

Read Construction
**Gwersyllt Community
Primary School**
Drainage Strategy

DS 10013-002

Issue 2

June 2018



Regus House,
Chester Business Park,
CH4 9QR

Email: info@jpstructural.co.uk

Document History

Job Number: - 10013		Document Reference: DS-10013-002		
2	Soakaway calculation updated to reflect 1/100 event + 20% C.C	CN	JP	04.06.2019
1	Discharge of planning conditions	CN	JP	30.04.2019
Revision	Purpose Description	Originated	Authorised	Date

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Introduction

1.1 Location

Gwersyllt Primary School,
Dodd's Lane,
Gwersyllt,
Wrexham,
LL11 4NT

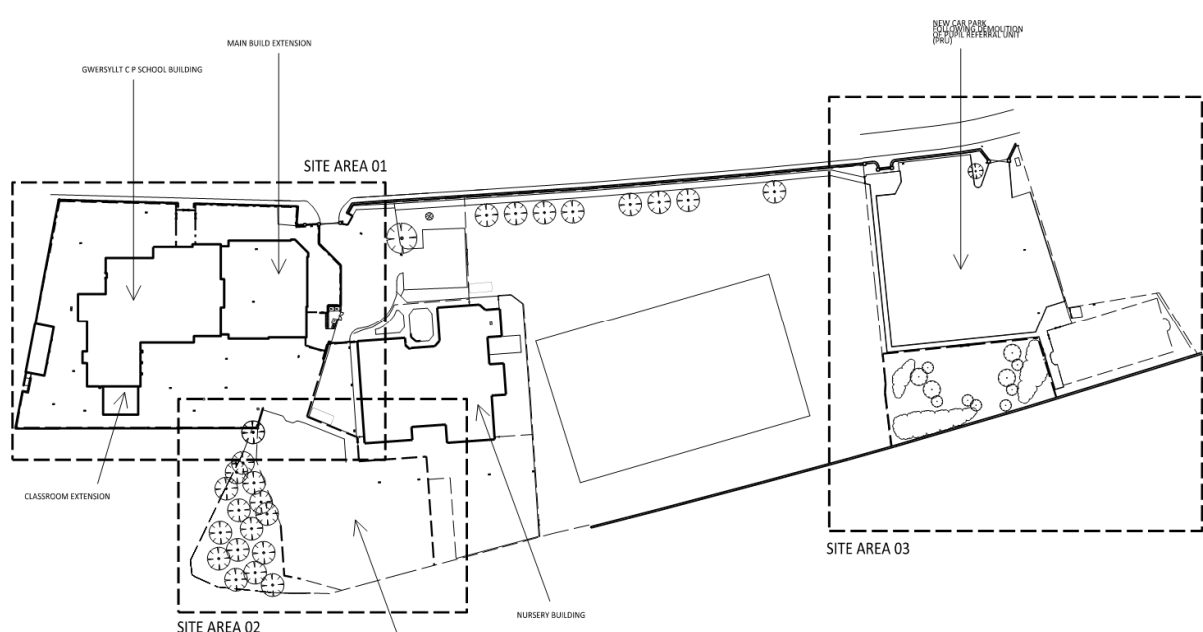
1.2 The Proposed Works

Extension and internal alteration works are proposed for an existing primary school.

The proposed works comprise two single-storey extensions to the existing structure. One extension to the west of the existing building and the second extension to the east as per the submitted architectural plans. Proposed works also include the creation of additional hardstanding MUGA play area and the creation of a car park in the place of an existing pupil referral unit.

This report considers the drainage strategy for the new car park to be formed on the site of an existing building with associated hardstanding.

1.3 roposed Arrangement



Site Key Plan

The Proposed Drainage Strategies

Site Area 3: Car Park

Existing Surface Water Drainage

The existing surface water from the existing building and car park is collected via gulleys and discharged to the sewer located within Rhosrobin Road.

Proposed Surface Water Drainage

The existing building is to be demolished and replaced with additional car park hardstanding. The net impermeable area is not increasing however as the site currently discharges to a combined sewer located in Rhosrhobin Road, it is the intention to capture the surface water run-off and infiltrate on site.

Soakaway tests were undertaken in the existing car park in accordance with BRE digest 365 to determine the infiltration rate. Results are presented in appendix A. From the three tests undertaken, the lowest infiltration rate recorded was 3.79×10^{-5} . This rate was used to size the soakaway on the basis of a 1/100 year storm event with 20% increase for climate change. The storage was calculated on the basis of geocellular crates with a void ratio of 95%.

Existing Foul Water Drainage

The existing foul water from the existing building appears to be connected into the combined system on site and discharges to the sewer located in Rhosrobin Road.

Proposed Foul Water Drainage

As the existing building is to be demolished and replaced with car parking, there will be no foul discharge from site. All existing foul runs will be grubbed up.

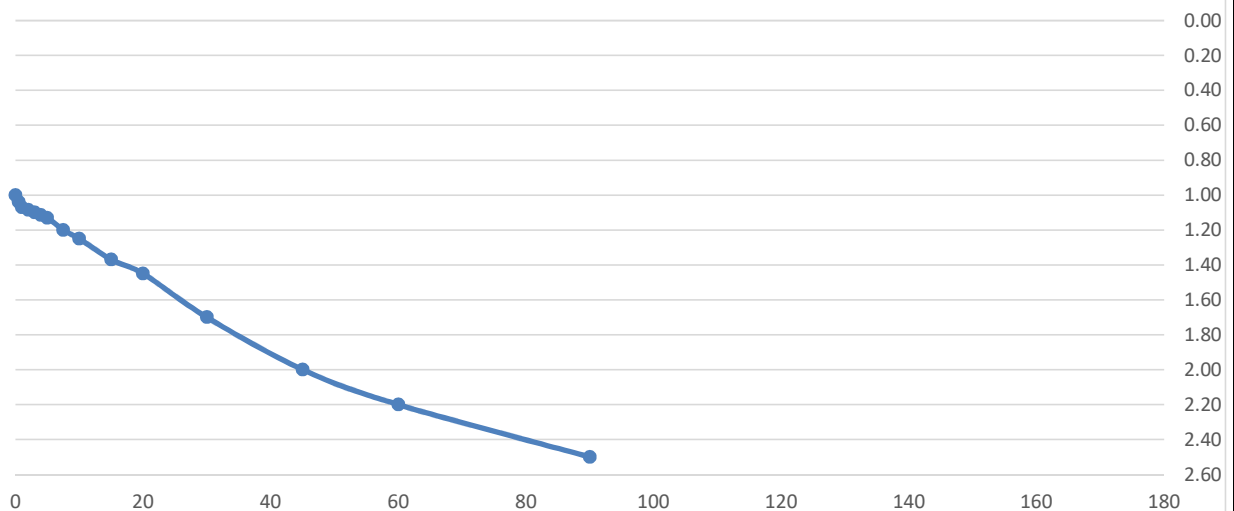
Appendix A: Infiltration results for Car Park

CALCULATION OF INFILTRATION RATE IN ACCORDANCE WITH BRE DG 365: 2016																																							
Client:	Read Construction																																						
Site:	Gwersyllt Primary School - Car Park on site of former PRU																																						
Job No:	10011	Test No:	TEST I																																				
Date	24.04.2019	Weather:	Dry																																				
INPUT DATA AND CALCULATION																																							
Time (min)	Depth (m)	Size of Trial Pit	Length (m) =	1.00																																			
0	1.00		Width (m) =	0.60																																			
0.5	1.03		Depth (m) =	2.50																																			
1	1.06																																						
2	1.10	Depth to water at start of test (m) =		1.00																																			
3	1.12	Depth to water at end of test (m) =		2.50																																			
4	1.14	Depth to water at 75% level (m) =		1.38																																			
5	1.16	Depth to water at 50% level (m) =		1.75																																			
7.5	1.21	Depth to water at 25% level (m) =		2.13																																			
10	1.30																																						
15	1.42	Base area of pit (m ²) =		0.60																																			
20	1.51	Effective area of loss a_{50} (m ²) =		3.00																																			
30	1.80	$V_{P75} - V_{P25}$ (m ³) =		0.45																																			
45	2.00																																						
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90	2.30																																						
120	2.50																																						
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180																																							
240																																							
300		Soil infiltration rate, f , (m/s) =		4.90E-05																																			
360																																							
420		Tested by:	JP	Date:	24.04.2019																																		
480		Checked by:	MM	Date:	24.04.2019																																		
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<table border="1"> <caption>Data points for Infiltration Graph</caption> <thead> <tr> <th>Time (min)</th> <th>Depth (m)</th> </tr> </thead> <tbody> <tr><td>0</td><td>1.00</td></tr> <tr><td>0.5</td><td>1.03</td></tr> <tr><td>1</td><td>1.06</td></tr> <tr><td>2</td><td>1.10</td></tr> <tr><td>3</td><td>1.12</td></tr> <tr><td>4</td><td>1.14</td></tr> <tr><td>5</td><td>1.16</td></tr> <tr><td>7.5</td><td>1.21</td></tr> <tr><td>10</td><td>1.30</td></tr> <tr><td>15</td><td>1.42</td></tr> <tr><td>20</td><td>1.51</td></tr> <tr><td>30</td><td>1.80</td></tr> <tr><td>45</td><td>2.00</td></tr> <tr><td>60</td><td>2.12</td></tr> <tr><td>90</td><td>2.30</td></tr> <tr><td>120</td><td>2.50</td></tr> </tbody> </table>						Time (min)	Depth (m)	0	1.00	0.5	1.03	1	1.06	2	1.10	3	1.12	4	1.14	5	1.16	7.5	1.21	10	1.30	15	1.42	20	1.51	30	1.80	45	2.00	60	2.12	90	2.30	120	2.50
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CALCULATION OF INFILTRATION RATE IN ACCORDANCE WITH BRE DG 365: 2016

Client:	Read Construction		
Site:	Gwersyllt Primary School - Car Park on site of former PRU		
Job No:	10011	Test No:	TEST I
Date	24.04.2019	Weather:	Dry
INPUT DATA AND CALCULATION			
Time (min)	Depth (m)	Size of Trial Pit	Length (m) = 1.00
0	1.00		Width (m) = 0.60
0.5	1.04		Depth (m) = 2.50
1	1.07		
2	1.09	Depth to water at start of test (m) = 1.00	
3	1.10	Depth to water at end of test (m) = 2.50	
4	1.12	Depth to water at 75% level (m) = 1.38	
5	1.13	Depth to water at 50% level (m) = 1.75	
7.5	1.20	Depth to water at 25% level (m) = 2.13	
10	1.25		
15	1.37	Base area of pit (m ²) = 0.60	
20	1.45	Effective area of loss a_{50} (m ²) = 3.00	
30	1.70	$V_{P75} - V_{P25}$ (m ³) = 0.45	
45	2.00		
60	2.20		
90	2.50		
120			
150			
180			
240			
300			
360			
420			
480			
		Soil infiltration rate, f, (m/s) =	6.25E-05
		Tested by:	JP
		Date:	24.04.2019
		Checked by:	MM
		Date:	24.04.2019

Infiltration



Notes

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90	2.20	From the graph:																																							
120	2.30	t_{p75} (min) =		12																																					
150	2.40	t_{p25} (min) =		78																																					
180		t_{lg} (min) =		66																																					
240																																									
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Appendix B: Infiltration / Soakaway Design to BRE 365

SOAKAWAY DESIGN

In accordance with BRE Digest 365 - Soakaway design

Design rainfall intensity

Location of catchment area	Other
Impermeable area drained to the system	A = 1840.0 m ²
Return period	Period = 100 yr
Ratio 60 min to 2 day rainfall of 5 yr return period	r = 0.400
5-year return period rainfall of 60 minutes duration	M5_60min = 19.0 mm
Increase of rainfall intensity due to global warming	p _{climate} = 20 %

Soakaway / infiltration trench details

Soakaway type	Rectangular
Minimum depth of pit (below incoming invert)	d = 1200 mm
Width of pit	w = 15737 mm
Length of pit	l = 6000 mm
Percentage free volume	V _{free} = 95 %

Soil infiltration rate (BRE digest 365)

Length of trial pit	l _{trial} = 1000 mm
Width of trial pit	b _{trial} = 600 mm
Depth of trial pit (below invert)	d _{trial} = 1500 mm
Free volume (if fill used)	V _{trial} = 100 %
75% depth of pit	d ₇₅ = (d _{trial} × 0.75) = 1125.00 mm
50% depth of pit	d ₅₀ = (d _{trial} × 0.50) = 750.00 mm
25% depth of pit	d ₂₅ = (d _{trial} × 0.25) = 375.00 mm
Test 1 - time to fall from 75% depth to 25% depth	T1 = 40 min
Test 2 - time to fall from 75% depth to 25% depth	T2 = 51 min
Test 3 - time to fall from 75% depth to 25% depth	T3 = 66 min
Longest time to fall from 75% depth to 25% depth	t _{lg} = max(T1, T2, T3) = 66 min
Storage volume from 75% to 25% depth	V _{p75_25} = (l _{trial} × b _{trial} × (d ₇₅ - d ₂₅)) × V _{trial} = 0.45 m ³
Internal surface area to 50% depth	a _{p50} = ((l _{trial} × b _{trial}) + (l _{trial} + b _{trial}) × 2 × d ₅₀) = 3.00 m ²
Surface area of soakaway to 50% storage depth	A _{s50} = 2 × (l _{trial} + b _{trial}) × d _{trial} / 2 = 2.400 m ²
Soil infiltration rate	f = V _{p75_25} / (a _{p50} × t _{lg}) = 37.9×10⁻⁶ m/s
Wetted area of pit 50% full	a _{s50} = l × d + w × d = 26084019 mm ²

Table equations

Inflow	I = M100 × A
Outflow	O = a _{s50} × f × D
Storage	S = I - O

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
5	0.37	8.5	1.87	16.0	29.36	0.30	29.06
10	0.52	11.9	1.94	23.2	42.61	0.59	42.02
15	0.63	14.4	1.98	28.6	52.64	0.89	51.75

Duration, D (min)	Growth factor Z1	M5 rainfalls (mm)	Growth factor Z2	100 year rainfall, M100 (mm)	Inflow (m ³)	Outflow (m ³)	Storage required (m ³)
30	0.80	18.3	2.02	36.9	67.96	1.78	66.18
60	1.00	22.8	2.02	46.0	84.69	3.56	81.14
120	1.21	27.5	1.99	54.7	100.73	7.11	93.62
240	1.45	33.0	1.95	64.2	118.11	14.23	103.88
360	1.60	36.6	1.92	70.1	128.98	21.34	107.64
600	1.79	40.9	1.88	77.0	141.66	35.57	106.09
1440	2.24	51.1	1.80	92.1	169.41	85.37	84.04

Required storage volume

$$S_{\text{req}} = 107.64 \text{ m}^3$$

Soakaway storage volume

$$S_{\text{act}} = l \times d \times w \times V_{\text{free}} = 107.64 \text{ m}^3$$

PASS - Soakaway storage volume

Time for emptying soakaway to half volume

$$t_{s50} = S_{\text{req}} \times 0.5 / (a_{s50} \times f) = 15\text{hr } 7\text{min } 52\text{s}$$

PASS - Soakaway discharge time less than or equal to 24 hours

Therefore provide 16m x 6m x 1.2m deep attenuation crate soakaway in location of sany gravel material to eastern boundary of site. Min void ratio of 95%

Appendix C: Proposed Drainage Layout

NOTES:

1. ALL DIMENSIONS AND LEVELS TO BE CHECKED ON SITE PRIOR TO UNDERTAKING ANY WORKS. ORDERING MATERIALS OR FABRICATING ANY COMPONENTS.
2. ALL LEVELS IN METERS UNLESS NOTED OTHERWISE ON DRAWING.
3. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEER'S AND ARCHITECT'S DRAWINGS AND RELEVANT SPECIFICATION CLAUSES.
4. PLEASE REFER TO ARCHITECT'S DRAWINGS FOR FINAL BUILDING LOCATION.
5. ALL DRAINAGE COMPONENTS ARE TO COMPLY WITH CURRENT BRITISH STANDARDS AND BUILDING REGULATIONS REQUIREMENTS.
6. ALL WORKS AND MATERIALS TO BE IN ACCORDANCE WITH THE SPECIFICATION FOR HIGHWAY WORKS (SHW SERIES 500).
7. DRAIN PIPE THROUGH WALLS OR BENEATH FOUNDATIONS (SPREAD ONLY) TO HAVE R.C BRIDGE LINTELS OVER AND PIPE SURROUNDED IN FLEXIBLE MATERIAL (50mm).
8. FINAL LOCATIONS AND DETAILS OF SOIL VENT PIPES, STUB STACKS, RAINWATER DOWN PIPES, GULLIES ETC. TO BE CONFIRMED BY REFERENCE TO ARCHITECT' DRAWINGS.
9. ALL THRESHOLD DRAIN DETAILS TO BE TO ARCHITECT' DETAILS.
10. ALL PIPES INTO CHAMBERS TO SOFFIT TO SOFFIT U.N.O.
11. AT ALL OUTFALL POINTS TO AN EXISTING NETWORK, THE POSITION AND INVERT LEVEL OF EXISTING DRAINS MUST BE CONFIRMED WELL IN ADVANCE OF THE PROGRAMMED DATE FOR INSTALLING ANY OF THE UPSTREAM DRAINAGE, OR ORDERING OF ANY MATERIALS IN ORDER TO ALLOW TIME FOR ANY NECESSARY REVISIONS TO THE HYDRAULIC DESIGN.
12. ALL NON ADOPTABLE DOMESTIC FOUL AND SURFACE WATER PIPE RUNS SHALL CONSIST OF 100MM DIA. PIPES LAID AT NO FLATTER THAN 1 IN 80 FALLS U.N.O.
13. ALL CONNECTIONS FROM HIGHWAY GULLIES TO BE 150mm DIA. LAID AT FALLS OF BETWEEN 1 IN 20 AND 1 IN 100 WITH TYPE S BED AND SURROUND TO ALL CONNECTIONS WITH MIN. 1.20m COVER, TYPE Z BED AND SURROUND TO ALL OTHER CONNECTIONS.
14. THERMOPLASTIC PIPES & FITTINGS: THERMOPLASTIC PIPES, JOINTS & FITTINGS FOR GRAVITY SEWERS SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 1401-1, BS EN 1852 & BS EN12666-1.

NOTES:

15. THERMOPLASTIC STRUCTURED WALL PIPE: THERMOPLASTIC STRUCTURED WALL SEWER PIPE SHALL COMPLY WITH THE RELEVANT PROVISIONS OF BS EN 13476-1 & WIS 4.35.01 AND BS EN 13476-2 OR BS EN 13476-3. PIPES SHALL BE BSI KITEMARKED OR HAVE EQUIVALENT THIRD PART CERTIFICATION. PIPES LESS THAN OR EQUAL TO 500mm IN DIAMETER SHALL HAVE NOMINAL SHORT-TERM RING STIFFNESS NOT LESS THAN 8kN/m² (8NB) OR BE SUBJECT TO A QUALITY SYSTEM FOR STORAGE & EMBEDMENT.
16. Nom. SHORT TERM RING STIFFNESS OF 2kN/m² (SN2) IS ACCEPTABLE FOR PIPES GREATER THAN Ø500mm, SUBJECT TO SUPPORTING STRUCTURAL DESIGN LOAD CALCULATIONS BEING PROVIDED.
17. TRANSPORTATION, HANDLING, STORAGE AND LAYING SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS.
18. WHERE A FITTING IS INSTALLED ON A SEWER LENGTH, IT SHALL HAVE THE SAME INTERNAL BORE AS THE SEWER. Max. LENGTH OF PIPE FOR LAYING IS 3.0m OR Ø x 10, WHICHEVER IS THE GREATER, UNLESS WELDED JOINTS ARE USED.
19. OPTIMUM TRENCH WIDTH OPTIMUM TRENCH WIDTH = PIPE + 300mm. CONTRACTOR TO ENSURE TRENCH WALLS ARE SUITABLY

00.00 = EXISTING LEVELS

00.00 = PROPOSED LEVELS

SITE LAYOUT (PROPSD DRAINAGE)

SCALE 1 : 150

PROPOSED 'SPEL STORMCEPTOR' CLASS I BY-PASS SEPARATOR COMPLETE WITH SILT CAPACITY. PRODUCT CODE 206C7/SC/160 NSB 6. ALLOW FOR 250mm THICK GRADE C28/35 CONCRETE BED AND 250mm THICK SURROUND ON 300mm THICK DOT TYPE I SUB-BASE. PROVIDE A SOLAR POWERED AUDIBLE AND VISUAL ALARM SECURED TO A 750x750x150mm THICK GRADE C28/35 CONCRETE BASE ON 300mm THICK DOT TYPE I SUB-BASE. EXACT LOCATION OF SEPARATOR ALARM AND VENT PIPES TO BE AGREED. INSTALLATION TO BE STRICTLY IN ACCORDANCE WITH MANUFACTURERS REQUIREMENTS. COVER AND INVERT LEVELS TO BE AGREED.

SPEL STORMCEPTOR DETAIL

SCALE 1 : 50

- EXISTING DRAINAGE TO BE REMOVED
- EXISTING FOUL DRAINAGE
- EXISTING SURFACE DRAINAGE

DRAINAGE LEGEND

SCALE 1 : 50