



TOWERS NURSERY GARAGE, WREXHAM

SURFACE WATER DRAINAGE ASSESSMENT

Final Report v1.0

SEPTEMBER 2019

**Weetwood Services Ltd
Park House
Broncoed Business Park
Ffordd Byrnwr Gwair
Mold
CH7 1FQ**

01352 700045
info@weetwood.net www.weetwood.net

Report Title	Towers Nursery Garage, Wrexham Flood Consequences Assessment Final Report v1.0
Client	Towers Day Nursery Ltd
Date of issue	25 September 2019

Prepared by	Tim Brook BSc (Hons) Civil Engineering Principal Engineer
Checked and approved by	Adam Edgerley BSc (Hons) Technical Director

This document has been prepared solely as a Flood Consequences Assessment for Towers Day Nursery Ltd. This report is confidential to Towers Day Nursery Ltd and Weetwood Services Ltd accepts no responsibility or liability for any use that is made of this document other than by Towers Day Nursery Ltd for the purposes for which it was originally commissioned and prepared.

Contents

	Page
Signature Sheet	i
Contents	ii
List of Tables, Figures & Appendices	iii
1 INTRODUCTION	1
1.1 Purpose of Report	1
1.2 Structure of the Report	1
2 PLANNING POLICY AND GUIDANCE	2
2.1 National Planning Policy and Guidance	2
3 SITE DETAILS AND PROPOSED DEVELOPMENT	5
3.1 Site Location	5
3.2 Existing and Proposed Development	5
3.3 Waterbodies in the Vicinity of the Site	5
3.4 Ground Conditions	6
3.5 Access and Egress	6
4 SURFACE WATER MANAGEMENT	7
4.1 Surface Water Drainage at the Existing Site	7
4.2 Surface Water Drainage at the Developed Site	7
5 SUMMARY	10

List of Tables

Table 1: Maintenance Requirements..... 9

List of Figures

Figure 1: Site Location 5

List of Appendices

Appendix A: Development Proposals
Appendix B: Ground Investigation Details
Appendix C: Surface Water Infiltration Calculations
Appendix D: Indicative Surface Water Drainage Layout

1 INTRODUCTION

1.1 PURPOSE OF REPORT

Weetwood Services Ltd ('Weetwood') has been instructed by Towers Day Nursery Ltd to prepare a Surface Water Drainage Assessment (SWDA) report with a view to obtaining Sustainable Drainage Systems (SuDS) Approving Body (i.e. the 'SAB') approval for the surface water drainage system serving the proposed development of a new garage building at Towers Day Nursery, Wrexham.

The assessment has been undertaken in accordance with the requirements of Technical Advice Note 15 (TAN15) and the Statutory Standards for Sustainable Drainage Systems in Wales.

1.2 STRUCTURE OF THE REPORT

The report is structured as follows:

- Section 1** Introduction and report structure
- Section 2** Presents national and local flood risk and drainage planning policy
- Section 3** Provides background information relating to the development site, the development proposals, ground conditions and existing site access arrangements
- Section 4** Addresses the effect of the proposed development on surface water runoff and presents an illustrative surface water drainage scheme to ensure that surface water runoff is sustainably managed and flood risk is not increased elsewhere.
- Section 5** Presents a summary of key findings

2 PLANNING POLICY AND GUIDANCE

2.1 NATIONAL PLANNING POLICY AND GUIDANCE

2.1.1 Technical Advice Note 15

The general approach of TAN15 is to set out a precautionary framework to guide planning decisions in areas at high risk of flooding. The overarching aim of the framework is, in order of preference, to:

- Direct new development away from those areas which are at a high risk of flooding.
- Where development has to be considered in high risk areas (i.e. Zone C) only those development which can be justified should be located in such areas.

2.1.1.1 Surface Water Drainage

TAN15 provides an overview of the requirements for the management of surface water to ensure that development does not increase flood risk at the site or elsewhere.

Paragraph 8.3 of TAN15 states that *“the aim should be for new development not to create additional run-off when compared with the undeveloped situation, and for redevelopment to reduce runoff where possible. It is accepted that there may be practical difficulties in achieving this aim”*.

2.1.2 Welsh Government

2.1.2.1 Climate Change Allowances for Planning, August 2016

A consultation letter¹ and supporting guidance note² issued by Welsh Government in August 2016 sets out allowances for climate change for use in FCAs submitted in support of planning applications.

When considering new development proposals, TAN15 states that it is necessary to take account of the potential impact of climate change over the lifetime of development. The Welsh Government guidance note states that *“residential development is assumed to have a lifetime of 100 years while a lifetime of 75 years is assumed for non-residential developments. To ensure future development can provide a safe and secure living and /or working environment throughout its lifetime, national planning policy requires proposals in areas of high flood risk to be accompanied by an assessment of flooding consequences to and from the development, taking into account the impacts of climate change”*.

The climate change allowances detailed within the Welsh Government guidance note are informed by latest available information on climate change projections and allowances are provided for different epochs (periods) of time over the next century.

The guidance note should be applied to planning applications (full, outline and reserved matters) submitted from 1 December 2016.

¹ Welsh Government consultation letter 23 August, 2016 (Ref: CL-03-16)

² <https://gov.wales/docs/desh/publications/160831guidance-for-flood-consequence-assessments-climate-change-allowances-en.pdf>

2.1.2.2 Statutory Standards for Sustainable Drainage in Wales

From 7 January 2019, the Flood and Water Management Act 2010 (Schedule 3) requires new developments to include SuDS features that comply with national standards.

New developments of more than one dwelling or where the area covered by construction work equals or exceeds 100 m² require approval before construction can commence from the SAB to ensure compliance with the SuDS standards.

The SAB will also require to adopt the SuDS unless the scheme serves only a single property or is a publically maintained road to which Section 41 of the Highways Act 1980 applies.

The statutory standards are as follows:

Standard S1: Surface water runoff destination

- Priority Level 1: Surface water runoff is collected for use;
- Priority Level 2: Surface water runoff is infiltrated to ground;
- Priority Level 3: Surface water is discharged to a surface water body;
- Priority Level 4: Surface Water is discharged to surface water sewer, highway drain, or another drainage system;
- Priority Level 5: Surface water runoff is discharged to a combined sewer.

Standard S2: Surface water runoff hydraulic control

1. Surface water should be managed to prevent, so far as possible, any discharge from the site for the majority of rainfall events of less than 5 mm.
2. The surface water runoff rate for the 1:1 annual probability event (or agreed equivalent) should be controlled to help mitigate the negative impacts of the development runoff on the morphology and associated ecology of the receiving surface water bodies.
3. The surface water runoff (rate and volume) for the 1:100 annual probability event (or agreed equivalent) should be controlled to help mitigate negative impacts of the development on flood risk in the receiving water body.
4. The surface water runoff for events up to the 1:100 annual probability (or agreed equivalent) should be managed to protect people and property on and adjacent to the site from flooding from the drainage system.
5. The risks (both on site and off site) associated with the surface water runoff for events greater than the 1:100 annual probability should be considered. Where the consequences are excessive in terms of social disruption, damage or risk to life, mitigating proposals should be developed to reduce these impacts.
6. Drainage design proposals should be examined for the likelihood and consequences of any potential failure scenarios (e.g. structural failure or blockage), and the associated flood risks managed where possible.

Standard S3: Surface water quality management

Treatment for surface water runoff should be provided to prevent negative impacts on the receiving water quality and/or protect downstream drainage systems, including sewers.

Standard S4: Amenity

The design of surface water management systems should maximise amenity benefits.

Standard S5: Biodiversity

The design of the surface water management system should maximise biodiversity benefits.

Standard S6: Design of drainage or construction, operation and maintenance

1. All elements of the surface water drainage system should be designed so that they can be constructed easily, safely, cost-effective, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
2. All elements of the surface water drainage system should be designed to ensure maintain and operation can be undertaken (by the relevant responsible body) easily, safely, cost-effective, in a timely manner, and with the aim of minimising the use of scarce resources and embedded carbon (energy).
3. The surface water drainage system should be designed to ensure structural integrity of all elements under anticipated loading conditions over the design life of the development site, taking into account the requirement for reasonable levels of maintenance.

3 SITE DETAILS AND PROPOSED DEVELOPMENT

3.1 SITE LOCATION

The approximately 0.044 ha site is located off Tower Hill, Acrefair, Wrexham at Ordnance Survey National Grid Reference SJ 272 428, as shown in **Figure 1**.

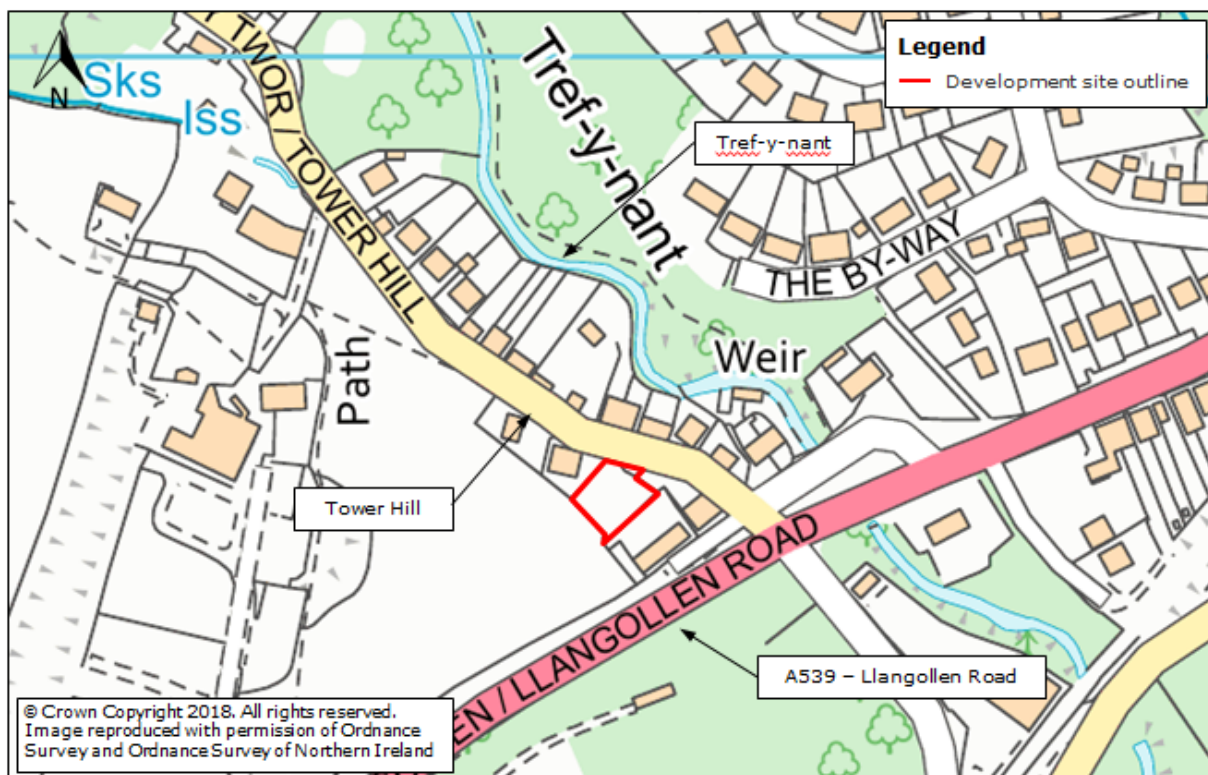


Figure 1: Site Location

3.2 EXISTING AND PROPOSED DEVELOPMENT

The site currently comprises a gravel car park associated with The Towers Childrens Nursery.

Proposals are for the development of a single storey garage building including office space, formalisation of the car park with block paving and soft landscaping to the north, south and west boundaries. (**Appendix A**)

TAN15 classifies commercial development as less vulnerable land use.

3.3 WATERBODIES IN THE VICINITY OF THE SITE

The locations of the waterbodies within the site's vicinity are identified in **Figure 1**.

Tref-y-nant Brook is located approximately 30.0 m to the north east of the site and is classified as an ordinary watercourse.

3.4 GROUND CONDITIONS

Smith Grant Environmental Consultancy has undertaken ground investigation work (**Appendix B**) to assist with an initial assessment of ground related development constraints. As the development area is relatively small, the site investigation comprised of one trial pit which indicated strata consisting of 'made ground' to a depth of 0.15 metres below ground level (m bgl) and 'sandy gravelly clay' beyond this to a depth of 1.59 m bgl. During the investigation groundwater was not observed in the trial pit.

Smith Grant Environmental Consultancy also undertook soakaway tests in accordance with BRE 365: Soakaway Design (2003) to determine the soil infiltration rates at the site. The infiltration results from test-pit SA1 were 5.22×10^{-5} metres per second (m/s), 3.80×10^{-5} m/s and 6.03×10^{-5} m/s. As these results are in the range of 10^{-5} m/s, they can be considered to afford satisfactory drainage conditions, typical of mixtures of sand, silt and gravel.

3.5 ACCESS AND EGRESS

Access and egress to the site is provided via Tower Hill.

At the location of the site entrance, Tower Hill falls in a south-easterly direction.

4 SURFACE WATER MANAGEMENT

4.1 SURFACE WATER DRAINAGE AT THE EXISTING SITE

The site is currently used as a gravel car park. It is understood that there is no existing drainage network on site. Therefore, surface water runoff is expected to flow towards the south-east corner of the site in accordance with local topography.

4.2 SURFACE WATER DRAINAGE AT THE DEVELOPED SITE

4.2.1 Disposal of Surface Water

In accordance with Welsh Government guidance³, surface water runoff should be disposed of according to the following hierarchy: Rainwater collected for use; Into the ground (infiltration); To a surface water body; To a surface water sewer or highway drain.

As part of the new drainage scheme, a rainwater harvesting system could be considered to collect potable water for reuse where possible. However, given the limited roof area available and the limited requirement of potable water within the development (i.e. a childrens nursery), this option has been discounted.

As noted in **Section 3.4**, infiltration tests have been undertaken by Smith Grant Environmental Consultancy in accordance with the guidelines in BRE365⁴ (**Appendix B**). The results indicate that the ground conditions can be considered satisfactory for facilitating the disposal of surface water into the ground. Groundwater was not encountered during testing.

4.2.2 Post Development Impermeable Area

The area of impermeable surfaces within the development has been estimated to be 0.031 ha, based on the extent of paving and the building extents depicted on the Architectural Design's 'Landscaping' drawing (**Appendix A**).

4.2.3 Managing Surface Water Within the Development

As previously mentioned, infiltration testing has been undertaken at the site. Based upon the results, the lowest infiltration rate of 3.80×10^{-5} m/s (0.137 m/hr) has been used in the drainage calculations.

It is proposed to discharge surface water for the whole of the development via infiltration. The site design allows for permeable block paving to be laid across the car parking area, as such, the car parking area will drain directly to ground utilising an aggregate sub-base within the pavement structure as a form of attenuation. Runoff from the building will be directed via pipework into the aggregate sub-base layer.

The proposed infiltration system has been modelled using the Detailed Design module of MicroDrainage Source Control (refer to **Appendix C**). The pavement structure has been designed to allow for 80 mm deep permeable paving blocks with a 50 mm bedding layer and 320 mm aggregate sub-base (30% voids). This allows for a total pavement depth of 450 mm which is required to help prevent the effect of frost heave from the

³ Section 2.1.2.1

⁴ BRE Digest 365: Soakaway Design

material below. Given the small nature of the development and adequate infiltration rates, the 320 mm aggregate sub-base layer is sufficient enough to store the 1:100 annual probability rainfall event including a 40% increase in rainfall intensity due to the effects of climate change.

An indicative drainage layout can be found in **Appendix D**. 'S1' will be constructed as a catchpit chamber to allow for any sediment or debris from the roof drainage to be captured.

The permeable paving will include a geotextile membrane and along with the catchpit chamber they will provide water quality treatment for surface water prior to entering the aggregate sub-base layer. This will help to minimise the risk of siltation within the drainage system.

4.2.4 Exceedance Routes

Flows resulting from rainfall in excess of the 1:100 annual probability rainfall event including an allowance for climate change will be managed in exceedance routes. It is assumed that the design of the site would ensure flood flows are directed towards carriageways, with the site being profiled to ensure that flood flows are directed away from built development.

4.2.5 Water Quality and Pollution Control

Residential roofs (the building roof in this instance can be attributed to the equivalent of a residential roof) have a very low pollution hazard level and individual property driveways and low traffic roads have a low pollution hazard level. Table 26.2 of the CIRIA SuDS Manual 2015 indicates that the combined pollution hazard indices associated with residential roofs, individual property driveways and low traffic roads for total suspended solids, hydrocarbons and metals are 0.70, 0.60 and 0.45 respectively. The indices range from 0 (no pollution hazard) to 1 (high pollution hazard).

Table 26.3 of the CIRIA SuDS Manual 2015 indicates that the SuDS mitigation indices for permeable paving for total suspended solids, hydrocarbons and metals are 0.70, 0.60 and 0.70 respectively. As such, the proposed drainage system incorporates adequate water quality treatment.

4.2.6 Amenity and Biodiversity

As discussed in **Section 4.2.3**, it is proposed to discharge surface water for the whole of the development via the mechanism of infiltration, with the aggregate sub-base layer of the car park structure used as attenuation.

The permeable paving used for infiltration and soft landscaped planting features to be implemented across the development will help increase soil moisture content and help recharge groundwater, thereby helping to mitigate problems of low river flows.

4.2.7 Adoption and Maintenance of SuDS

Under Schedule 3 of the Flood and Water Management Act 2010, the SAB must adopt SuDS that serve two or more properties. However, the duty to adopt does not appear to apply if the system serves a site which is under overall single ownership. As this development is to be controlled under one owner, it is assumed that the SAB will not have to adopt the SuDS system.

Therefore, it is anticipated that the owner of the site, Towers Day Nursery, will be responsible for the ongoing maintenance of the SuDS system.

An indicative maintenance schedule is presented in **Table 1**.

Table 1: Maintenance Requirements

Schedule	Required action	Frequency
Permeable Paving		
Regular maintenance	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 manufacturer's recommendations.
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	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	
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required
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 accumulation rates and establish appropriate removal frequencies	Annually
	Monitor inspection chambers	

4.2.8 Summary

The purpose of this report is to demonstrate that a surface water drainage strategy is feasible for the site given the development proposals and the land available. The proposals provide the opportunity for the inclusion of SuDS elements, ensuring that there will be no increase in surface water runoff from the proposed development.

5 SUMMARY

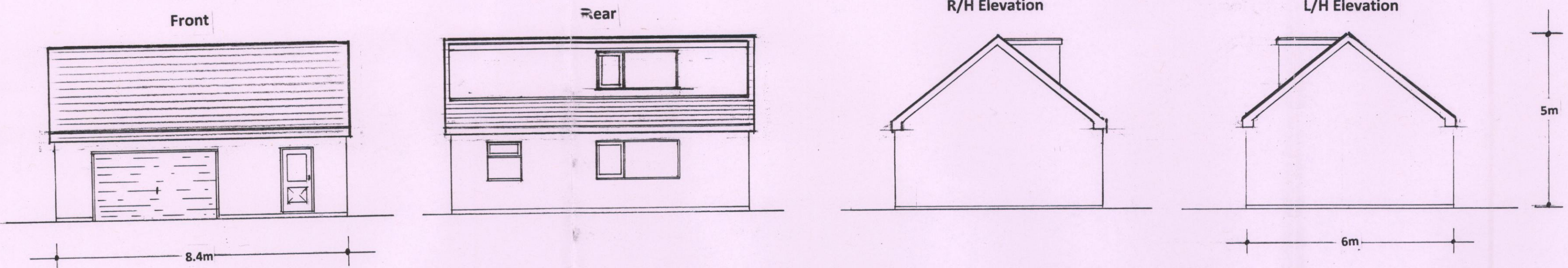
This report has been prepared on behalf of Towers Day Nursery and relates to the proposed development of a new garage building with associated hard and soft landscaping at Towers Day Nursery, Wrexham.

Surface water runoff from the developed site can be sustainably managed in accordance with planning policy.

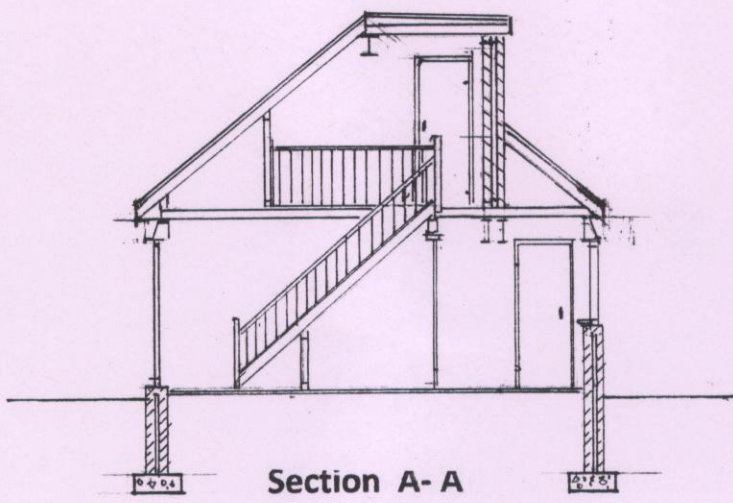
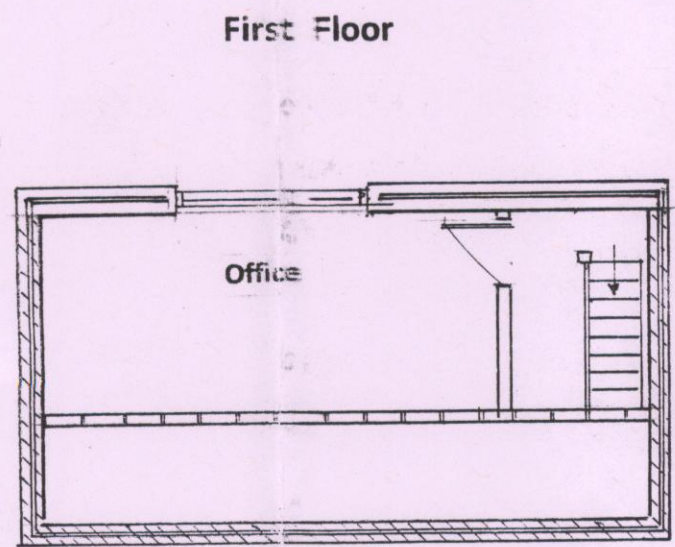
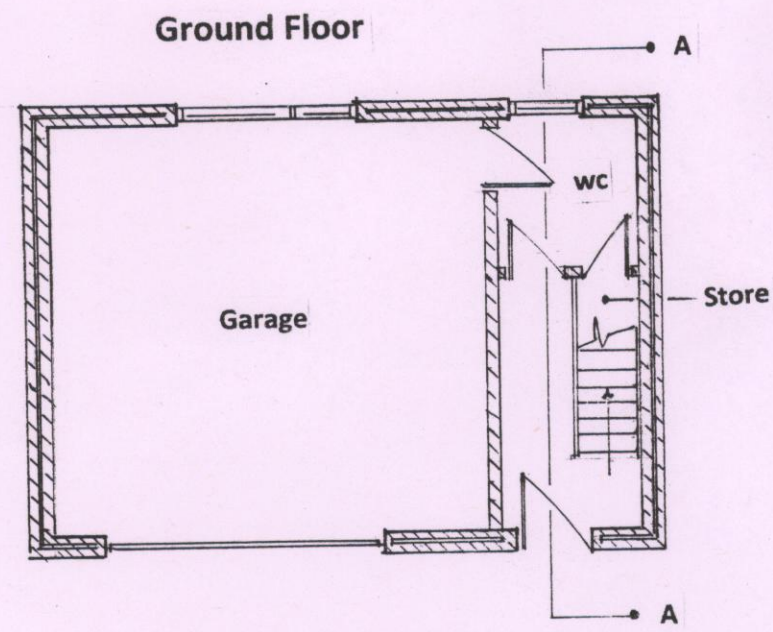
APPENDIX A:

Development Proposals

Proposed Elevations.



Scale: 1-100



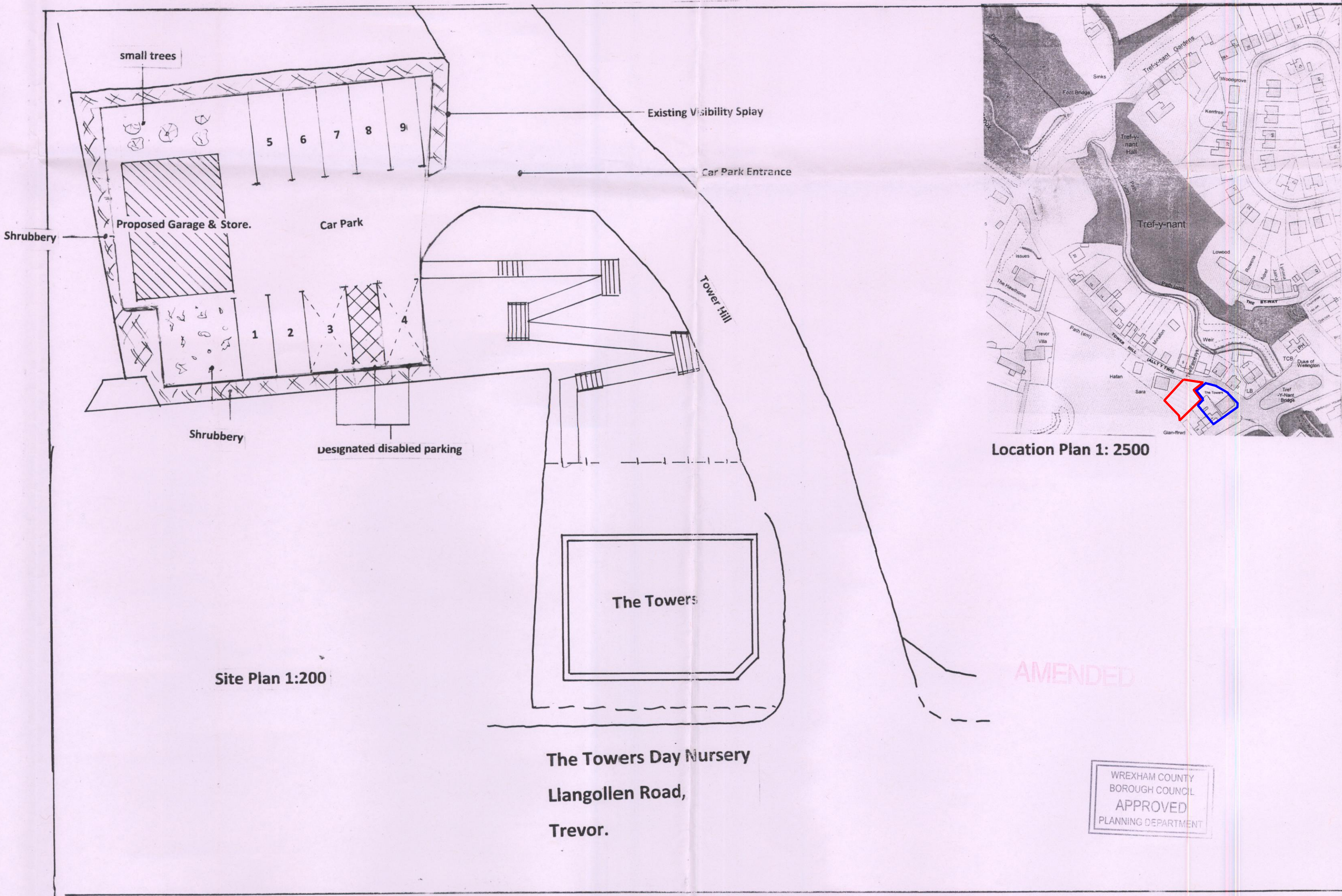
Proposed Floor Plans.

Proposed Garage and Office
For
The "Towers" Day Nursery.
At
Llangollen Road, Acrefair, Wrexham. LL20 7UP.

AMENDED

Planning Notes.

Walls to be constructed of facing brick to match "Ruabon Red" as close as possible.
Roof to be covered in good quality re-claimed in Welsh slate.
Windows, doors, fascia's and barge boards to be of white U.P.V.C.
Steel up and over door to the garage to be painted.
Car parking area has a permeable surface (a condition to a previous planning approval) additionally this is to be maintained with brick sets to distinguish parking bays.

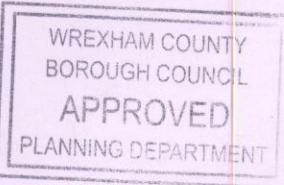


Location Plan 1: 2500

Site Plan 1:200

The Towers Day Nursery
Llangollen Road,
Trevor.

AMENDED

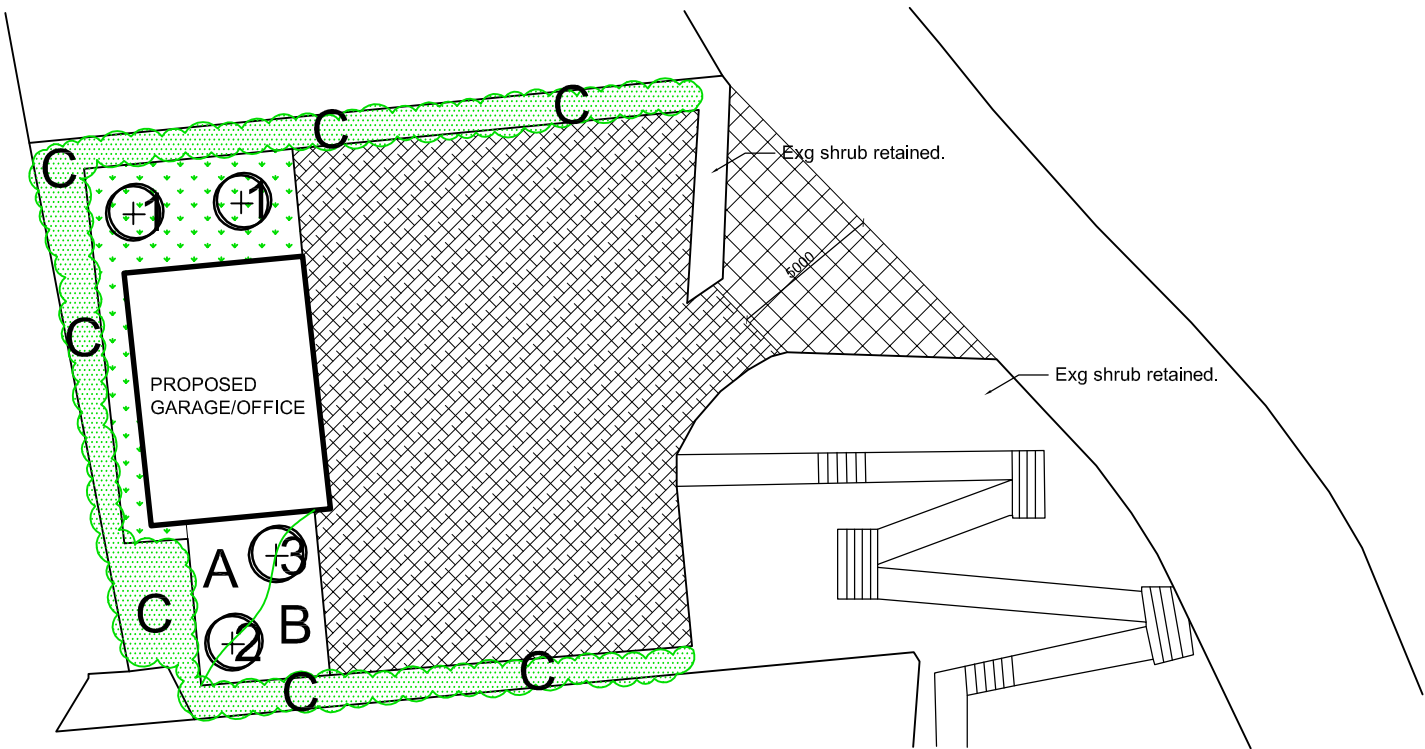


Drawn By:
Phil Higgins M.C.I.O.B. Tel no; 01978 362046 Mobile no; 07830649856
email; philhiggins78@gmail.com

Ref: 2015 0890 Rev A

This drawing is the property of CB ARCHITECTURAL DESIGN. Copyright is reserved by them and the drawing issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person either wholly or in part without the written consent of CB ARCHITECTURAL DESIGN.

1. All dimensions to be verified on site prior to any shop works being commenced.
2. Any discrepancies to be reported to the Designer before any work is put in hand.
3. Do not scale from this drawing.
4. This drawing is to be read in conjunction with relevant consultants and specialists drawings.
5. This is a metric drawing.
6. Dimensions indicated thus '***' are site dimensions and are to be adjusted onsite by the Contractor accordingly.



KEY:

- Proposed grassed areas.
- Proposed dense shrub planting. Lettered as Planting Schedule below.
- Proposed area to recieve Marshalls permeable blocks laid strictly to manufacturers recommendations. Colour to be 'Brindle'.
- Proposed area to recieve tarmacadam finish complete with Marshalls kerbing and edging as required, or similar approved.

PLANTING SCHEDULE:

- A — Ranunculus Ficaria (Brazen Hussy)
- B — Lavendula spica (Lavender)
- C — Fagus Sylvatica 'Purpurea' (Copper Beech)

TREE PLANTING:

- 1 — Corylus avellana 'Pendula' Weeping Hazel. Final type to be agreed and to be to LA approval.
- 2 — Prunus Spinosa (Blackthorn). Final type to be agreed and to be to LA approval.
- 3 — Crataegus Monogyna (Common Hawthorn). Final type to be agreed and to be to LA approval.

MULCHING PLANTING BEDS:

- Material: Shredded bark, cocoa fibre, free of pests, disease, fungus and weeds.
- Clear all weeds, water soil thoroughly, and mulch the whole surface of planting beds at 1 cu m of material per 20 sq m.

NOTE:
All soft landscaping to be carried out in accordance with BS 4428: 1989
Code of Practice for General Landsacpe Operations (excluding hard surfaces).

Rev.	Date:	Description:	Initial:	Chkd:
Client	MRS RUTH ROBERTS	Drwg. Title	Landscaping AS PROPOSED	
Project	The Towers Nursery, Trevor Wrexham LL14 3SG	Scale	1:250	Drawn CB Chkd. CB Date 22/02/19
Drwg. No.	813/L(9)01	Revision	-	

APPENDIX B:

Ground Investigation Details

Our ref: R2744-L20190617
Your ref: Soil Infiltration (Soakaway) Calculations

Ruth Roberts
The Towers Day Nursery
Llangollen Road
Acrefair
Wrexham
LL14 3SG

17th June 2019

By e-mail: ruth831@btinternet.com

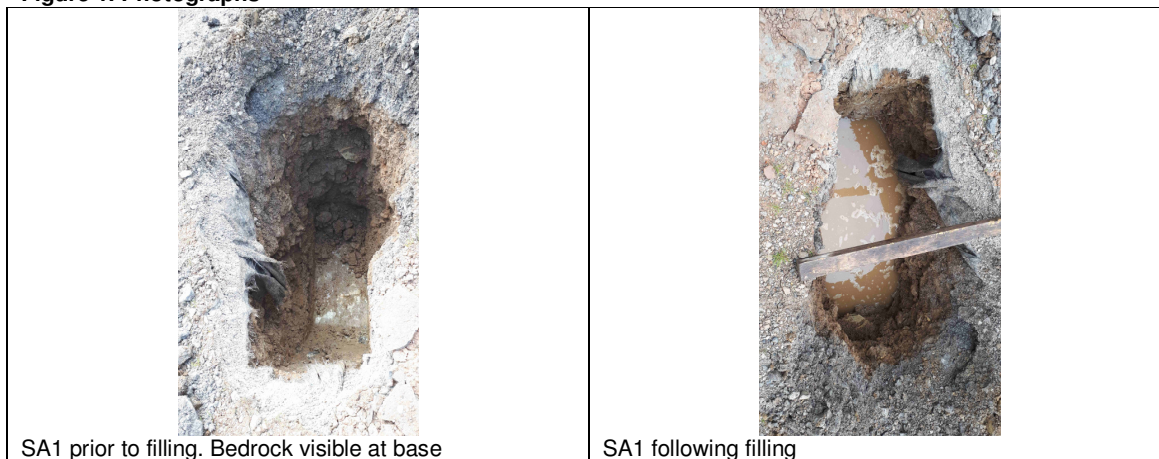
Dear Ruth,

Soil Infiltration Testing at Towers Day Nursery, Acrefair

SGP were instructed to carry out a soakaway trial-pit at the above site to determine a soil infiltration rate and assist in the determination of the feasibility of soakaways.

SGP attended site on 17.04.19 and 1 soakaway pit (SA1) was excavated within the predetermined area to a depth of 1.59m bgl. The location of the test-pit is as per the attached plan provided by the client (ref. 813/L(52)01) with works carried out in accordance with BRE 365¹.

Figure 1. Photographs



Three runs of soakaway tests were carried out within SA1 due to good drainage (fully drained on all tests), however due to some spalling of the side walls during the third run was ended before being fully drained. Soil infiltration rates were calculated by the methodology detailed in BRE 365; a copy of the worksheet is provided with soil infiltration rates summarised in the table below:

¹ Building Research Establishment; Soakaway Design. Digest 365

Table 1.1 Soil infiltration rates

Test-Pit	Soil Infiltration Rate (m/s)		
	Run 1	Run 2	Run 3
SA1	5.22×10^{-5}	3.80×10^{-5}	6.03×10^{-5}

Soil infiltration rates for SA1 were within the range of 10^{-5} m/s. The results of soakaway testing correspond to good drainage conditions², typical of mixtures of sand, silt and gravel.

The results should be provided to a specialist drainage engineer who can determine the suitability of soakaways on the site and advise on the design.

Yours sincerely
for: Smith Grant LLP

A handwritten signature in black ink, appearing to read "D. Wayland", with a stylized flourish at the end.

D Wayland BSc MSc AssocCIWM MCIWEM C.WEM
Partner

Enc: Soakaway test results (SA1 Infiltration calculations)
Drawing D01 Soakaway test locations (813/L(52)01)
SA1 Log

² BS 8004:2015 Code of practice for foundations

Site: Towers Day Nursery, Acrefair

Trial Pit SA1

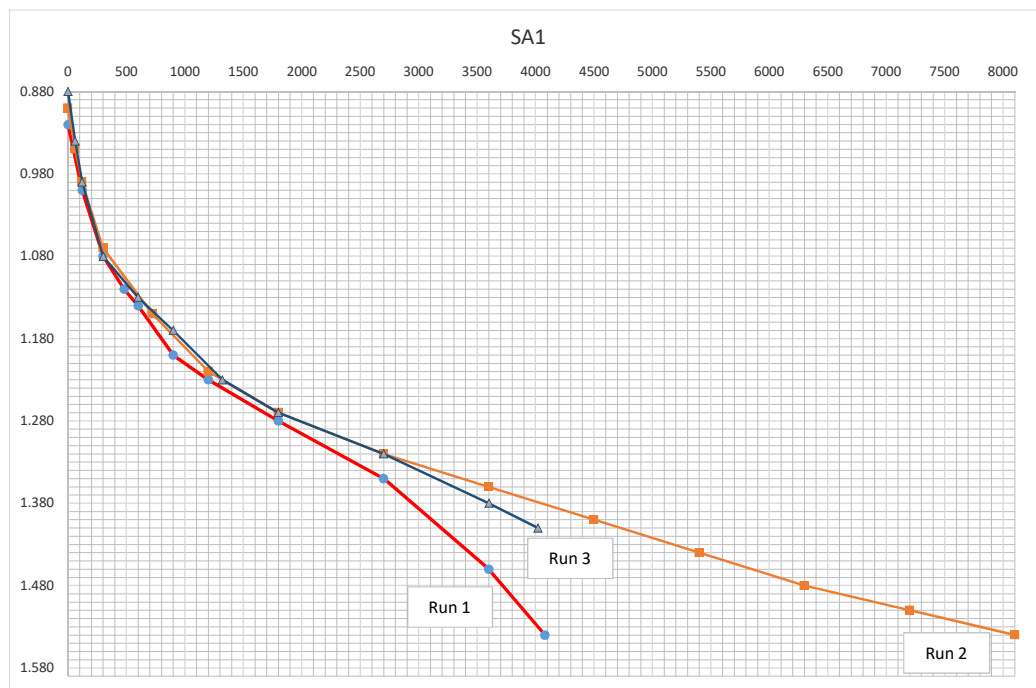
Trial Pit dimensions (m)				effective depth (ed)	Run 1 0.590 m	Run 2 0.590	Run 3 0.590
	Run 1	Run 2	Run 3				
Length	1.500	1.500	1.500				
Width	1.000	1.000	1.000				
Depth	1.590	1.590	1.590				
Trial pit fill	None	None	None				
Initial water volume (m ³)	1.005	1.035	1.065				

Drainage times	
Run 1	
elapsed time (s)	depth to water (m)
0	0.920
120	1.000
300	1.080
480	1.120
600	1.140
900	1.200
1200	1.230
1800	1.280
2700	1.350
3600	1.460
4080	1.540

Run 2	
elapsed time (s)	depth to water (m)
0	0.900
60	0.950
120	0.990
300	1.070
720	1.150
1200	1.220
1800	1.270
2700	1.320
3600	1.360
4500	1.400
5400	1.440
6300	1.480
7200	1.510
8100	1.540

Run 3	
elapsed time (s)	depth to water (m)
0	0.880
60	0.940
120	0.990
300	1.080
600	1.130
900	1.170
1320	1.230
1800	1.270
2700	1.320
3600	1.380
4020	1.410

Calculations			
	Run 1	Run 2	Run 3
(m) level at start (0%)	0.920	0.900	0.880
(m) level at end (100%)	1.540	1.540	1.410
(m) 25% level	1.075	1.06	1.0125
(m) 75% level	1.385	1.38	1.2775
(m) level change (75-25%)	0.31	0.32	0.265
(m ³) volume drained (75-25%)	0.465	0.48	0.3975
(m ²) surface area drained (75-25%)	3.3	3.35	3.725
(s) time at 25% level	288.75	277.5	165
(s) time at 75% level	2986.36	4050	1935
soil infiltration rate (75-25% actual), $f =$	5.22E-05	3.80E-05	6.03E-05

ms⁻¹

This drawing is the property of CB ARCHITECTURAL DESIGN. Copyright is reserved by them and the drawing issued on the condition that it is not copied, reproduced, retained or disclosed to any unauthorised person either wholly or in part without the written consent of CB ARCHITECTURAL DESIGN.

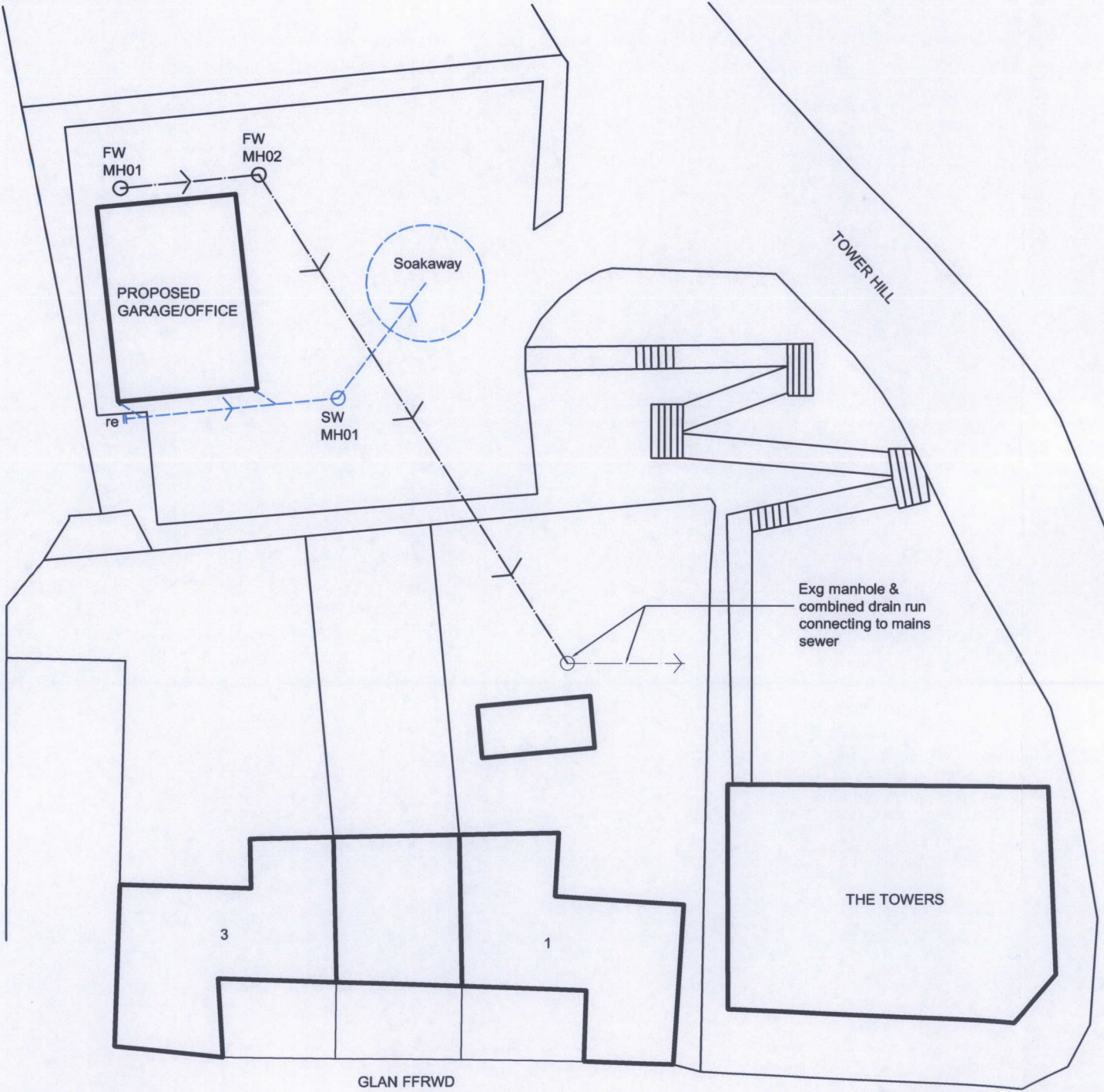
- 1. All dimensions to be verified on site prior to any shop works being commenced.
- 2. Any discrepancies to be reported to the Designer before any work is put in hand.
- 3. Do not scale from this drawing.
- 4. This drawing is to be read in conjunction with relevant consultants and specialists drawings.
- 5. This is a metric drawing.
- 6. Dimensions indicated thus "****" are site dimensions and are to be adjusted onsite by the Contractor accordingly.

WARRICK COUNTY
COUNCIL
26 FEB 2019
PLANNING DEPARTMENT

P2019/0151

SANITARY/DRAINAGE NOTES:

Above slab level sanitary drainage designed and installed to meet the requirements of BS5572: 1978 using upvc pipework.
Wastes to discharge into new vertical stack through boss pipes and branches, basin waste 32mm diameter fitted with 75mm bottle trap and WC connecting with 100mm multi-kwik adapters. Soil pipes to be fitted with access saddle for rodding purposes. All wastes and pipes to be adequately supported at maximum vertical centres of 2.0m and 1.0m horizontally.
Wastes from w.h.b.'s to be fitted with anti-vac traps.
Positions shown on plans are indicative only and all depths locations etc are to be determined on site and any discrepancy to be reported to the designer immediately.
Any drainage running under the building, where the crown of the pipe is within 300mm of the underside of the slab, concrete encasement should be integral with the slab.
Any drainage running under the building to be encased in min. 150mm concrete surround.
All drainage to accord with BSEN 295.
Drainage running through the footings are to be protected by a re-inforced pre-cast conc. lintel over, providing 50mm space all around the pipe.
Mask opening both sides of the opening with a rigid sheet material to prevent entry of fill or vermin.
IMPORTANT: Fill any voids with compressible sealant to prevent entry of gas.
All external drainage to be proprietary pipework as detailed on drawings.
All pipe runs, inspection chambers and manholes to be bedded and surrounded in strict accordance with the manufacturer's recommendations.
Generally, 150mm dia PVC pipework to BS 4660:1989 with flexible joints laid to minimum 1:40 fall for foul and 1:80 for surface and bedded on 50mm layer of 10mm granular material. PPIC's (100's and 150's) to BS 7158:1989 up to max 930mm deep and encased in 150mm concrete to manufacturers recommendations.
Any drainage trench within 1m of the foundation shall be filled with concrete at least to the level of the underside of the foundation.
All lengths to be tested as works proceed and with the approval of the Building Control Officer.
All surface water drainage from new rwg's to connect to soakaway min. 5m from the building.
Soakaway to be in accordance with BRE Digest 365 and sized appropriately.
Contractor to allow for permeability test.
NOTE: FW drainage to run under SW system in all cases.



T: 07833 029535
E: info@cbarchitecturaldesign.co.uk
W: www.cbarchitecturaldesign.co.uk



Rev.	Date	Description	Initialed	Checked
Client MRS RUTH ROBERTS				
Project The Towers Nursery, Trevor Wrexham LL14 3SG				
Drawn CB				
Date 24/02/19				
Revision -				
Drawn No. 813/L(52)01				
Title Drainage AS PROPOSED				
Scale 1:250				

0 10 20 50mm NATURAL SCALE

ORIGINAL DRAWING SIZE 420 x 297 (A3)

SHEET: 1 of 1	LOCATION: Acrefair	PROJECT: Towers Day Nursery	ENGINEER: SM	JOB NO. R2744	TRIAL PIT NO. SA1
		EXCAVATED BY: JCB 180 Sitemaster	CLIENT: Ruth Roberts	DATE: 17/06/2019	
DEPTH (m)	SAMPLES/ TESTING	FIELD RECORDS	DEPTH (m)	DESCRIPTION OF STRATA	LEGEND
		Geotextile present between interface of natural soils and placed gravel at 0.15m bgl	0.00	MADE GROUND: Fine to coarse gravel of limestone fill	
			0.15	Soft to firm light brown sandy gravelly CLAY with frequent cobbles and boulders of sandstone.	
			1.00		
			1.59	Terminated on encountering sandstone bedrock at 1.59m bgl	
			2.00		
			3.00		
			4.00		
			5.00		
 Smith Grant LLP Station House, Station Road, Ruabon, Wrexham LL146DL Tel: 01978822367 Fax: 019788247182 www.smithgrant.co.uk email: consult@smithgrant.co.uk		GROUND WATER: Not encountered			
		REMARKS:			
		SCALE: 1:250	LOGGED BY: SM	FIGURE NO. 1	

APPENDIX C:

Surface Water Infiltration Calculations

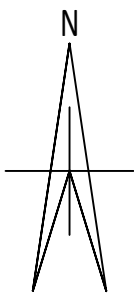
Weetwood			Page 1																																																																																																																																																																																																																			
Joseph's Well Hanover Walk Leeds, LS3 1AB		4405 The Towers Nursery Garage Soakaway Calculations																																																																																																																																																																																																																				
Date 01/08/2019 File 2019-08-16 4405 R1 Soak...		Designed by TB Checked by																																																																																																																																																																																																																				
XP Solutions		Source Control 2019.1																																																																																																																																																																																																																				
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 13 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>99.602</td><td>0.052</td><td>4.3</td><td>3.5</td><td>O K</td></tr><tr><td>30 min Summer</td><td>99.617</td><td>0.067</td><td>4.3</td><td>4.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>99.623</td><td>0.073</td><td>4.3</td><td>5.0</td><td>O K</td></tr><tr><td>120 min Summer</td><td>99.615</td><td>0.065</td><td>4.3</td><td>4.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>99.604</td><td>0.054</td><td>4.3</td><td>3.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>99.597</td><td>0.047</td><td>4.0</td><td>3.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>99.588</td><td>0.038</td><td>3.2</td><td>2.6</td><td>O K</td></tr><tr><td>480 min Summer</td><td>99.582</td><td>0.032</td><td>2.8</td><td>2.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>99.578</td><td>0.028</td><td>2.4</td><td>1.9</td><td>O K</td></tr><tr><td>720 min Summer</td><td>99.575</td><td>0.025</td><td>2.2</td><td>1.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>99.571</td><td>0.021</td><td>1.8</td><td>1.4</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>99.566</td><td>0.016</td><td>1.4</td><td>1.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>99.562</td><td>0.012</td><td>1.0</td><td>0.8</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>99.560</td><td>0.010</td><td>0.8</td><td>0.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>99.557</td><td>0.007</td><td>0.6</td><td>0.5</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>99.556</td><td>0.006</td><td>0.5</td><td>0.4</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>99.555</td><td>0.005</td><td>0.4</td><td>0.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>99.554</td><td>0.004</td><td>0.4</td><td>0.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>99.554</td><td>0.004</td><td>0.3</td><td>0.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>99.610</td><td>0.060</td><td>4.3</td><td>4.1</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>109.830</td><td>0.0</td><td>13</td></tr><tr><td>30 min Summer</td><td>76.317</td><td>0.0</td><td>22</td></tr><tr><td>60 min Summer</td><td>50.812</td><td>0.0</td><td>40</td></tr><tr><td>120 min Summer</td><td>32.671</td><td>0.0</td><td>72</td></tr><tr><td>180 min Summer</td><td>24.811</td><td>0.0</td><td>100</td></tr><tr><td>240 min Summer</td><td>20.225</td><td>0.0</td><td>130</td></tr><tr><td>360 min Summer</td><td>15.132</td><td>0.0</td><td>190</td></tr><tr><td>480 min Summer</td><td>12.304</td><td>0.0</td><td>250</td></tr><tr><td>600 min Summer</td><td>10.468</td><td>0.0</td><td>310</td></tr><tr><td>720 min Summer</td><td>9.167</td><td>0.0</td><td>370</td></tr><tr><td>960 min Summer</td><td>7.425</td><td>0.0</td><td>492</td></tr><tr><td>1440 min Summer</td><td>5.504</td><td>0.0</td><td>736</td></tr><tr><td>2160 min Summer</td><td>4.067</td><td>0.0</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>3.276</td><td>0.0</td><td>1456</td></tr><tr><td>4320 min Summer</td><td>2.409</td><td>0.0</td><td>2200</td></tr><tr><td>5760 min Summer</td><td>1.941</td><td>0.0</td><td>2904</td></tr><tr><td>7200 min Summer</td><td>1.641</td><td>0.0</td><td>3560</td></tr><tr><td>8640 min Summer</td><td>1.431</td><td>0.0</td><td>4328</td></tr><tr><td>10080 min Summer</td><td>1.275</td><td>0.0</td><td>5072</td></tr><tr><td>15 min Winter</td><td>109.830</td><td>0.0</td><td>14</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	99.602	0.052	4.3	3.5	O K	30 min Summer	99.617	0.067	4.3	4.5	O K	60 min Summer	99.623	0.073	4.3	5.0	O K	120 min Summer	99.615	0.065	4.3	4.4	O K	180 min Summer	99.604	0.054	4.3	3.6	O K	240 min Summer	99.597	0.047	4.0	3.2	O K	360 min Summer	99.588	0.038	3.2	2.6	O K	480 min Summer	99.582	0.032	2.8	2.2	O K	600 min Summer	99.578	0.028	2.4	1.9	O K	720 min Summer	99.575	0.025	2.2	1.7	O K	960 min Summer	99.571	0.021	1.8	1.4	O K	1440 min Summer	99.566	0.016	1.4	1.1	O K	2160 min Summer	99.562	0.012	1.0	0.8	O K	2880 min Summer	99.560	0.010	0.8	0.6	O K	4320 min Summer	99.557	0.007	0.6	0.5	O K	5760 min Summer	99.556	0.006	0.5	0.4	O K	7200 min Summer	99.555	0.005	0.4	0.3	O K	8640 min Summer	99.554	0.004	0.4	0.3	O K	10080 min Summer	99.554	0.004	0.3	0.2	O K	15 min Winter	99.610	0.060	4.3	4.1	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	109.830	0.0	13	30 min Summer	76.317	0.0	22	60 min Summer	50.812	0.0	40	120 min Summer	32.671	0.0	72	180 min Summer	24.811	0.0	100	240 min Summer	20.225	0.0	130	360 min Summer	15.132	0.0	190	480 min Summer	12.304	0.0	250	600 min Summer	10.468	0.0	310	720 min Summer	9.167	0.0	370	960 min Summer	7.425	0.0	492	1440 min Summer	5.504	0.0	736	2160 min Summer	4.067	0.0	1100	2880 min Summer	3.276	0.0	1456	4320 min Summer	2.409	0.0	2200	5760 min Summer	1.941	0.0	2904	7200 min Summer	1.641	0.0	3560	8640 min Summer	1.431	0.0	4328	10080 min Summer	1.275	0.0	5072	15 min Winter	109.830	0.0	14
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																	
15 min Summer	99.602	0.052	4.3	3.5	O K																																																																																																																																																																																																																	
30 min Summer	99.617	0.067	4.3	4.5	O K																																																																																																																																																																																																																	
60 min Summer	99.623	0.073	4.3	5.0	O K																																																																																																																																																																																																																	
120 min Summer	99.615	0.065	4.3	4.4	O K																																																																																																																																																																																																																	
180 min Summer	99.604	0.054	4.3	3.6	O K																																																																																																																																																																																																																	
240 min Summer	99.597	0.047	4.0	3.2	O K																																																																																																																																																																																																																	
360 min Summer	99.588	0.038	3.2	2.6	O K																																																																																																																																																																																																																	
480 min Summer	99.582	0.032	2.8	2.2	O K																																																																																																																																																																																																																	
600 min Summer	99.578	0.028	2.4	1.9	O K																																																																																																																																																																																																																	
720 min Summer	99.575	0.025	2.2	1.7	O K																																																																																																																																																																																																																	
960 min Summer	99.571	0.021	1.8	1.4	O K																																																																																																																																																																																																																	
1440 min Summer	99.566	0.016	1.4	1.1	O K																																																																																																																																																																																																																	
2160 min Summer	99.562	0.012	1.0	0.8	O K																																																																																																																																																																																																																	
2880 min Summer	99.560	0.010	0.8	0.6	O K																																																																																																																																																																																																																	
4320 min Summer	99.557	0.007	0.6	0.5	O K																																																																																																																																																																																																																	
5760 min Summer	99.556	0.006	0.5	0.4	O K																																																																																																																																																																																																																	
7200 min Summer	99.555	0.005	0.4	0.3	O K																																																																																																																																																																																																																	
8640 min Summer	99.554	0.004	0.4	0.3	O K																																																																																																																																																																																																																	
10080 min Summer	99.554	0.004	0.3	0.2	O K																																																																																																																																																																																																																	
15 min Winter	99.610	0.060	4.3	4.1	O K																																																																																																																																																																																																																	
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																			
15 min Summer	109.830	0.0	13																																																																																																																																																																																																																			
30 min Summer	76.317	0.0	22																																																																																																																																																																																																																			
60 min Summer	50.812	0.0	40																																																																																																																																																																																																																			
120 min Summer	32.671	0.0	72																																																																																																																																																																																																																			
180 min Summer	24.811	0.0	100																																																																																																																																																																																																																			
240 min Summer	20.225	0.0	130																																																																																																																																																																																																																			
360 min Summer	15.132	0.0	190																																																																																																																																																																																																																			
480 min Summer	12.304	0.0	250																																																																																																																																																																																																																			
600 min Summer	10.468	0.0	310																																																																																																																																																																																																																			
720 min Summer	9.167	0.0	370																																																																																																																																																																																																																			
960 min Summer	7.425	0.0	492																																																																																																																																																																																																																			
1440 min Summer	5.504	0.0	736																																																																																																																																																																																																																			
2160 min Summer	4.067	0.0	1100																																																																																																																																																																																																																			
2880 min Summer	3.276	0.0	1456																																																																																																																																																																																																																			
4320 min Summer	2.409	0.0	2200																																																																																																																																																																																																																			
5760 min Summer	1.941	0.0	2904																																																																																																																																																																																																																			
7200 min Summer	1.641	0.0	3560																																																																																																																																																																																																																			
8640 min Summer	1.431	0.0	4328																																																																																																																																																																																																																			
10080 min Summer	1.275	0.0	5072																																																																																																																																																																																																																			
15 min Winter	109.830	0.0	14																																																																																																																																																																																																																			
©1982-2019 Innovyze																																																																																																																																																																																																																						

Weetwood				Page 2	
Joseph's Well Hanover Walk Leeds, LS3 1AB		4405 The Towers Nursery Garage Soakaway Calculations			
Date 01/08/2019 File 2019-08-16 4405 R1 Soak...		Designed by TB Checked by			
XP Solutions		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.625	0.075	4.3	5.1	O K
60 min Winter	99.628	0.078	4.3	5.3	O K
120 min Winter	99.610	0.060	4.3	4.0	O K
180 min Winter	99.596	0.046	4.0	3.2	O K
240 min Winter	99.589	0.039	3.4	2.7	O K
360 min Winter	99.581	0.031	2.6	2.1	O K
480 min Winter	99.575	0.025	2.2	1.7	O K
600 min Winter	99.572	0.022	1.9	1.5	O K
720 min Winter	99.569	0.019	1.7	1.3	O K
960 min Winter	99.566	0.016	1.4	1.1	O K
1440 min Winter	99.562	0.012	1.0	0.8	O K
2160 min Winter	99.559	0.009	0.8	0.6	O K
2880 min Winter	99.557	0.007	0.6	0.5	O K
4320 min Winter	99.555	0.005	0.5	0.3	O K
5760 min Winter	99.554	0.004	0.4	0.3	O K
7200 min Winter	99.554	0.004	0.3	0.2	O K
8640 min Winter	99.553	0.003	0.3	0.2	O K
10080 min Winter	99.553	0.003	0.2	0.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	76.317	0.0	24		
60 min Winter	50.812	0.0	42		
120 min Winter	32.671	0.0	74		
180 min Winter	24.811	0.0	102		
240 min Winter	20.225	0.0	134		
360 min Winter	15.132	0.0	192		
480 min Winter	12.304	0.0	254		
600 min Winter	10.468	0.0	314		
720 min Winter	9.167	0.0	370		
960 min Winter	7.425	0.0	490		
1440 min Winter	5.504	0.0	722		
2160 min Winter	4.067	0.0	1068		
2880 min Winter	3.276	0.0	1484		
4320 min Winter	2.409	0.0	2188		
5760 min Winter	1.941	0.0	3056		
7200 min Winter	1.641	0.0	3720		
8640 min Winter	1.431	0.0	4112		
10080 min Winter	1.275	0.0	5112		
©1982-2019 Innovyze					

Weetwood		Page 4																								
Joseph's Well Hanover Walk Leeds, LS3 1AB	4405 The Towers Nursery Garage Soakaway Calculations																									
Date 01/08/2019 File 2019-08-16 4405 R1 Soak...	Designed by TB Checked by																									
XP Solutions Source Control 2019.1																										
<u>Model Details</u> Storage is Online Cover Level (m) 100.000 <u>Porous Car Park Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.13700</td> <td>Width (m)</td> <td>10.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>22.6</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>62.8</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>99.550</td> <td>Cap Volume Depth (m)</td> <td>0.320</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.13700	Width (m)	10.0	Membrane Percolation (mm/hr)	1000	Length (m)	22.6	Max Percolation (l/s)	62.8	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	99.550	Cap Volume Depth (m)	0.320
Infiltration Coefficient Base (m/hr)	0.13700	Width (m)	10.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	22.6																							
Max Percolation (l/s)	62.8	Slope (1:X)	0.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	99.550	Cap Volume Depth (m)	0.320																							
©1982-2019 Innovyze																										

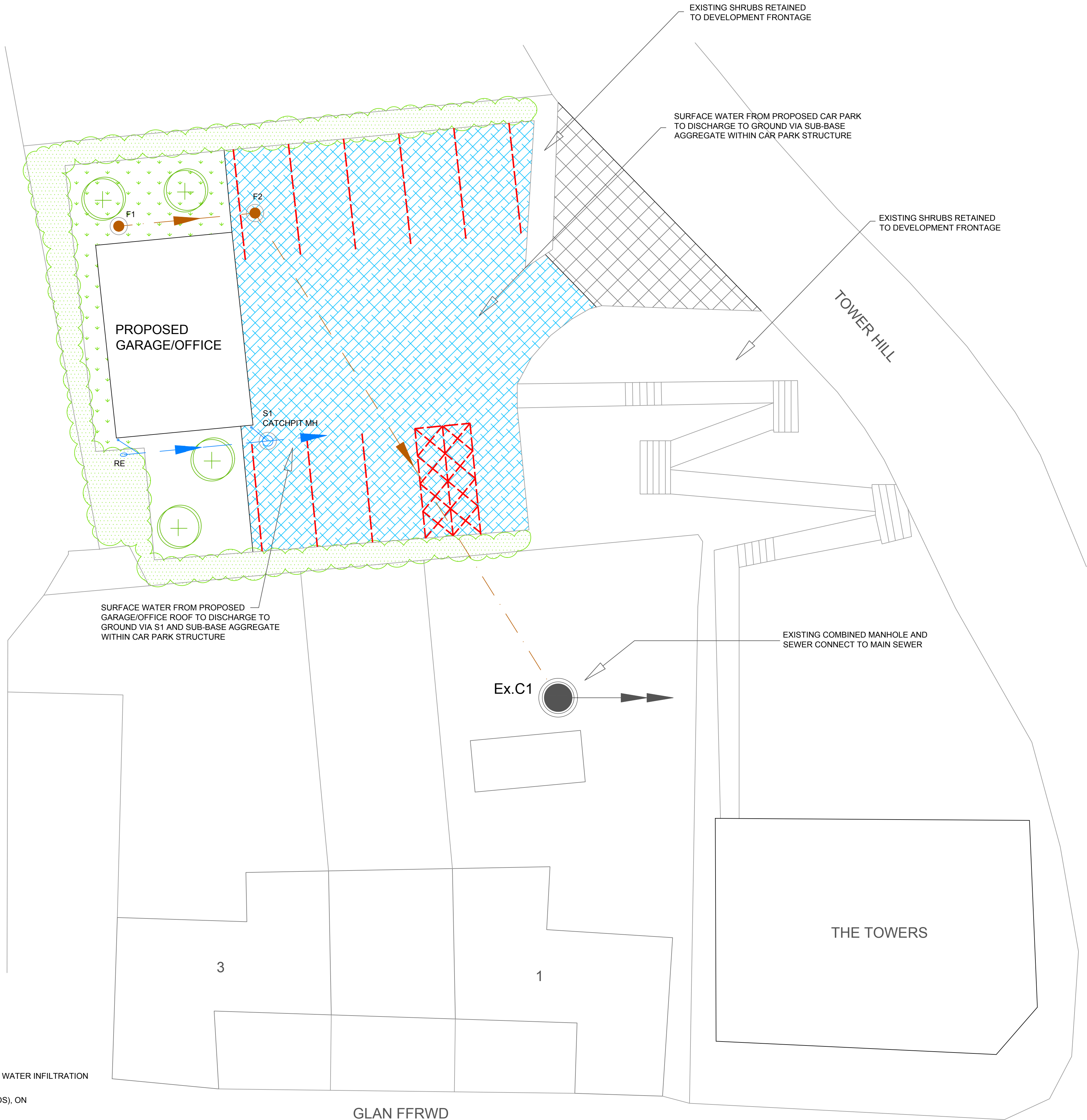
APPENDIX D:

Indicative Surface Water Drainage Layout



NOTES

1. This drawing to be read in conjunction with all relevant Weetwood drawings.



DRAINAGE KEY

- EXISTING COMBINED WATER SEWER
- PROPOSED FOUL WATER SEWER
- PROPOSED SURFACE WATER SEWER
- EXISTING COMBINED WATER CHAMBER
- PROPOSED FOUL WATER CHAMBER
- PROPOSED SURFACE WATER CHAMBER
- PERMEABLE PAVING - WHOLE EXTENT TO TO BE UTILISED FOR SURFACE WATER INFILTRATION
80mm PERMEABLE BLOCK PAVING, ON
50mm BEDDING LAYER, ON
320mm SUB-BASE 20-4mm OPEN GRADED CRUSHED ROCK (MIN. 30% VOIDS), ON
MT120 FILTRATION TEXTILE
- PROPOSED BITUMEN SURFACE
- PROPOSED DENSE SHRUBS
- PROPOSED GRASS AREA
- PROPOSED TREE PLANTING

P1	25.09.19	INITIAL ISSUE	TB	AE
Rev	Date	Description	Drawn	Check
Weetwood Development • Planning • Environment			Suite C22 Josephs Wells Hanover Walk, Leeds LS3 1AB Tel 0113 244 1377 info@weetwood.net www.weetwood.net	
Client				
TOWERS DAY NURSERY LTD				
Drawing Status			Date	
PRELIMINARY			SEP 2019	
Project			Scale (A1)	1:100
TOWERS NURSERY GARAGE			Drawn	TB
WREXHAM			Checked	AE
			Project No	
			4405	
Title			Drawing No	
INDICATIVE DRAINAGE LAYOUT			102	
			Revision	
			P1	

Delivering client focussed services

Flood Risk Assessments
Flood Consequences Assessments
Surface Water Drainage
Foul Water Drainage
Environmental Impact Assessments
River Realignment and Restoration
Water Framework Directive Assessments
Flood Defence Consent Applications
Sequential, Justification and Exception Tests
Utility Assessments
Expert Witness and Planning Appeals
Discharge of Planning Conditions

www.weetwood.net