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PROPOSED NEW DEVELOPMENT AT PAINTWORLD, 1-2 BALLYMOUNT ROAD LOWER, DUBLIN 12

DRAINAGE DESIGN REPORT

Prepared by ONCE, Consulting Engineers

Date: September 2022

DOCUMENT REVIEW SHEET
DOCUMENT NO: ONCE-00-01
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Project Client: Paintworld Limited

Project Title: 1-2 Ballymount Road Lower

Project Number: 5342

Document Title: DRAINAGE PLANNING REPORT

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Project Preparation and Contact Person

27/09/2022

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1. INTRODUCTION

This report has been prepared in reply to the South Dublin County Council additional information request, date of decision 22-Mar-2022, Decision Order No.0366, Register **Reference SD22A/0017** item **4 b,4c&6**.

1.1 DRAINAGE PROPOSALS

- to attenuate all surface run-off into STORMTECH SC-740 attenuation chambers lined with separated geotextile membrane. capacity 13.13m3 flow control to Q bar for 100 year return period
- permeable paving to all private car parking spaces and 50% runoff from all permeable paved areas. A piped link through the permeable paving sub base from the roof water discharge to the main drainage network. This pipe shall be perforated to encourage infiltration of roof water through the sub-base of the permeable paving area
- green roof & hydroplanter

2. EXISTING SITE SERVICES LOCAL AUTHORITY NETWORKS

Referring to South Dublin County Council utility maps, the existing site is serviced as follows:

Surface Sewer
there is an existing 225mm public sewer along Ballymount Road Lower

3. SURFACE WATER DESIGN

The Site Drainage Layout Drawing No. C101 shows the proposed surface water layout. Permeable paving is proposed for the parking spaces and 50% runoff from all permeable paved areas. A piped link through the permeable paving sub base from the roof water discharge to the main drainage network. This pipe shall be perforated to encourage infiltration of roof water through the sub-base of the permeable paving area. All surface run-off is collected and discharges into STORMTECH SC-740 attenuation tank. An overflow outlet is then connected to an manhole fitted with hydrobrake flow control device & penstock valve which then discharges to the existing public surface water.

The surface water design methodology is in accordance with the criteria below:

- The pipe network is designed for a rainfall intensity of 50mm/hr, BS8301 8.8.2 or 1in 2year return period;
- Allowance for 20% Climate change;
- Attenuation storage in accordance with SUDS & GDRCoP for Drainage Works requirements;
- Design for interception of the first 5mm of all rainfall events;
- Designed based on Wallingford method outlined in the CIRIA Report R156 (1996) and SuDS Manual C753

3.1. EXISTING SITE DATA

Average annual rainfall data obtained from Met Eireann for the area is shown in the figure below.

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 311060, Northing: 230897,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.4,	3.6,	4.2,	5.2,	5.9,	6.4,	8.2,	10.2,	11.6,	13.6,	15.4,	16.8,	19.0,	20.7,	22.2,	N/A ,
10 mins	3.4,	5.0,	5.9,	7.2,	8.2,	8.9,	11.4,	14.3,	16.2,	19.0,	21.5,	23.4,	26.5,	28.9,	30.9,	N/A ,
15 mins	4.0,	5.9,	6.9,	8.5,	9.6,	10.5,	13.4,	16.8,	19.0,	22.3,	25.2,	27.5,	31.1,	34.0,	36.4,	N/A ,
30 mins	5.3,	7.7,	9.0,	11.0,	12.3,	13.4,	17.0,	21.1,	23.8,	27.8,	31.3,	34.1,	38.3,	41.7,	44.5,	N/A ,
1 hours	7.0,	10.0,	11.6,	14.1,	15.8,	17.2,	21.5,	26.5,	29.9,	34.6,	38.8,	42.1,	47.2,	51.2,	54.5,	N/A ,
2 hours	9.2,	13.0,	15.1,	18.2,	20.3,	21.9,	27.3,	33.4,	37.4,	43.1,	48.1,	52.1,	58.1,	62.8,	66.7,	N/A ,
3 hours	10.8,	15.2,	17.6,	21.1,	23.5,	25.3,	31.3,	38.2,	42.7,	49.0,	54.6,	58.9,	65.6,	70.8,	75.1,	N/A ,
4 hours	12.2,	17.0,	19.6,	23.4,	26.0,	28.0,	34.6,	42.0,	46.8,	53.6,	59.7,	64.4,	71.6,	77.1,	81.7,	N/A ,
6 hours	14.3,	19.9,	22.8,	27.2,	30.1,	32.4,	39.7,	48.0,	53.4,	61.0,	67.7,	72.9,	80.8,	86.9,	92.0,	N/A ,
9 hours	16.9,	23.2,	26.5,	31.5,	34.8,	37.4,	45.6,	54.9,	60.9,	69.3,	76.8,	82.5,	91.3,	98.0,	103.6,	N/A ,
12 hours	18.9,	25.9,	29.5,	35.0,	38.6,	41.4,	50.4,	60.4,	66.9,	76.0,	83.9,	90.1,	99.5,	106.7,	112.7,	N/A ,
18 hours	22.3,	30.2,	34.4,	40.5,	44.6,	47.7,	57.8,	69.0,	76.3,	86.4,	95.2,	102.0,	112.3,	120.3,	126.8,	N/A ,
24 hours	25.0,	33.8,	38.3,	45.0,	49.5,	52.9,	63.8,	75.9,	83.7,	94.6,	104.1,	111.4,	122.5,	131.0,	138.0,	162.1,
2 days	31.1,	41.0,	46.1,	53.5,	58.4,	62.1,	74.0,	86.9,	95.1,	106.5,	116.4,	123.9,	135.3,	144.0,	151.1,	175.4,
3 days	36.0,	46.9,	52.4,	60.4,	65.6,	69.6,	82.2,	95.8,	104.5,	116.4,	126.6,	134.4,	146.2,	155.1,	162.4,	187.3,
4 days	40.3,	51.9,	57.9,	66.4,	71.9,	76.1,	89.4,	103.6,	112.7,	125.0,	135.6,	143.6,	155.8,	164.9,	172.4,	197.8,
6 days	47.7,	60.8,	67.4,	76.7,	82.8,	87.4,	101.8,	117.1,	126.8,	139.9,	151.2,	159.7,	172.4,	182.1,	189.9,	216.4,
8 days	54.3,	68.6,	75.7,	85.8,	92.3,	97.2,	112.6,	128.9,	139.1,	152.9,	164.7,	173.6,	187.0,	197.0,	205.1,	232.6,
10 days	60.4,	75.7,	83.2,	94.0,	100.9,	106.1,	122.3,	139.4,	150.2,	164.6,	177.0,	186.2,	200.1,	210.5,	218.9,	247.2,
12 days	66.0,	82.3,	90.3,	101.6,	108.9,	114.4,	131.4,	149.2,	160.4,	175.4,	188.2,	197.8,	212.1,	222.8,	231.5,	260.7,
16 days	76.5,	94.4,	103.2,	115.6,	123.5,	129.5,	147.8,	167.0,	179.0,	195.0,	208.7,	218.8,	234.0,	245.3,	254.5,	285.1,
20 days	86.1,	105.5,	115.0,	128.4,	136.9,	143.2,	162.8,	183.2,	195.9,	212.8,	227.1,	237.8,	253.7,	265.6,	275.2,	307.1,
25 days	97.4,	118.5,	128.8,	143.2,	152.3,	159.1,	180.1,	201.8,	215.3,	233.2,	248.3,	259.6,	276.3,	288.8,	298.8,	332.3,

NOTES:
N/A Data not available
These values are derived from a Depth Duration Frequency (DDF) Model
For details refer to:
'Fitzgerald D. L. (2007), Estimates of Point Rainfall Frequencies, Technical Note No. 61, Met Eireann, Dublin',
Available for download at www.met.ie/climate/dataproducts/Estimation-of-Point-Rainfall-Frequencies_TN61.pdf

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	Section	Qbar Calculation			Sheet No	
CALCULATION SHEET	Calcs by	Date	Chkd by	Date	DWG No	Calc. Rev
	AA	27/09/2022	TON			

1. SITE DETAILS

Site Area (m2):	464	m2	
Public open space	94	m2	Not draining to system
Site Area (HA):	0.037	HA	Site area minus POS
SAAR (mm):	700	mm	*Source: www.met.ie/climate/services*
Soil Type:	2	-	*Reference: Flood Studies Report (NERC,1975)*
SPR:	0.3	-	*Reference: Flood Studies Report (NERC,1975)*

2. IH124 METHOD (WALLINGFORD)

Is Qbar < 50 HA? Yes — Use Method 1 Below

1. QBAR BASED ON AREA RATIO (AREA<50 HA)

Area Ratio:	0.0007		
Qbar (50 HA):	0.0911	m3/s	*Calculation: Qbar=0.00108*((0.01*Site Area)^0.89)*(SAAR^1.17)*SPR^2.17*
Qbar (Actual):	0.0001	m3/s	*Calculation: Qbar(50HA)*Area Ratio*
Qbar (Actual):	0.0674	l/s	*Calculation: Qbar Actual (m3/s)*1000*

2. QBAR ON FULL AREA (AREA > 50HA)

Qbar:	0.0001	m3/s	*Calculation: Qbar=0.00108*((0.01*Site Area)^0.89)*(SAAR^1.17)*SPR^2.17*
Qbar:	0.1490	l/s	*Calculation: Qbar Actual (m3/s)*1000*

Applicable Qbar	0.0674	l/s	*Source: Based on applicable method above*

3. GROWTH REDUCTION CURVE

Method 1 (AREA<50HA)

Return Period	Factor	Qbar	Unit	
10 Years	1.7	0.11	l/s	*Calculation: Applicable Qbar*Factor*
30 Years	2.13	0.14	l/s	*Calculation: Applicable Qbar*Factor*
100 Years	2.61	0.18	l/s	*Calculation: Applicable Qbar*Factor*
200 Years	2.86	0.19	l/s	*Calculation: Applicable Qbar*Factor*

Method 2 (AREA>50 HA)

Return Period	Factor	Qbar	Unit	
10 Years	1.7	0.25	l/s	*Calculation: Applicable Qbar*Factor*
30 Years	2.13	0.32	l/s	*Calculation: Applicable Qbar*Factor*
100 Years	2.61	0.39	l/s	*Calculation: Applicable Qbar*Factor*
200 Years	2.86	0.43	l/s	*Calculation: Applicable Qbar*Factor*

Qbar was calculated in accordance with the Wallingford Method for the existing site:

Site Area = 0.0464 ha

Qbar = 0.674 l/s

3.2. SURFACE WATER PIPE NETWORK DESIGN

The system is designed in accordance with BS8301: 1985 British Standard Code of Practice for Building Drainage. Two methods are compared with the greater used for the design.

METHOD 1 - BS8301 8.8.3 (Wallingford Rational Method)

Impermeable area drained to surface water sewer is 300 m2 from roof runoff.

Time of concentration = time of entry + (length of drain / full bore velocity of flow)

BS8301 8.8.4 (c)

Time of entry for a two-year return period is 4 to 7 mins

For a flat catchments we take the longer time of 7 mins = 420 s

Taking an average velocity = 0.75m/s

Total length of drain picking up the development catchment = 50m approx

t = 420 + (50 / 0.75) = 487s t = 8 mins

Referring to published Met office rainfall depth data table on the previous page:

Closest data is for storm duration of 10 mins with a two-year return period,

Rainfall = 5.7mm per 10min period = 34.2 mm per hour

Q=Ap x i x Cv x Cr x 2.78 (area drained by section of network 3000m2)

Q= (3000/10000) x 34.2 x 1.3 x .8 x 2.78

Q= 3 l/s

METHOD 2 - BS8301 8.8.2 design for rainfall intensity of 50mm/hr

Outfall Flow = [(300x50/1000) / (60x60)] x1000 = 4.2 l/s

The surface water pipe network is therefore designed to cater for an outfall of 4.2 l/s, per the requirements of BS8301.

The proposed surface water network utilises 150 mm uPVC pipes at a minimum fall of 1:150. The capacity of which based on a roughness value of Ks=0.6mm at full bore is 22 l/s

3.3. ATTENUATION DESIGN

The storage volume is determined in accordance with Wallingford method based on correlations between storage requirements and hydrological and hydraulic characteristics of the site (ww.uksuds.com).

The calculated volume based on the IH124 method that follows is 9.7m3 at the minimum 2 l/s acceptance rate into the Public Sewer.

Surface run-off attenuates into STORMTECH SC-740 attenuation chambers lined with separated geotextile membrane. capacity 13.13m3 flow control to Q bar for 100 year return period

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System Volume and Bed Size

Installed Storage Volume:	13.13 cubic meters.
Storage Volume Per Chamber:	1.30 cubic meters.
Number of Chambers Required:	4
Number of End Caps Required:	4
Chamber Rows:	2
Maximum Length:	6.64 m.
Maximum Width:	3.54 m.
Approx. Bed Size Required:	23.46 square meters.

System Components

Amount Of Stone Required: 20 cubic meters

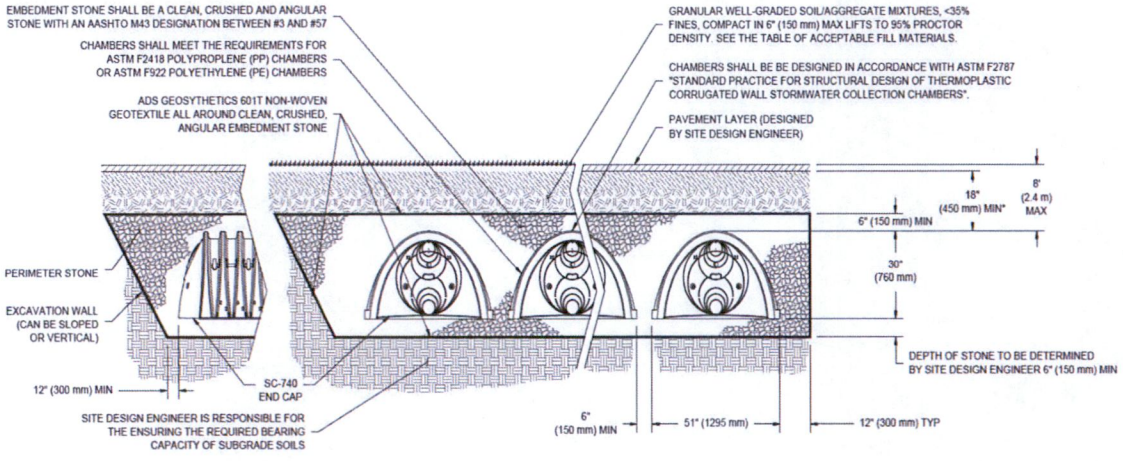
Volume of Excavation (Not Including 33 cubic meters
Fill):

Total Non-woven Geotextile Required:99 square meters

Woven Geotextile Required (excluding 7 square meters **Isolator Row):**

Woven Geotextile Required (Isolator 9 square meters **Row):**

Total Woven Geotextile Required: 19 square meters



*MINIMUM COVER TO BOTTOM OF FLEXIBLE PAVEMENT. FOR UNPAVED INSTALLATIONS WHERE RUTTING FROM VEHICLES MAY OCCUR, INCREASE COVER TO 24" (600 mm).

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						5342	
	Section		Attenuation Volume			Sheet No	
CALCULATION SHEET	Calcs by		Date	Chkd by	Date	DWG No.	Calc. Rev
	AA		27/09/2022	TON			

1. SITE DETAILS

Site Area (m2):	464	m2	
Public Open Space	94		
Site Area (HA):	0.037	HA	
SAAR (mm):	700	mm	*Source: www.met.ie/climate/services*
Soil Type:	2	-	*Reference: Flood Studies Report (NERC,1975)*
SPR:	0.3	-	*Reference: Flood Studies Report (NERC,1975)*

2. RUN-OFF AREAS

Surface Run-off zones (m2)	Area (m2)	Coefficient of	Effective Area (m2)
Impermeable Area	370	1	370.00
Landscaping and or green area	0	0.8	0.00
Partially permeable area	0	0.3	0.00
		Total Area	370.00

Use Qbar from Method 1 (Area<50 HA) or Method 2 (Area>50 HA)?	Method 1	
Qbar	0.07	l/s
Minimum flow rate	2.00	l/s
Interception rainfall depth	5.00	mm
Climate Change allowance	20	%

30 YEAR RETURN PERIOD

Time	Mins	Secs	Max Rainfall for 30 Year Storm (m)	Climate change Factored rainfall (m)	Area (m2)	Flow (l/s)	Volume (m3)	QBAR vol.(m3)	Attenuation volume required (m3)
5 min	5	300	0.0116	0.01392	370	11.00	3.30	0.60	2.70
10 min	10	600	0.0162	0.01944	370	8.90	5.34	1.20	4.14
15 min	15	900	0.019	0.0228	370	7.32	6.59	1.80	4.79
30 min	30	1800	0.0238	0.02856	370	4.84	8.72	3.60	5.12
60 min	60	3600	0.0299	0.03588	370	3.17	11.43	7.20	4.23
2 hour	120	7200	0.0374	0.04488	370	2.05	14.76	14.40	0.36
3 hour	180	10800	0.0427	0.05124	370	1.58	17.11	21.60	-4.49
4 hour	240	14400	0.0468	0.05616	370	1.31	18.93	28.80	-9.87
6 hour	360	21600	0.0534	0.06408	370	1.01	21.86	43.20	-21.34
9 hour	540	32400	0.0609	0.07308	370	0.78	25.19	64.80	-39.61
12 hour	720	43200	0.0669	0.08028	370	0.64	27.85	86.40	-58.55
18 hour	1080	64800	0.0763	0.09156	370	0.49	32.03	129.60	-97.57
24 hour	1440	86400	0.0837	0.10044	370	0.41	35.31	172.80	-137.49
48 hour	2880	172800	0.0951	0.11412	370	0.23	40.37	345.60	-305.23

100 YEAR RETURN PERIOD

Time	Mins	Secs	Max Rainfall for 100 Year Storm (m)	Climate change Factored rainfall (m)	Area (m2)	Flow (l/s)	Volume (m3)	QBAR vol.(m3)	Attenuation volume required (m3)
5 min	5	300	0.0168	0.02016	370	18.70	5.61	0.60	5.01
10 min	10	600	0.0234	0.02808	370	14.23	8.54	1.20	7.34
15 min	15	900	0.0275	0.033	370	11.51	10.36	1.80	8.56
30 min	30	1800	0.0341	0.04092	370	7.38	13.29	3.60	9.69
60 min	60	3600	0.0421	0.05052	370	4.68	16.84	7.20	9.64
2 hour	120	7200	0.0521	0.06252	370	2.96	21.28	14.40	6.88
3 hour	180	10800	0.0589	0.07068	370	2.25	24.30	21.60	2.70
4 hour	240	14400	0.0644	0.07728	370	1.86	26.74	28.80	-2.06
6 hour	360	21600	0.0729	0.08748	370	1.41	30.52	43.20	-12.68
9 hour	540	32400	0.0825	0.099	370	1.07	34.78	64.80	-30.02
12 hour	720	43200	0.0901	0.10812	370	0.88	38.15	86.40	-48.25
18 hour	1080	64800	0.102	0.1224	370	0.67	43.44	129.60	-86.16
24 hour	1440	86400	0.1114	0.13368	370	0.55	47.61	172.80	-125.19
48 hour	2880	172800	0.1239	0.14868	370	0.31	53.16	345.60	-292.44

Design Attenuation Volume	9.7	m3

Version 1.1 (28/03/2022)

3.4. PERMEABLE PAVING

Porous paving is proposed for the parking.

All surface run-off from the roof zones will enter the sump in the coarse graded aggregate layer through a perforated pipe. A perforated outlet pipe is provided should overflow conditions occur which discharges to Public Surface water network.

Vehicle access is required including emergency vehicles, therefore load category B was chosen. The proposed build-up is described below:

1. TOBERMORE HYDROPAVE 200x100x80mm
2. 50mm Thickness of 6.3-2mm grit to BS EN13242:2002
3. 350MM Thickness 4/20mm coarse graded aggregate to BS en 13242:2002
4. Impermeable to BS 7533 Part 13

3.5. Green roof &GREEN BLUE URBAN HYDROPLANTER SuDS

Proposed GREEN BLUE URBAN hydroplanter SuDS system or similar approved,overflow runoff to be drained towards adjacent attenuation tank.

Green roof can provide benefits in terms of reducing peak flow rates