

Purbrook Park School – Drainage Assessment

Project:	SHF.1086.003.HY.R.001.A – Purbrook Park School
For:	Persimmon Homes
Status:	Final
Date:	April 2016
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1. Introduction

Enzygo Ltd were commissioned to produce a Drainage Assessment in relation to a planning permission for a proposed residential development, located on land at Purbrook Park School, Purbrook.

2. Purpose of File Note

The purpose of this File Note is to address the following points:

- Calculate the greenfield runoff rates from the existing Site;
- Establish a surface water outfall, in line with requirement H3 of the Building Regulations 2000;
- Calculate storage attenuation up to the 1 in 100+CC event, based on greenfield runoff rates and the proposed layout;
- Comment on the nature of proposed foul flow discharge from the Site;
- Demonstrate that the proposed development would not increase flood risk elsewhere.

3. Site Description

3.1 Site Location

The Site is located on land at Purbrook Park School, Stakes Road, Purbrook, PO7 5BF. The National Grid Reference of the Site is 468277, 107796 (see Appendix 1).

3.2 Existing Site

The Site is approximately 0.73 hectares (ha) in area, and is the former Site of Purbrook Park School, which has since been demolished, and is currently undeveloped scrubland.

The Site is bounded by Stakes Road to the south, a new residential development to the east, and further residential development to the north and west.

The Site is currently access off Stakes Road to the south.

3.3 Proposed Development

It is understood that the proposal will include 26 residential units, include associated highways, driveways, gardens and landscaping.

A copy of the indicative layout has been included within Appendix 1.

3.4 Topographic Information

A detailed topographic survey of the Site was undertaken by Sitrine during January 2015. A copy of the survey has been included within Appendix 2.

Based on the topographic survey, the Site falls in a north-east direction. The Site falls from a topographic peak of 53.27m AOD located towards the south-west corner of the Site, to a topographic low of 50.08m AOD located towards the north-east corner of the Site. This is a fall of 137m over an approximate distance of 137m (approximate slope of 1:43).

3.5 Catchment Hydrology

Based on a review of the Environment Agency flood map and Ordnance Survey mapping, there are no Main Rivers (watercourses under the authority of the Environment Agency), or 'Ordinary Watercourses' (watercourses under the authority of the local drainage authority) located within the immediate vicinity of the Site.

The closest watercourses to the Site is an unnamed Main River flowing in northerly direction approximately 400m to the south-west of the Site, where the watercourse enters into culvert and flows north-west away from the Site.

3.6 Southern Water Assets

There is a Ø225mm public surface water sewer and a Ø225mm public foul sewer, flowing west within Stakes Road to the south of the Site.

Southern Water's sewer assets have been included within the topographic survey of the Site (see Appendix 2) and highlighted within the indicative drainage drawing (see Appendix 2).

3.7 Soils and Geology

Soils mapping produced by the National Soils Resources Institute (Cranfield University) shows that the Site is underlain by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

The British Geological Survey (BGS) online mapping (Geology of Britain Viewer) shows that there are no superficial deposits beneath the Site, whereas the bedrock geology is Wittering Formation (sand, silt and clay,) of which is surrounded by an area of London Clay Formation (clay, silt and sand).

Based on the above, the permeability of the soil and bedrock geology are likely to be low.

Soakaway testing was carried out by Enzygo as part of a Geo-Environmental Report during July 2015. Results from the soakaway tests have been summarised below in Section 4.5.

4. Surface Water Drainage Strategy

4.1 Drainage Principles

A surface water management strategy for the development will be required to manage and reduce the flood risk posed by the surface water runoff from the Site. The developer will be required to ensure that any scheme for surface water should build in sufficient capacity for the entire Site.

There are three possible options to discharge the surface water runoff in accordance with requirement H3 of the Building Regulations 2000¹. Rainwater must discharge to one of the following, listed in order of priority:

- i. An adequate soakaway or some other adequate infiltration system; or, where that is not reasonably practicable,
- ii. a watercourse; or where that is not reasonably practicable,
- iii. a sewer.

An assessment of the surface water runoff rates has been undertaken in order to determine the surface water options and attenuation requirements for the Site. The assessment considers the impact of the developed Site compared to current conditions. Therefore, the surface water attenuation requirement for the developed Site can be determined and reviewed against existing arrangements.

The surface water drainage arrangements for any development Site should be such that the volume and peak flow rates of surface water leaving a developed Site are no greater than the rates prior to the proposed development, unless specific off-Site arrangements are made and result in the same net effect.

4.2 Existing Drainage System

It is assumed that the former development discharged to the Southern Water sewer network, located to the south of the Site. It is assumed that the former Site discharged at the brownfield runoff rate.

The 0.73 Ha Site currently undeveloped scrubland with no impermeable (hardstanding) areas, therefore is considered to be entirely permeable. Following demolitions of the former development, it is assumed that the connection to the public sewer connect was severed. It is therefore assumed that rainfall ponds on Site, infiltrating over time due to the expected low permeability of the underlying soils and geology.

4.3 Proposed Development

The application is for 26 residential units, include associated highways, driveways, gardens and landscaping. A proposed layout has been included within Appendix 1.

A figure of 52% has been calculated for impermeable areas of the Site. A comparison of existing and proposed impermeable areas is included below within Table 4.1.

¹ Office of the Deputy Prime Minister, The Building Regulations 2000.

Table 4.1: Impermeable Area

	Existing Buildings and Hardstanding	Proposed Buildings and Hardstanding	Difference
Area (Ha)	0.00	0.38	+0.38
Percentage of Total Site Area (%)	0.0	52	+52

Based on the above it is clear that the proposed development will increase the overall area of impermeable surfaces. Therefore attenuation of surface runoff for the proposed development will need to be introduced.

4.4 Calculated Greenfield Runoff Rate

The greenfield runoff rates of runoff have been determined using the current 'industry best practice' guidelines as outlined in the Interim Code of Practice for SUDS². The recommended methodology for Sites up to 50 hectares in area is the ICP SUDS method.

- Catchment Area: 0.73ha
- Average Annual Rainfall (SAAR): 700 mm/year;
- Soil: 0.400;
- Impermeable Areas: 0% (0.00ha)
- Region No.: 7

Table 4.2 below summarises the greenfield runoff rates for the Site over a range of return periods. PDS calculations have been included within Appendix 3.

The measures detailed in Section 4.5 and 4.6 will control the surface water runoff from the Site and therefore surface water flood risk from the developed Site.

Based on the above, the QBAR greenfield runoff rate has been calculated to be 2.5 l/s. It is however noted that 5 l/s is normally the recommended minimum rate as per the current best practice guidance contained within 'Preliminary rainfall runoff management for developments, R&D Technical Report W5-074/A/TR/1, Revision E'. As such, 5l/s will be carried forward within this report as the recommended minimum rate.

² Office of the Deputy Prime Minister, National SUDS Working Group, July 2004, Interim Code of Practice for sustainable drainage systems.

Table 4.2: Changes in Site Runoff Characteristics

Annual Probability (Return Period, years)	Greenfield/Pre-development Runoff (l/s)
QBAR	2.5
50% (2)	2.2
3.33% (30)	5.6
1% (100)	7.9
1% + Climate Change	11.1

Note: 40% added to the data to account for long-term climate change as stated in PPG ID: 7. The 2 year, 30 year and 100 year annual probability events are of importance to the Water Companies and the Environment Agency when looking at sewage discharge and flood risk.

The greenfield runoff rate has been calculated to be 2.5l/s. It is however noted that 5 l/s is normally the recommended minimum rate as per the current best practice guidance contained within 'Preliminary rainfall runoff management for developments, R&D Technical Report W5-074/A/TR/1, Revision E'. As such, 5l/s will be carried forward within this report as the recommended minimum rate.

4.5 Sustainable Drainage Options (SUDS)

Sustainable water management measures should be used to control the surface water runoff from the proposed development Site therefore, managing the flood risk to the Site and surrounding areas from surface water runoff.

Current guidance promotes sustainable water management through the use of SUDS. SUDS options applicable to this Site include:

- Water butts
- Permeable paving
- Filter strips
- Cellular Storage
- Detention basins
- Oversized pipes
- Swales

A hierarchy of techniques is identified³:

1. **Prevention** – the use of good Site design and housekeeping measures on individual Sites to prevent runoff and pollution (e.g. minimise areas of hard standing).
2. **Source Control** – control of runoff at or very near its source (such as the use of rainwater harvesting).
3. **Site Control** – management of water from several sub-catchments (including routing water from roofs and car parks to one/several large soakaways for the whole Site).
4. **Regional Control** – management of runoff from several Sites, typically in a detention pond or wetland.

It is generally accepted that the implementation of SUDS as opposed to conventional drainage systems, provides several benefits by:

³ CIRIA (2004) Report C609, Sustainable Drainage Systems – Hydraulic, Structural and Water Quality advice.

- reducing peak flows to watercourses or sewers and potentially reducing the risk of flooding downstream;
- reducing the volumes and frequency of water flowing directly to watercourses or sewers from developed Sites;
- improving water quality over conventional surface water sewers by removing pollutants from diffuse pollutant sources;
- reducing potable water demand through rainwater harvesting;
- improving amenity through the provision of public open spaces and wildlife habitat; and
- replicating natural drainage patterns, including the recharge of groundwater so that base flows are maintained.

As noted in Section 3.7, the permeability of the soil and bedrock geology are likely to be low. The presence of made ground may also present a potential for contamination issues.

Enzygo Ltd prepared a Geo-Environmental Report during July 2015, and included soakaway testing. BRE 365 soakaway tests were undertaken at three locations (SA1 to SA3) within areas of proposed hardstanding. Tests were undertaken in accordance with the principles of BRE 365 although only one test cycle was possible per pit and the results were extrapolated using a negative exponential line to predict the time to 75% soakage.

Table 4.3: Soakaway Test Results

Soakaway	Depth (m bgl)	Test No.	Infiltration Rate (m/hr)	Note
SA1	2.0	1	-	Insufficient soakage
SA2	2.0	1	0.0223	Extrapolated
SA3	2.0	1	0.0223	Extrapolated

Based on the above soakaway results, the use of infiltration based SUDS is considered to be unfeasible.

4.6 Surface Water Management Strategy

i. Introduction

A surface water management strategy for the proposed development has been developed to manage and reduce the flood risk posed by the surface water runoff from the Site.

ii. Hierarchy of Discharge

As noted above, the use of infiltration is considered to be unfeasible.

There are no watercourses located within the vicinity of the Site.

Southern Water sewer asset plans show that there is a Ø225mm public surface water sewer flowing west within Stakes Road to the south of the Site.

Based on the above, it is proposed that surface water discharges to the public surface water sewer.

iii. *Runoff Rate*

A runoff rate of 5l/s will be carried forward within this report as the recommended minimum rate. This is in line with current best practice guidance.

iv. *Drainage Design*

Landscaped areas should be incorporated into the layout where possible, and the associated gardens of each unit/associated landscaping will allow a proportion of the rainfall to infiltrate into the soil substrate.

Surface water runoff would be directed to the drainage system through drainage gullies located around the perimeter of the buildings and through contouring of the hardstanding areas.

Storage should be provided on Site for surface water, up to the 1 in 100 year plus 40% climate change event, using the same runoff rate.

v. *Attenuation Requirements*

The attenuation volume required to reduce the post-application surface water runoff from the Site to the 5 l/s recommended minimum runoff rate, to Southern Water's sewer has been calculated below. This is up to the 100 year (+40%) rainfall event and assuming no infiltration losses to the ground.

A summary of the flow restrictions and attenuation volumes is provided in Table 4.3.

It is proposed that attenuation storage could be provided in oversized pipes below the proposed highways on Site. Attenuation requirements are considered below.

An indicative drainage layout has been included within Appendix 5, which demonstrates a positive outfall to sewer.

Table 4.3 Flow Restrictions/Attenuation Volumes

Total Site Area (Ha)	Impermeable Area (Ha)	Flow Restriction (l/s)	M100+40%CC Volume of Storage (m ³)
0.73	0.38	5.0	182

5. Foul Drainage Strategy

5.1 Existing Foul Drainage

It is assumed that the former development discharged to the Southern Water sewer network, located to the south of the Site.

The Site is currently undeveloped scrubland, therefore there is not foul discharge from the Site. Following demolitions of the former development, it is assumed that the connection to the public sewer connect was severed.

5.2 Proposed Foul Drainage

We proposed that a gravity fed outfall is established to the public foul sewer, as per the previous development arrangement. A copy of the drainage layout has been included within Appendix 4.

The proposed development will create foul flows from the Site. In accordance with Sewers for Adoption (7th Edition), peak foul water discharge from a residential development can be considered to be 4,000 litres per property per day. Using this method, approximate foul flows can be calculated for the proposed residential development.

Indicative foul flow rates are included within Table 5.1 below.

Table 5.1: Summary of Anticipated Foul Flows

Discharge Rate Per day (litres)	No. Properties	Peak Foul Flows (l/s)
4,000	26	1.2

It is noted that the drainage above is indicative only. The foul water connection points, Invert Levels and outfall rates would need to be established/agreed with Southern Water.

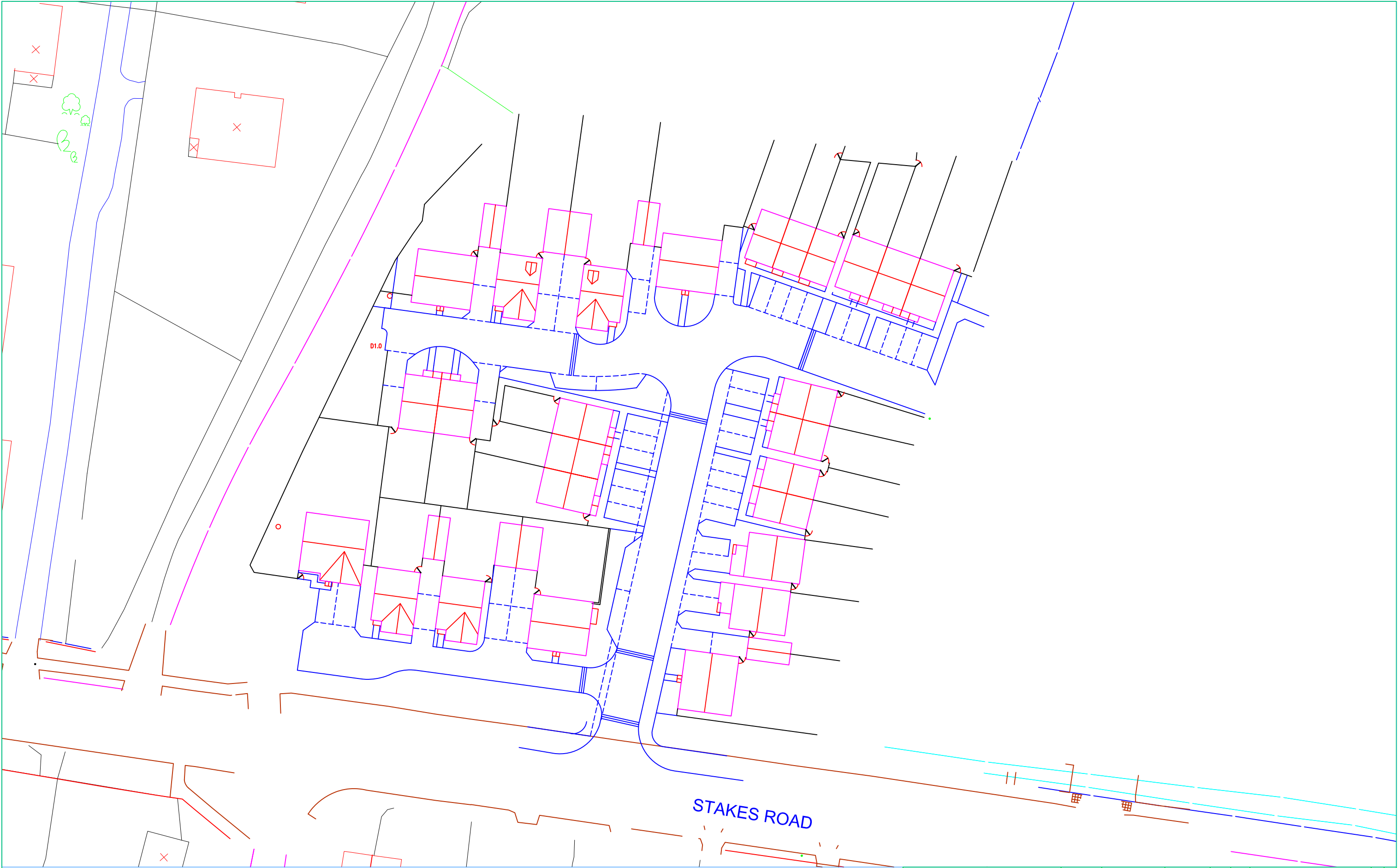
6. Summary and Conclusions

This Drainage Statement proposes the following:

- It is proposed that surface water discharges to the public sewer at the 5 l/s recommended minimum runoff rate.
- Attenuation of surface water (up to the 1 in 100 year plus 30% climate change event) could be provided through oversized pipes beneath the proposed highways.
- It is proposed that foul flows (estimated 1.2 l/s) should discharge to the public sewer network.

It has been demonstrated that both surface water flows from the Site can be managed such that flood risk to and from the Site following development is not increased. The development should not therefore be precluded on the grounds of drainage.

Appendix 1 – Indicative Layout



Job Title Any Town, Hants		Drawing Title Drawing Title		Job No 23423	Drawing No 011	Rev A	PERSIMMON Together, we make a home
		Drawn SC	Checked br	Date 11.00.15			
Scale 1:250 @ A3 metres 2 4 6 8 10		Status INFORMATION					

Appendix 2 – Topographic Survey

FENCES	
BWF	Barbed Wire Fence
CBF	Closed Board Fence
CF	Cafortse Post
CPE	Chestnut Paling Fence
CWF	Chicken Wire Fence
RF	Rail Rolling Fence
PK	Picket Fence
PRF	Post & Rail Fence
PWF	Post & Wire Fence
SCF	Security Fence
WVF	Wire Mesh Fence
WPF	Wood Panel Fence

NOTES

Survey grid is based on OS National Grid determined from the National GPS Network using OSN202. A local geoid transformation has been applied to provide a metric grid of scale factor 1.0 reduced co-ordinates. A grid shift of +480.00mm/+100.00mm will provide a 'good' approximation of full OS co-ordinates but some distortion due to scale factor will occur.

Levels based on OS datum determined from National GPS Network using OSBM2. No assumption should be made regarding the interconnection of manholes. Drainage details have been obtained from surface inspection and should be verified if critical information.

The position and height of adjacent buildings have been obtained using high level reflectorless measurement and may not take account of single storey extensions or conservatories below the line of sight.

Geomatics Surveyors		
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PERSIMMON HOMES SOUTH COAST	Client	
FORMER PLAYING FIELDS STAKES ROAD PURBROOK, HAMPSHIRE	Contract	
SITE SURVEY	Title	
11PFD01	Drawing No.	
JANUARY 2015	Date	
1:200 (A0)	Scale	
MJR/TL	Surveyor	

Appendix 3 – PDS Calculations

Drainage Design Report

Flow

V2.0

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Network

Storm Network 1

Filename

J:\PROJECTS\1086 - PERSIMMON HOMES\003 - PURBROOK PARK SCHOOL\PDS\FLOW\PURBROOK NETWORK 1.PFD

Username

ENZYGO\mark.jarvis

Last analysed

21/03/2016 13:20:49

Report produced on

21/03/2016 13:43:50

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Rainfall Methodology	FSR
Return Period (years)	1
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	19.600
Ratio-R	0.325
CV	0.750
Time of Entry (mins)	5.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Type (m)	1.000
Preferred Cover Depth (m)	1.200

	Name	Area (ha)	T of E (mins)	Add Inflow (l/s)	Cover Level (m)	Node Type	Manhole Type	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)	Notes
✓	1	0.038	5.00		52.741	Manhole	Adoptable	2400		468281.746	107763.509	3.286	
✓	2	0.151	5.00		52.670	Manhole	Adoptable	2400		468287.303	107798.621	3.286	
✓	3	0.075	5.00		52.704	Manhole	Adoptable	2400		468274.769	107809.412	3.319	
✓	4	0.098	5.00		52.451	Manhole	Adoptable	3000		468290.497	107814.103	3.099	
✓	5				51.931	Manhole	Adoptable	2400		468314.101	107809.107	2.627	
✓	6				51.794	Manhole	Adoptable	1500		468319.887	107807.444	2.550	

	Name	US Node	DS Node	Length (m)	k (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)	Min DS IL (m)	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (ha)	Pro Depth (mm)	Pro Velocity (m/s)
✓	1.000	1	2	35.549	0.600	49.455	49.384	0.071	500.0	1350	5.33	47.1		1.791	2564.0	4.8	1.936	1.936	0.038	0.0	43	0.364
✓	1.001	2	4	15.808	0.600	49.384	49.352	0.032	500.0	1350	5.48	46.5		1.791	2564.0	23.8	1.936	1.749	0.189	0.0	89	0.588
✓	2.000	3	4	16.413	0.600	49.385	49.352	0.033	500.0	1350	5.15	47.7		1.791	2564.0	9.7	1.969	1.749	0.075	0.0	58	0.447
✓	1.002	4	5	24.127	0.600	49.352	49.304	0.048	500.0	1350	5.70	45.7		1.791	2564.0	44.9	1.749	1.277	0.362	0.0	121	0.710
?	1.003	5	6	6.020	0.600	49.304	49.244	0.060	100.3	150	5.80	0.0	49.594	1.003	17.7	0.0	2.477	2.400	0.362	0.0	0	0.000

Results for 1 year Critical Storm Duration. Largest routing error: 0.48%														
Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Name	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
180 minute winter	1	136	49.698	0.243	2.5	1.1012	0.0000	OK	1.000	2	1.2	0.075	0.000	7.6134
180 minute winter	2	140	49.698	0.314	5.9	1.4205	0.0000	OK	1.001	4	3.5	0.176	0.001	4.2882
180 minute winter	3	140	49.698	0.313	2.7	1.4153	0.0000	OK	2.000	4	1.8	0.095	0.001	4.4417
180 minute winter	4	140	49.698	0.346	8.5	2.4448	0.0000	OK	1.002	5	5.0	0.198	0.002	7.6879
180 minute winter	5	140	49.698	0.394	5.0	1.7815	0.0000	SURCHARGED	1.003	6	3.3	0.759	0.185	0.0260
180 minute winter	6	140	49.286	0.042	3.3	0.0000	0.0000	OK						

Results for 30 year Critical Storm Duration. Largest routing error: 0.48%														
Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Name	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute winter	1	232	50.184	0.729	4.2	3.2977	0.0000	OK	1.000	2	1.3	0.083	0.001	29.7217
240 minute winter	2	236	50.184	0.800	10.2	3.6200	0.0000	OK	1.001	4	3.9	0.195	0.002	14.3046
240 minute winter	3	236	50.184	0.799	5.0	3.6162	0.0000	OK	2.000	4	2.9	0.108	0.001	14.8431
240 minute winter	4	236	50.184	0.832	13.2	5.8836	0.0000	OK	1.002	5	6.5	0.238	0.003	23.0985
240 minute winter	5	236	50.184	0.880	6.5	3.9829	0.0000	SURCHARGED	1.003	6	3.3	0.759	0.185	0.0260
30 minute winter	6	191	49.286	0.042	3.3	0.0000	0.0000	OK						

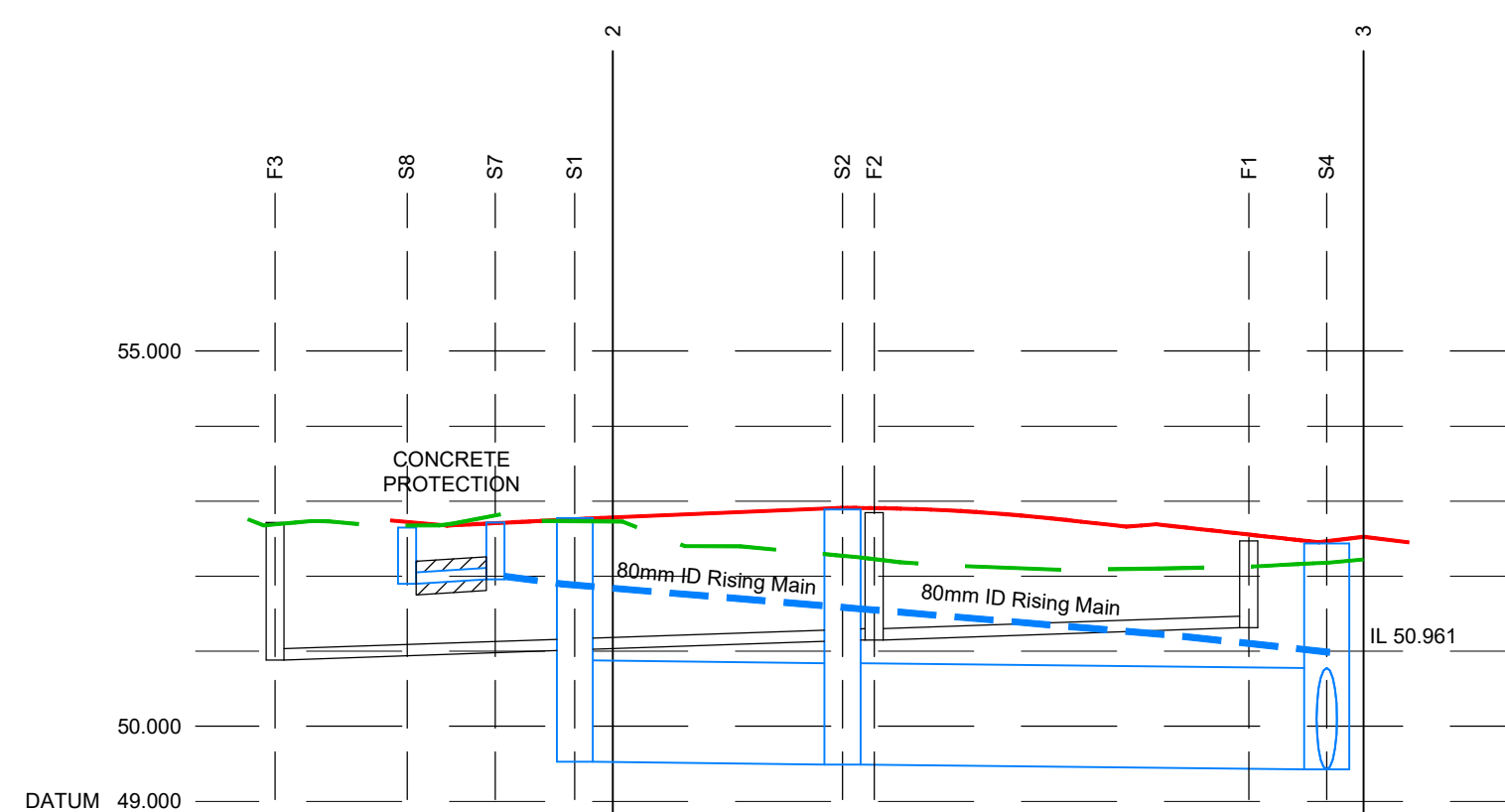
Results for 100 year +40% Critical Storm Duration. Largest routing error: 0.48%														
Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status	Link Name	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
360 minute winter	1	344	51.365	1.910	6.5	8.6407	0.0000	SURCHARGED	1.000	2	1.5	0.090	0.001	50.8901
360 minute winter	2	344	51.365	1.981	13.8	8.9623	0.0000	SURCHARGED	1.001	4	4.8	0.191	0.002	22.6299
360 minute winter	3	344	51.365	1.980	6.8	8.9580	0.0000	SURCHARGED	2.000	4	3.8	0.109	0.001	23.4960
360 minute winter	4	344	51.365	2.013	16.7	14.2306	0.0000	SURCHARGED	1.002	5	7.4	0.251	0.003	34.5390
360 minute winter	5	344	51.365	2.061	7.4	9.3245	0.0000	SURCHARGED	1.003	6	4.2	0.809	0.234	0.0309
360 minute winter	6	344	49.291	0.047	4.2	0.0000	0.0000	OK						

Appendix 4 – Drainage Layout

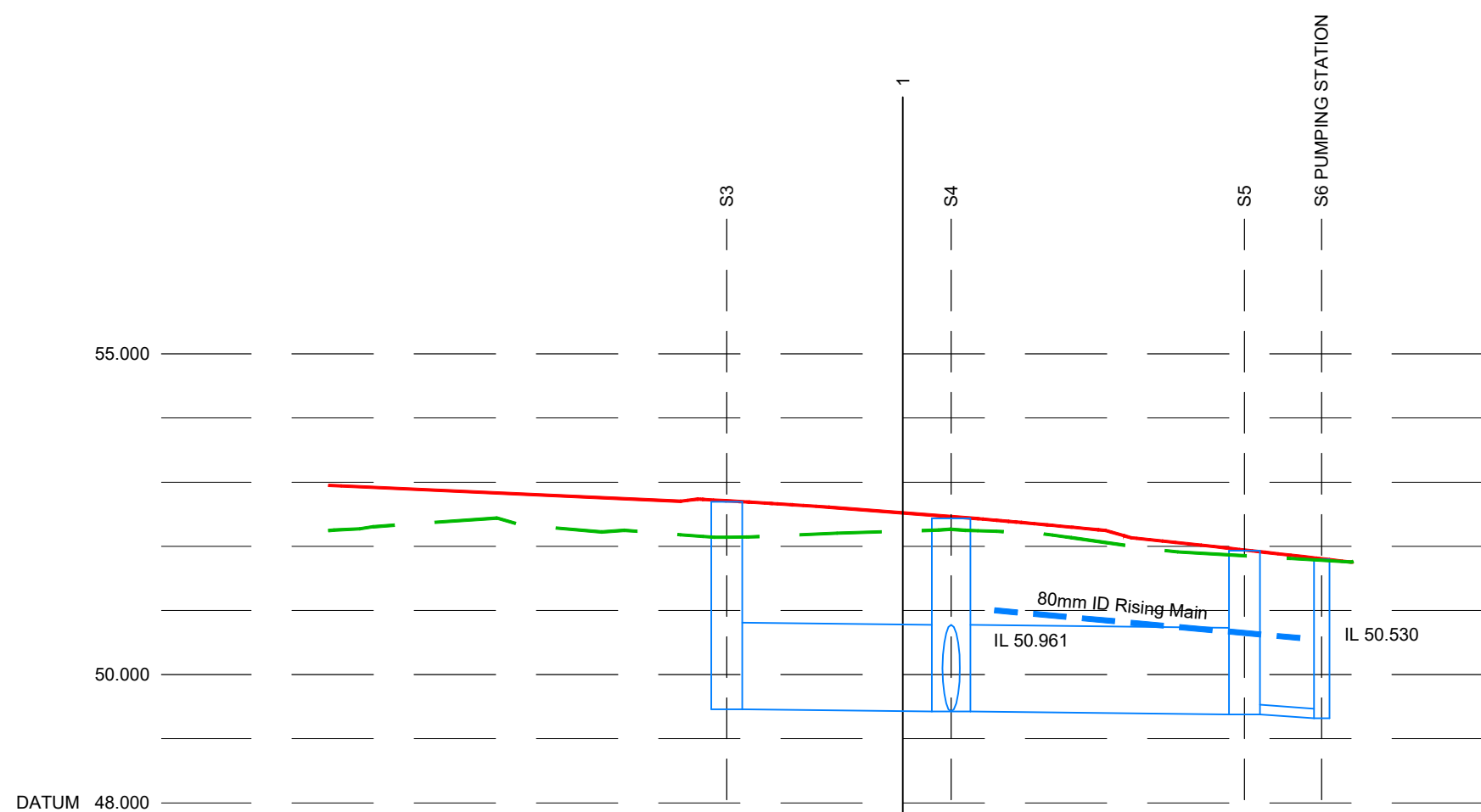


NOTES

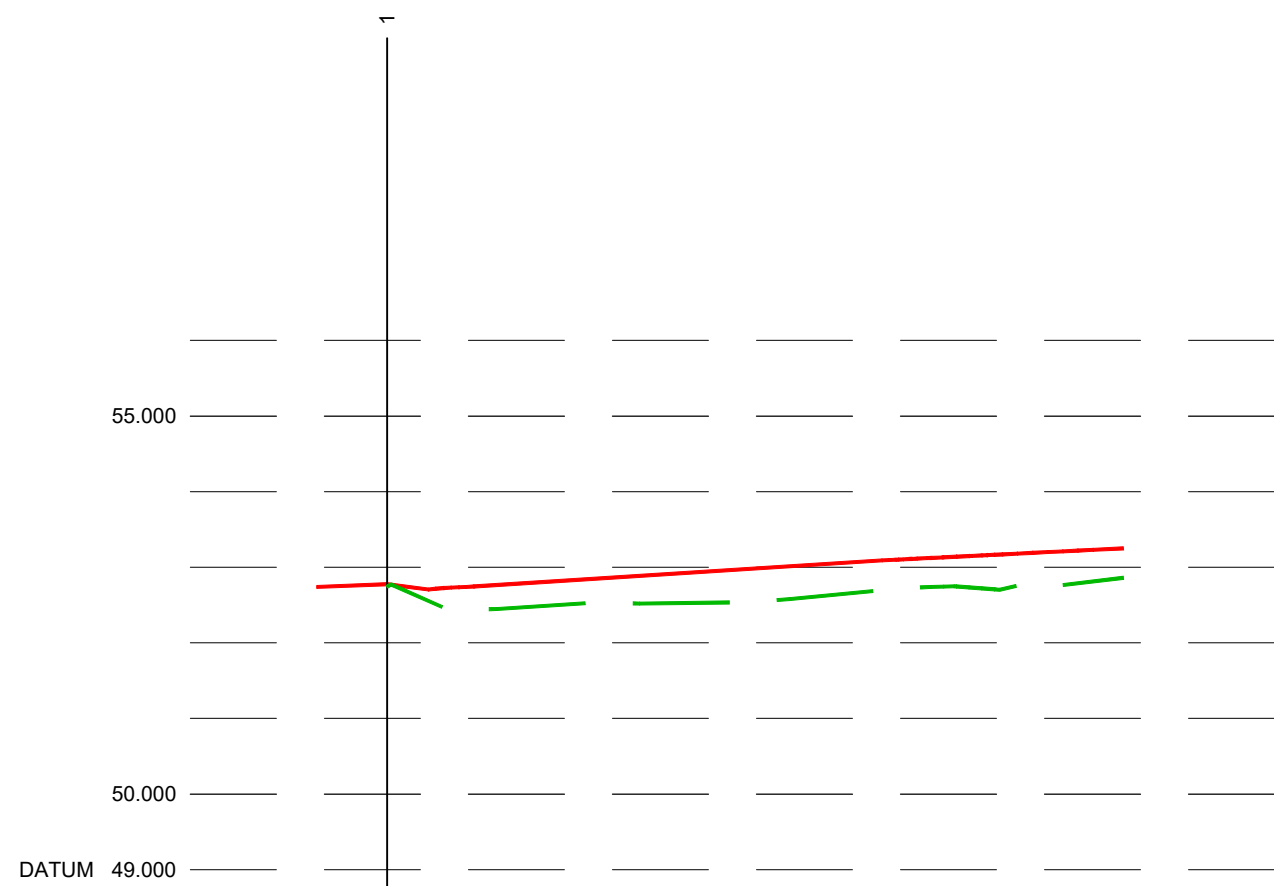
1. DO NOT SCALE.
2. This drawing is to be read in conjunction with all other relevant drawings.
3. Should there be any conflict between the details indicated on this drawing and those indicated on other drawings, the Engineer should be informed PRIOR to construction on site.
4. Until Technical Approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and Not for Construction. Should the Contractor commence site work prior to Approval being given, it is entirely at his own risk.
5. All dimensions are in metres U.N.O.
6. All levels in metres.
7. All Adoptable Sewer Work and Materials to be in accordance with 'Sewers for Adoption' 6TH Edition, the relevant British/European and Local Water Authority standards and the addendum to the Mechanical and Electrical Specification and Kite-marked.
8. Manhole covers must have a clear opening of 600mm and shall be class D400 to BS EN 124 with 150mm deep frames in highways.
9. Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
10. The Local Water Authority is not obliged to accept filter or land drainage run-off into the public sewer or adoptable drainage system (direct or indirectly). An alternative method of disposal of the land drainage run-off will therefore be required and you will have to liaise with the Local Authority Land Drainage Section with regard to the disposal of land drainage run-off.
11. Cover slabs must carry the BSI Kite-mark or will be rejected by The Local Water Authority. Where the clear opening of the Kite-marked product is different to that of the cover and frame, a load bearing slab should be fitted above the cover slab to bring the size down to 600x600mm for the Local Water Authority specified cover size. Please refer to Concrete Pipe Systems Association (CPSA) 'Technical Bulletin' issued autumn 2004 for Kite-marked cover slab opening sizes.
12. Sulphate resistant cement (C20-DC2) and precast concrete products must be used or a laboratory report provided proving that such precautions are not necessary.
13. The adoptable sewers should be a minimum of 1m and manholes 0.5m from kerb faces and service margins.
14. Sewers must have 5m clearance from trees and hedges (also refer to Figure 2.3 on page 33 in Sewers for Adoption 6th Edition for restrictions on tree planting adjacent to sewers).
15. Sewers to be laid with Class S Bedding (150mm granular bed and surround). Where depth of cover to top of the sewer is less than 1.2m in highways and verges (or less than 500mm in none vehicular access areas) then a concrete slab should be provided above the granular bed and surround.
16. Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-02 (Table A2).
17. The chamber size of manholes with more than one connection in them may need to be increased an increment to accommodate the connections and bends.
18. The Local Water Authority policy is not to accept Type C brick manholes and 1050mm dia manhole rings. Instead it is preferred that you use a Type B manhole with 1200mm dia or 1500mm dia rings, with the opening sited over the channel where depth of cover to pipe soffit is 1-1.5m.

[illegible]

ROAD 1

[illegible]

ROAD 3

[illegible]

ROAD 2

NOTES

1. **DO NOT SCALE.**
2. This drawing is to be read in conjunction with all other relevant drawings.
3. Should there be any conflict between the details indicated on this drawing and those indicated on other drawings, the Engineer should be informed PRIOR to construction on site.
4. Until Technical Approval has been obtained from the relevant Authority, it should be understood that all drawings issued are Preliminary and Not for Construction. Should the Contractor commence site work prior to Approval being given, it is entirely at his own risk.
5. All dimensions are in metres U.N.O.
6. All levels in metres.

Adoptable Drainage Notes

- All Adoptable Sewer Work and Materials to be in accordance with "Sewers for Adoption" 6TH Edition, the relevant British Standards and the relevant standards and the addendum to the Mechanical and Electrical Specification and Kite-marked.
- Manhole covers should have a clear opening of 600mm and shall be class D40 to BS EN 124 with 150mm deep frames in highways.
- Filled ground must be filled and consolidated under the supervision and to the satisfaction of Yorkshire Water before any sewer works are carried out.
- The Local Water Authority is not obliged to accept fill or land drainage run-off into the public sewer or adoptable drainage system (direct or indirect). An agreed method of disposal of the land drainage run-off will therefore be required and you will have to liaise with the Local Authority Land Drainage Section regarding the disposal of land drainage run-off.
- Cover slabs must carry the BS1 Kite-mark or will be rejected by the Local Water Authority. Where the clear opening of the Kite-marked structure is different to that of the cover and frame, a load bearing slab should be fitted above the cover slab to bring the size down to 600x600mm for the Local Water Authority specified cover. Please refer to Concrete Pipe Systems Association (CPSA), Technical Bulletin¹ issued autumn 2004 for Kite-marked cover slab opening sizes.
- Sulphate resistant cement (C20-CC2) and precast concrete products must be used or a laboratory report provided proving that such precautions are not necessary.
- The adoptable sewers must be a minimum of 1m and manholes 0.5m from kerb faces and service margins.
- Sewers must show 5m clearance from trees and hedges (also refer to Figure 2.3 on page 33 in Sewers for Adoption 6th Edition for restrictions on tree planting adjacent to sewers).
- Sewers to be laid with Class S Bedding (150mm granular bed and surround). Where depth of cover to top of the sewer is less than 1.5m, the bedding may be omitted (this bedding is not in a vehicle access areas) then a concrete slab must be provided above the granular bed and surround.
- Bedding and backfill material to conform to the requirement of Water Industry Specification 4-08-002 (Table A2).
- The chamber size of manholes with more than one connection in them may need to be increased an increment to accommodate the connections and bends.
- The Local Water Authority policy is not to accept Type C brick manholes and 1050mm dia manhole rings. Instead it is preferred that you use a Type B manhole with 1200mm dia or 1050mm dia rings, with the opening offset above the channel where depth of cover to pipe is soft is 1-1.5m.