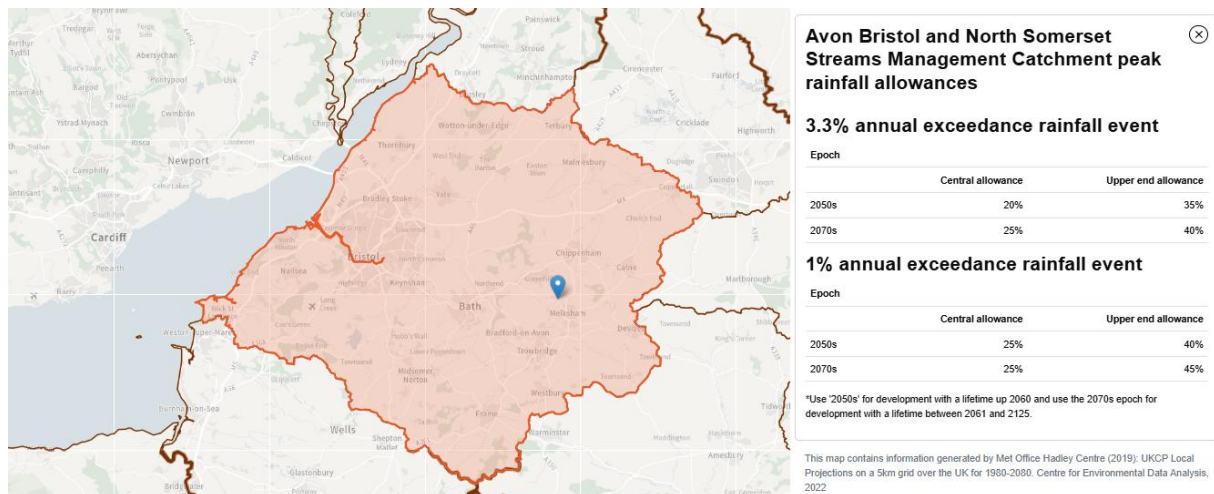


Figure 3-1 Avon Bristol and North Somerset Streams Management Catchment Peak Rainfall Allowances

3.3 Discharge Rates

As the development is proposed existing soft landscaping, it is proposed to discharge surface water at greenfield rate. The calculations in Appendix F show the greenfield runoff rate utilising FEH22 rainfall data, as well as the proposed developed catchment and are outlined in the table below.

Return Period (yr)	Area (ha)	Greenfield Discharge Rate (l/s)
Q_{BAR}	0.263	2.0
Q₃₀	0.263	3.8
Q₁₀₀	0.263	4.9

Table 3-1 Pre-Development Greenfield Runoff Rates

The Wiltshire Council Drainage and Betterment Strategy (June 2024) requires discharge to provide a 30% betterment to pre development rates. Therefore, for all storms, up to and including the 1% AEP rainfall event with a 45% allowance for climate change, the discharge rate will be limited to 1.4l/s, providing a 70% betterment on the pre-development greenfield 1% AEP rate.

3.4 Calculations

The proposed surface water drainage system has been modelled using Causeway FLOW software, and the calculations are shown in Appendix F. No flooding will occur as a result of the development in the 1% AEP event with a 45% allowance for climate change, in accordance with the NSS, while limiting the flow to 1.4l/s.

3.5 Water Quality

The CIRIA 753 SuDS Manual has been consulted to ensure that the SuDS provided successfully mitigate the anticipated pollutants, which may arise from the proposed land use. Table 26.2 of CIRIA753 outlines the pollution hazard indices for the anticipated worst case land use type. This has been tabulated against the mitigation indices of the proposed SuDS for the surface water network, found in table 26.3 of CIRIA753.

Land Use	Hazard Level	TSS	Metals	Hydrocarbons
Low Traffic Road (<300 Movements)	Low	0.5	0.4	0.4
SuDS		TSS	Metals	Hydrocarbons
Permeable Surfacing		0.7	0.6	0.7
Mitigation>Pollution?		Y	Y	Y

Table 3-2 Network 1 - Simple Index Approach

As the SuDS mitigation indices are equal or greater than the pollution hazard indices, the proposed SuDS provide suitable water quality treatment to the anticipated pollutants on site.

3.6 Ditch Connection and Catchment

It is proposed to construct a revetment headwall within the existing ditch forming the western boundary of the site. A 100mm drain will convey the discharge from the flow control device to the revetment headwall. A land drainage consent application will undertaken to facilitate the headwall construction.

The contour mapping in the figure below shows the site falls to the south west, where the ditch is located. Flows from the existing site will discharge as overland flow to the existing ditch, at the pre-development rates aforementioned. It is proposed to maintain this approach, albeit restricting the rates to 30% greenfield QBAR and therefore providing a betterment to the pre-development scenario, for all storms up to and including the 1% AEP rainfall event with a 45% climate change allowance. The development will not re-direct any existing catchments, since the natural topography ensures overland flows discharge to the existing ditch at present, as shown in the figure below. The total developed catchment has been calculated as 0.22ha.

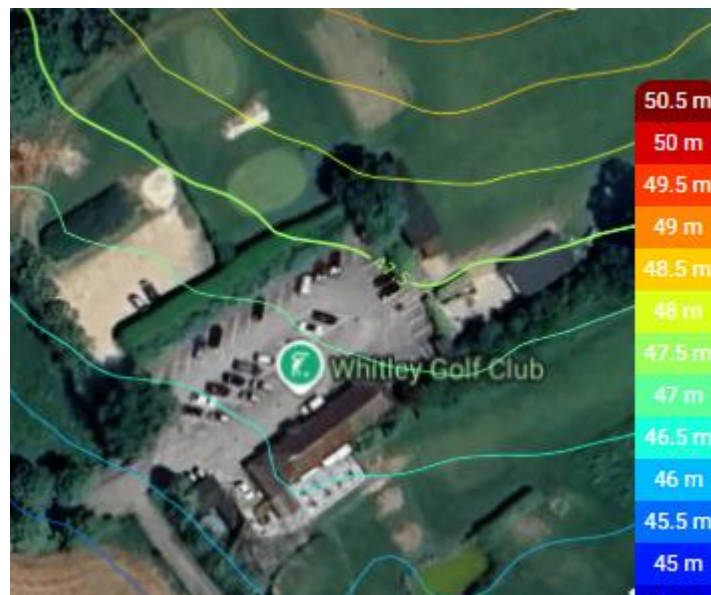


Figure 3-2 Existing Contour Mapping

3.7 Flood Exceedance Routing

In the unlikely event the on-site drainage becomes blocked, or the system experiences a storm more intense than current design standards, exceedance routes need to be considered. The exceedance routes mimic the existing overland flow routes on site.

The drainage layout in Appendix F shows routing of flows in an exceedance event. The car park falls away to the south west of the development, where there is a ditch located. Flows arising from the driving range and shop will

fall to the south, and disperse across the soft landscape golf course. All exceedance flows will eventually discharge to the South Brook. Flows will be kept within land ownership of the developer and not impact any public or private land.

3.8 Operation and Maintenance

As the drainage system is to remain private, the responsibility for the upkeep and maintenance of drainage features will reside with the golf club itself.

Operation and maintenance will be undertaken in accordance with the recommendations outlined in the SuDS Manual (CIRIA C753), provided in Tables 3-3, 3-4 & 3-5.

Maintenance schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect surface structures, removing obstructions and silt as necessary. Check there is no physical damage.	Monthly
	Remove cover and inspect, ensuring water is flowing freely and that the exit route for water is unobstructed. Remove any debris and silt. Undertake inspection after leaf fall in autumn.	Annually
	Jet the pipes leading from overflow structures and check water is going through the overflow	Annually
Remedial Actions	Repair physical damage	As required

Table 3-3 Operation and Maintenance Requirements for Chambers, Drains and Inspection Chambers

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturers recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Removal of weeds	As required – once per year on less frequently used pavements.
Remedial action	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 3-4 Operation and Maintenance Requirements for Pervious Pavements

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae, or other matter; remove and replace surface infiltration medium as necessary	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table 3-5 Operation and Maintenance Requirements for Geocellular Attenuation

4 Conclusion

- The development has followed the surface water discharge hierarchy as set out in the National Standards for SuDS Standard 1. Infiltration testing to BRE365 methodology confirmed poor discharge rates. It is therefore proposed to discharge to the existing ditch to the west of the development.
- Attenuation has been provided in the terraced sub base of the permeable surfacing, as well as within a geocellular attenuation tank. This allows the surface water drainage system to discharge at 1.4l/s, which is a 30% betterment of greenfield QBAR, in line with the Wiltshire Council Drainage and Betterment Strategy (2024).
- Network calculations have been provided, which show that the site can achieve a 1.4l/s discharge for all storms up to and including the 1% AEP rainfall event with a 45% allowance for climate change, with no flooding.
- The existing catchment which is to be developed will continue to discharge to the ditch it currently does, with no catchment transfer as a result of development. The rates which are limited below greenfield QBAR will provide a betterment in all storms up to and including the 1% AEP rainfall event with a 45% allowance for climate change, furthering capacity within the ditch. A land drainage consent application will be required to facilitate the construction of the revetment headwall outfall.
- Flood exceedance routes will continue to follow the existing discharge route, generally towards the ditch in the south west of the development. The driving range and shop will discharge southwards away from the building and disperse across the soft landscape.
- Operation and maintenance tables have been provided for the SuDS proposed on the development. The responsibility for the upkeep of drainage features will lie with the golf course themselves, as all features are to remain private.

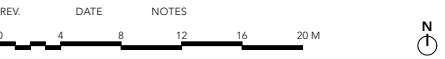
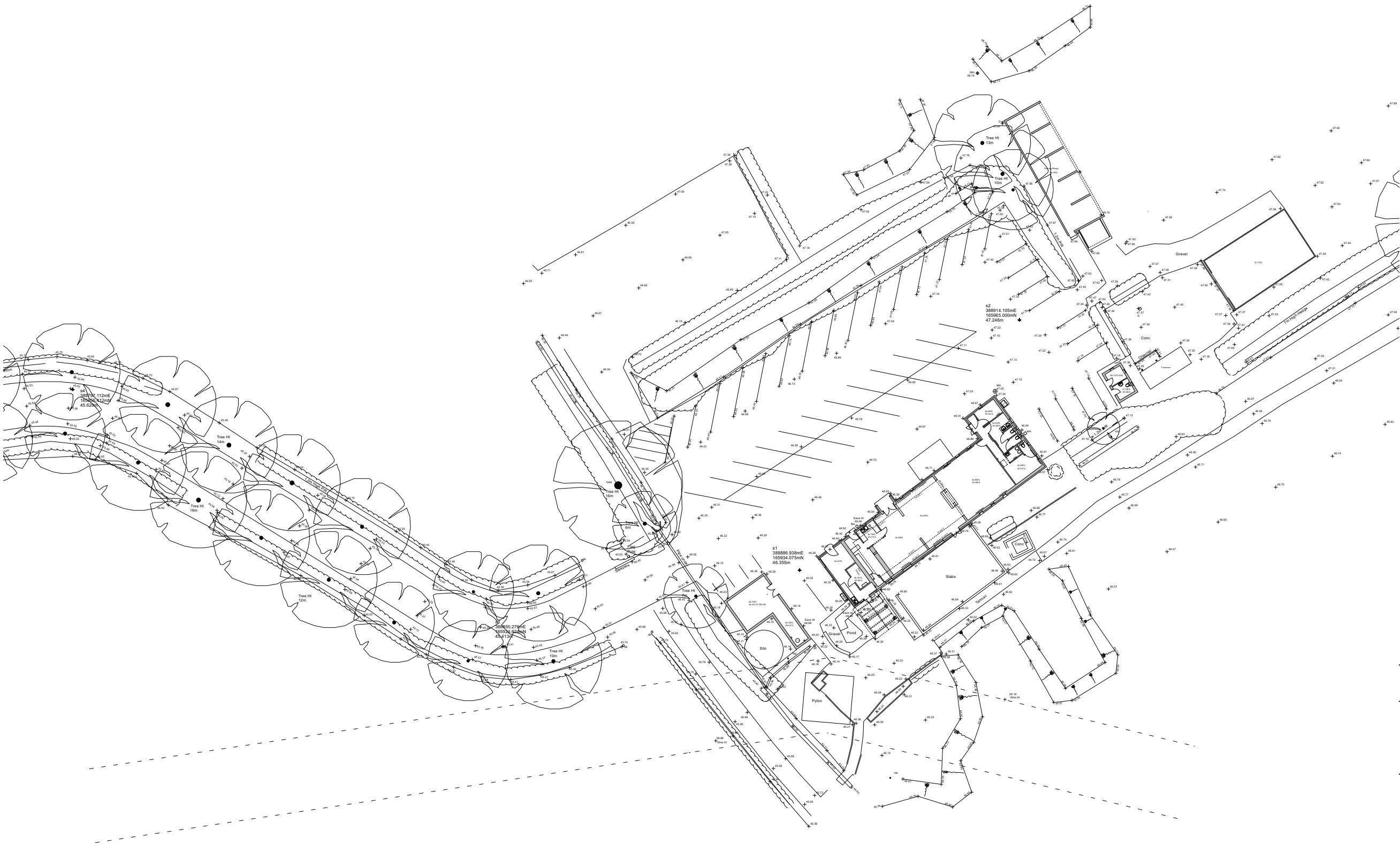
Appendix A - Topographic Survey

734 Whitley Golf Course

Survey

CLIENT
Mr Tom & Jack Nicholas

ADDRESS
Whitley Golf Course
Corsham Road
Whitley
Melksham
SN12 8EQ

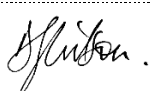


EX site plan

PROJECT	STAGE	DRAWING	REV	DRAWN
734	SU	- 01		lbb
SCALE	SIZE	CREATION		
1:500	@ A3 L	FEB 2024		

Appendix B - Ground Investigation

INFILTRATION AND CBR TESTING REPORT FOR
WHITLEY GOLF CLUB, CORSHAM ROAD, WHITLEY, MELKSHAM SN12 8EQ

Report Production Record		
Report No	5643	
Site Name	Whitley Golf Club, Corsham Road, Whitley, Melksham SN12 8EQ	
Client	Whitley Golf Club	
Report on	Infiltration and CBR Testing	
Prepared by	Timothy D Coe BSc (Hons) MSc FGS Principal Geologist	
Approved by	David J Wilson BSc(Geol) CGeol FGS Director	
Report Revision Record		
Issue No.	Date	Revision Details
1	26 February 2026	Initial issue to Client

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Introduction

It is understood that the above site is being considered for redevelopment primarily including an extension to the existing covered driving range teeing area and a new larger permeable gravel car park, plus nominal changes to soft landscaping.

As instructed, this Practice recently attended the above site to undertake 'full-scale' percolation testing to determine the infiltration potential of the natural ground to provide robust data to aid the design (by others) of the drainage strategy. Additionally, representative samples of near surface soil were taken for laboratory recompacted California Bearing Ratio (CBR) testing to aid car park design (again by others). Having now processed the field and laboratory results we report as follows.

This report has been prepared in accordance with quotation reference Q26017 dated 12th January 2026, with instruction confirmed 14th January 2026 by Whitley Golf Club, to whom reliance on this report is presently restricted.

Background Setting

Centred on National Grid Reference 388878, 165981 the site is located off Corsham Road, on the southeastern outskirts of the village of Whitley, Wiltshire approximately 2.8km northwest of Melksham town centre as shown on drawing 5643/1.

British Geological Survey (BGS) mapping indicates that the site is entirely underlain by bedrock of the Oxford Clay Formation (OxC) which usually comprises grey sometimes slightly silty mudstone that weathers near surface to firm plastic clay. No areas of mapped made ground, superficial deposits or geological faulting are shown either on or within potential influencing distance of the site.

Neither this Practice nor the BGS have any intrusive data from either inside or within a useful useable distance of the site.

Site Investigation and Testing

Site work was undertaken on 28th January 2026 by trial pitting. Three trial pits (TP1-3) were excavated using a 5 ton mechanical excavator to depths of 1.60-2.00m at positions selected by the client. The trial pit positions are indicated on existing/proposed development layout drawing 5463/2.

Percolation testing was completed as insitu 'full-scale' tests (in general accordance with BRE DG365 "Soakaway Design" (2016)); this comprised the rapid filling of three machine-excavated trial pits (TP1-3) at positions selected by the client to depths of 1.60-2.00m using clean water delivered via the mains, and monitoring of subsequent outflow.

As per BRE365 guidance it is recommended that three test runs are completed within each pit from which the soil infiltration rate is then calculated. Due to negligible infiltration during the first test run within all three test pits at this site, it has only been possible to complete a single test run in each pit. Graphs showing depth to water against time plus test zone depths are presented on the pit logs attached in Appendix 2 and a summary table of infiltration data is presented as Table 1 below.

A representative sample of soil was acquired from both TP1 and TP2 at 0.45m depth and sent to the laboratory for remoulded CBR testing on unsoaked specimens. CBR results are presented in Table 2 and Appendix 2 with road/pavement design discussed below.

Upon completion of logging, sampling and in-situ testing of the excavations, arisings were used to backfill the pits, compacted with the excavator bucket.

Summary of Ground Conditions

Beneath a thin surface mantle of topsoil, all exploratory holes encountered clay to terminal depths, representing a typical weathering profile of the bedrock OxC. Trial pit logs are included in Appendix 2.

No perched/groundwater was encountered in any of the trial pits during the short time that they remained open; levels are of course subject to seasonal fluctuation according to the prevailing weather conditions, and the situation encountered and described could potentially change in the future, especially in a period of seemingly ever-apparent but unpredictable climate change, which would of course have an effect on soakaway founding depth.

Results

BRE365 calculations suggest infiltration rates as summarised below.

TABLE 1: SOIL INFILTRATION TEST DATA

Trial Pit No.	Test Zone Depth (m)	Approximate Soil Infiltration Rate (m/sec)	Time to drain to 50% storage
TP1	0.97-2.0	Negligible	>24hours
TP2	0.6-1.6	Negligible	>24hours
TP3	0.55-1.8	Negligible	>24hours

All geology in test zone is OxC bedrock

TABLE 2: SUMMARY OF CBR TEST RESULTS

TP No	Depth (m)	Sample of	Bulk Density (mg/m ³)	Dry Density (mg/m ³)	Moisture Content (%)	CBR Value (%)	
						Top of Sample	Bottom of Sample
TP1	0.45	OxC	4.03	3.01	33.8	3.5	3.8
TP2	0.45	OxC	1.78	1.28	39.2	3.1	3.2

OxC = Oxford Clay Formation

Implications

Considering soakaway drainage, it will be seen on the logs and in Table 1 that since negligible infiltration was recorded, the time to drain to 50% storage capacity is therefore greater than the BRE365 limit of 24 hours. Ground conditions (at the specific test locations at least) are eminently unsuitable for the adoption of soakaway (SUDS) drainage for on-site disposal of surface water, and based on the recorded geology, the findings are considered representative of the entire site due to the proportion of cohesive material within near surface soil. . It is understood that these results will be provided to the drainage consultant for their use in design of the site drainage strategy.

The field-testing methodology and subsequent data-processing and calculations have been undertaken in accordance with BRE DG365, so in the event of local authority consultation the results enclosed should be acceptable. The digest includes a requirement to consider ground contamination, although no such evidence was forthcoming from our observations, which given the absence of made ground suggests a negligible risk.

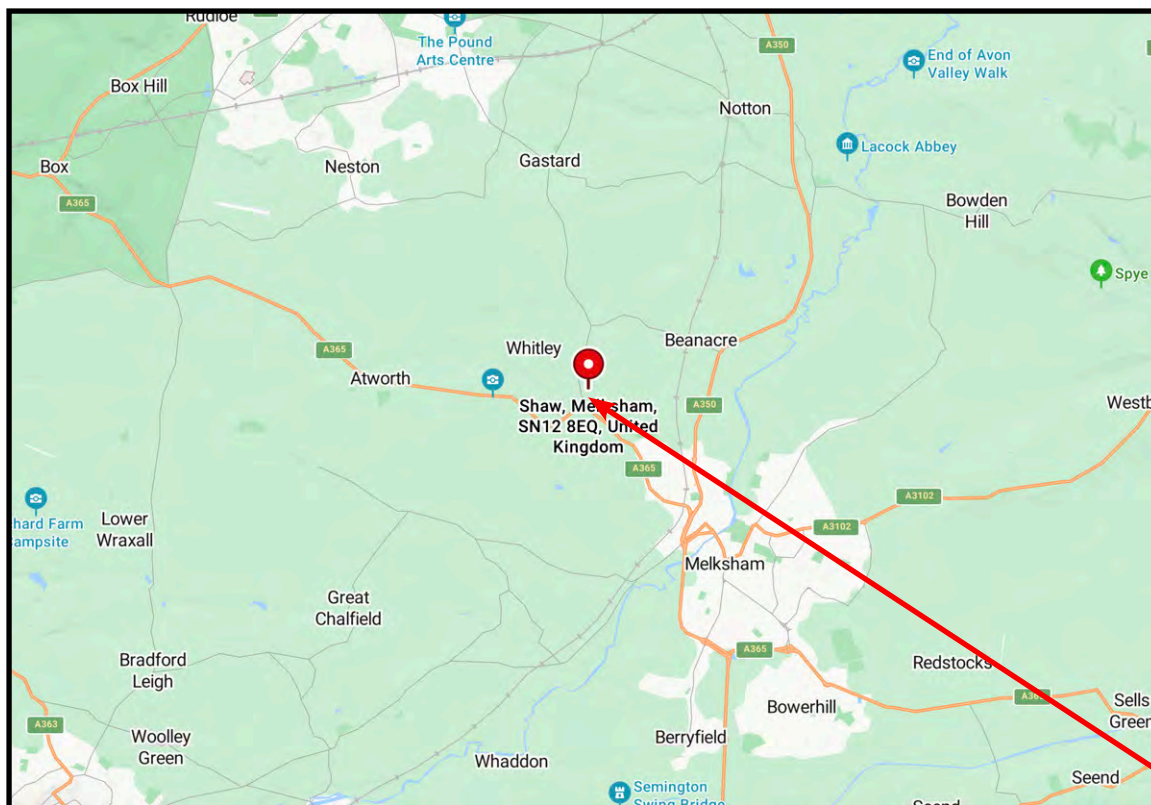
With regard to road/pavement design, the results in Tables 2 indicate that a minimum CBR of 3.1% can be achieved. The soils encountered are unlikely to be frost-susceptible, although the Local Authority should be able to advise based upon their previous experience in the area.

This report is subject to our standard terms and conditions.



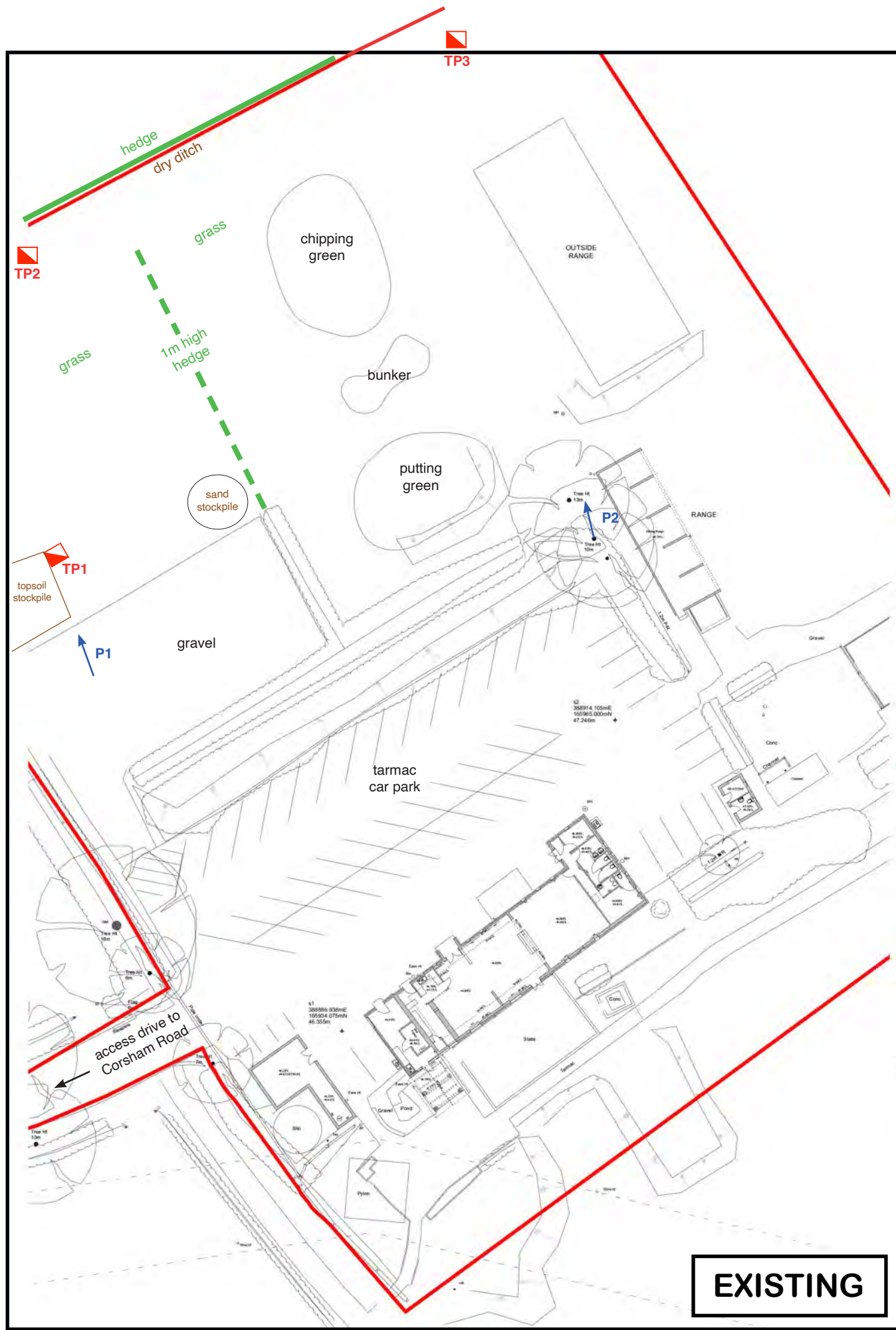
Wilson Associates
Consulting Engineering Geologists & Geo-Environmental Engineers

Job No.	Drawing No.	Scale:	Date:
5643	5643/1	NTS	13-01-26



THE SITE

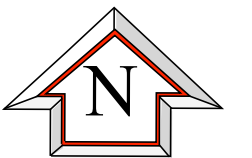




EXISTING



PROPOSED



Number and direction of photograph (Appendix 1)

- 1 Driving range
- 2 Car park
- 3 Club house
- 4 Practice area
- 5 Short game area
- 6 Putting green
- 7 Teeing area
- 8 Children's play area
- 9 Bicycle park
- 10 Waste & recycling

WHITLEY GOLF CLUB, CORSHAM ROAD, WHITLEY,
MELKSHAM SN12 8EQ



EXISTING / PROPOSED SITE PLANS (based on Arel dtd. 734 3 01, dated January 2025)
SHOWING SITE WALKOVER NOTES AND INVESTIGATION LOCATIONS

Job No. 5643

Drawing No. 5643/2

Scale: 1:500 @ A3

Date: 26-02-26

APPENDIX 1

SITE PHOTOGRAPHS



Photograph **P1**

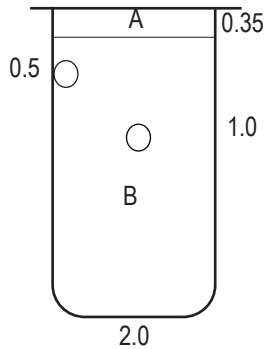


Photograph **P2**

APPENDIX 2

TRIAL PIT LOGS WITH PHOTOGRAPHS

Site: WHITLEY GOLF CLUB, CORSHAM ROAD, WHITLEY, MELKSHAM SN12 8EQ				TRIAL PIT No. TP1
Job No. 28-01-26	Date 28-02-26	Ground Level (c.m, AOD) 48m	Co-Ordinates (c.) E 388,862 N 165,984	



DETAILS OF SUBSOIL

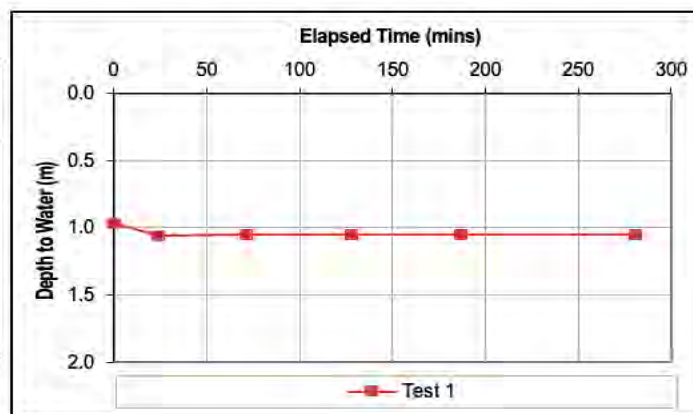
- A TOPSOIL: probable soft, dark brown, organic, plastic CLAY with many roots from overlying grass
- B CLAY: probable firm, light brown and locally mottled orangish-brown, plastic CLAY
0.5m : white plastic pipe
1.0m : red clay pipe

NOTES

- Pit logged from surface
- Pit dry and stable
- Soil sample taken at 0.45m depth
- Falling head testing carried out:
Pit dimensions 1.4 x 0.5 x 2.0m (LxWxD)

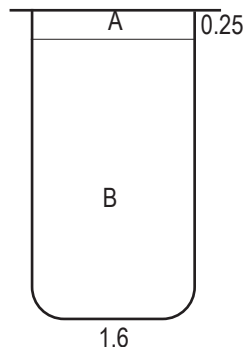


Elapsed Time (mins)	Depth to Water (m)
Test 1	
0	0.97
24	1.06
71	1.05
128	1.05
187	1.05
281	1.050



Scale: NTS	Client Whitley Golf Club	Logged By: TC
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Site: WHITLEY GOLF CLUB, CORSHAM ROAD, WHITLEY, MELKSHAM SN12 8EQ				TRIAL PIT No. TP2
Job No. 28-01-26	Date 28-02-26	Ground Level (c.m, AOD) 48m	Co-Ordinates (c.) E 388,861 N 166,007	

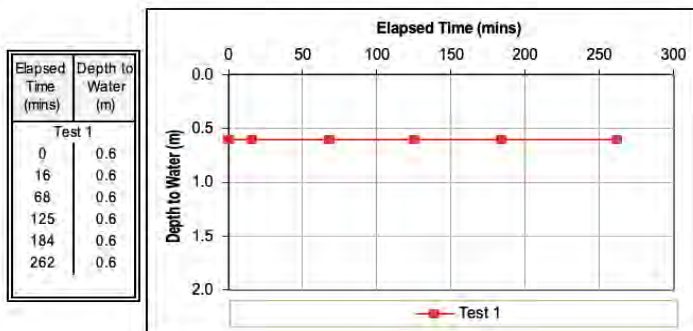


DETAILS OF SUBSOIL

- A TOPSOIL: probable soft, dark brown, organic, plastic CLAY with many roots from overlying grass and rare golf ball
- B CLAY: probable firm, mottled light brown and orangish-brown and grey, plastic CLAY
0.75m : initially desiccated
0.75 - 0.8m : grading to visually normally hydrated plastic CLAY

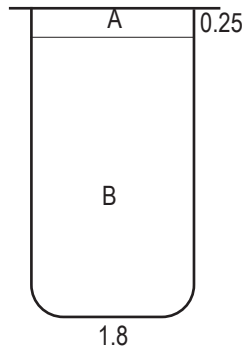
NOTES

- Pit logged from surface
- Pit dry and stable
- Soil sample taken at 0.45m depth
- Falling head testing carried out:
Pit dimensions 1.5 x 0.5 x 1.6m (LxWxD)



Scale: NTS	Client: Whitley Golf Club	Logged By: TC
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Site: WHITLEY GOLF CLUB, CORSHAM ROAD, WHITLEY, MELKSHAM SN12 8EQ				TRIAL PIT No. TP3
Job No. 28-01-26	Date 28-02-26	Ground Level (c.m, AOD) 49m	Co-Ordinates (c.) E 388,900 N 166,029	

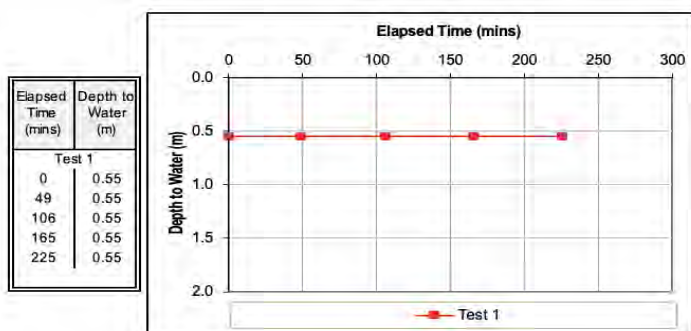


DETAILS OF SUBSOIL

- A TOPSOIL: probable soft, dark brown, organic, plastic CLAY with rare coarse gravel of limestone, rare golf ball and frequent roots
- B CLAY: probable firm, mottled light brown and light grey, plastic CLAY
1.5m : with many gypsum crystals

NOTES

- Pit logged from surface
- Pit dry and stable
- Falling head testing carried out:
Pit dimensions 1.3 x 0.5 x 1.8m (LxWxD)



Scale: NTS	Client: Whitley Golf Club	Logged By: TC
-------------------	----------------------------------	----------------------

APPENDIX 3

CERTIFIED CBR TEST RESULTS

**Determination of California Bearing Ratio (CBR)
BS 1377-2:2022 Clause 15**

Contract Number 84290

Borehole/Pit No. TP1

Project Name Whitley Golf Club

Sample No.

Soil Description Brown silty CLAY

Depth Top 0.45

Compaction Method 2.5 Kg Rammer

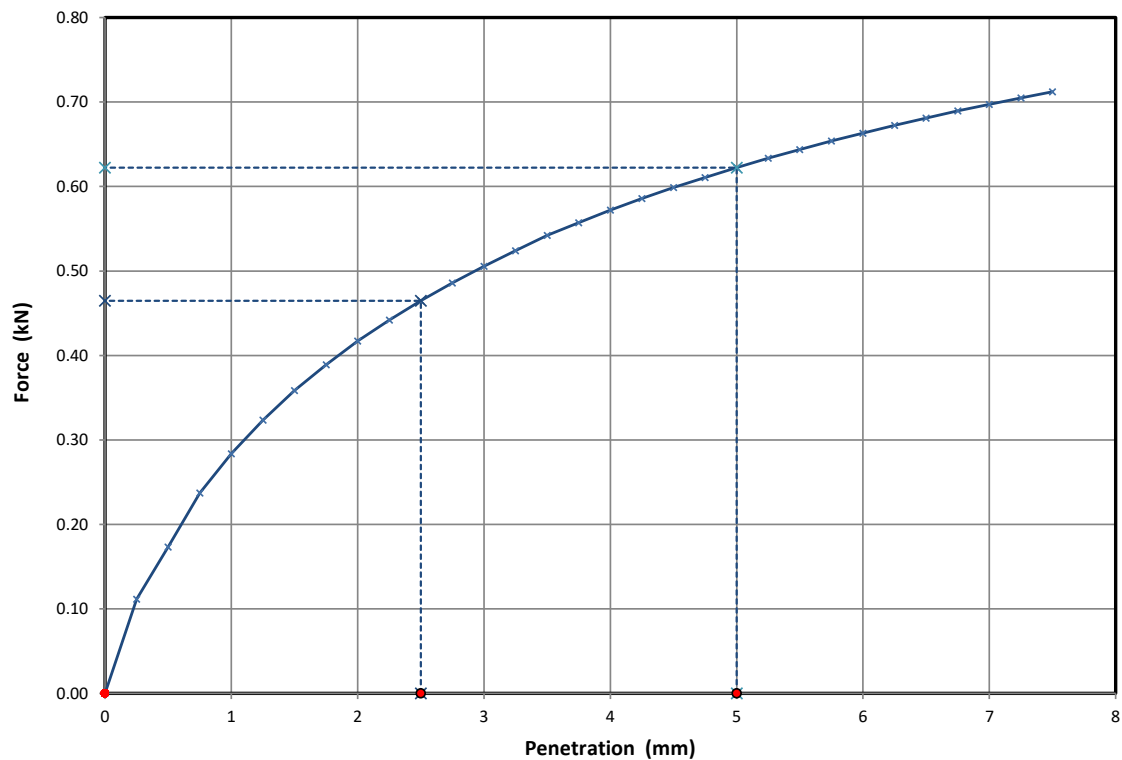
Depth Base

Material Retained on
20mm Sieve
Removed (%) 0

Sample Type B

Date Tested 00/01/1900

—x— top data —●— base data - - -x- - 2.5top - - -●- - 2.5base
 - - -x- - 5.0top - - -●- - 5.0base — top correction — base correction



Initial Sample Conditions	
Water Content (%)	33.8
Water Content Top (%)	34.5
Water Content Base (%)	
Bulk Density (Mg/m3)	4.03
Dry Density (Mg/m3)	3.01

Specified Testing Parameters	
Surcharge Applied (Kg)	2
Soaking Time (Days)	N/A
Amount of Swelling recorded (mm)	N/A
Final Sample Conditions After Soaking	
Dry Density (Mg/m3)	N/A

Curve Correction Applied	
Top	Base
No	No

CBR Test Values			
2.5mm Top	3.5	2.5mm Base	
5mm Top	3.1	5mm Base	
CBR Value %	3.5	CBR Value %	

Remarks

Operator

**Determination of California Bearing Ratio (CBR)
BS 1377-2:2022 Clause 15**

Contract Number 84290

Borehole/Pit No. TP2

Project Name Whitley Golf Club

Sample No.

Soil Description Brown silty CLAY

Depth Top 0.45

Compaction Method 2.5 Kg Rammer

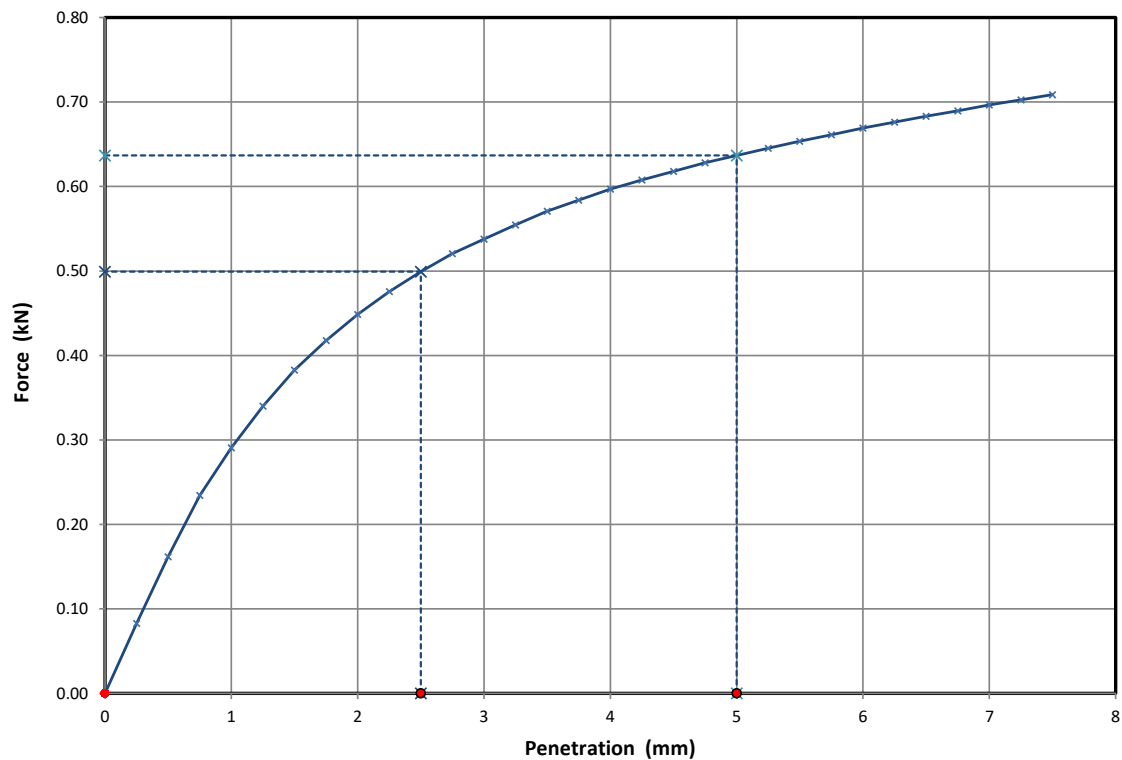
Depth Base

Material Retained on 20mm Sieve Removed (%) 0

Sample Type B

Date Tested 12/02/2026

—x— top data —●— base data - - -x- 2.5top - - -●- 2.5base
 - - -x- 5.0top - - -●- 5.0base — top correction — base correction



Initial Sample Conditions	
Water Content (%)	39.2
Water Content Top (%)	38.6
Water Content Base (%)	
Bulk Density (Mg/m3)	1.78
Dry Density (Mg/m3)	1.28

Specified Testing Parameters	
Surcharge Applied (Kg)	2
Soaking Time (Days)	N/A
Amount of Swelling recorded (mm)	N/A
Final Sample Conditions After Soaking	
Dry Density (Mg/m3)	N/A

Curve Correction Applied	
Top	Base
No	No

CBR Test Values			
2.5mm Top	3.8	2.5mm Base	
5mm Top	3.2	5mm Base	
CBR Value %	3.8	CBR Value %	

Remarks

Operator

CONDITIONS OF CONTRACT - CONSULTANCY SERVICES

- 1 Wilson Associates (Consulting) Limited ("the Consultant") shall carry out the Services, including any proposal, report or other document, as detailed in any relevant correspondence, which forms part of this Agreement, for the Client with reasonable skill, care and diligence. The Consultant shall use reasonable endeavors to adhere to any agreed programme. Each instruction or acceptance of a quotation shall be deemed to be an offer to purchase the services subject to the conditions laid out in this document.
- 2 An interim invoice will normally be submitted upon completion of the site works, to include all disbursements and fees to date, and for contracts extending over a long period, monthly invoices will be submitted for payment. The final report will not be issued until payment of the first interim invoice has been received, unless otherwise agreed with this Practice beforehand. Invoices are not to be assigned to a third party without prior agreement. Should the contract be cancelled after either preparatory or fieldwork has commenced an invoice will be raised to cover work completed to that date. A cancellation charge to cover aborted sub-contractor hire costs may be raised for any works cancelled with <48 hours notice.
- 3 The rates quoted, are net of Value Added Tax (VAT) which will be added to invoices at the standard prevailing rate, and are valid for a period of 12 weeks from the date of the quote. The Consultant shall issue accounts monthly in respect of that part of the Services carried out in the preceding period. The Client shall make payment of accounts without discount or retention within 30 days of submission. Disputes should be raised within 10 days. In the event of non-payment of the account(s) within the specified period the Consultant reserves the right to charge, from time to time, interest on the unpaid amount at the rate of 2% per calendar month above the Bank of England base rate (at time of original invoice date).
- 4 In the event of non-payment of the account(s), the Client undertakes to pay to the Consultant all costs and expenses, on an indemnity basis, incurred by the Consultant in: (i) the recovery from the Client of money or arrears (ii) the enforcement of any of the provisions of these conditions of contract (iii) the service of any notice relating to the breach by the Client of any of their obligations under this contract whether or not the same shall result in court proceedings (iv) the cost of any bank or other charges incurred by the Consultant if any cheque written by the Client is dishonoured or if any standing order payment is withdrawn by the Client's bankers (v) compensation for the breach of any terms of this agreement.
- 5 Unless expressly stipulated to the contrary, payment of the account(s) is not dependent upon the Client achieving regulatory approval for or discharge of a planning condition relating to the project, nor is it dependent upon the Client's securing of funding for the development where this may be conditional upon the prior granting of planning or building regulations approval, nor the Client's onward sale of the site to another party. In the case of provision of services to another consultant, payment of our account is not dependent upon the prior settlement of their own account by their Client.
- 6 No work will commence until an official written order or completed Quote Acceptance form has been received by post or email. Such order will be deemed to constitute acceptance of the quotation and these terms and conditions. Where the instruction to undertake the Services may have been issued by an intermediary on behalf of the Client, full Client details including confirmation of and contact details for the person responsible for authorising payment must be provided to the Consultant. In the event that the Client defaults or otherwise fails to pay the due account, the Consultant reserves the right to pursue and recover any unpaid amount from the instructing intermediary.
- 7 Neither party shall assign any obligation or benefit under this Agreement without prior written consent of the other Party. The Client shall not be entitled to assign the report(s) or any part of it without our prior written consent. Re-assignment of reports can be provided on request, subject to liaison with our Insurers and standard administration costs. Any assignment shall exclude the Contracts (Rights of Third Parties) Act 1999. Provision of a Collateral Warranty can only be considered if it is agreed at the pre-works stage, and fees for legal advice and warranty provision agreed before the works commence.
- 8 The Client guarantees that it has the right to have the Services performed and that they have obtained all the necessary certificates, licences, permits and consents required by Statute or any order or regulation made there under or by any regulation or by-law of any authority undertaker. The Client shall indemnify and hold harmless the Consultant from and against all consequences of a failure in this respect. The Client shall arrange such rights of access to property and use of Client's facilities as described in (or reasonably to be inferred from) this Agreement. The Client shall use reasonable endeavours to supply to the Consultant, promptly and free of charge: (a) any other necessary things in accordance with this Agreement; (b) any instructions, decisions, consents and approvals; and (c) any relevant data and information in the Client's possession; all of which the Consultant may reasonably require in order to carry out the Services. The Client will indemnify the Consultant in respect of any failure by the Client under this Clause.
- 9 In line with the Construction (Design & Management) Regulations 2015 and AGS guidance, neither the Consultant nor any sub-contractor shall be held responsible for any accidental damage or the consequences of any damage to buried services such as cables, pipes, sewers, etc., the positions and nature of which have not been clearly indicated to the Consultant in writing prior to the commencement of the work, unless the locating of same is expressly part of the Services. Where necessary it is assumed that the Client will permit the use of their toilet/welfare facilities by Consultant's staff and sub-contractors, including domestic properties. We will normally undertake the role of Contractor on a ground investigation project, but may occasionally 'inherit' the role of Principal Contractor. In either case that role is restricted to the ground investigation phase ONLY and not the subsequent build.
- 10 The Consultant shall not be held responsible for any loss, damage or injury arising from actions or omissions of the Client, his agents, servants and/or independent contractors. The Client shall indemnify the Consultant from any such acts or omissions.
- 11 Each Party shall retain the copyright of its documents. Information relating to the contract will only be disclosed to those employees who require it to carry out their job. If necessary this may include subcontractors. Any other third party enquiry about the purposes of these works will be referred back to the Client. Upon completion any technical information or ground investigation data obtained as part of your commission will thereafter be archived as 'in-house' data, and may be used (without specific reference to your site) on other projects in the future; this specifically excludes any personal data.
- 12 Copyright And Non-Disclosure Notice - The contents and layout of any report produced by the Consultant are subject to copyright owned by Wilson Associates save to the extent that copyright has been legally assigned by us to another party or is used by Wilson Associates under licence. To the extent that we own the copyright of a particular report, it may not be copied or used without our prior written agreement for any purpose other than the purpose indicated in that report. The methodology (if any) contained in that report is provided to you in confidence and must not be disclosed or copied to third parties without the prior written agreement of Wilson Associates. Disclosure of such a information may constitute an actionable breach of confidence or may otherwise prejudice our commercial interests. Any third party who obtains access to that report by any means will, in any event, be subject to the Third Party Disclaimer set out below.
- 13 Third Party Disclaimer - Any disclosure of our report(s) to a third party is subject to this disclaimer. Reports are prepared by Wilson Associates at the instruction of, and for use by, the named Client. It does not in any way constitute advice to any third party who is able to access it by any means. Wilson Associates excludes to the fullest extent lawfully permitted all liability whatsoever for any loss or damage howsoever arising from reliance on the contents of that report. We do not however exclude our liability (if any) for personal injury or death resulting from our negligence, for fraud or any other matter in relation to which we cannot legally exclude liability. Legal re-assignment to another party can be arranged - see Clause 7.
- 14 The Consultant's liability under this Agreement shall be limited to £500,000 (five hundred thousand pounds). The Consultant shall maintain professional indemnity insurance in this amount providing that such insurance cover is available at commercially reasonable rates.
- 15 To comply with the General Data Protection Regulation (GDPR) 2018, we will only request contact details sufficient to complete our project with you, name/job title, address/postcode/email. Any data collected will be used only by authorised personnel in the context of that project. We are committed to ensuring that your information is secure and in order to prevent unauthorised access or disclosure, we have put in place suitable physical, electronic and managerial procedures to safeguard and secure the information we collect. We will not share your information with third parties.

Appendix C – Proposed Site Plan

Key 1

Perennial mix borders

St - Mexican feather grass '*Stipa tenuissima*'

Se - Sedum purple emperor '*Hylotelephium telephium*'

M - Purple moor grass '*Molinia caerulea*'

Se

Verbena

M

Allium

St

Silver birch



Ecological Enhancements



The image displays three different ecological enhancement products. On the left is a rusted metal mold with a semi-circular opening, marked with an orange circle. In the center is a concrete block with a blue circle. On the right is a black box labeled 'SMARTCOAT' with a yellow circle, and a small white packet of 'SMARTCOAT' powder.

Building regs

Landscaping

- ### Ecological Enhancements

- REV. DATE NOTES
- 0 4 8 12 16 20 M
- INSERT SCALE BAR HERE - USE STYLE TEXT - 1/8" block scale=1" N

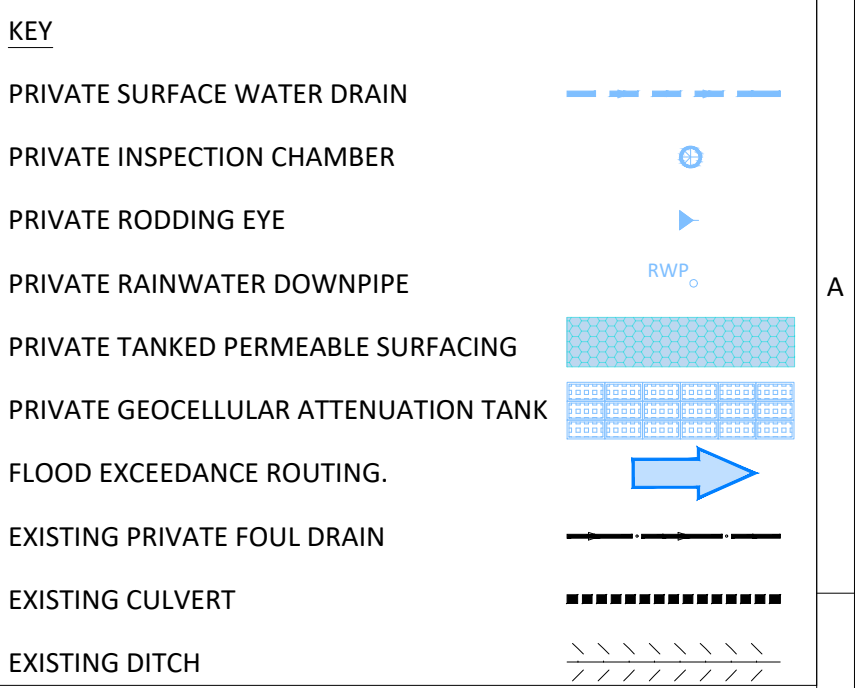
PROJECT	STAGE	DRAWING	REV	DRAWN
734	- 4	- 17		AN
SCALE	SIZE	CREATION		
1:500	@ A3 L	AUG 2025		

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Appendix D - Proposed Drainage Layout



RAINAGE NOTES

ALL PRIVATE DRAINAGE WORKS TO BE CARRIED OUT IN ACCORDANCE WITH BUILDING REGULATIONS PART 8.

ALL FOUL WATER PRIVATE PIPES TO BE 100MM Ø UNLESS OTHERWISE STATED. MIN GRADIENT 1:80 WHERE CONNECTED TO A MINIMUM OF 15WC, OTHERWISE MIN 1:40.

ALL SURFACE WATER PIPES TO BE 150MM Ø UNLESS OTHERWISE STATED. MIN GRADIENT 1:100 UNLESS OTHERWISE STATED.

ALL SURFACE WATER PIPES 225MM Ø OR LESS TO BE UPVC OR SIMILAR APPROVED. ALL SURFACE WATER PIPES 300MM Ø OR MORE TO BE PRECAST CONCRETE OR SIMILAR APPROVED. ALL FOUL WATER DRAINS UP TO 225B TO BE UPVC OR SIMILAR APPROVED.

PRIVATE FOUL WATER DRAIN ROUTE UNDER SLAB IS INDICATIVE ONLY. BEDDING, PIPE, JOINTS AND WARD OFFICE OF PROPERTY WALL DETAILS BY OTHERS.

CONTRACTOR TO REVIEW ALL BELOW SLAB PRIVATE DRAINAGE AND ENSURE, WHERE NECESSARY, FOUNDATION WALLS AND FOOTINGS ARE PROVIDED IN ACCORDANCE WITH STRUCTURAL ENGINEER REQUIREMENTS.

IMPORTANT NOTE: WHERE RETAINING WALLS AND PLOT/GARAGE FOUNDATIONS ARE TO BE LOCATED OR DEEPER THAN EXISTING FOUNDATIONS, THE FOUNDATIONS ARE TO BE BELOW INVERT LEVELS OF PIPES / TANKS AS NOT TO CAUSE LOADING ONTO DRAINAGE.

DRAINAGE TO BE CONSTRUCTED FROM THE DOWNSTREAM END FIRST, VERIFYING THE CONNECTION INVERT LEVEL PRIOR TO ANY UPSTREAM DRAINAGE CONNECTION.

PROPOSED DRAINAGE AREA - 0.263ha



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REV.	DESCRIPTION	Date	BY	CHK

DESIGN BY:

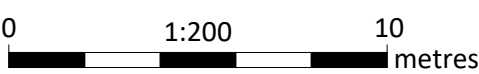


CLIENT:

ARTEL 31

DRAWING STATUS:
DISCHARGE OF PLANNING CONDITIONS

SCALE @ A1:



PROJECT:

WHITLEY GOLF COURSE

TITLE:

SURFACE WATER DRAINAGE STRATEGY

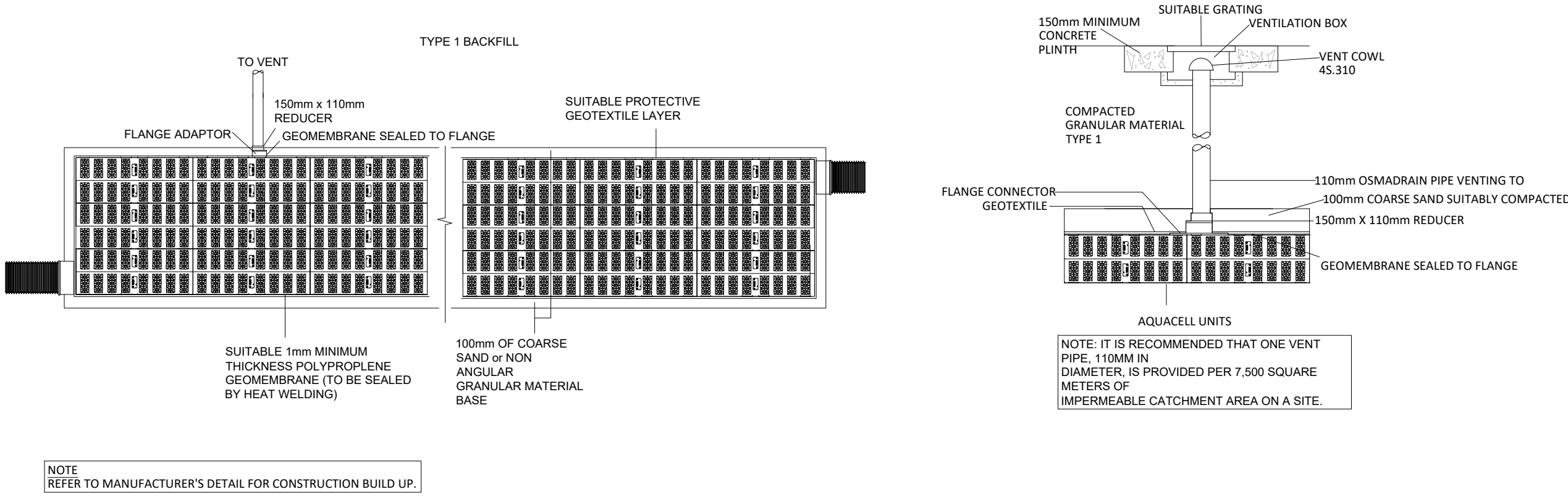
Project Ref: Originator: Stage: Phase: Number:
20036-TUM-PL-XXX-0200

REV.

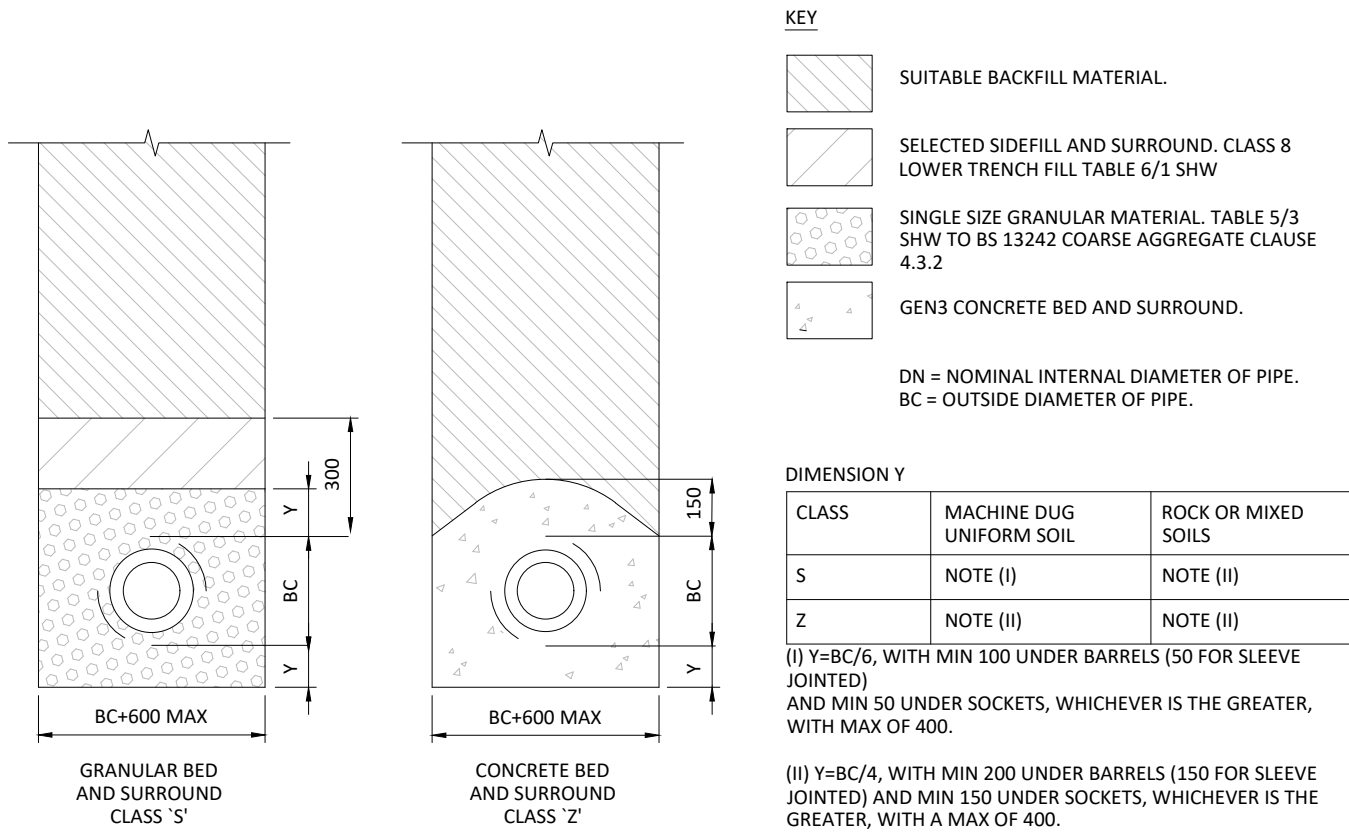
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Appendix E - Drainage Details

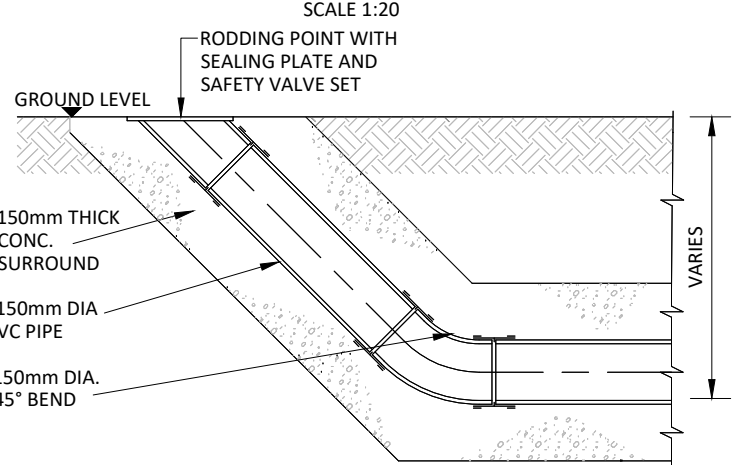
WAVIN AQUACELL PLUS-R INSTALLATION



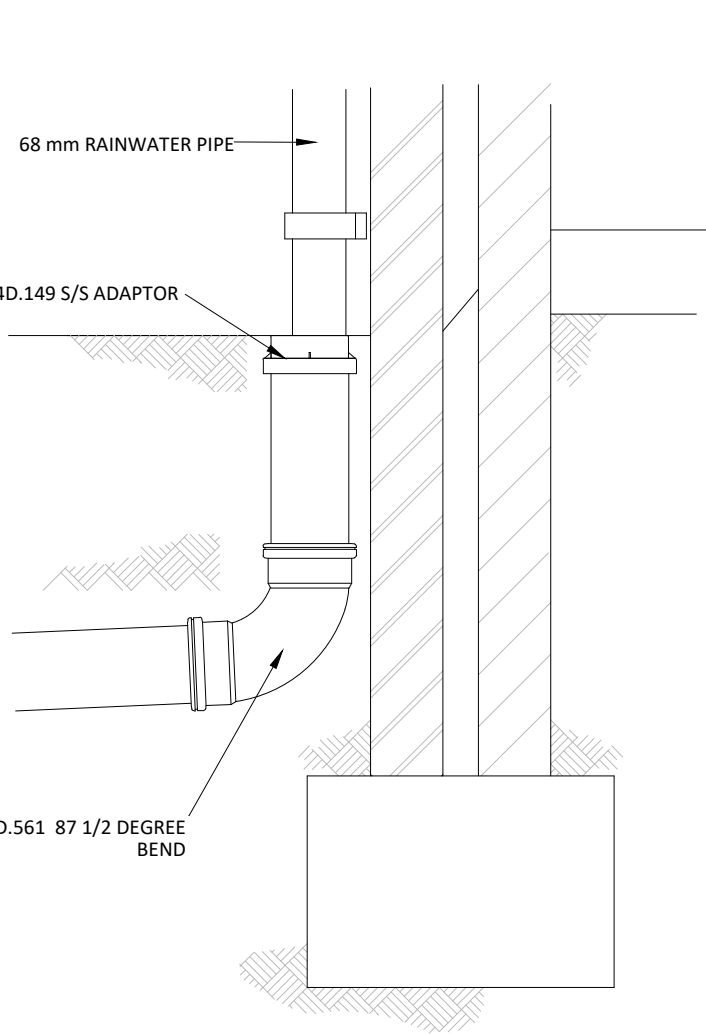
PIPE BEDDING DETAILS



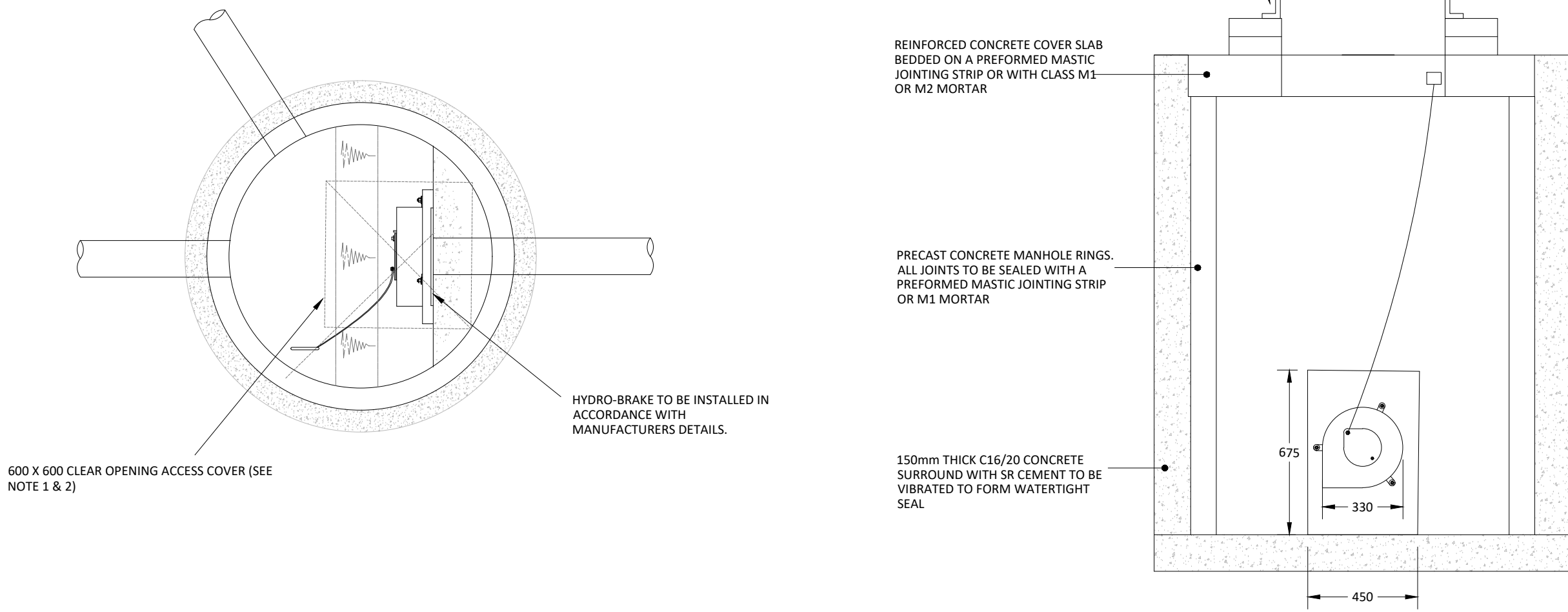
RODDING EYE DETAIL



EXTERNAL R.W.P. TO DRAIN



FLOW CONTROL MANHOLE



- NOTE:
- ACCESS COVER GRADES (DEPTH OF FRAME TO SUIT LOCATION AND HIGHWAY CATEGORY) BS EN 124 CLASS D400 - CARRIAGEWAY AND PARKING AREAS CLASS B125 - FOOTWAYS, ETC.
 - ACCESS COVERS TO HAVE A MINIMUM CLEAR OPENING OF 600mm SQUARE
 - CHAMBER SHALL BE SIZED APPROPRIATELY IN RELATION TO PIPES, MAN ACCESS AND REQUIREMENTS AND REQUIREMENTS OF CONTROL DEVICES
 - PIPES BUILT INTO MANHOLES SHALL HAVE A FLEXIBLE JOINT AS CLOSE AS FEASIBLE TO THE EXTERNAL FACE OF THE STRUCTURE AND THE LENGTH OF THE NEXT ROCKER PIPE SHALL BE AS SHOWN BELOW

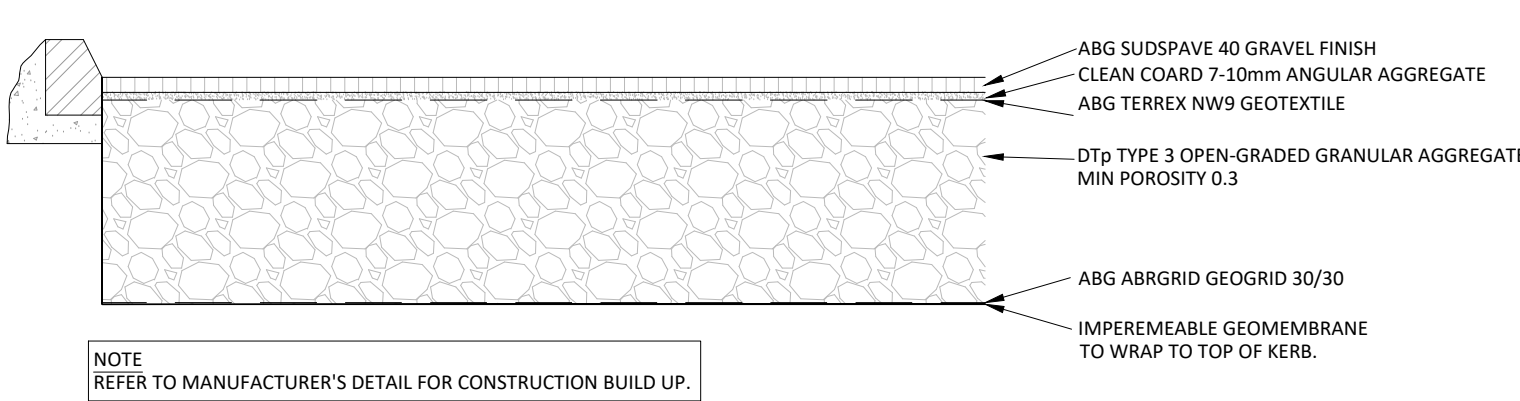
NOMINAL DIAMETER (mm)	EFFECTIVE LENGTH (m)
150 - 600	0.60
601 - 750	1.00
OVER 750	1.25

- STEP RUNGS SHALL BE DOUBLE POLYPROPYLENE ENCAPSULATED
- ALL IN-SITU CONCRETE TO HAVE 50-75mm SLUMP AND TO BE VIBRATED TO FORM DENSE WATERTIGHT SEAL WITH PRECAST SECTIONS
- BENCHING TO BE C28/35 OR GRANULITHIC TO FORM DENSE SMOOTH FINISH WITH A 500mm X 500mm FLAT AREA AT BOTTOM OF MAN ENTRY SYSTEM.
- IN-FILL COVERS OF ANY TYPE SHALL NOT BE USED. WHERE A COVER IS LOCATED IN AN AREA OF CLOCK PAVING THE FRAME SHALL BE 150mm DEEP
- FRAME FOR MANHOLE COVERS SHALL BE BEDDED IN A POLYESTER RESIN BEDDING MORTAR IN ALL SITUATIONS WHERE COVERS ARE SITED IN NRSWA ROAD CATEGORIES 1, 2 OR 3.
- LADDERS SHALL BE EITHER STAINLESS STEEL OR GRP. FIXINGS TO BE STAINLESS STEEL. DOUBLE RUNG STEP IRONS ALSO AVAILABLE
- WHERE FITTED LADDERS SHALL BE EXTENDABLE TO A HEIGHT OF 1m ABOVE GROUND LEVEL
- WHERE TOE HOLE PROVIDED IN BENCHING. SIZE OF HOLE SHALL BE 150mm HIGH X 150mm (MIN) DEPTH AND WIDTH. VERTICAL SPACING SHALL BE SAME AS STEP RUNGS
- FRAMES FOR MANHOLE COVERS SHALL BE BEDDED IN A POLYESTER RESIN BEDDING MORTAR IN ALL SITUATIONS WHERE COVERS ARE SITED IN NRSWA ROAD CATEGORIES 1, 2 OR 3.
- UNLESS NOTED OTHERWISE ALL DIMENSIONS ARE IN MILLIMETERS

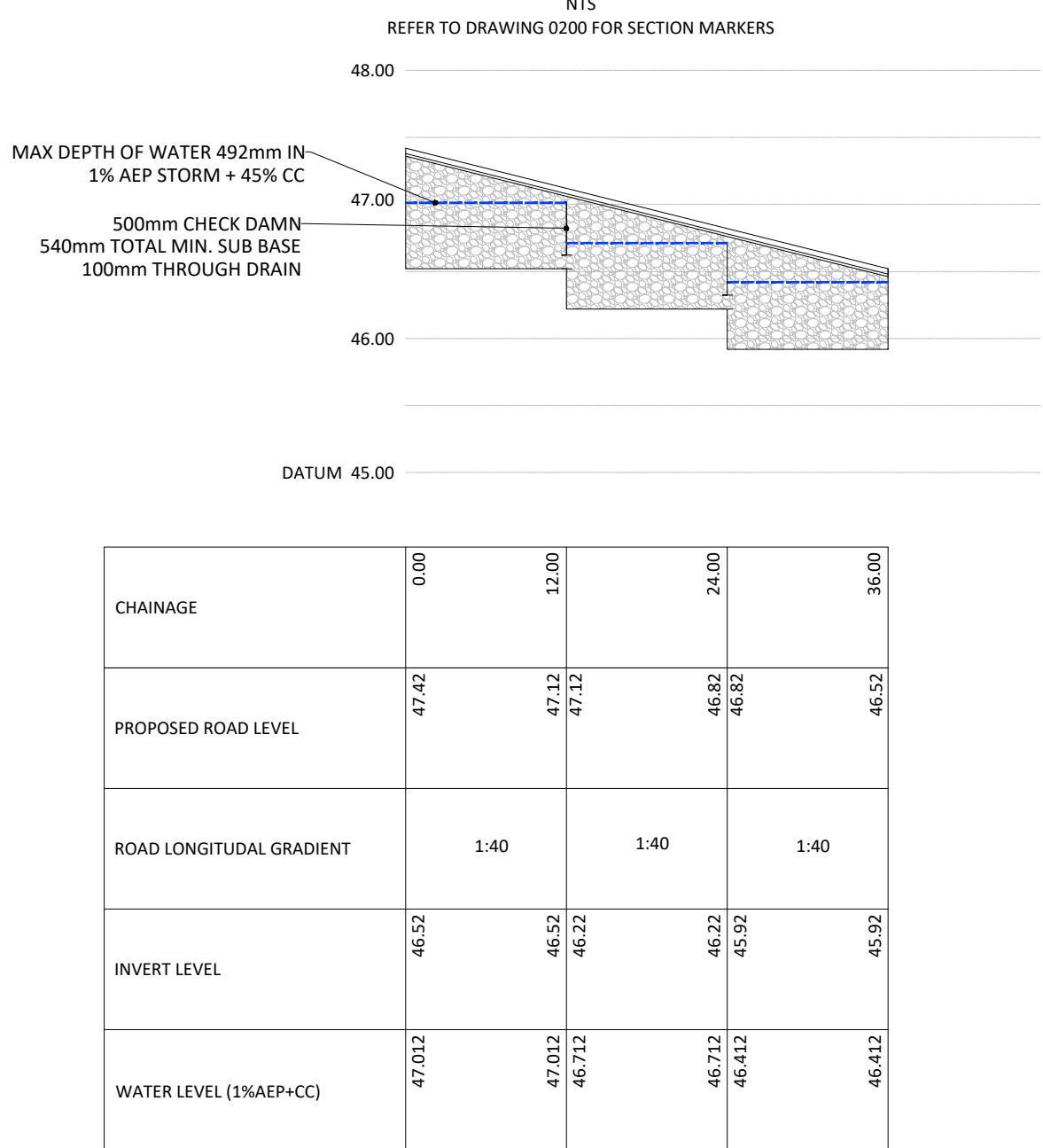
Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	0.700	1.400
Flush-Flo™	0.212	1.396
Kick-Flo®	0.446	1.145
Mean Flow		1.224

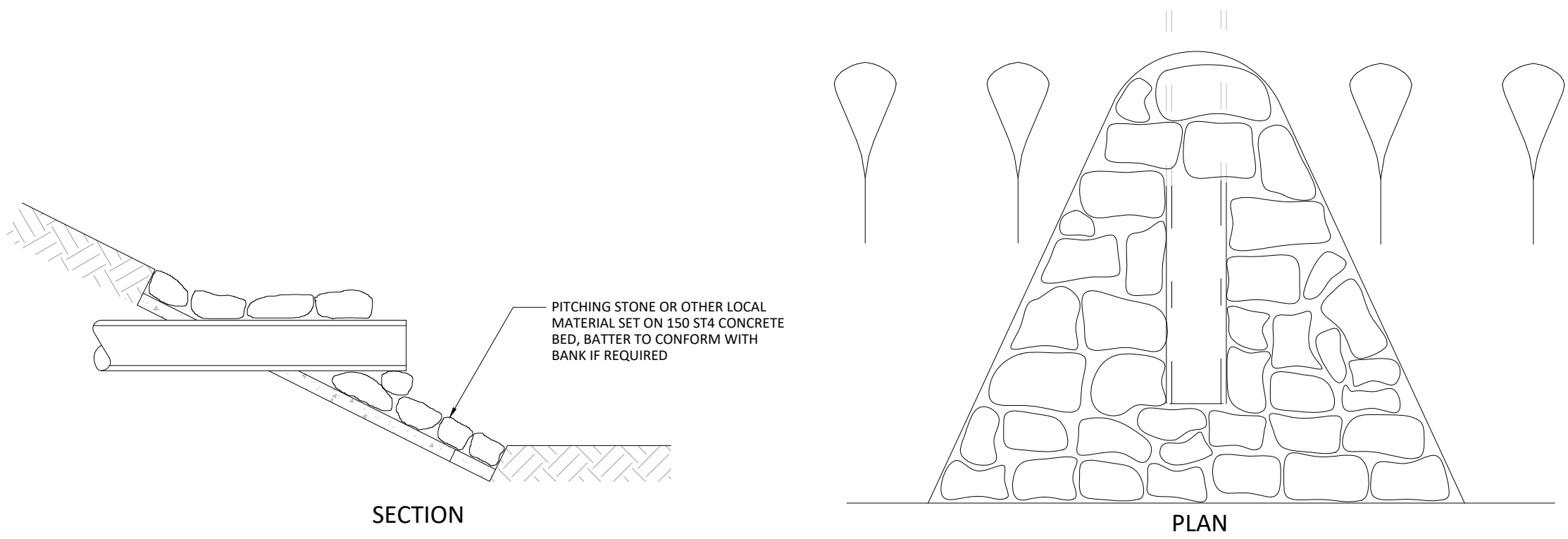
ABG SUDSPAVE 40 - TYPICAL CONSTRUCTION



SECTION A-A PERMEABLE SURFACING SECTION

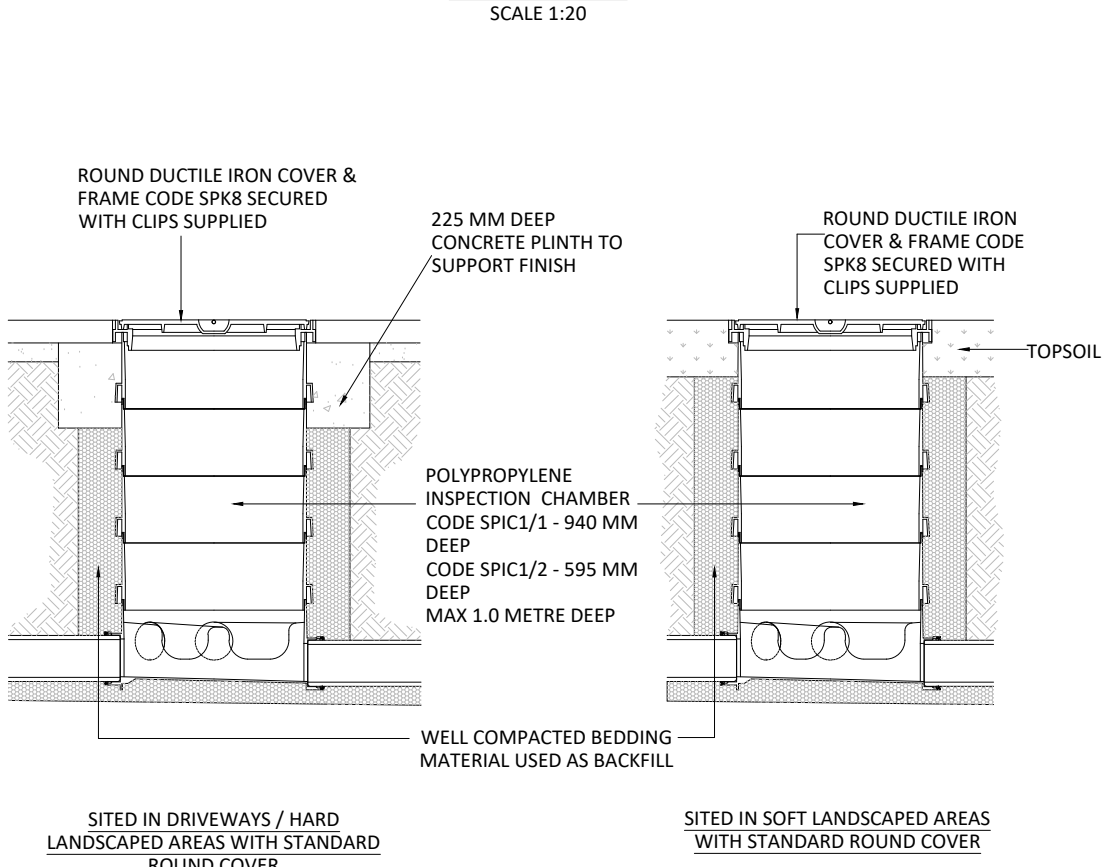


HEADWALL - PIPES LESS THAN 300MM DIAMETER



- NOTES:
- THE OUTFALL PIPE SHALL PROJECT A MINIMUM OF 50 BEYOND THE HEADWALL TO ALLOW THE DISCHARGE TO BE SAMPLED.
 - WHERE REQUIRED SLOTS / BRACKETS SHOULD BE CAST INTO OR FIXED EITHER SIDE OF THE OUTFALL PIPE TO ALLOW POLLUTION CONTROL OFFICERS TO PLACE BOARDING OVER AND LIMIT DISCHARGE DURING A POLLUTION INCIDENT.
 - IF THE DEPTH OF COVER TO THE TOP OF THE PIPE IS LESS THAN 450, PROTECTION OF THE PIPE MAY BE NECESSARY.
 - GRILLES ON OUTFALLS SHALL BE AVOIDED UNLESS THERE ARE EXCEPTIONAL CIRCUMSTANCES.

POLYPROPYLENE INSPECTION CHAMBER



A	FIRST ISSUE	13.03.25	RP	DB
REV.	DESCRIPTION	Date	BY	CHK
DESIGN BY:				
CLIENT:				
ARTEL 31				
DRAWING STATUS:				
DISCHARGE OF PLANNING CONDITIONS				
SCALE @ A1:				
AS SHOWN				
PROJECT:				
WHITLEY GOLF COURSE				
TITLE:				
DRAINAGE DETAILS				
Project Ref: Originator: Stage: Phase: Number:				REV:
20036-TUM-PL-XXX-0220				A

Appendix F - Surface Water Network Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
RE1	0.016	5.00	48.900		388906.280	166003.574	0.600	48.300
S2	0.020	5.00	48.000	450	388916.492	165987.769	0.700	47.300
RE3	0.031	5.00	47.400		388935.495	165961.505	0.600	46.800
S4			47.400	450	388926.835	165956.318	0.750	46.650
S5			47.250	450	388911.644	165962.943	0.850	46.400
S6			47.400	450	388900.758	165977.755	1.300	46.100
S7	0.196	5.00	46.630	1200	388863.980	165954.890	0.830	45.800
Outfall			46.100		388860.860	165952.677	0.380	45.720

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	RE1	S2	18.817	0.600	48.300	47.300	1.000	18.8	150	5.13	50.0
1.001	S2	S6	18.650	0.600	47.300	46.100	1.200	15.5	150	5.26	50.0
2.000	RE3	S4	10.095	0.600	46.800	46.650	0.150	67.3	150	5.14	50.0
2.001	S4	S5	16.573	0.600	46.650	46.400	0.250	66.3	150	5.36	50.0
2.002	S5	S6	18.382	0.600	46.400	46.100	0.300	61.3	150	5.60	50.0
1.002	S6	S7	43.306	0.600	46.100	45.800	0.300	144.4	150	6.46	50.0
1.003	S7	Outfall	3.825	0.600	45.800	45.720	0.080	47.8	225	6.50	50.0

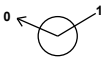
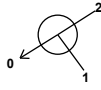
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	2.332	41.2	2.9	0.450	0.550	0.016	0.0	27	1.343
1.001	2.568	45.4	6.5	0.550	1.150	0.036	0.0	38	1.833
2.000	1.227	21.7	5.6	0.450	0.600	0.031	0.0	52	1.031
2.001	1.237	21.9	5.6	0.600	0.700	0.031	0.0	52	1.039
2.002	1.287	22.7	5.6	0.700	1.150	0.031	0.0	51	1.068
1.002	0.834	14.7	12.1	1.150	0.680	0.067	0.0	103	0.929
1.003	1.896	75.4	47.5	0.605	0.155	0.263	0.0	130	2.001

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	18.817	18.8	150	Circular	48.900	48.300	0.450	48.000	47.300	0.550
1.001	18.650	15.5	150	Circular	48.000	47.300	0.550	47.400	46.100	1.150
2.000	10.095	67.3	150	Circular	47.400	46.800	0.450	47.400	46.650	0.600
2.001	16.573	66.3	150	Circular	47.400	46.650	0.600	47.250	46.400	0.700
2.002	18.382	61.3	150	Circular	47.250	46.400	0.700	47.400	46.100	1.150
1.002	43.306	144.4	150	Circular	47.400	46.100	1.150	46.630	45.800	0.680
1.003	3.825	47.8	225	Circular	46.630	45.800	0.605	46.100	45.720	0.155

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	RE1		Junction		S2	450	Manhole	Adoptable
1.001	S2	450	Manhole	Adoptable	S6	450	Manhole	Adoptable
2.000	RE3		Junction		S4	450	Manhole	Adoptable
2.001	S4	450	Manhole	Adoptable	S5	450	Manhole	Adoptable
2.002	S5	450	Manhole	Adoptable	S6	450	Manhole	Adoptable
1.002	S6	450	Manhole	Adoptable	S7	1200	Manhole	Adoptable
1.003	S7	1200	Manhole	Adoptable	Outfall		Junction	

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
RE1	388906.280	166003.574	48.900	0.600					
						0	1.000	48.300	150
S2	388916.492	165987.769	48.000	0.700	450		1	1.000	47.300
						0	1.001	47.300	150
RE3	388935.495	165961.505	47.400	0.600					
						0	2.000	46.800	150
S4	388926.835	165956.318	47.400	0.750	450		1	2.000	46.650
						0	2.001	46.650	150
S5	388911.644	165962.943	47.250	0.850	450		1	2.001	46.400
						0	2.002	46.400	150
S6	388900.758	165977.755	47.400	1.300	450		1	2.002	46.100
						2	1.001	46.100	150
						0	1.002	46.100	150
S7	388863.980	165954.890	46.630	0.830	1200		1	1.002	45.800
						0	1.003	45.800	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Outfall	388860.860	165952.677	46.100	0.380		1	1.003	45.720	225

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	2 year (l/s)	1.8
Rainfall Events	Singular	Drain Down Time (mins)	1440	30 year (l/s)	3.8
Summer CV	1.000	Additional Storage (m³/ha)	0.0	100 year (l/s)	4.9
Winter CV	1.000	Starting Level (m)		Check Discharge Volume	x
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	40	0	0
100	45	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Growth Factor 30 year	1.95
Greenfield Method	FEH	Growth Factor 100 year	2.48
Positively Drained Area (ha)	0.263	Betterment (%)	0
SAAR (mm)	801	QMed	1.8
Host	8	QBar	2.0
BFIHost	0.302	Q 2 year (l/s)	1.8
Region	1	Q 30 year (l/s)	3.8
QBar/QMed conversion factor	1.111	Q 100 year (l/s)	4.9
Growth Factor 2 year	0.90		

Node S7 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	45.800	Product Number	CTL-SHE-0060-1400-0700-1400
Design Depth (m)	0.700	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.4	Min Node Diameter (mm)	1200

Node S7 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	45.920	Slope (1:X)	9999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.540
Safety Factor	2.0	Width (m)	48.000	Inf Depth (m)	
Porosity	0.30	Length (m)	31.000		

Node S6 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	46.100
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	990

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	202.5	202.5	0.400	202.5	222.7	0.401	0.0	222.7

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.47%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	10	48.326	0.026	2.6	0.0000	0.0000	OK
15 minute summer	S2	9	47.346	0.046	5.8	0.0073	0.0000	OK
15 minute summer	RE3	10	46.850	0.050	5.0	0.0000	0.0000	OK
15 minute summer	S4	10	46.698	0.048	5.0	0.0077	0.0000	OK
15 minute summer	S5	10	46.462	0.062	4.9	0.0098	0.0000	OK
240 minute summer	S6	144	46.136	0.036	3.7	6.9267	0.0000	OK
480 minute summer	S7	384	46.001	0.201	8.3	34.6662	0.0000	OK
15 minute summer	Outfall	1	45.720	0.000	1.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S2	2.6	0.833	0.063	0.0611	
15 minute summer	S2	1.001	S6	5.8	2.624	0.128	0.0465	
15 minute summer	RE3	2.000	S4	5.0	0.987	0.229	0.0508	
15 minute summer	S4	2.001	S5	4.9	0.864	0.226	0.0972	
15 minute summer	S5	2.002	S6	5.0	1.562	0.221	0.0670	
240 minute summer	S6	1.002	S7	1.9	0.149	0.127	0.4513	
480 minute summer	S7	Hydro-Brake®	Outfall	1.4				70.8

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	10	48.350	0.050	9.8	0.0000	0.0000	OK
15 minute summer	S2	9	47.389	0.089	22.0	0.0142	0.0000	OK
15 minute summer	RE3	10	46.916	0.116	19.0	0.0000	0.0000	OK
15 minute summer	S4	10	46.766	0.116	18.9	0.0184	0.0000	OK
15 minute summer	S5	10	46.530	0.130	18.7	0.0207	0.0000	OK
960 minute winter	S6	945	46.264	0.164	2.8	31.5322	0.0000	SURCHARGED
960 minute winter	S7	930	46.264	0.464	11.0	149.8406	0.0000	SURCHARGED
15 minute summer	Outfall	1	45.720	0.000	1.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S2	9.8	1.282	0.237	0.1492	
15 minute summer	S2	1.001	S6	22.1	3.258	0.488	0.1400	
15 minute summer	RE3	2.000	S4	18.9	1.294	0.870	0.1472	
15 minute summer	S4	2.001	S5	18.7	1.237	0.856	0.2556	
15 minute summer	S5	2.002	S6	18.9	1.857	0.830	0.1899	
60 minute summer	S6	1.002	S7	9.5	0.601	0.644	0.6137	
15 minute summer	S7	Hydro-Brake®	Outfall	1.4				69.3

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.10%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	RE1	10	48.358	0.058	13.0	0.0000	0.0000	OK
15 minute summer	S2	9	47.406	0.106	29.2	0.0168	0.0000	OK
15 minute summer	RE3	11	47.191	0.391	25.1	0.0000	0.0000	FLOOD RISK
15 minute summer	S4	11	46.976	0.326	23.6	0.0519	0.0000	SURCHARGED
15 minute summer	S5	12	46.633	0.233	23.0	0.0370	0.0000	SURCHARGED
1440 minute winter	S6	1410	46.412	0.312	3.2	60.0333	0.0000	SURCHARGED
1440 minute winter	S7	1410	46.412	0.612	9.9	215.6010	0.0000	FLOOD RISK
15 minute summer	Outfall	1	45.720	0.000	1.4	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	RE1	1.000	S2	12.9	1.387	0.314	0.1828	
15 minute summer	S2	1.001	S6	29.3	3.322	0.645	0.1792	
15 minute summer	RE3	2.000	S4	23.6	1.341	1.089	0.1777	
15 minute summer	S4	2.001	S5	23.0	1.307	1.052	0.2918	
15 minute summer	S5	2.002	S6	23.2	1.824	1.022	0.2600	
30 minute summer	S6	1.002	S7	10.3	0.630	0.696	0.6893	
15 minute summer	S7	Hydro-Brake®	Outfall	1.4				93.0