

Calculation Sheet



Project : PHASE 2 .
Banwaha
 Project Number : 17071
 Element : Pond Liner UPLIFT.

Sheet Number : 1 of : 1
 Prepared by : [Signature] Date : 10/01/17
 Checked by : [Signature] Date : 10/01/17

BANNERS GATE
 CIVIL, STRUCTURAL AND
 TRANSPORTATION ENGINEERS

Data	Calculation	Results
Consider levels.	potential uplift of pond liner due to high groundwater levels.	
Base of Pond 2 = 9.1m. Ground level at pond = 9.4m.		
Area of pond base = 210m ² .		
Assume 0.3m submerged.		
Uplift = 210 x 0.3 x 1 = 63 kN/m ² . ↑		
Pond formation level using 550mm topsoil = 8.55		
Consolidated topsoil = 1.7 tonnes/m ³ .		
Down force = 210 x 0.55 x 1.7 = 196.35 kN/m ² .		
Assume worst case uplift from formation level and dry pond.		
Uplift = 210 x 0.55 x 1 = 115.5 kN/m ² .		
FS = 1.7 = ($\frac{196.35}{115.5}$) ok ✓		
<u>Conclusion:</u>		
	Increase topsoil thickness over pond liner to 550mm to provide an allowance for variations in groundwater levels and a robust FS.	

a trial pit is necessary to gain a better indication of the maximum root depth.

Roots may be found to greater depths at other locations on the site, particularly close to trees and/or trees that have been removed both within the site and its close environs.

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As discussed in the Phase I Desk Study, undertaken on the above site by Soils Limited (Report ref: 14123/DS, April 2014), hedgerows were noted transecting the south-west of site in an east-west direct and mature trees were noted along boundary of site to north and west.

2.4 Groundwater

Groundwater equilibrium conditions may only be conclusively established by means of a series of measurements made in a standpipe, or piezometer installed in the ground after completion of site works.

Monitoring wells were installed in two of the cable percussion borehole (BH2 and BH4) and one of the window sampler boreholes (WS11) to allow long-term groundwater level monitoring on six occasions, following instructions by the client.

Groundwater was not encountered during the excavation of the trial pits; however their depth was limited to 0.60 metre bgl as they were excavated solely for contamination sampling/testing purposes.

Groundwater was encountered during the drilling of the boreholes and during the long-term monitoring undertaken to date, as presented in Table 2.2.

Changes in groundwater level do occur for a number of reasons including seasonal effects and variations in drainage.

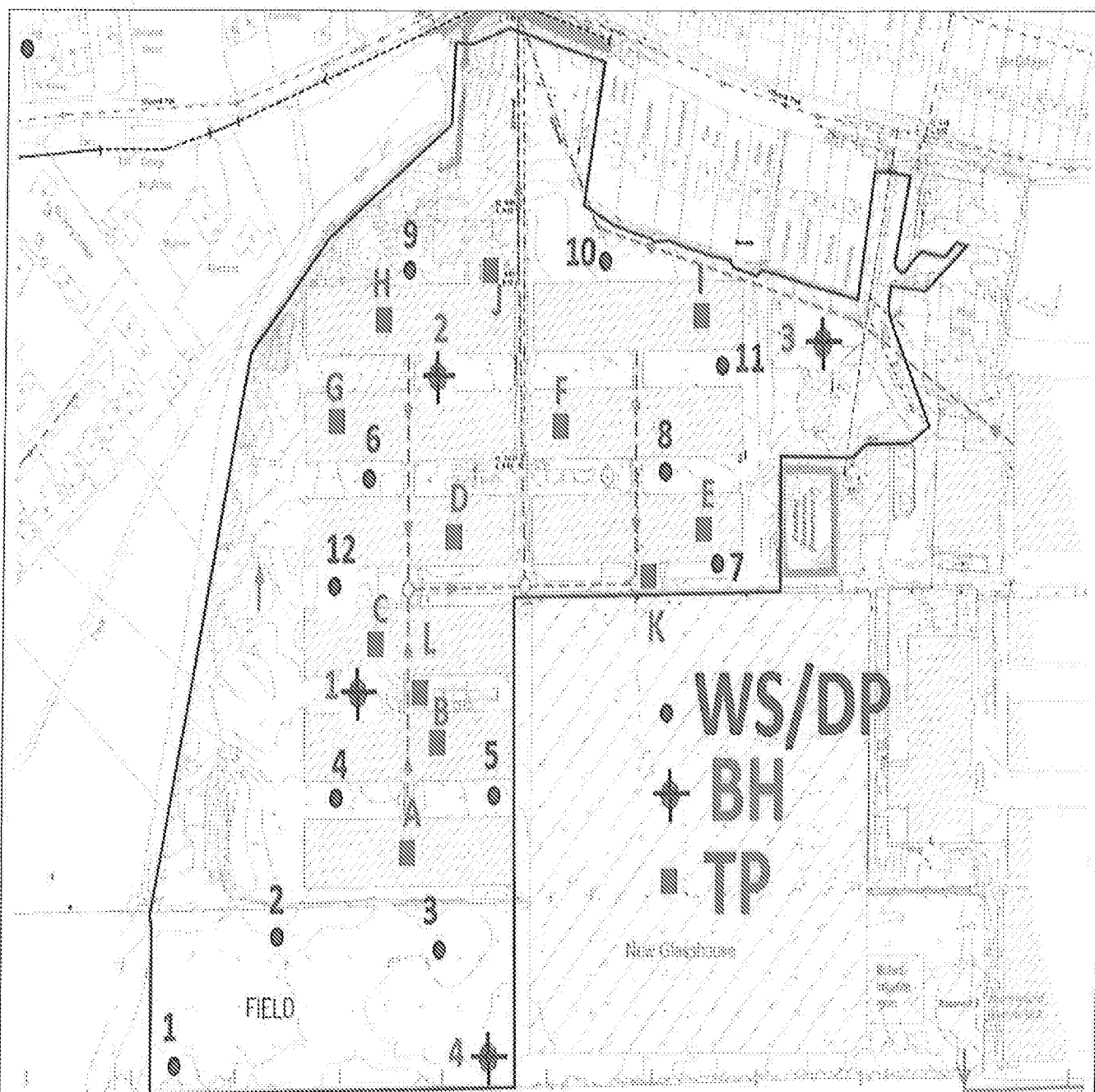
Groundwater was encountered from surface during the drilling of the boreholes as the site was noted to be waterlogged. The extremely heavy rainfall in late January 2014 and February 2014 may well result in significantly higher groundwater levels than normally anticipated.

The site investigation was undertaken in February 2014 and the groundwater monitoring (to date) were conducted in March 2014, when groundwater levels should typically be rising to their annual maximum elevation (i.e. highest in March).

Any groundwater or surface water ingress **must** be prevented from entering foundation trenches. The possible effect of groundwater on the proposed redevelopment and the foundations will be discussed later in the report.

Table 2.2
Groundwater Records (to date)

Trial hole	Groundwater Depth (m bgl)	Comment
WS1	Strike at 2.00	Reading taken on 26-28.02.14
WS2	Standing at 1.45	Reading taken on 26-28.02.14
WS3	Standing at 1.40	Reading taken on 26-28.02.14
WS4	Groundwater from surface	Reading taken on 26-28.02.14
WS5	Strike at 1.60	Reading taken on 26-28.02.14
WS6	Standing at 1.00	Reading taken on 26-28.02.14
WS7	Standing at 1.10	Reading taken on 26-28.02.14
WS8	Standing at 1.60	Reading taken on 26-28.02.14
WS9	Standing at 0.45	Reading taken on 26-28.02.14
WS10	Standing at 2.05	Reading taken on 26-28.02.14
	Groundwater from surface	Reading taken on 26-28.02.14
WS11	Standing at 1.32	Reading taken from monitoring well on 19.03.14
	Standing at 1.28	Reading taken from monitoring well on 28.03.14
WS12	Groundwater from surface	Reading taken on 26-28.02.14
BH1	Standing at 1.00	Reading taken on 25-27.02.14
	No groundwater observed	Reading taken on 25-27.02.14
BH2	Standing at 1.15	Reading taken from monitoring well on 19.03.14
	Standing at 0.99	Reading taken from monitoring well on 28.03.14
BH3	No groundwater observed	Reading taken on 25-27.02.14
	Seepage at 0.70	Reading taken on 25-27.02.14
BH4	Standing at 0.87	Reading taken from monitoring well on 19.03.14
	Standing at 0.99	Reading taken from monitoring well on 28.03.14
TPA	No groundwater observed	Reading taken on 26.02.14
TPB	No groundwater observed	Reading taken on 26.02.14
TPC	No groundwater observed	Reading taken on 26.02.14
TPD	No groundwater observed	Reading taken on 26.02.14
TPE	No groundwater observed	Reading taken on 26.02.14
TPF	No groundwater observed	Reading taken on 26.02.14
TPG	No groundwater observed	Reading taken on 26.02.14
TPH	No groundwater observed	Reading taken on 26.02.14
TPI	No groundwater observed	Reading taken on 26.02.14



Project: Eric Wall Nursery, Lake Lane, Barnham, West Sussex PO22 0AF		Fig No. 2  Geotechnical & Environmental Consultants
Client Epitair Limited	Date: April 2014	
Trial Hole Locations Plan	Ref: J14123	

BH 1

Sheet 1 of 2

Project Name
Eric Wall NurseryProject No.
14123

Co-ords: -

Hole Type
Cable

Location: Eric Wall Nursery, Lake Lane, Barnham

Level: -

Scale
1:50

Client: Epitair Limited

Dates: 26/02/2014

Logged By

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.10			Dark brown sandy clay with occasional gravel TOPSOIL.	
		0.50-0.70	B					HEAD Orange brown silty sandy CLAY with fine to medium gravel	
	▽	1.20-1.70	B						1
		2.00	SPT	N=17 (1,2/ 3,4,5,5)	1.80			RTD Orange brown fine to medium SAND with occasional fine to medium gravel	2
		2.00-2.45	D						
		3.00	SPT	N=40 (2,2/ 5,9,12,14)					3
		3.00-3.45	D						
		3.10-3.55	D						
		4.00	SPT	N=42 (4,5/ 7,9,11,15)	4.20			RTD SAND and GRAVEL	4
		4.00-4.45	D						
		4.20-4.60	B						
		5.00	CPT	N=15 (5,8/ 5,3,3,4)					5
		5.00-5.50	B						
		6.00	D		5.70			LCF Grey to dark grey fissured CLAY	6
		6.50-6.80	U						
		7.00	D						7
		7.50	D						
		8.00	SPT	N=21 (3,4/ 4,5,5,7)					8
		8.00-8.45	D						
		9.00	D						9
		9.50-9.95	U	50					
		9.95	D						
			Type	Results					

Continued next sheet

Remarks: 1 Hour day work hand digging inspection pit to 1.20m bgl. No roots observed. Groundwater encountered at 1.0m bgl



Project Name
Eric Wall Nursery

Project No.
14123

Co-ords: -

Hole Type
Cable

Location: Eric Wall Nursery, Lake Lane, Barnham

Level: -

Scale
1:50

Client: Epitair Limited

Dates: 27/02/2014

Logged By

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	D		0.10			TOPSOIL Dark sandy clay with gravel	
		0.50-0.70	D		0.40			HEAD Brown silty clayey SAND	
								HEAD Brown silty sandy CLAY	
		1.20-1.70	B						1
		2.00	SPT	N=5 (2,1/					
		2.00-2.45	D	1,1,2,1)	1.80			RTD Brown fine SAND	2
		3.00	SPT	N=18 (1,2/					
		3.00-3.45	D	2,3,5,8)					3
		4.00	CPT	N=32 (4,5/	3.90			RTD SAND and GRAVEL	4
		4.00-4.50	B	7,7,8,10)					
		5.00	CPT	N=41 (5,7/					5
		5.00-5.50	B	9,10,11,11)					
		6.00	D		6.30				6
		6.50-6.95	U	35				LCF Grey to dark grey fissured CLAY	
		6.95	D						7
		7.50	D						
		8.00	SPT	N=15 (2,2/					8
		8.00-8.45	D	3,3,4,5)					
		9.00	D		9.00			LCF Grey silty SAND	9
		9.50	SPT	50 (8,9/					
		9.50-9.90	D	2,12,14,12 for 65mm)					
			Type	Results				End of Borehole at 10.00 m	

Remarks: 1 Hour day work hand digging inspection pit to 1.20m bgl. 1 Hour day work winch rig and equipment out of field. No roots observed. Groundwater seepage at 0.70m bgl.



WS 4

Sheet 1 of 1

Project Name

Eric Wall Nursery

Project No.

14123

Co-ords: -

Hole Type

WS

Location: Eric Wall Nursery, Lake Lane, Barnham

Level: -

Scale

1:50

Client: Epitair Limited

Dates: 26/02/2014

Logged By

GB

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.50			Turf over soft dark grey brown very clayey SILT with fine to medium gravel and abundant rootlets. TOPSOIL	
		0.80 0.50-1.12 1.00	D D & J D					HEAD Soft becoming very soft with depth light becoming dark orange grey slightly sandy CLAY with fine to medium gravel.	1
		1.50	D						2
		2.00	D						3
		2.50	D		2.50			RTD Fine to medium dark yellow orange brown SAND with fine to medium gravel.	4
		3.00	D						5
		3.50	D		3.65			End of Borehole at 3.65 m	6
									7
									8
									9

Remarks: Roots observed to 0.50m bgl. Groundwater encountered from surface.



