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Consulting Civil Engineers

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17th October 2022

REF: 5052-OTP6-ICS-CO-C-03.003

OXFORD TECHNOLOGY PARK, UNIT 6 – DRAINAGE STATEMENT

1.0 PROPOSED FOUL DRAINAGE ARRANGEMENT

1.1 Foul water flows from the site are to drain by gravity into the 150mm drain along the main access road, to the west of the plot.

1.2 From there it will be conveyed to a pumping station serving the whole industrial estate, and pumped into the Thames Water sewer.

1.3 The pipe network is to remain private.

2.0 PROPOSED SURFACE WATER DRAINAGE STRATEGY

2.1 The surface water drainage system for Unit 6 has been designed to accommodate the flows generated by a 1 in 100-year event, plus an allowance of 40% for climate change.

2.2 An initial engineering appraisal for the whole park was carried out by Haydn Evans Consulting in November 2013. The ground conditions indicate a topsoil layer of 200-400mm over fractured rock. Non fractured rock was encountered between 1.5 and 2.2mbgl. Infiltration tests to BRE365 were carried out and results were good in general, ranging from 5E-6m/s to 1.84E-4m/s. The permeable paving solution for surface water was proposed as a viable alternative.

2.3 In Autumn 2018 (October and November), a groundwater monitoring report was prepared by RSK Environment Ltd. The depth varied within the park but in some areas the water table was found as shallow as 0.89mbgl.

Table 1: Enzygo groundwater monitoring data Autumn 2018

Location	X	Y		18.10.18		24.10.18		31.10.18		14.11.18	
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				1.3	-	1.26	-	1.19	-	1.01	-
BH2	447627.305	214814.004	69.118	0.93	68.188	1.1	68.018	1.21	67.908	1.13	67.988
BH3	447539.634	214698.974	69.621	1.11	68.511	1.2	68.421	1.32	68.301	1.27	68.351
BH4	447646.099	214755.091	68.884	0.89	67.994	1.02	67.864	1.12	67.764	1.08	67.804
BH5	447567.268	214619.444	70.344	2.32	68.024	2.34	68.004	2.47	67.874	2.54	67.804
BH6	447662.021	214663.078	69.998	2.34	67.658	2.45	67.548	2.55	67.448	2.56	67.438
Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum											

A second round of visits took place in Spring 2019 with values even higher. The monitoring identified groundwater as shallow as 68.81m AOD in the west and 68.31m AOD in the east.

Table 2: RSK groundwater monitoring data Spring 2019

Location	X	Y		25.03.19		09.04.19		23.04.19		07.05.19	
			GL (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)	bgl (m)	aOD (m)
BH1				-	-	-	-	-	-	-	-
BH2	447627	214814	69.118	0.87	68.248	0.89	68.228	-	-	-	-
BH3	447539	214698	69.621	0.94	68.681	1.27	68.351	1.53	68.091	1.37	68.251
BH4	447646	214755	68.884	0.77	68.114	2.82*	66.064*	1.26	67.624	0.90	67.984
BH5	447567	214619	70.344	1.53	68.814	1.89	68.454	2.02	68.324	1.68	68.664
BH6	447662	214663	69.998	1.69	68.308	-	-	2.44	67.558	2.15	67.848
Notes: X/Y-grid coordinates, GL-Ground Level, bgl-Below ground level, aOD-Above ordinance datum Notes: * results from BH4 on the 9.4.19 have not been considered as part of the overall assessment											

2.4 Another Phase 2 Geo-Environmental report was produced by enzygo Ltd in January 2019 for the northeastern corner, near plots 1, 3 and 5. In there, groundwater is noted to be as shallow as 0.6mblg. Soakage tests were abandoned as a result.

Table 6.1 Ground and groundwater conditions check sequence of solid geology

Strata	Summary Description	Depths Encountered (m)
Made Ground	Firm consistency brown/orange brown silty sandy gravelly cobbly clay	GL to 0.80
Weathered Cornbrash Formation	Light brown sandy gravelly cobbles of limestone	0.50 to 3.20
	Soft orange brown silty sandy gravelly cobbly clay	0.30 to 2.10
Cornbrash Formation	Medium strong light brown/light grey limestone	6.60 to 9.80
Weathered Forest Marble Formation	Stiff light blueish grey silty gravelly clay	2.50 to 10.00
Groundwater	BH1 and BH2, SA1 to SA4, SA4a	GL to 0.60

2.5 Since all the above testing was not site specific for Unit 6, further BRE365 tests were carried out in September 2022 to a depth of 0.9m. The most conservative value of the three repetitions was 4.931E-5m/s, which is far higher than the originally design value of 1E-5m/s. See Appendix A for results.

2.6 The SuDS hierarchy has been followed. It says that new developments should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible in line with the following drainage hierarchy:

- store rainwater for later use
- **use infiltration techniques, such as porous surfaces in non-clay areas**
- discharge rainwater direct to a watercourse
- discharge rainwater to a surface water sewer/drain
- discharge rainwater to the combined sewer.

2.7 Runoff from the roof and external hard landscaping areas (front car park and rear yard) will be discharged into the permeable paving subbase and, from there, it will percolate into the ground. The rear car park has some impermeable bitmac areas however the subbase of OGCR is installed throughout to maximise water storage capacity. See Appendix C for drainage layout.

2.8 The estimated runoff rate from the site is 0l/s. Some overland flows might be expected for storms beyond the design event, however these are difficult to quantify. They will not impact other buildings as they are at a higher elevation.

2.9 All parking bays to the front are to be constructed in permeable block paving to increase the water quality. This is where oil spillage is most likely to occur and the open graded crushed rock in the subbase will break down hydrocarbons before they percolate into the ground.

2.10 A catchment area plan has bene produced where almost all site areas are included. Urban creep has not been considered as this is an industrial site and, more importantly, there is no extra areas to include in the catchment. See Appendix D

2.11 Full water quality discussion in line with CIRIA 753 - SUDS manual is in Appendix B.

2.12 The surface water networks will remain private, to be maintained as per the SuDS Maintenance Guide produced separately.

Yours sincerely

M. BLANCO
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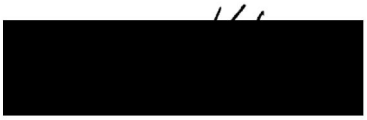
DIRECTOR

Authorised by



A. J. GRIFFITHS
BEng (Hons) MCIHT
DIRECTOR

Appendix A- BRE365 Test Results

Soakaway Design Calculations to BRE365 (DG 365 Revised 2016)

Test Reference:	B6.1
Site:	Unit 7, OTP
Client:	Russel Wrapson
Test Date:	22/09/2022
Results logged by:	R.Ireanius

Calculations By:	RJW
Calculation Date:	13/10/2022
Length (m) =	1.40
Width (m) =	0.80
Depth (m) =	0.90

Infrastruct CS Ltd

File ref:	4929-OTP7-13-001-BRE365.xlsx

First Fill	
Time [Mins]	Test 1 Depth [m]
0.00	0.39
5.00	0.46
10.00	0.52
15.00	0.56
20.00	0.60
25.00	0.64
30.00	0.68
35.00	0.71
40.00	0.73
45.00	0.75
50.00	0.77
55.00	0.79
60.00	0.80

Second Fill	
Time [Mins]	Test 2 Depth [m]
0.00	0.29
5.00	0.35
10.00	0.42
15.00	0.46
20.00	0.50
25.00	0.54
30.00	0.57
35.00	0.60
40.00	0.63
45.00	0.67
50.00	0.70
55.00	0.73
60.00	0.75

Third Fill	
Time [Mins]	Test 3 Depth [m]
0.00	0.30
5.00	0.37
15.00	0.44
20.00	0.48
25.00	0.52
30.00	0.56
35.00	0.60
40.00	0.63
45.00	0.66
50.00	0.70
55.00	0.73
60.00	0.76
65.00	0.79

RESULTS

Volume Vp75 - 25 [m³]	0.24640
Area A_{p50} [m²]=	2.3960
Time t_{p75-25} [s] =	1750
Surface Water Soil infiltration rate [m/s]	5.876E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	7.95
Surface Water Soil infiltration rate [m/hr]	0.212

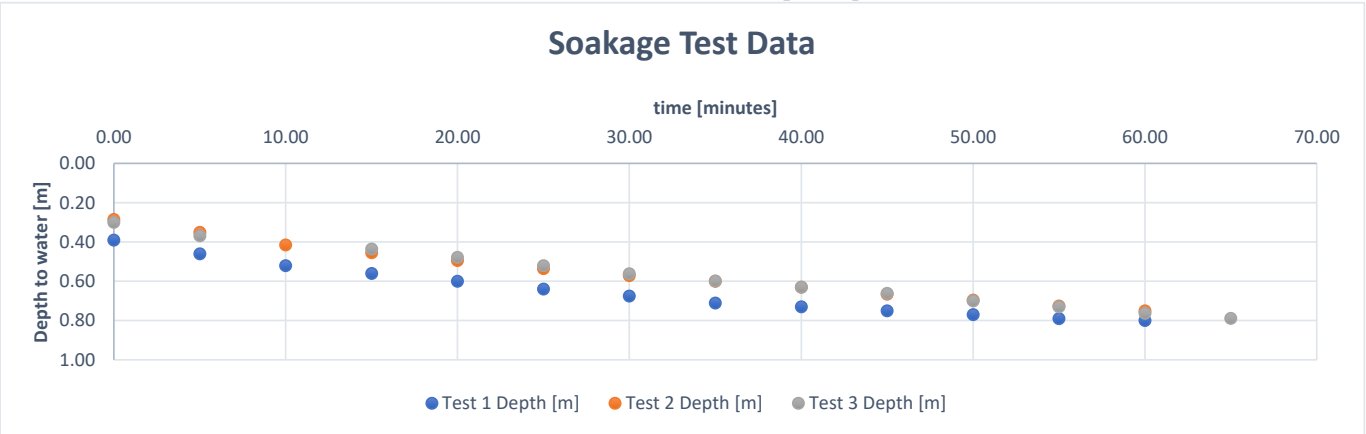
RESULTS

Volume Vp75 - 25 [m³]	0.27720
Area A_{p50} [m²]=	2.7370
Time t_{p75-25} [s] =	2054
Surface Water Soil infiltration rate [m/s]	4.931E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	8.30
Surface Water Soil infiltration rate [m/hr]	0.178

RESULTS

Volume Vp75 - 25 [m³]	0.29064
Area A_{p50} [m²]=	2.6182
Time t_{p75-25} [s] =	2076
Surface Water Soil infiltration rate [m/s]	5.347E-05
Treated Effluent Soil infiltration rate ($V_{p)}$ [s/mm]	8.00
Surface Water Soil infiltration rate [m/hr]	0.192

Slowest Soil Infiltration Rate [m/s] = 4.931E-05



Appendix A- Water quality

According to the CIRIA SUDS Manual, the pollution hazard level for car parks is low, and the simple index approach should be used.

TABLE 4.3 Minimum water quality management requirements for discharges to receiving surface waters and groundwater

Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of gross solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (eg cul de sacs, home zones, general access roads), non-residential car parking with infrequent change (eg schools, offices)	Low	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources1* In England and Wales, Risk Screening[4] must be undertaken first to determine whether consultation with the environmental regulator is required. In Northern Ireland, the need for risk screening should be agreed with the environmental regulator.
Trunk roads and motorways	High	Follow the guidance and risk assessment process set out in HA (2009)	
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit[3]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5].	

Table 4.3 of the SUDS Manual CIRIA C753. Page 63.

The method is guided by the land use and SuDS performance evidence. The steps to be followed are outlined below.

BOX 26.2 Steps of the simple index approach

Step 1 – Allocate suitable pollution hazard indices for the proposed land use

Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index

Step 3 – Where the discharge is to protected[1] surface waters or groundwater, consider the need for a more precautionary approach

Note:

1 Designated as those protected for the supply of drinking water (Table 4.3).

Box 26.2 of the SUDS Manual CIRIA C753. Page 567.

Step 1: Pollution hazard indices are presented in table 26.2 below. These indices range from 0 (no pollution hazard for this contaminant) to 1 (high pollution hazard for this contaminant type).

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

Table 26.2 of the SUDS Manual CIRIA C753. Page 568.

Step 2: To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index for each contaminant type that equals or exceeds the pollution hazard index. In this case the principal destination of the runoff is the ground, so table 26.4 should be used.

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates[1]	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.6[4]	0.5	0.6
A soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.4[4]	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential[2] of at least 300 mm in depth[3]	0.8[4]	0.8	0.8
Proprietary treatment systems[5, 6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

Table 26.3 of the SUDS Manual CIRIA C753. Page 569.

In this case, the mitigation indices are equal to the hazard indices which means the water quality treatment is adequate.

Step 3: Where the discharge is to protected groundwater, a more precautionary approach is needed. This is not the case since the discharge is not into the ground.

Source Protection Zones map. Oxford is outside any protection zone.

Appendix C- Drainage Layout

DESIGNERS CDM NOTE - RESIDUAL RISKS IDENTIFIED

The design Engineer(s) have analysed this design as the scheme has been developed, in order to identify if there are any significant residual risk hazards (i.e. unusual, unexpected, abnormal or difficult).

Residual risks **HAVE** been identified and are therefore shown on this drawing. These risks have not been possible to remove by design.

This statement assumes that a competent Contractor with the appropriate qualified staff will be employed for the works, and that they will be familiar with site wide construction risks and hazards that they can reasonably be expected to encounter as part of their work.

CDM RESIDUAL RISK ITEM
Drainage pipes, manhole rings covers and fittings.
Risk of Manual handling injury.

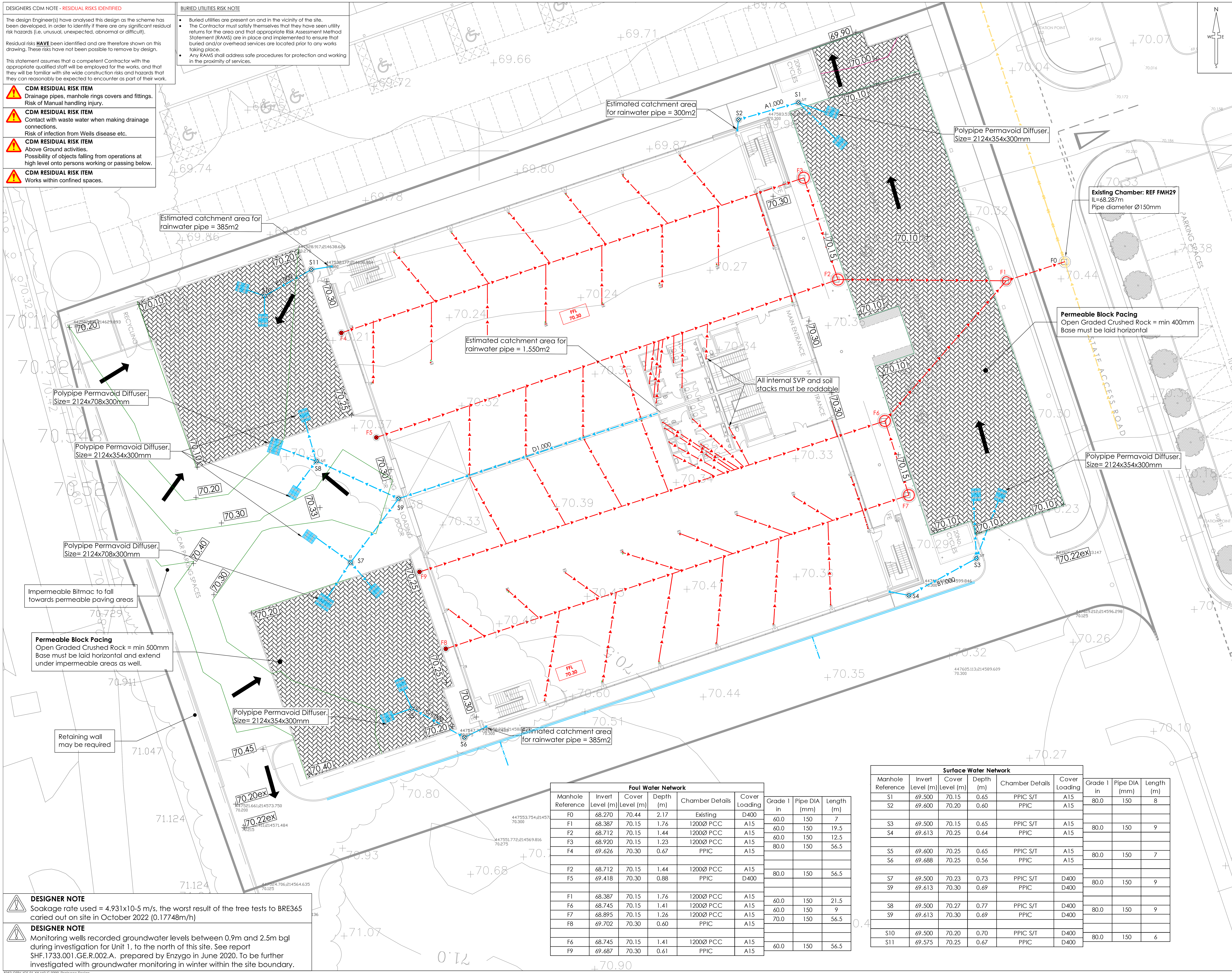
CDM RESIDUAL RISK ITEM
Contact with waste water when making drainage connections.
Risk of infection from Weils disease etc.

CDM RESIDUAL RISK ITEM
Above Ground activities.
Possibility of objects falling from operations at high level onto persons working or passing below.

CDM RESIDUAL RISK ITEM
Works within confined spaces.

BURIED UTILITIES RISK NOTE

- Buried utilities are present on and in the vicinity of the site.
- The Contractor must satisfy themselves that they have seen utility returns for the area and that appropriate Risk Assessment Method Statement (RAMS) are in place and implemented to ensure that buried and/or overhead services are located prior to any works taking place.
- Any RAMS shall address safe procedures for protection and working in the proximity of services.



DESIGNER NOTE
Soakage rate used = 4.931x10-5 m/s, the worst result of the tree tests to BRE365 caried out on site in October 2022 (0.17748m/h)

DESIGNER NOTE
Monitoring wells recorded groundwater levels between 0.9m and 2.5m bgl during investigation for Unit 1, to the north of this site. See report SHF.1733.001.GE.R.002.A. prepared by Enzygo in June 2020. To be further investigated with groundwater monitoring in winter within the site boundary.

Foul Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
F0	68.270	70.44	2.17	Existing	D400	60.0	150	7
F1	68.387	70.15	1.76	1200Ø PCC	A15	60.0	150	19.5
F2	68.712	70.15	1.44	1200Ø PCC	A15	60.0	150	12.5
F3	68.920	70.15	1.23	1200Ø PCC	A15	80.0	150	56.5
F4	69.626	70.30	0.67	PPIC	A15			
F2	68.712	70.15	1.44	1200Ø PCC	A15	80.0	150	56.5
F5	69.418	70.30	0.88	PPIC	D400			
F1	68.387	70.15	1.76	1200Ø PCC	A15	60.0	150	21.5
F6	68.745	70.15	1.41	1200Ø PCC	A15	60.0	150	9
F7	68.895	70.15	1.26	1200Ø PCC	A15	70.0	150	56.5
F8	69.702	70.30	0.60	PPIC	A15			
F6	68.745	70.15	1.41	1200Ø PCC	A15	60.0	150	56.5
F9	69.687	70.30	0.61	PPIC	A15			

Surface Water Network

Manhole Reference	Invert Level (m)	Cover Level (m)	Depth (m)	Chamber Details	Cover Loading	Grade 1 in	Pipe DIA (mm)	Length (m)
S1	69.500	70.15	0.65	PPIC S/T	A15	80.0	150	8
S2	69.600	70.20	0.60	PPIC	A15			
S3	69.500	70.15	0.65	PPIC S/T	A15	80.0	150	9
S4	69.613	70.25	0.64	PPIC	A15			
S5	69.600	70.25	0.65	PPIC S/T	A15	80.0	150	7
S6	69.688	70.25	0.56	PPIC	A15			
S7	69.500	70.23	0.73	PPIC S/T	D400	80.0	150	9
S9	69.613	70.30	0.69	PPIC	D400			
S8	69.500	70.27	0.77	PPIC S/T	D400	80.0	150	9
S9	69.613	70.30	0.69	PPIC	D400			
S10	69.500	70.20	0.70	PPIC S/T	D400	80.0	150	6
S11	69.575	70.25	0.67	PPIC	D400			

NOTES

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4. This drawing contains coloured lines / information that may not be clear if reproduced in black and white.
5. Digital copies of this plan can only be considered accurate if supplied directly by Infrastruct CS Ltd.

Construction Note
It is essential that new drainage associated with the development is laid from the outfall(s) into the site. This is essential to avoid unforeseen obstructions where encountered (such as services). If the drainage is laid from the site out to the outfall it can result in significant abortive works to relay and overcome such obstructions.

Location of Public Sewers have been taken from record drawings which should be fully substantiated by the contractor prior to commencing works on site

All manholes covers located within carriageways shall have no slip covers to prevent motorcycles/cycles losing control

Manhole schedules - Invert level shown related to the deepest pipe within the chamber

Drainage Key

Sewers

	Foul water drain (private/non adoptable)
	Surface water drain (private/non adoptable)
	Existing foul water sewer (Adopted)

Chamber Key

FW/SW

FW	SW	
mac	mac	Mini access chamber (mac) - 300mmØ
		PPIC - 475mmØ*
		P.C.C. units/brick*
		Manhole Depth: 1.25m to 1.5m* Depth: 1.55m to 3.0m*

* General note
(Refer to standard details & longitudinal sections for chamber sizes. Size may need to increase dependant on number of incoming pipes/size of incoming pipes)

	Soil vent pipe/soil stack
	Silt Trap (ST) with removable silt bucket
S1/F1	Manhole reference number
DU	RWP cellular discharge/collection unit (DU) (Permavoid or similar)
FFL XX.XX	Finished Floor Level (FFL)
	Block paving - permeable
	Flood exceedance routing
	Impermeable barrier to stop lateral movement of water
	Baffle to prevent rapid through flow of water through permeable paving

REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P02	MBD	RJW	Pipe numbering added. Reference to new soakage tests added	17/10/22
P01	RSI	MBD	Initial issue	16/08/22

DRAWING TITLE: Drainage Design

SHEET NO.: 1/1

PROJECT: Oxford Technology Park, Unit 6 (A & B)

CLIENT: SWJ STRUCTURING PROJECTS THROUGH ENGINEERING EXCELLENCE

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SCALE @ A1: 1:200 (0m 5m 10.0m)

ENGINEER	DRAFT	APPROVED
MBD	SNN	RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5052	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP6	ICS	01	XX	DR	C	0200	P02

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Appendix D- Catchment Area Plan

NOTES

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REV	DRAWN	CHECK	REVISION COMMENTS	ISSUE DATE
P01	RSI	MBD	Initial issue	17/10/2022

DRAWING TITLE: Catchment Areas

SHEET NO.: 1/1

PROJECT: Oxford Technology Park, Unit 6 (A & B)

CLIENT: SWJ — STRUCTURING PROJECTS THROUGH ENGINEERING EXCELLENCE

Infrastruct CS Ltd

SCALE @ A1: 1:200 (0m, 5m, 10.0m)

ENGINEER: MBD
DRAFT: SNN
APPROVED: RJW

PROJECT NUMBER	STATUS	ISSUE PURPOSE
5052	S2	INFORMATION

PROJECT	ORIGIN	PHASE	LEVEL	TYPE	ROLE	NO.	REVISION
OTP6	ICS	01	XX	DR	C	0201	P01

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