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DRAINAGE SCHEME DESIGN

LAND TO REAR OF NEWBOLD TYRES, ROCHDALE, OL16 5AS

HME
CIVIL ENGINEERING
CONSULTANTS

STRUCTURAL | ENVIRONMENTAL | GEOTECHNICAL



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Client:

ATIQ ISHTIAQ

22 Fletton Close, Rochdale, OL12 6BF

Site visit date and time:

3rd December 2024.

Revision:

00 First Revision

Document Approved by:



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1. Introduction

Mr Atiq Ishtiaq has appointed HME Civil Engineering to design a drainage scheme for the proposed MOT and valeting building (reference 21.2552.1) on the land to the rear of Newbold Tyres, Rochdale, OL16 5AS.

This report outlines the findings from site visits, site testing and desktop survey along with a proposed drainage design for the development.

The purpose of this design to discharge of the surface water runoff, created by the development, in line with the latest standards and regulations.



Figure 1 Site Location (Land to the rear of Newbold Tyres)

2. Infiltration Testing

On the 3rd December 2024 HME Civil Engineering Consultants undertook infiltration testing on the site, to determine the suitability of the existing sites strata for soakaway discharges, including permeability.

The field investigations are required to confirm and determine infiltration rates. The procedure followed was to excavate 2nr soakage trial pit to the same depth as anticipated in the full-size soakaway. For run-off from 100 m², such as the Newbold Tyres site, the pits were dug to 1m below the invert level of the drain discharging to the soakaway.

Overall depths of excavation were 1.5 m The soakage trial pits were at least 1.5m long and 0.3 m wide. Both trial pits had vertical sides trimmed square and there was no requirement for granular material to be used in these tests.

Measurements of the soakage trial pit were carefully taken before trials. For safety reasons HME Civil Engineering Consultants did not enter the soakage trial pit. The inflow was as rapid as could be achievable for the site, and filled as near to the design invert level of the drain as possible to effectively test the permeability of the ground.

HME took care to ensure that the inflow did not cause the walls of the soakage trial pit to collapse.

HME filled the soakage trial pits and allowed them to drain three times to near empty. Each time recording the water level in 50mm intervals, which was determined as sufficiently close to clearly define water level versus time. The filling of the soakage trial pits were on the same days.

Prior to testing, the pits were well soaked and saturated by HME Civil Engineering Consultants.

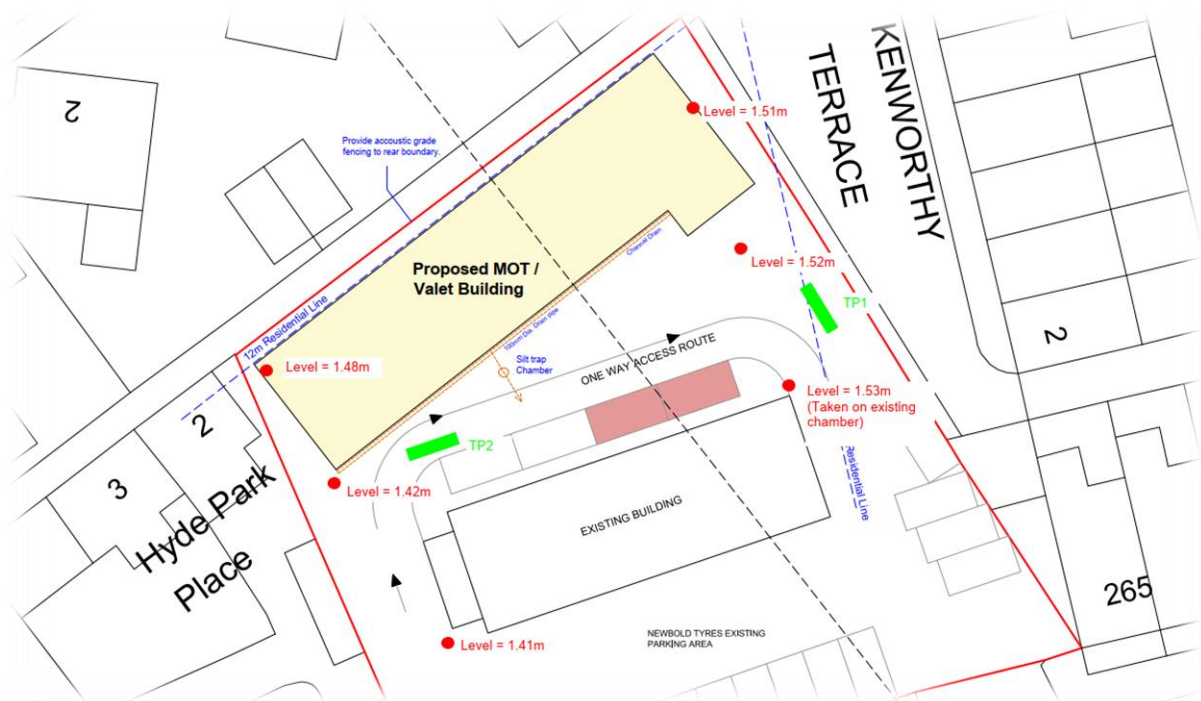


Figure 2 Trial Pit Location Plan

HME Civil Engineering Limited – Drainage Design

2.1. Test Results

Two trial pits were dug using a tracked excavator, to enable infiltration testing. Both pits were dug and filled a minimum of three times each, on the same day. TP1 and TP2 images pre-sent and during test below.

Trial Pit 1 photos: 300W x 1600L x1500D	Trial Pit 2 photos: 300W x 1500L x1500D
 A vertical view into Trial Pit 1 showing a measuring tape on the left side of the pit. The pit is filled with water, and the water level is visible. The soil walls are dark and moist.	 A vertical view into Trial Pit 2 showing a measuring tape on the right side of the pit. The pit is filled with water, and the water level is visible. The soil walls are dark and moist.
 A wide view of Trial Pit 1 before the test. The pit is dug into a gravel surface. A measuring tape is visible on the left side of the pit. The background shows a residential area with houses and a blue sky.	 A wide view of Trial Pit 2 before the test. The pit is marked with a yellow rectangle on the ground. A measuring tape is visible on the left side of the pit. The background shows a residential area with houses and a blue sky.

2.1.1. Trial Pit 1

See below test results showing depth below ground and the time, for trial pit 1. The worst case results, highlighted in **Red**, are to be used for calculation purposes.

Location	Test pit size	Test number	Depth below ground	Time
Test Pit 1	300W x 1600L x1500D	1	1000	0m 0s
			1050	8m 20s
			1100	16m 50s
			1150	25m 20s
			1200	35m 10s
			1250	48m 4s
			1300	1hr 7m
			1350	1hr 27m
			1400	1hr 59m
			1450	2hr 22m
			1500	N/A
Test Pit 1	300W x 1600L x1500D	2	1000	0m 0s
			1050	10m 30s
			1100	22m 12s
			1150	42m 45s
			1200	1hr 2m
			1250	1hr 24m
			1300	1hr 48m
			1350	2hr 15m
			1400	2hr 45m
			1450	3hr
			1500	N/A
Test Pit 1	300W x 1600L x1500D	3	1000	0m 0s
			1050	11m 20s
			1100	26m 10s
			1150	45m 30s
			1200	1hr 15m
			1250	1hr 36m
			1300	1hr 59m
			1350	2hr 30m
			1400	2hr 55m
			1450	3hr 20m
			1500	N/A

2.1.2. Trial Pit 2

See below test results showing depth below ground and the time, for trial pit 2. The worst case results, highlighted in **Red**, are to be used for calculation purposes.

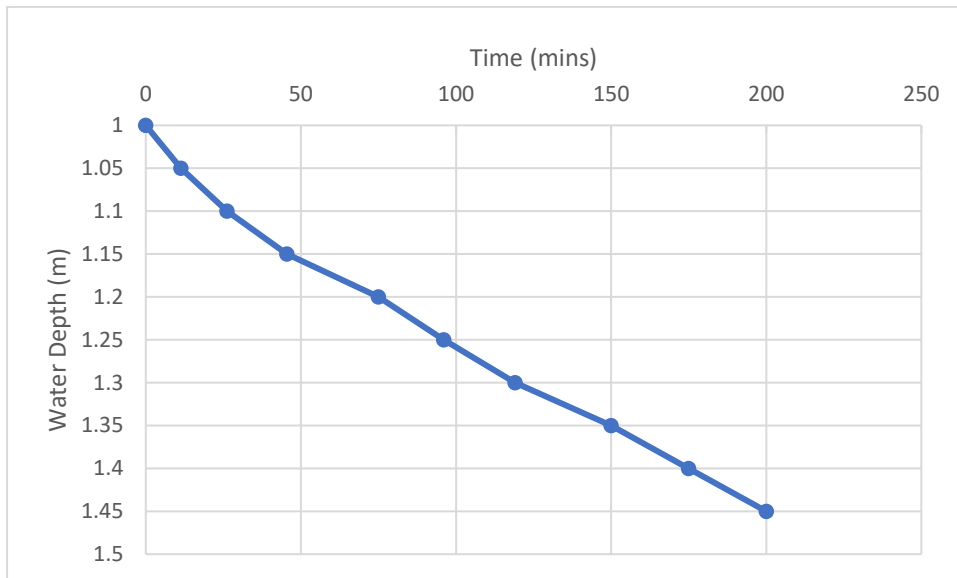
Location	Test pit size	Test number	Depth below ground	Time
Test Pit 2	300W x 1500L x1500D	1	1000	0m 0s
			1050	3m 11s
			1100	7m 12s
			1150	11m 44s
			1200	17m 32s
			1250	23m 54s
			1300	30m 33s
			1350	37m 29s
			1400	44m 10s
			1450	52m 5s
			1500	1hr 0m 30s
Test Pit 2	300W x 1500L x1500D	2	1000	0m 0s
			1050	4m 12s
			1100	8m 50s
			1150	13m 55s
			1200	19m 31s
			1250	27m 15s
			1300	35m 48s
			1350	44m 50s
			1400	52m 10s
			1450	1hr 10m 3s
			1500	N/A
Test Pit 2	300W x 1500L x1500D	3	1000	0m 0s
			1050	8m 40s
			1100	18m 50s
			1150	30m 45s
			1200	43m 10s
			1250	57m 30s
			1300	1hr 11m 40s
			1350	1hr 25m 55s
			1400	1hr 38m 38s
			1450	1hr 53m
			1500	N/A

3. Calculation of Infiltration Rate

To enable the soakaway to be located 5m from the edge of a building only the results from test pit 2 have been analysed. The equation from BRE Digest 365 is used to calculate the infiltration rate.

$$f = \frac{V_{P75-25}}{a_{s50} \times t_{P75-25}}$$

The infiltration rate was calculated using the slowest emptying time from the tests. The depth and time are shown in the graph below.



$$V_{P75-25} = 0.1125\text{m}^3$$

$$a_{s50} = 1.35\text{m}^2$$

$$t_{P75-25} = 126.7 \text{ mins (extracted from the graph above)}$$

Entering these numbers in the equation results in an infiltration rate of 0.000658 m/min which has been used in the drainage design calculations.

4. Drainage Design

From Environment Agency information the hydrology in the area of the development is classified as a Secondary A Aquifer which comprises of permeable layers that can be an important source of base flows to rivers.

A soakaway design was carried out and simulated to allow the discharge of the surface water from the scheme. The design principles from BRE Digest 365 were followed. The design proposal is shown on drawings contained in appendices to this report.

The proposal is to simply collect the surface water by a linear drainage channel then discharge via a proprietary sump unit to a catchpit. The catchpit will be constructed as per the details in Highway Construction Detail F11. The sump on this catchpit will enable any silt to be collected and provide an easily accessible point for future maintenance.

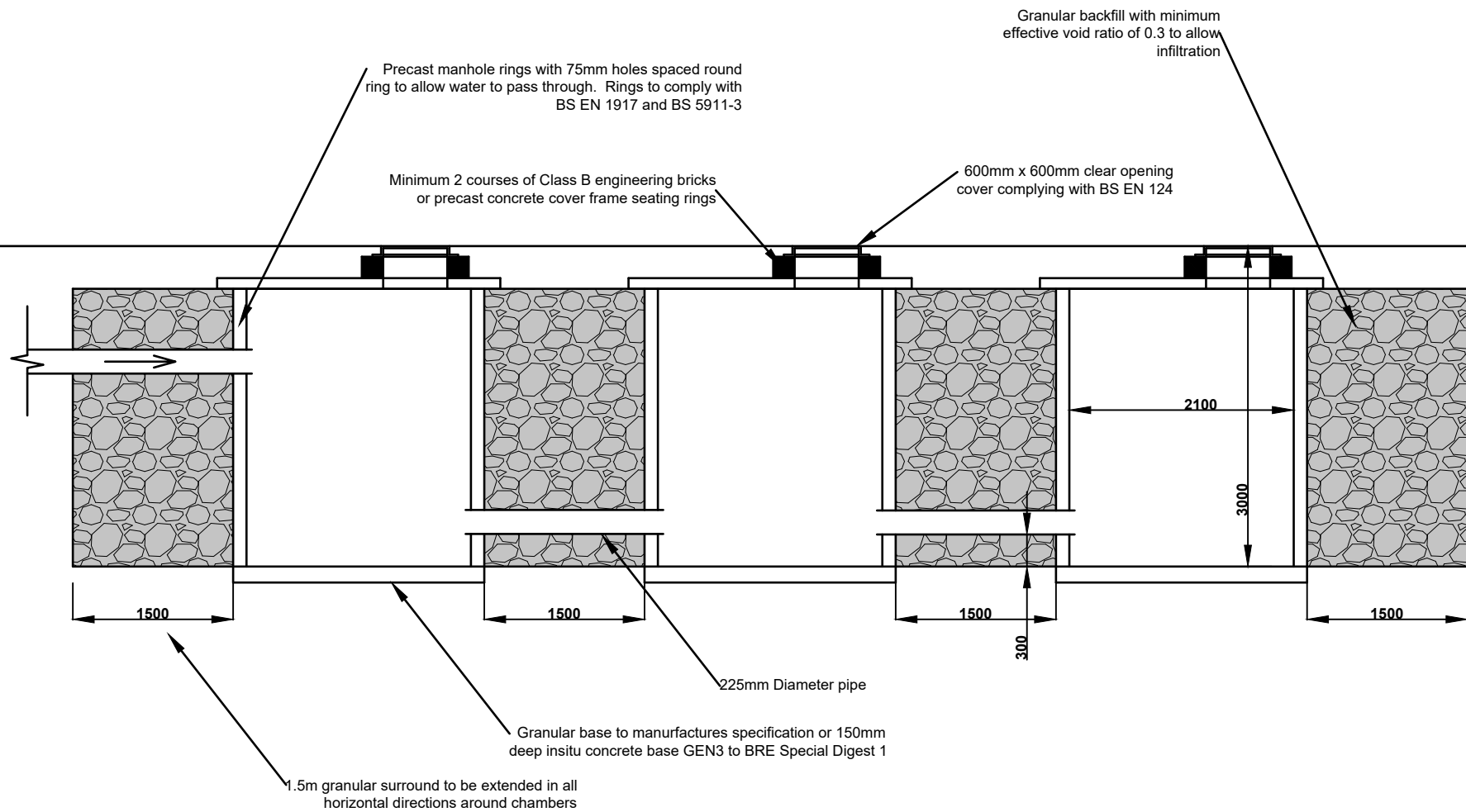
This catchpit will then connect to 3 soakaway chambers. These will be formed from perforated manhole rings the detail of which is shown on a detail drawing.

All pipes shall be twin wall HDPE backfilled with single sized pipe bedding to the requirements of both the manufacturer and Sewers for Adoption.

The design was simulated using MicroDrainage to ensure that it would function for a 100-year return period storm with a 30% allowance made for climate change with no flooding. The output of the drainage simulation is also included in appendices to this report.

5. Appendix A – Proposed Drainage General Arrangement Drawing

6. Appendix B – Proposed Soakaway Detail



Soakaway Detail

7. Appendix C – MicroDrainage Calculations



STORM SEWER DESIGN by the Modified Rational Method

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	10.422	0.069	150.0	0.073	3.00	0.0	0.600	o	225	Pipe/Conduit	
S1.001	3.589	0.279	12.8	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	3.16	8.875	0.073	0.0	0.0	3.0	1.07	42.4	12.9
S1.001	50.00	3.18	8.806	0.073	0.0	0.0	3.0	3.67	146.0	12.9

		Page 2																				
																						
Innovyze	Network 2020.1.3																					
<u>Storage Structures for Storm</u> <u>Lined Soakaway Manhole: S2, DS/PN: S1.001</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Ring Diameter (m)</td><td>2.10</td></tr><tr><td>Infiltration Coefficient Side (m/hr)</td><td>0.03948</td><td>Pit Multiplier</td><td>1.5</td></tr><tr><td>Safety Factor</td><td>2.0</td><td>Number Required</td><td>3</td></tr><tr><td>Porosity</td><td>0.30</td><td>Cap Volume Depth (m)</td><td>0.000</td></tr><tr><td>Invert Level (m)</td><td>7.000</td><td>Cap Infiltration Depth (m)</td><td>0.000</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Ring Diameter (m)	2.10	Infiltration Coefficient Side (m/hr)	0.03948	Pit Multiplier	1.5	Safety Factor	2.0	Number Required	3	Porosity	0.30	Cap Volume Depth (m)	0.000	Invert Level (m)	7.000	Cap Infiltration Depth (m)	0.000
Infiltration Coefficient Base (m/hr)	0.00000	Ring Diameter (m)	2.10																			
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Invert Level (m)	7.000	Cap Infiltration Depth (m)	0.000																			
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Innovyze

Network 2020.1.3

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.293
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

```
Margin for Flood Risk Warning (mm) 300.0      DVD Status OFF
      Analysis Timestep      Fine Inertia Status OFF
      DTS Status      ON
```

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	30, 30, 30

									Water
	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Level
PN	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	(m)
S1.000	S1 1440	Winter	30	+30%	30/480	Winter			9.342
S1.001	S2 1440	Winter	30	+30%	30/360	Winter			9.341

PN	US/MH	Surcharged	Flooded			Half Drain	Pipe	Status	Level Exceeded
	Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)		
S1.000	S1	0.242	0.000	0.05			1.8	SURCHARGED	
S1.001	S2	0.310	0.000	0.00		1296	0.0	SURCHARGED	

Network 2020.1.3

Simulation Criteria

Number of Input Hydrographs	0	Number of Storage Structures	1
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

```
Margin for Flood Risk Warning (mm) 300.0      DVD Status OFF
      Analysis Timestep      Fine Inertia Status OFF
      DTS Status      ON
```

									Water
PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Level (m)
S1.000	S1 1440	Winter	100	+30%	30/480	Winter			9.877
S1.001	S2 1440	Winter	100	+30%	30/360	Winter			9.876

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