



CONSULTING ENGINEERS

CIVIL • STRUCTURAL
GEOTECHNICAL • ENVIRONMENTAL

SURFACE WATER DRAINAGE

**WOODLANDS FARM
DODDS LANE
GWERSYLLT
WREXHAM**

**WALES AND WEST
HOUSING ASSOCIATION**

AUGUST 2018

Revision A

Project 14155

ROBERT E FRY & ASSOCIATES LTD.
45, Bridgeman Terrace
Wigan, WN1 1TT

Telephone: 01942 826020
Fax: 01942 230816
Email: mail@refa.co.uk
Company Registration No. 2436911



1.0 INTRODUCTION

Robert E Fry & Associates are consulting civil and structural engineers based in Wigan, with over 20 years experience in the appraisal and design of drainage schemes to serve new housing developments, ranging from small developments of 6 units up to 400 units plus.

We are instructed by Wales and West Housing Association to review the surface water drainage options for a housing development at Woodlands Farm, Dodds Lane, Gwersyllt, Wrexham, consisting of 23 properties.

2.0 PROPOSED SURFACE WATER DRAINAGE SOLUTION

There is an established hierarchical process to be adopted when arriving at a surface water drainage solution for a development site set out in part H3 of the Approved Document, summarised in order of preference as follows:

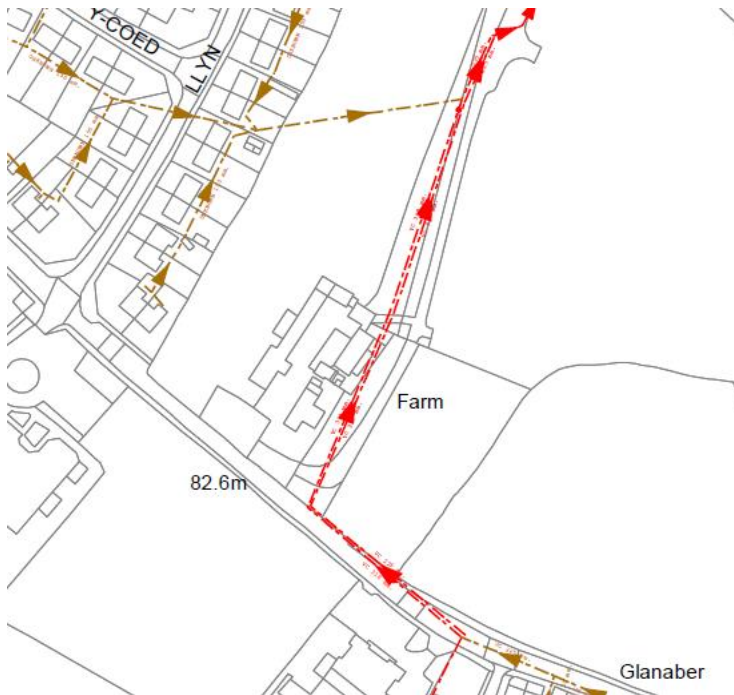
- a. Infiltration / soakaway
- b. Discharge to watercourse
- c. Discharge to sewer

Reference to Geo-Environmental report reference 14155/GEIR dated April 2015 indicates that infiltration may be an option for surface water disposal on this site.

A more detailed review of the trial pit records for this portion of the site indicates that the clay subgrade in some areas is of a stiff nature which in our opinion would preclude the use of traditional soakaways at nominal depths.

There are no watercourses contiguous with or in close proximity to this parcel of land, likewise the sewer records do not indicate any suitable surface water sewers into which the site could connect.

See plan below



It was thus decided in conjunction with our client to explore further the possibility of soakaways using deep bore techniques.

To this end Geo-Ventures were appointed to undertake 2 boreholes and perform falling head tests to ascertain the suitability of strata at a lower level in to which the surface water runoff from this site could discharge.

The boreholes were taken down to depths of 13m below existing ground level.

Standing water was observed in borehole 1 at a depth of 9.25m below ground level and at 9.75m in borehole 2.

250 gallons of water were added to each hole over a 5 minute period.

In both cases the water level was measured immediately and the level of water was noted to have remained unchanged.

The results and conclusions from Geo-Ventures are appended to this report and indicate that the ground appears to be highly permeable at the depths tested.

Due to the very rapid ingress of water it was not possible to calculate an infiltration rate in the usual manner.

Geo-Ventures have however undertaken lower boundary estimation on the assumption that had it been possible to fill the borehole to top of gravel stratum in say 1.5 minutes and $H/H_o @ 0.37$ approximately 30 seconds then a k value of 2×10^{-3} m./sec. (7.2 m./hour) is foreseeable, which is within the range of a clean sand / gravel mixture.

To introduce a further factor of safety a sample calculation using an infiltration rate reduced by 41% to 4.25 m./hour is appended to this report for an area drained of 180 square metres. (Plots 1 and 2). This predicts no flooding for the 1 in 100-year event + 30% climate change, the SuDS manual only requires designs for the 1 in 10-year return period, with checks for the 1 in 100 year.

The total number of proposed soakaways has been rationalised from the previous proposals to reduce ongoing maintenance costs.

As this development is being undertaken by a housing association it is envisaged that future maintenance to the properties and associated elements including the soakaways will be undertaken by the housing association or their appointed maintenance company.

Reference to the appended drawings shows outline details of the proposed deep bore soakaways.

The construction allows for a 500mm deep sump to allow for settlement on any silt which may enter the soakaway chamber with the outlet pipe incorporating a mesh capping set 500mm above the chamber inlet. This will significantly reduce the possibility of silt entering the borehole pipe and causing future blockage. To further reduce the likelihood of silt entering the soakaway chamber the upstream drainage network will incorporate a silt trap manhole on immediately up stream of the soakaway chamber along with trapped rainwater gullies to all properties. Road gully's will also incorporate silt traps.

During the initial operation of the soakaways it will be important for regular inspections by the housing associations maintenance team, initially on a 3 monthly basis, to assess the level of any siltation which is occurring. From this a de-silting regime can be put in place as necessary.

It is considered that the use of this type of soakaway, with the maintenance measures in place will provide a better long-term solution that say as tone filled soakaway or indeed a PCC ring type soakaway. (see extract below from Soakaway Design Guidance)

On this basis it is considered that deep borehole soakaways will provide an effective surface water drainage solution for this phase of the development.

It is also noted that parts of this site appear to be at "low risk" of surface water, see extract below.



This information relates to LIDAR data and is only very approximate and very often relates to areas where water may pond during periods of prolonged rainfall. With any development site there will be an element of design and re-contouring that will take place which will alter the existing run off pattern and areas of potential minor ponding of surface water. Site levels will be designed to direct water away from proposed properties and indeed properties will be sited at a minimum of 150mm above surrounding ground levels as standard practice which will negate this potentially very low risk of flooding.

Signed for and on behalf of
R E FRY & ASSOCIATES LTD

Geoff Hardman B.Sc.

15.8.18

2.6 Silting-up of the soakaway

Whether a conventional or deep bored soakaway is installed it is prone to collect silt in the chamber. Surface run-off naturally transports fine particles of soil from the road and verges which eventually channels it into the soakaway. With time this accumulates in the bottom of the chamber and threatens the soakage capacity in two ways.

The silt can migrate through the perforations and clog the fissures of the soakage medium. This of course depends on whether the granular surround can allow the passage of the silt. If this filters out the silt and prevents its transition through to the soakage medium then the perforations become filled and the capacity of the soakaway is very much reduced. This state is generally only reached after the soakaway has partially filled in order that a reservoir of silt is available to be stored up into suspension when the water enters the chamber

In a conventional soakaway its capacity is reduced more or less immediately because the presence of the silt influences the available storage volume. With a deep bored soakaway the perforated liner is protected by fixing the tube above the base and capping it with a syphon head. This provides a volume whereby silt can collect, although excessive build up will enable the silt to become water borne and be drawn down into the liner.

New soakaways and silt traps should be jetted and cleaned out prior to adoption by the highway authority as considerable quantities of silt can be generated during construction works associated with a development. It is essential that the soakaways are then cleaned out at regular intervals during their lifetime. Linked soakaways also put a greater burden on the initial chamber in the sequence and the associated inlet pipe which will require a greater frequency of maintenance for the initial chamber in a series compared to a series of isolated soakaways. Banks of soakaways and their connecting pipes will effectively sterilise a large area from development. They are often located in areas of public open space which may still be subject to future development including childrens play areas, tree planting, lighting columns and service trenches. The depth of the connecting pipes must still consider the risk of future trenching taking place in the vicinity of the soakaways.

PERMEABILITY TEST RESULTS (Borehole)

Contract:

Woodlands Farm, Gwersylt

Borehole

BH 1

Test No.

1

Test Zone

1.00 - 13.00m

Date

12.10.15

Type of Test : Falling Head

Units in metres unless otherwise stated

Elapsed Time (mins)	Depth of water below top of casing
0.0	
0.5	
1.0	
2.0	
3.0	
4.0	
5.0	
7.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	
45.0	
50.0	
55.0	
60.0	

Height of casing above GL =

0.00

Borehole dia. (mm)

150

Ground Level

Depth of casing below GL =

N/A

Water added to borehole to ground level

Water level within borehole before test 9.25m

Remarks:

Before commencement of test, water level within well monitored at 9.25m below existing ground level. 250 gallons of water added to well over a 5 minute period water level immediately monitored and water level within well remained unchanged at 9.25m

Assumed highly permeable

Test undertaken by:

P. Platt / M. Foster

Geo-Ventures (UK) Limited

70 Riverside Close, Waterside, Howley, Warrington, Cheshire, WA1 2JD

Tel. 01925 240476 / 01942 870967

PERMEABILITY TEST RESULTS (Borehole)

Contract:

Woodlands Farm, Gwersylt

Borehole

BH 2

Test No.

1

Test Zone

1.00 - 12.00m

Date

12.10.15

Type of Test : Falling Head

Units in metres unless otherwise stated

Elapsed Time (mins)	Depth of water below top of casing
0.0	
0.5	
1.0	
2.0	
3.0	
4.0	
5.0	
7.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	
45.0	
50.0	
55.0	
60.0	

Height of casing above GL =

0.00

Borehole dia. (mm)

150

Ground Level

Depth of casing below GL =

N/A

Water added to borehole to ground level

Water level within borehole before test 9.75m

Remarks:

Before commencement of test, water level within well monitored at 9.75m below existing ground level. 250 gallons of water added to well over a 5 minute period water level immediately monitored and water level within well remained unchanged at 9.75m

Assumed highly permeable

Test undertaken by:

P. Platt / M. Foster

Geo-Ventures (UK) Limited

70 Riverside Close, Waterside, Howley, Warrington, Cheshire, WA1 2JD

Tel. 01925 240476 / 01942 870967

Woodlands Farm, Gwersylt

Although it has not been possible to calculate a value of permeability from the insitu tests, due to the very rapid fall in head, a lowerbound figure can be estimated as follows:

prior to test water standing at an average of 9.50m depth.

assume if had been possible to fill borehole to top of the gravel stratum in say 1.50 mins and $H/H_o @ 0.37$

approximately 30 secs

$k \approx 2 \times 10^{-3} \text{ m/ sec}$

This is within range of a clean sand and gravel mix, which is the case at this site

Robert E Fry & Associates		Page 1
45 Bridgeman Terrace Wigan WN1 1TT	Woodlands Farm Gwersylt Deep Bore Soakaway P1/P2	
Date 15/08/2016 File P1 AND P2.SRCX	Designed by GWH Checked by	
XP Solutions	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 8 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	82.426	6.726	2.4	1.5	O K
30 min Summer	82.551	6.851	2.4	1.7	O K
60 min Summer	82.480	6.780	2.4	1.6	O K
120 min Summer	82.169	6.469	2.4	1.0	O K
180 min Summer	81.885	6.185	2.4	0.5	O K
240 min Summer	81.724	6.024	2.4	0.2	O K
360 min Summer	80.547	4.847	1.9	0.2	O K
480 min Summer	79.679	3.979	1.6	0.1	O K
600 min Summer	79.104	3.404	1.3	0.1	O K
720 min Summer	78.679	2.979	1.2	0.1	O K
960 min Summer	78.111	2.411	0.9	0.1	O K
1440 min Summer	77.484	1.784	0.7	0.1	O K
2160 min Summer	77.018	1.318	0.5	0.0	O K
2880 min Summer	76.762	1.062	0.4	0.0	O K
4320 min Summer	76.479	0.779	0.3	0.0	O K
5760 min Summer	76.329	0.629	0.2	0.0	O K
7200 min Summer	76.232	0.532	0.2	0.0	O K
8640 min Summer	76.161	0.461	0.2	0.0	O K
10080 min Summer	76.109	0.409	0.2	0.0	O K
15 min Winter	82.584	6.884	2.4	1.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	96.918	0.0	16
30 min Summer	67.029	0.0	25
60 min Summer	44.405	0.0	42
120 min Summer	28.487	0.0	72
180 min Summer	21.655	0.0	102
240 min Summer	17.694	0.0	128
360 min Summer	13.184	0.0	186
480 min Summer	10.704	0.0	246
600 min Summer	9.097	0.0	306
720 min Summer	7.960	0.0	366
960 min Summer	6.440	0.0	488
1440 min Summer	4.766	0.0	726
2160 min Summer	3.518	0.0	1072
2880 min Summer	2.831	0.0	1424
4320 min Summer	2.079	0.0	2156
5760 min Summer	1.668	0.0	2840
7200 min Summer	1.408	0.0	3544
8640 min Summer	1.226	0.0	4248
10080 min Summer	1.090	0.0	4960
15 min Winter	96.918	0.0	17

Robert E Fry & Associates		Page 2
45 Bridgeman Terrace Wigan WN1 1TT	Woodlands Farm Gwersylt Deep Bore Soakaway P1/P2	
Date 15/08/2016 File P1 AND P2.SRCX	Designed by GWH Checked by	
XP Solutions	Source Control 2017.1.2	

Summary of Results for 100 year Return Period (+30%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m ³)	Status
30 min Winter	82.694	6.994	2.4	1.9	O K
60 min Winter	82.510	6.810	2.4	1.6	O K
120 min Winter	81.962	6.262	2.4	0.7	O K
180 min Winter	81.485	5.785	2.3	0.2	O K
240 min Winter	80.451	4.751	1.9	0.1	O K
360 min Winter	79.256	3.556	1.4	0.1	O K
480 min Winter	78.592	2.892	1.1	0.1	O K
600 min Winter	78.161	2.461	1.0	0.1	O K
720 min Winter	77.853	2.153	0.8	0.1	O K
960 min Winter	77.442	1.742	0.7	0.1	O K
1440 min Winter	76.989	1.289	0.5	0.0	O K
2160 min Winter	76.652	0.952	0.4	0.0	O K
2880 min Winter	76.466	0.766	0.3	0.0	O K
4320 min Winter	76.263	0.563	0.2	0.0	O K
5760 min Winter	76.152	0.452	0.2	0.0	O K
7200 min Winter	76.082	0.382	0.1	0.0	O K
8640 min Winter	76.032	0.332	0.1	0.0	O K
10080 min Winter	75.995	0.295	0.1	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Time-Peak (mins)
30 min Winter	67.029	0.0	26
60 min Winter	44.405	0.0	44
120 min Winter	28.487	0.0	74
180 min Winter	21.655	0.0	96
240 min Winter	17.694	0.0	126
360 min Winter	13.184	0.0	186
480 min Winter	10.704	0.0	246
600 min Winter	9.097	0.0	306
720 min Winter	7.960	0.0	366
960 min Winter	6.440	0.0	484
1440 min Winter	4.766	0.0	724
2160 min Winter	3.518	0.0	1088
2880 min Winter	2.831	0.0	1460
4320 min Winter	2.079	0.0	2140
5760 min Winter	1.668	0.0	2840
7200 min Winter	1.408	0.0	3664
8640 min Winter	1.226	0.0	4248
10080 min Winter	1.090	0.0	4960

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	17.000	Shortest Storm (mins)	15
Ratio R	0.300	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.018

Time (mins) Area			Time (mins) Area		
From:	To:	(ha)	From:	To:	(ha)
0	4	0.009	4	8	0.009

Woodlands Farm
Gwersylt
Deep Bore Soakaway P1/P2

Designed by GWH
Checked by



Source Control 2017.1.2

Depth	Side	Depth	Side	Depth	Side
(m)	Infil.	(m)	Infil.	(m)	Infil.
	Coef.		Coef.		Coef.
	(m/hr)		(m/hr)		(m/hr)
0.000	4.50000	5.500	4.50000	6.000	0.00000

1. All disposable drawings were torn before designed and one to be constructed in accordance with *Sevens for Adoption*, 7th Edition, and *Wash State Supplemental Guidelines*.
2. *Sevens for Adoption*, 7th Edition, and *Wash State Supplemental Guidelines*, BS 5.25(1991: part 1).
3. All present concrete pipework shall be in the sizes stated in the drawings.
4. The Contractor may elect to use reinforced PVC pipes as covered by BS 6668:2000 & BS 9414:1997 as approved by the Engineer.
5. All manholes and chambers shall be to BS EN 1937:2002 up to and including 1500mm high, with a 45–10° up to and including 1500mm high, prior agreement with adopting authority. MK: PPE, LBN/10 to BE: 3.0m
5. All levels relate to an Ordnance datum.
6. Recent drawings to be used in conjunction with all other drawings.
7. House drainage connections to sewers must be 150mm Ø and must be made in accordance with the adopted drawings.
8. House drainage connections to disposal drains must be 150mm Ø.
9. House drainage runs to be kept within the cuttings of the plot.
10. Where necessary, for ensuring that any existing invert levels indicated on drawings are correct before work commences.

11. The contractor should satisfy himself as to the position and depth of the reinforcement bars and the position of the reinforcement point which could affect the works before the works are commenced.
12. Road gully connections are to be 150mm x connecting other directly to manholes shown, or to be run using up-pre-formed ducts.
13. All junction pipes, ductable connections will be by manlifted.
14. All sewers for addition with greater than 120 metres cover in roads and surrounds.
15. Any sewer for addition with less than 12 metres cover in roads or surrounds, shall be installed to a minimum of 150mm 300 of 150mm cover, finished surface to be 100mm 300 of 150mm of Falcott or similar approved joint filter breaks in the concrete surround of each pipe joints

SEE TABS: REINFORCEMENT, MANHOLES, PIPES, SEWERS, GULLIES, GULLY CONNECTIONS, MANHOLES, MANHOLES, CEMENTATION, FROM THE PRE-CASTING, STRUCTURAL, MANHOLES, PIPES, SEWERS, TO BE, JOINT IN 3m LENGTHS

ALL PIPES TO HAVE CLASS 3" BED
AND SURROUND UNLESS SHOWN OTHERWISE
ALL CONCRETE PIPES TO BE CLASS 120
ALL CLAY PIPES TO BE EXTRA STRENGTH
UNGRAVELLED CLAY ALL UPON
PIPES TO COMPLY WITH BS 4660:2000 & BS EN 1401-1
STRENGTHENED WALL UPVC PIPES TO COMPLY WITH MS 4-35-01
MAX. PIPE LENGTH TO BE 3.0m

FOUNDATIONS TO BE DESIGNED / CONSTRUCTED TO TAKE AND ACCURATELY MEASURE AND REPORT ON THE STATUS AND TRENDS OF THE WORKS ACCORDANCE WITH THE EDITION PART B

CONTRACTOR TO BE AWARE OF TAKE APPROPRIATE ACTION TO ENSURE RE-CONSTRUCTION

DESIGNS SHOWN IN THE DRAWING IS A RESULT OF ANY COORDINATIONS WORKS UNDERTAKEN IN ACCORDANCE WITH THE DESIGNS SHOWN ON THIS DRAWING. IF CONFORMANCE IS UNSURE ABOUT ANY ASPECT OF THE WORK, HE SHOULD SEEK ADVICE BEFORE COMMENCING EXCAVATION WORK.

ALL EXISTING SERVICES TO BE LOCATED AT COMMENCEMENT IN ACCORDANCE WITH THE DRAWING AND PROTECTED ACCORDINGLY DURING THE WORKS

ALL EXISTING WHOLE INVERT LEVELS ARE TO
 LOCATED AND SURVEYED PRIOR TO START ON SITE TO ENSURE
 THAT THEY ARE CORRECT AND ALSO TO ENSURE THAT LEVEL
 CLASSES ARE ADDED AND THAT INTERPOLATED INVERT LEVELS
 ARE CORRECT. ANY DISCREPANCY TO BE REPORTED TO REVA
 PRIOR TO START TO ENABLE ANY CHANGES TO BE MADE TO
 DESIGN THAT PROVE NECESSARY

ALL DRAUGHT CONNECTIONS FROM MAIN SEWER MAINHOLES TO
 FIRST INJECTION CHAMBER
 TO BE 150mm Ø UNLESS INDICATED OTHERWISE

ALL ROAD GULLY CONNECTIONS TO BE 150mmØ

THE OFF SITE SEWER CONNECTIONS HAVE BEEN DESIGNED TO THE IN WITH THE EXISTING SEWERS AND WHILST IT IS ANTICIPATED NO CLASHES WITH EXISTING SERVICES WILL OCCUR

DUE TO THE INHERENT INACCURACIES IN DEPTHS OF EXISTING SERVICES THIS CANNOT BE GUARANTEED.

REFA WOULD ADVISE THE CLIENT TO EMPLOY A SUITABLY EXPERIENCED COMPANY TO UNDERTAKE A SURVEY ALONG THE ROUTE OF THE CONNECTIONS TO ASCERTAIN THE EXISTENCE AND PROXIMITY OF ANY SERVICES AND ADVISE REFA OF ANY POTENTIAL CLASHES TO ASCERTAIN IF DESIGN CHANGES CAN BE MADE.

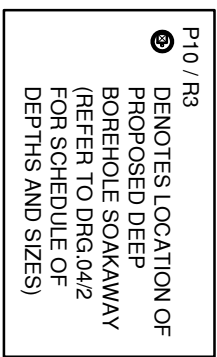
CONTRACTOR/CLIENT SHOULD NOTE THE EXISTENCE OF EXISTING BUILT PLANT AND/OR OTHERING POWER CABLES) BEFORE WORK COMMENCES. CONTRACTOR MUST UNDERTAKE RISK ASSESSMENT AND PROVIDE METHOD STATEMENT FOR WORKING IN THIS AREA IN ACCORDANCE WITH HSE AND POWER OF LINES REGULATIONS TO PREVENT THE OCCURRENCE OF A PRINCIPLE VIOLATION.

TO CATER FOR ANY DEVIATIONS IN THE AS CONSTRUCTED ROAD / FOOTPATH LEVELS IN RELATION TO THE DESIGN LEVELS, THE CONTRACTOR SHALL BE ADVISED THAT THIS MUST BE CHECKED ON SITE BY THE SITE AGENT OR ENGINEER IN RELATION TO AS BUILT ROAD LEVELS TO ENSURE COMPLIANCE WITH PART 14 OF THE BUILDING REGULATIONS.

Accounted for manual residual risks associated with the design outcomes shown on this drawing are:

1. EXISTING SERVICES
2. WORKING IN EXISTING HIGHWAY
AND WORKING IN EXISTING
THE PUBLIC HAVE ACCESS
3. DANGER OF COLLAPSE TO
BE ASSESSED AND MANAGED BY CONTRACTOR
IN ACCORDANCE WITH HSE GUIDANCE

3RBEFA Ltd has followed its Design Risk Management process for Hazard Elimination and Risk reduction in developing the designs shown on this drawing.



HORIZONTAL AND VERTICAL CONTROL ESTABLISHED USING SMARTNET
GPS NETWORK AND OSGB36(V2) COORDINATE SYSTEM THIS SURVEY
HAS BEEN CONVERTED TO A LOCAL GRID ORIENTATED TO OS GRID.
POSITION IS ONLY TRUE AT ONE POINT TO OS COORDINATES

1. All adoptable sewers and associated works are to comply fully with "Sewers for Adoption" 7th.Edition dated August 2012.

2. All highway notes to be to observable standards and to comply fully with the local authority's policy.
3. All private drainage notes to be to comply fully with the local authority's policy.
4. All existing invert levels to be checked by the local authority's surveyors and any discrepancies noted to ECRAs, and any all levels are based on topographical survey information provided by others.
5. All inlets need to bear the relevant BS/EN standard and comply fully with the specifications.
6. All opening notices etc. as required under the Statutory Instrument must be obtained prior to the investigation report being finalised (i.e. from both soils and groundwater will not occur)
7. All opening notices etc. as required under the Highway Act 1980, must be obtained prior to the investigation report being finalised.
8. All notes to be inspected by J.A., NMCB or Relevant Water Authority as appropriate.

C.D.M. REGULATIONS 2015

In line with the above regulations we are obliged to inform the Client of their responsibilities under section 2(3) and 2(4) of the Regulations. This may be done by the Contractor, or by the Client, or by a third party, such as the Health and Safety Commission.

All design work has been carried out with Health and Safety aspects given full consideration. Wherever possible plans have been eliminated from the design, however due to the very nature of this type of work it is not possible to remove all of the design elements.

We would also respectfully remind the Client of his obligations to take all reasonable steps in ensuring that only competent Contractors who have a valid safety policy are employed.

They should also provide satisfactory references of previous work.

Should the Client wish to refer to what we will regard as a 'Design Statement' in which we specify the work and in particular those highlighted by FEA below:-

1. Support / treatment for ALL excavation work.
2. Guarding to edges of excavations to prevent people, rodents and vehicles falling into excavations.
3. Guarding of excavations outside working hours to prevent unauthorised access.
4. Underpinning to adjacent roads or structures.
5. Confined space operations.
6. Dealing with existing services.

7. Traffic management on existing highways.
8. Procedure to be followed in event of accident or emergency.
9. Method of working where contaminated ground is present on site.

10. Confirmation will be required that all operatives are adequately trained, copies of relevant training certificates to be supplied.

The above list is by no means exhaustive but it does highlight operations that present a risk to contractors and the general public.
For clarification on any item please contact REFA.

[illegible]

Drawing Stage		Drawing Status	
☐	Draft	☒	Tender
☒	Issued	☐	Construction
☐	Approval	☐	As Built

HOUSING ASSOCIATION

Drawing title

LAYOUT

REFRA
CONSULTING ENGINEERS
CIVIL • STRUCTURAL
GEOTECHNICAL • ENVIRONMENTAL

45 Bridgeman Terrace
Wilton, Texas
Tel. (817) 942-8260/20
Fax: (817) 942-2208/16

Date	Scale	Drawn
5.2.16	1/500	GMH

