



Foul and Surface Water Drainage Strategy

Temporary Building at Trinity Academy, Barnsley

December 2020

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This document has been prepared and checked in accordance with
Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	Date	Prepared by	Checked by	Approved by
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Comments

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1. Introduction

1.1 Background

Waterman Infrastructure & Environment Limited ("Waterman") have been instructed by Department for Education to prepare a Drainage Strategy to support a planning application for the proposed erection of a temporary school building, an associated access road, parking, external play areas and associated works at Keresforth Close, Barnsley (hereafter referred to as 'the Site')

The purpose of this drainage strategy is to provide an assessment and details of how the foul and surface water drainage from the proposed development would be managed in consideration of the surface water drainage hierarchy and appropriate discharge points.

1.2 Site Description

The Site is entirely greenfield and approximately 0.95 hectares in area. It is located in the north-eastern area of an open field south of Keresforth Close. The Site is bound by Keresforth Close to the north, Keresforth Centre to the east and the remaining field areas to the south and west. The nearest postcode to the Site is S70 6RS. The grid reference at the centre of the Site is SE 33344 05585. A site location plan is shown in **Figure 1.1**.

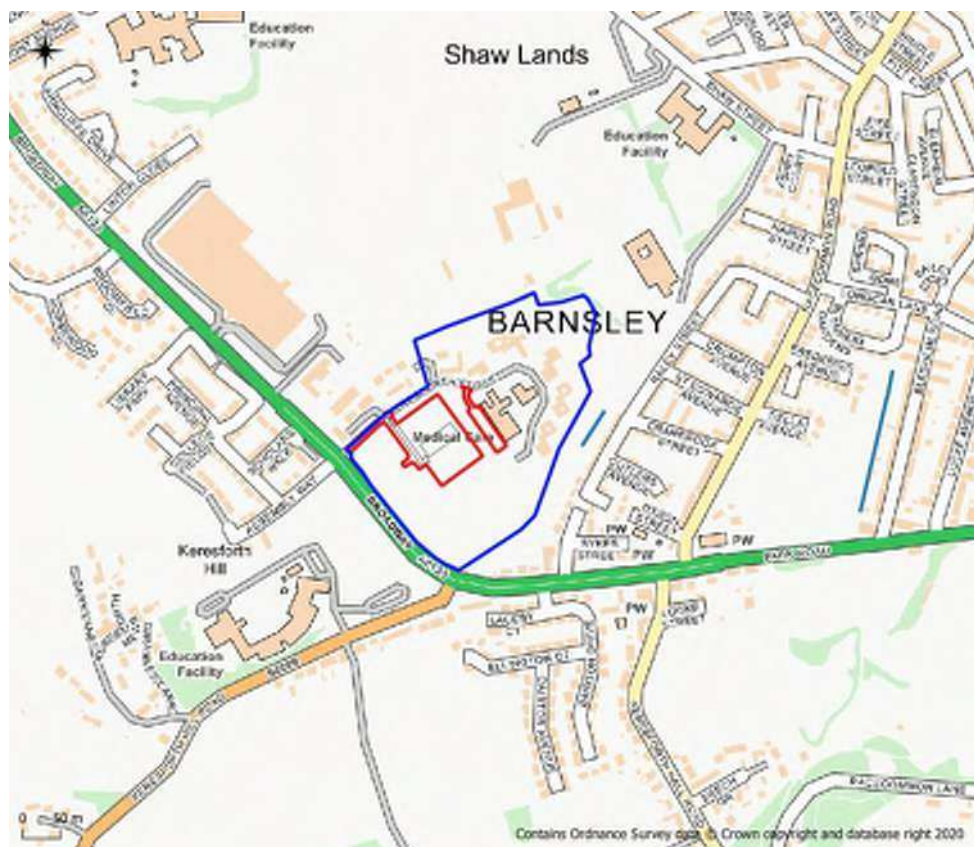


Figure 1-1 Site Location

The site is within the administrative area of Barnsley Metropolitan Borough Council (BMBC), the Lead Local Flood Authority (LLFA). Yorkshire Water Services is the statutory sewerage undertaker in the area.

1.3 Development Proposals

The development proposals involve erection of a temporary school building, an associated access road, parking, external play areas and associated works. The proposed temporary building is expected to be removed after 2 years.

The red line planning boundary consists of two parcels. The main parcel is located in the open field for the proposed temporary school building, approximately 0.84ha in area. The second parcel is an existing car park which will be retained and there will be no development in this parcel. The proposed layout is provided in **Appendix A**.

2. Planning Policy and Guidance

2.1 National Planning Policy Framework and Planning Practice Guidance

The National Planning Policy Framework¹ (NPPF) last revised in February 2019 and its supporting Planning Practice Guidance² (PPG) states that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk. Where development is necessary, it must be made safe without increasing flood risk elsewhere.

In relation to drainage it states that when determining planning applications, Local Planning Authorities (LPA) should only consider development in areas where priority is given to the use of Sustainable Drainage Systems (SuDS).

The PPG states that developers and LPAs should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of SuDS.

2.2 Non-statutory Technical Standards for Sustainable Drainage Systems

The Non-statutory Technical Standards for SuDS³ was published in March 2015 and is the current guidance for the design, maintenance and operation of SuDS.

The standards set out that the peak runoff rates should be as close as is reasonably practicable to the greenfield rate but should never exceed the pre-development runoff rate.

The standards also set out that the drainage system should be designed so that flooding does not occur on any part of the Site for a 1 in 30 year rainfall event, and that no flood of a building (including basement) would occur during a 1 in 100 year rainfall event.

It is also noted within the standards that pumping should only be used when it is not reasonably practicable to discharge by gravity.

2.3 Local Planning Policy

2.3.1 Barnsley Adopted Local Plan (January 2019)

The site is located within an area allocated for mixed-use development for housing and green space identified as MU4 - Land off Broadway. The indicative number of dwellings proposed for this area is 150 in total.

The Site is also located within an area identified as Urban Fabric which has no specific allocation. Development in this area will be required to comply with Policy GD1 which outlines overall requirements including residential amenity, compatibility with neighbouring land, access, landscape and adverse impacts to the environment, trees and drainage.

2.3.2 Barnsley Metropolitan Borough Council Strategic Flood Risk Assessment (SFRA) Level 1 (September 2010)

The SFRA indicates that surface water runoff from developments should aim to achieve the Greenfield runoff rate up to the 1 in 100 years and the minimum design for drainage systems should be able to cope with a 1 in 30 year event. It is acknowledged that in specific circumstances, attenuation to greenfield runoff

¹ Ministry of Housing, Communities and Local Government, February 2019. National Planning Policy Framework.

² Ministry of Housing, Communities and Local Government, March 2014. Planning Practice Guidance.

³ Department for Environment, Food, and Rural Affairs, March 2015. Non-statutory technical standards for sustainable drainage systems.

rate may not be achievable, which would need to be dealt with through a site-specific FRA. Sustainable Drainage Systems (SuDS) have to be investigated and any obstacles to the use of SuDS will need to be clearly justified.

3. Baseline Conditions

3.1 Topography

A topographical survey was undertaken by Survey Operations in July 2020. A copy of the survey is provided in **Appendix B**.

The survey indicates that the main parcel of the Site falls from southwest to northeast with the levels ranging between 146.70mAOD and 149.1mAOD, giving an average slope of approximately 1 in 32.

The car park parcel is relatively flat with a level of around 140.8mAOD, raising to 141.8mAOD to tie into Keresforth Close.

3.2 CCTV Survey

A CCTV survey indicates a 100mm diameter surface water sewer in Keresforth Close, flowing northeast toward an existing building to the north of the Site.

Along the eastern boundary of the car park, there is a 150mm diameter surface water sewer which joins the rest of the existing surface water network in the north. The CCTV survey is incorporated into the topographical survey which can be found in **Appendix B**.

3.3 Watercourses

The current records do not indicate any watercourses within the vicinity of the Site. However, it is understood that there is a ditch 70m to the north and another ditch 180m to the east of the Site as shown in **Figure 3-1**.

It is understood that the northern ditch forms part of a tributary (culverted) to the River Dearne. The ditch to the east of the Site running parallel to the back gardens of the residential properties off Raley Street. Both ditches are likely to fall under the responsibility of the riparian owners and Barnsley Metropolitan District Council (BMDC) in their role as Lead Local Flood Authority (LLFA).

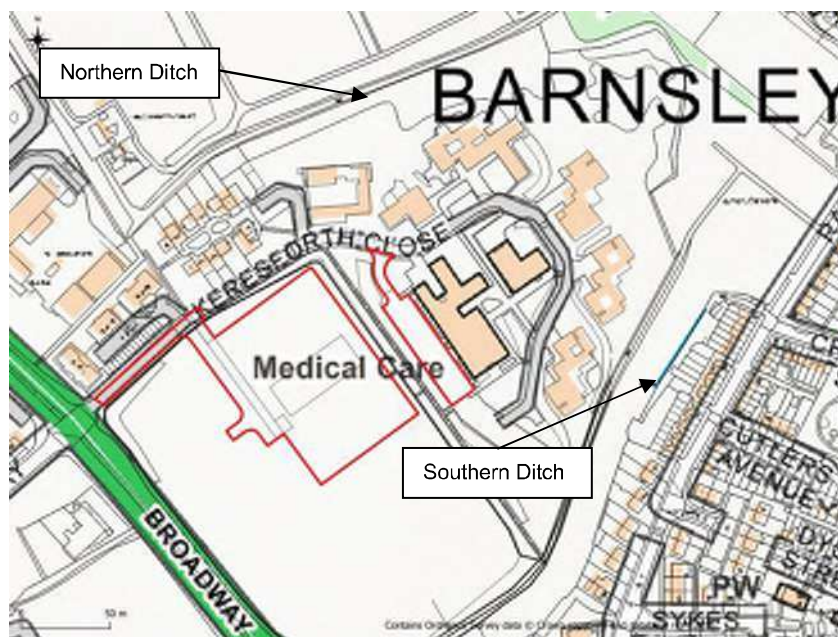


Figure 3-1 Existing watercourses

3.4 Geology

According to the British Geological Survey (BGS) online datasets, the bedrock geology at the Site is described as Pennine Middle Coal Measures comprising mudstone, siltstone and sandstone. The information of the superficial deposits is not available.

Soilscapes describes the soil characters at the Site as slowly permeable, seasonally wet, acid, loamy and clayey soils with impeded drainage.

3.5 BGS Borehole Data

There is no BGS borehole data within the Site. The nearest borehole is 180m to the southwest of the Site at coordinates X:433200, Y:405490 and 190m to the northeast of the Site at coordinates X:433400, Y:405770. The soil in the boreholes indicates clay, sandy clay and mudstone characters up to 2m depth, and coal in the deeper strata, consistent with the information from the BGS website. Refer to a copy of the borehole scans in **Appendix C**.

3.6 Existing public sewers

A sewer map from Yorkshire Water indicates that there are no public sewers within the Site. However, the nearest foul and surface water sewers are found behind Keresforth Court. A 300mm diameter surface water sewer runs in the footpath between Barnsley Fire Station and residential flats in Keresforth Court. This then reduces to 225mm diameter behind 1-12 Keresforth Close. A 225mm diameter foul sewer is also found in the footpath in the same area. Refer to the sewer map in **Appendix D**.

4. Surface Water Drainage Strategy

4.1 Pre and Post Development Drainage Area

The planning redline boundary equates to an area of 0.968 hectares which consists of an existing car park and a greenfield area. A summary of the permeable and impermeable areas is shown in **Table 4-1**.

Table 4-1 Drainage Areas

		Developable Area (ha)	Impermeable Area (ha)	Permeable Area (ha)	% Impermeable
Pre-Development	Open field	0.841	0.047	0.794	6%
	Existing car park	0.127	0.127	0.000	100%
	Total	0.968	0.174	0.794	
Post-Development	Open field	0.841	0.841	0.000	100%
	Existing car park	0.127	0.127	0.000	100%
	Total	0.968	0.968	0.000	

4.2 Existing Surface Water Drainage

As the entire developable area of the main parcel is greenfield, the existing surface water runoff would be at greenfield runoff rates, flowing towards the existing car park and buildings to the east of the Site. The existing flow paths and contours based on the LiDAR data are shown in **Figure 4-1**.

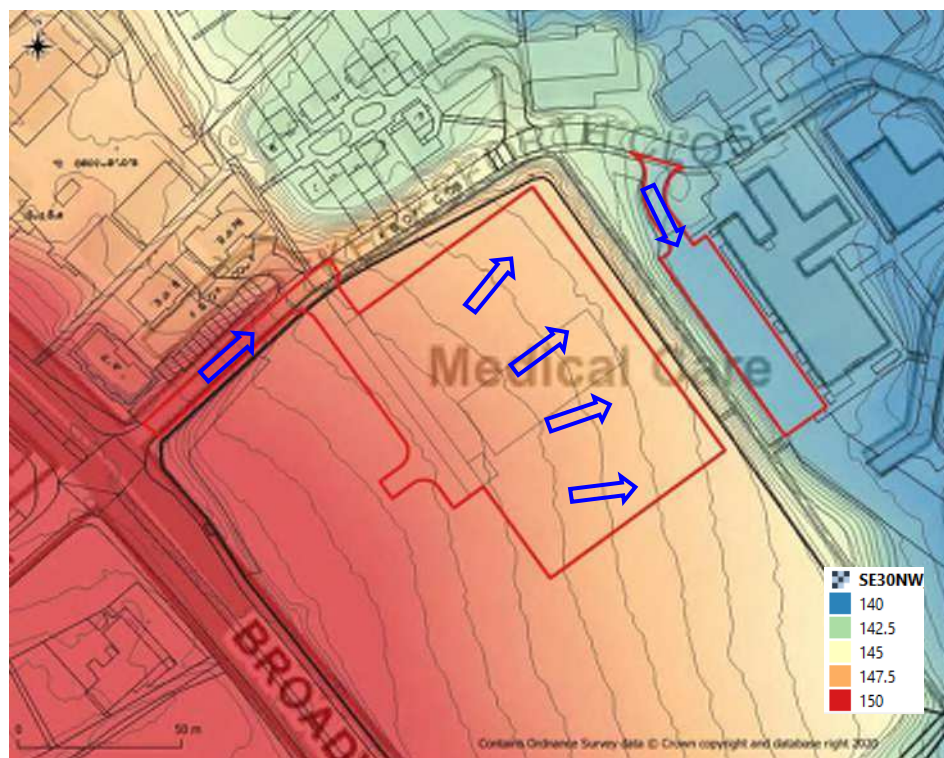


Figure 4-1 Existing overland flow paths

4.2.1 Greenfield Runoff Rates

The greenfield runoff rates have been calculated using the ICP SUDS method in MicroDrainage which uses the IH124 method and scales the runoffs down from on a 50 ha site. Based on the pre-development site areas, the greenfield runoff rates are shown in **Table 4-2** below and **Appendix E**.

Table 4-2 Greenfield Runoff Rates

Flood Event	Open Field	Car Park
QBar	4.1 l/s (4.88 l/s/ha)	0.6l/s (0.71l/s/ha)
Q1 year	3.6 l/s (4.28 l/s/ha)	0.5l/s (0.59l/s/ha)
Q30 year	7.3 l/s (8.68 l/s/ha)	1.1l/s (1.31l/s/ha)
Q100 year	8.6 l/s (10.23 l/s/ha)	1.3l/s (1.55l/s/ha)

4.2.2 Greenfield Runoff Volume

Using the FSR Rainfall method, the greenfield runoff volumes from the open field and the car park are 164m³ and 25m³ for the 1 in 100 year event 6-hour storm duration. Refer to **Appendix E** for MicroDrainage calculations.

4.2.3 Brownfield Runoff Rates of the existing car park

As the entire car park area is hardstanding, a brownfield runoff rate has been calculated based on the site area of 0.127ha.

In order to assess the current discharge rates from the Site, the Wallingford Procedure Modified Rational Method has been used to predict the current surface water discharge rate from the hardstanding area.

$$Q = 2.78 * C * i * A$$

Where: Q = Peak Discharge (l/s)

i = Rainfall Intensity (mm/hr)

A = Area (ha)

C = Runoff Coefficient (0.975)

Based on the method above, the rainfall intensity and runoff rates of the brownfield area are summarised in **Tables 4-3** to **4-5**.

Table 4-3 Brownfield Runoff Rates for 1 in 1 year

Storm Duration (mins)	Average Rainfall Intensity (mm/hr)	Brownfield Runoff Rate (l/s)
	1 in 1 year	Modified Rational Method $Q = 2.78 C i A$
15	28.8	9.9
30	18.6	6.4
60	12.1	4.2
120	7.6	2.6
240	4.8	1.6
360	3.6	1.3
600	2.5	0.9
1440	1.4	0.5

Table 4-4 Brownfield Runoff Rates for 1 in 30 year

Storm Duration (mins)	Average Rainfall Intensity (mm/hr)	Brownfield Runoff Rate (l/s)
	1 in 100 year	Modified Rational Method $Q = 2.78 C i A$
15	70.6	24.3
30	45.7	15.7
60	29.3	10.1
120	17.8	6.1
240	10.8	3.7
360	8.0	2.8
600	5.4	1.9
1440	2.8	1.0

Table 4-5 Brownfield Runoff Rates for 1 in 100 year

Storm Duration (mins)	Average Rainfall Intensity (mm/hr)	Brownfield Runoff Rate (l/s)
	1 in 100 year	Modified Rational Method $Q = 2.78 C i A$
15	91.0	31.3
30	59.6	20.5
60	38.4	13.2
120	23.4	8.1
240	14.0	4.8
360	10.4	3.6
600	7.0	2.4
1440	3.6	1.2

The brownfield runoff rates for the 1 in 1, 1 in 30 and 1 in 100 year for 60-minute storm duration are 4.2l/s, 10.1l/s and 13.2l/s, respectively.

4.3 Proposed Surface Water Drainage

As the existing car park will not be developed, the surface water runoff will remain the same. It is proposed that the existing drainage and connection is retained and not altered.

The drainage strategy for the proposed temporary building in the open field is outlined below.

4.3.1 Surface Water Drainage Hierarchy

The drainage hierarchy has been considered and is assessed as follows:

- i. Into the ground (infiltration),

The BGS and Soilsclapes data indicates mudstone and clay soil with impeded drainage. It is unlikely that infiltration would be suitability.

ii. To a surface water body

There are existing ditches 70m to the northeast and 180m to the southeast of the Site. Due to the distance to the ditches and existing buildings between the Site and the ditches, outfall directly to any of the ditches would not be feasible. This method of discharge is, therefore, not appropriate.

iii. To a surface water sewer, highway drain or another drainage system

There are existing private surface water sewers in Keresforth Close and a drainage system serving the existing car park. Discharging to the existing surface water sewer is, therefore, the most appropriate.

iv. To a combined sewer

There are no combined sewers within the vicinity of the Site.

4.3.2 Sustainable Drainage System (SuDS)

Sustainable Drainage System (SuDS) has been considered in relation to site constraints. The suitability for SuDS has been assessed in accordance with CIRIA C753 'The SuDS Manual'. Based on the site constraints and opportunities, the following SuDS techniques could be appropriate for the proposed development.

- Permeable paving
- Attenuation tanks

The increase in surface water runoff as a result of the proposed development will be stored within the permeable paving in the parking and play areas, and the attenuation tanks which attenuate surface water runoff before discharging to the existing surface water sewer in Keresforth Close.

Permeable paving allows rainwater to infiltrate through the permeable surface to be temporarily stored beneath the overlying surface in the granular subbase layer. The surface structure and the sub-surface layer also treat the rainwater as the surface water passes through the sub-base materials.

4.3.3 Proposed Discharge Rate

The SFRA states that surface water runoff from developments should aim to achieve the Greenfield runoff rate up to the 1 in 100 years and the minimum design for drainage systems should be able to cope with a 1 in 30 year event.

Restricting the proposed discharge rate to the QBar rate of 4.1l/s could increase the risk of blockage, it is, therefore, proposed to restrict the surface water discharge to the maximum of 5l/s for up to the 1 in 100 year using a flow control device.

The restricted discharge would provide up to 62% betterment for the 1 in 100 year, as shown in **Table 4-6**.

Table 4-6 Summary of Runoff Rates and Betterment

Rainfall Event	Post-Development Runoff Rate (l/s)	Proposed Restricted Runoff (l/s)	% Betterment
1 year	4.2	5	0%
30 year	10.1	5	50%
100 year	13.2	5	62%

4.3.4 Proposed Attenuation Volume

Using MicroDrainage Source Control, it is estimated that a storage volume between 337m³ and 482m³ would be required to achieve the surface water runoff attenuation for up to the 1 in 100 year at the restricted discharge rate of 5.0 l/s. Refer to **Appendix E** for the MicroDrainage calculations and results.

It is noted that a climate change allowance has not been considered within the storage attenuation calculations as the proposed temporary building is expected to be removed after 2 years.

4.3.5 Exceedance Flow

In an event that the capacity of the proposed surface water drainage network is exceeded, flood water escaping from the drainage system will be retained temporarily on-site and routed away from the buildings until there is sufficient capacity to allow it back into the system. A raise kerb should be installed along the northern, eastern and southern perimeters of the Site to temporarily contain the exceedance flow on site.

4.3.6 Surface Water Drainage Strategy

The proposal for the surface water drainage is outlined as follows:

- The surface water drainage runoff would be attenuated within the permeable paving and the attenuation storage tanks for up to the 1 in 100 year.
- The runoff would be restricted to 5l/s for up to the 1 in 100 year using a flow control device.
- The surface water drainage from the temporary building development is to connect to the existing surface water sewer in Keresforth Close. The car park parcel will not be developed, and the existing surface water drainage and connection will be retained.
- A surface water drainage strategy is provided in **Appendix F**.

4.4 Drainage Maintenance

The proposed SuDS and drainage network will be the responsibility of and will be maintained by the site owner, to ensure their effectiveness over the lifetime of the development.

The maintenance requirements for the SuDS elements of the proposed surface water drainage system have been formulated as per the recommendations within the CIRIA SuDS Manual (C753).

Access for inspection and maintenance of the SuDS features will be available at all times. This will include adequate access for appropriate equipment and vehicles.

During the first year of operation, inspections should ideally be carried out after every significant storm event to ensure proper functioning. All those responsible for maintenance should take appropriate health and safety precautions and risk assessments should always be carried out. **Tables 4-7 to 4-9** indicate the maintenance requirements for the key SuDS components.

Table 4-7 Operation and maintenance requirements for Permeable Paving

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over the whole surface)	Once a year
	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required

Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds	As required
Remedial actions	Remedial work to any depressions rutting and cracked or broken blocks	As required
Monitoring	Inspect for evidence of poor operation and weed growth	Three-monthly
	Inspect silt accumulation	Annually

Table 4-8 Operation and maintenance requirements for Attenuation Tanks

Maintenance schedule	Required action	Typical frequency
Regular inspection	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Debris removal from catchment surface (where may cause risk to performance)	Monthly
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlets, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms
	Survey inside of tank for sediment build-up and remove if necessary	Annually until evidence this is too regular, every 5 years thereafter

Table 4-9 Operation and maintenance requirements for Flow Control Device

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Keep the device free from silt and debris	Monthly
Occasional maintenance	Remove obstructions and silt as necessary	As necessary
Remedial actions	Repair physical damage if necessary	As required

5. Foul Drainage Strategy

5.1 Existing Foul Drainage

The Site has no foul flow and existing foul drainage. However, there is an existing foul sewer network serving the Keresforth Centre to the east of the Site. The nearest foul sewers are located to the north of Keresforth Close (X:433352, Y:405642) and to the southeast of the car park (X:433471, Y:405532.791). These are 100mm diameter and 150mm diameter sewers, respectively.

5.2 Proposed Foul Drainage

The proposed temporary school building will be occupied by pupils and staff for a total of 606 people. Based on British Water Code of Practice Flows and Loads 4, the maximum foul flow rate for non-residential schools with canteen cooking on site is 90 litres per person per 12-hour day. The proposed foul flow is estimated to be approximately 1.26l/s.

There are two existing foul sewers suitable for connection as outlined above. The foul sewer from the Site can be connected to either of the sewers, subject to detailed design.

6. Conclusions and Recommendations

Waterman Infrastructure & Environment Limited ("Waterman") have been instructed by Department for Education to prepare a Drainage Strategy to support a planning application for the proposed erection of a temporary school building, an associated access road, parking, external play areas and associated works at Keresforth Close, Barnsley

Based on the assessment in this report, our conclusions are as follows:

- The red line planning boundary consists of two parcels. The main parcel is located in the open field for the proposed temporary school building. The second parcel is an existing car park which will be retained its current use and there will be no development in this parcel.
- The site geology indicates mudstone and low permeability. It is unlikely that infiltration would be appropriate
- Following the surface water drainage hierarchy, discharging to the existing surface water sewer is the most appropriate method of discharge surface water runoff from the proposed development.
- The surface water drainage runoff would be attenuated within permeable paving and attenuation storage tanks for up to the 1 in 100 year.
- The runoff would be restricted to 5l/s using a flow control device for up to the 1 in 100 year.
- It is estimated that a storage volume between 337m³ and 482m³ would be required to achieve the surface water runoff attenuation for up to the 1 in 100 year at the restricted discharge rate of 5.0 l/s. It is noted that a climate change allowance has not been considered within the storage attenuation calculations as the proposed temporary building is expected to be removed after 2 years.
- The proposed SuDS and drainage network will be the responsibility of and maintained by the site owner (or their appointed management company) to ensure the capacity and functionality of the drainage networks
- Proposed foul flow is approximately 1.26l/s and can be discharged into an existing foul sewer in the Keresforth Centre.

Our recommendations are as follows:

- The existing drainage connection for the proposed foul and surface water sewers for the temporary school needs to be maintained throughout the construction of the main school site.
- The propose drainage strategy is indicative and for the purposes of planning and would be confirmed during the detailed design stage post planning.
- It is unclear how the proposed foul and surface water discharge would have an impact on the existing drainage network. Further assessment should be made to ensure that there is sufficient capacity.
- It is recommended that a raise kerb is installed along the northern, eastern and southern perimeters of the Site to temporarily contain the exceedance flow on site.



APPENDICES

Appendices

Foul and Surface Water Drainage Strategy

Document Reference: WIE17125

WIE17125-100-R-9-1-2-FRA



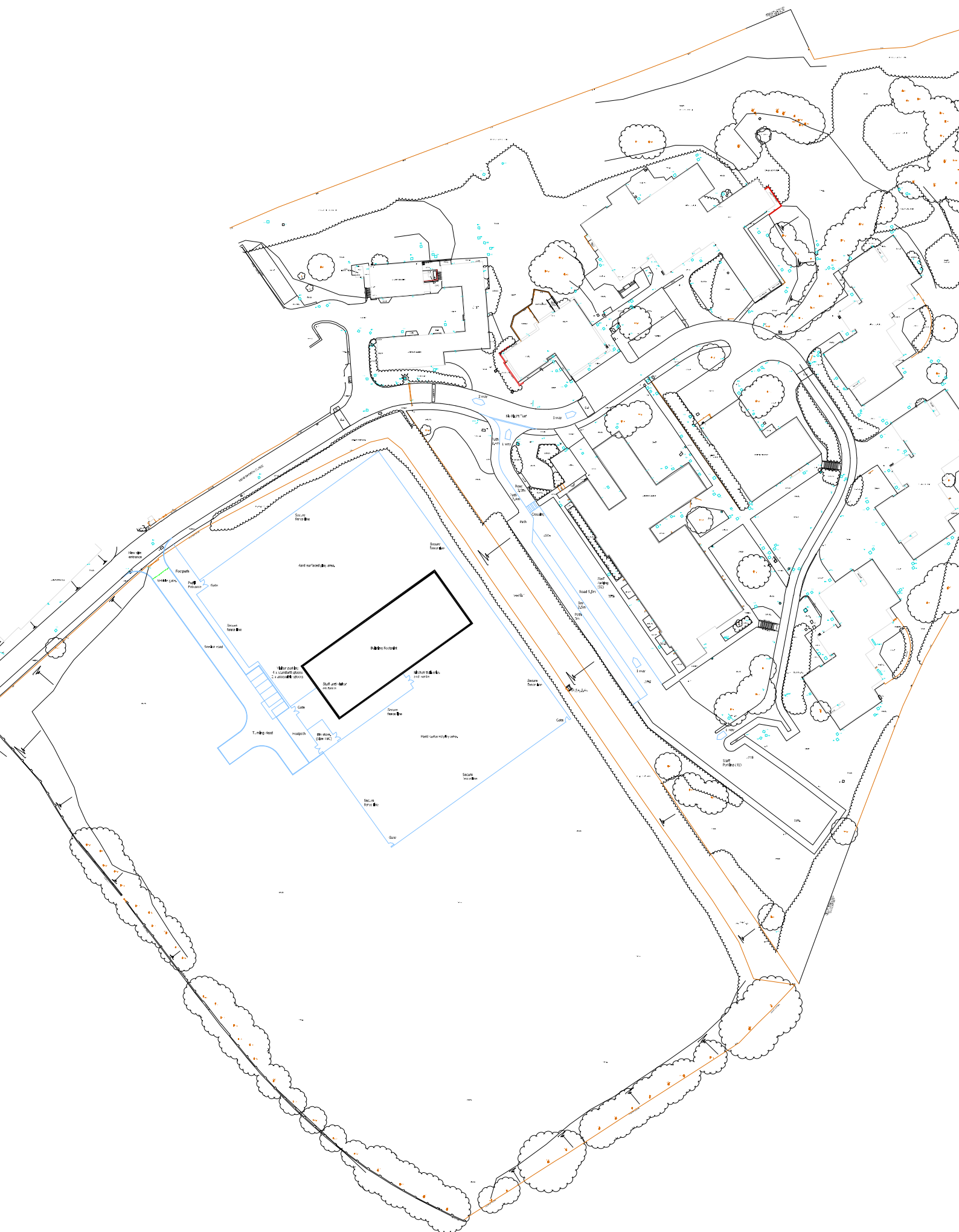
A. Proposed Layout

Appendices

Foul and Surface Water Drainage Strategy

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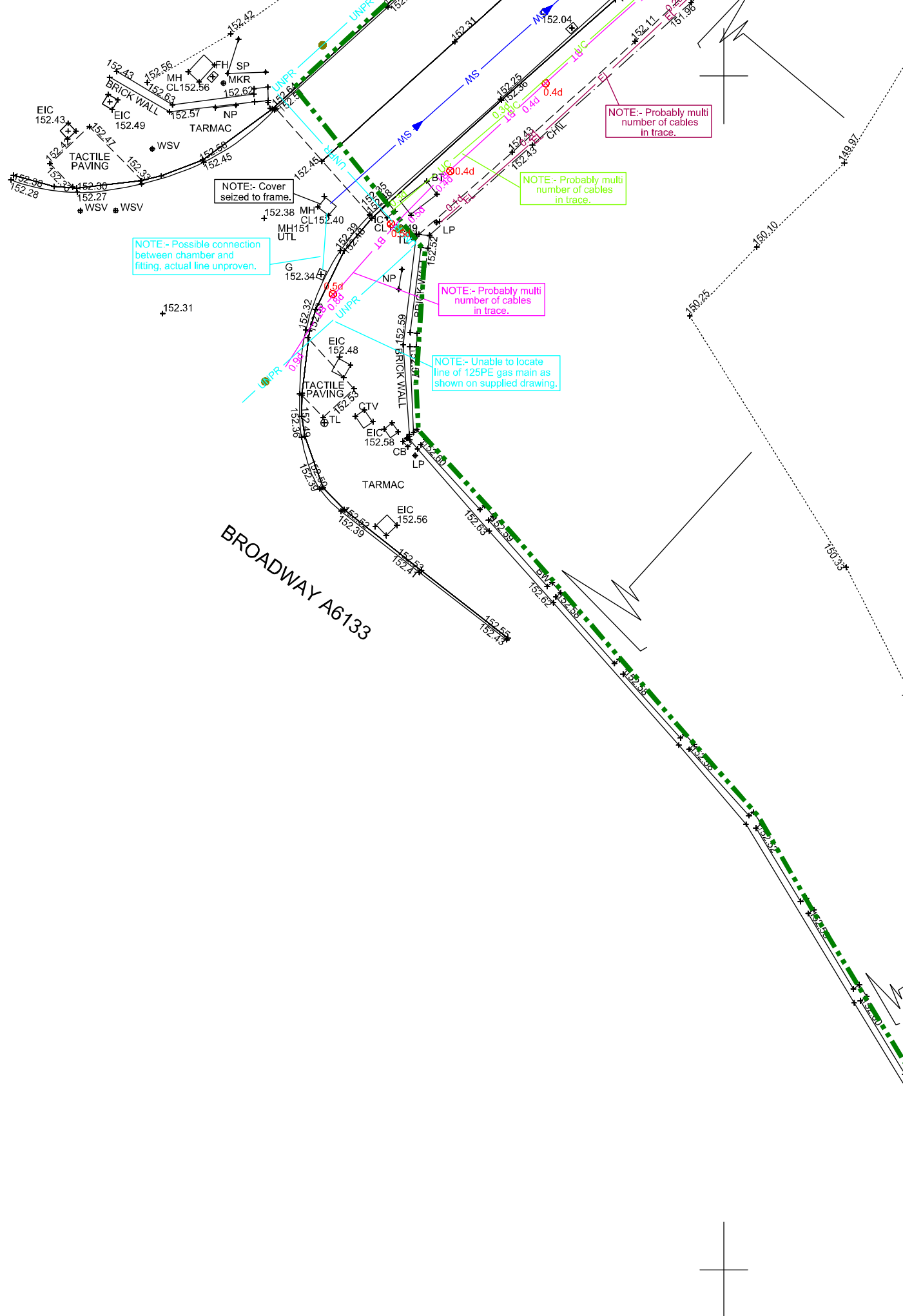
B. Topographical Survey and CCTV Survey

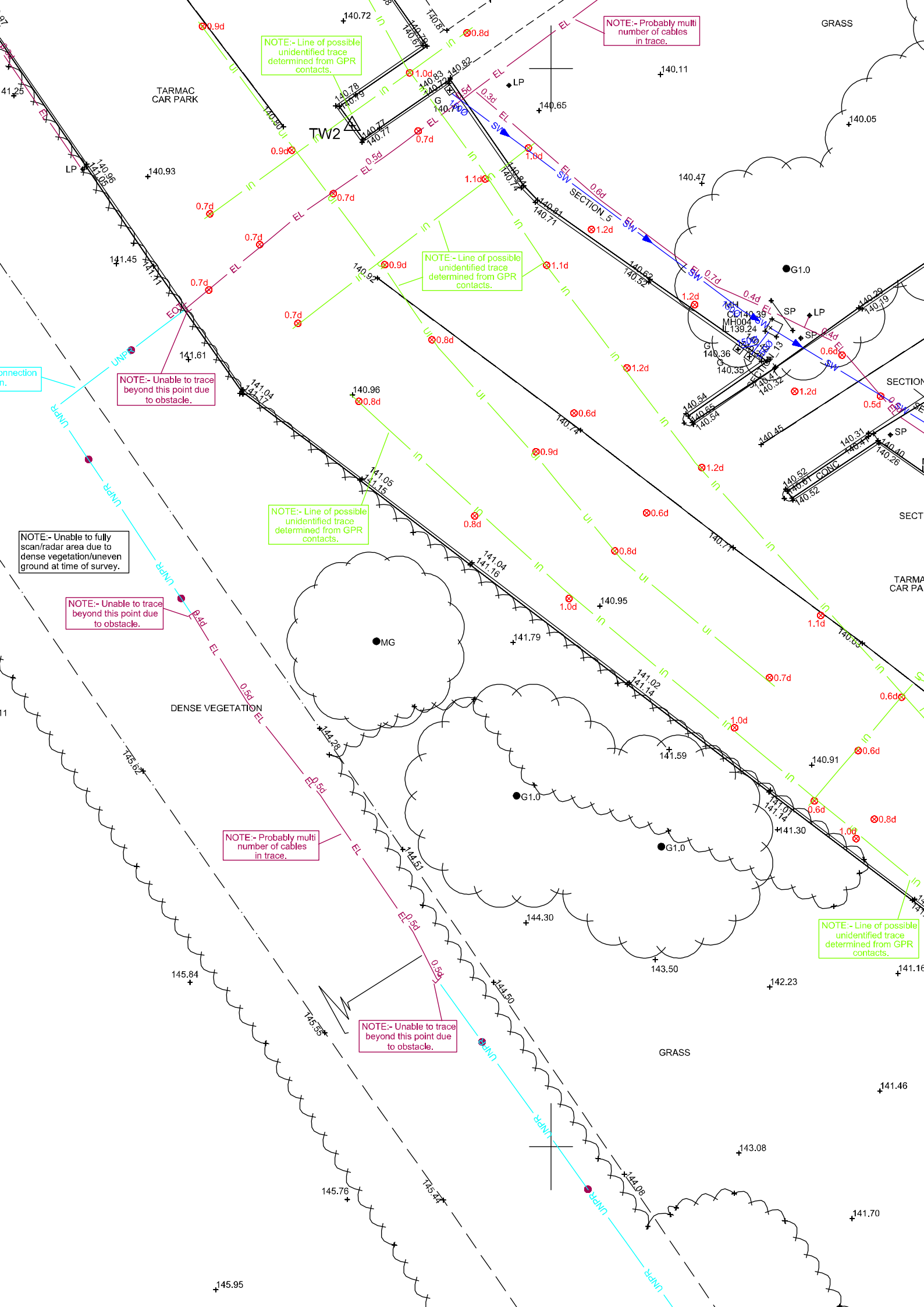
Appendices

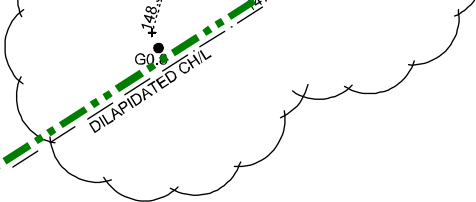
Foul and Surface Water Drainage Strategy

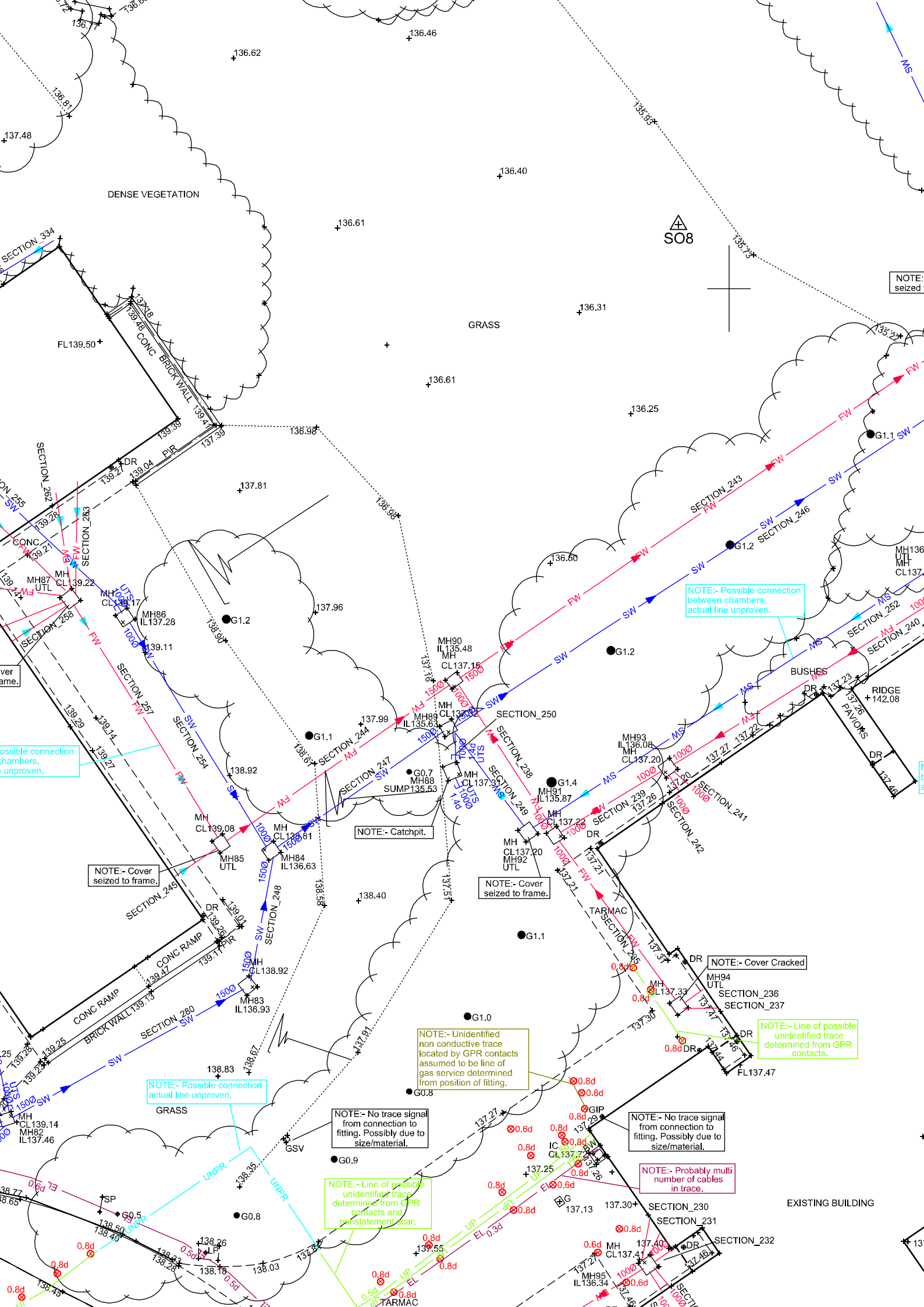
Document Reference: WIE17125

WIE17125-100-R-9-1-2-FRA









DENSE VEGETATION

GRASS

EXISTING BUILDING

SO8

NOTE:- seized

NOTE:- Possible connection between chambers, actual line unproven.

possible connection chambers, actual line unproven.

NOTE:- Catchpit.

NOTE:- Cover seized to frame.

NOTE:- Cover seized to frame.

NOTE:- Cover Cracked

NOTE:- Line of possible unidentified trace determined from GPR contacts.

NOTE:- Unidentified non conductive trace located by GPR contacts assumed to be line of gas service determined from position of fitting.

NOTE:- No trace signal from connection to fitting. Possibly due to size/material.

NOTE:- No trace signal from connection to fitting. Possibly due to size/material.

NOTE:- Probably multi number of cables in trace.

NOTE:- Line of possible unidentified trace determined from GPR contacts and re-instatement scar.

NOTE:- Possible connection actual line unproven.

C. BGS Borehole Data

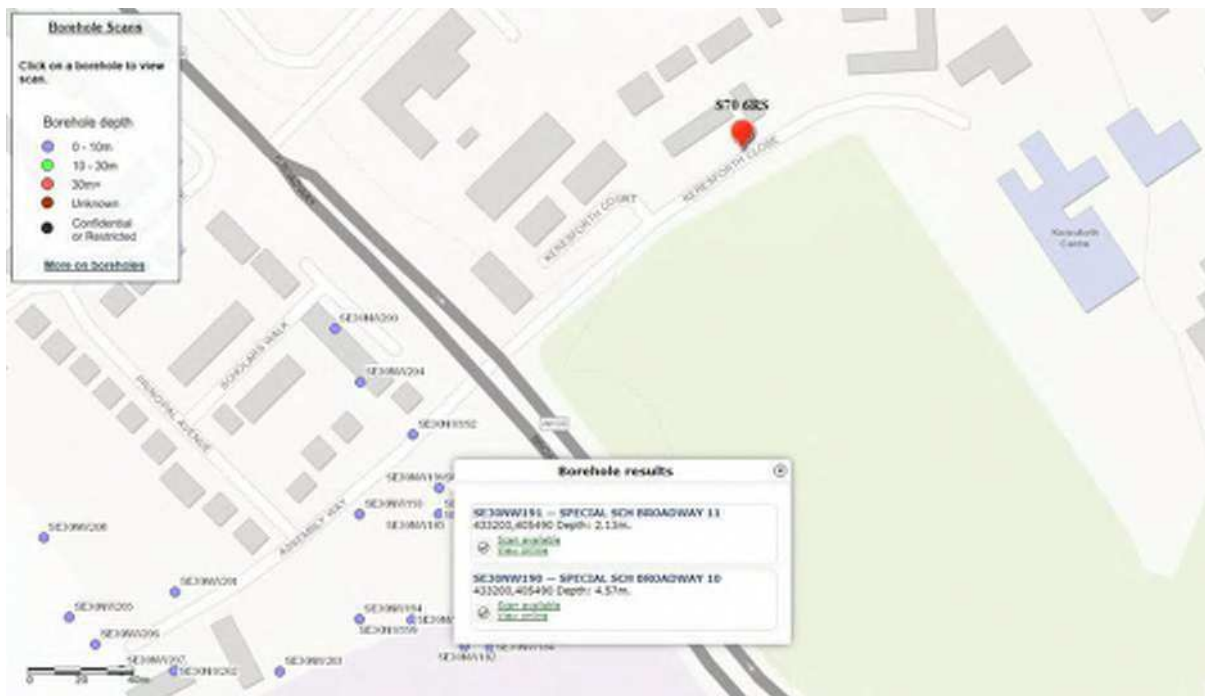
Appendices

Foul and Surface Water Drainage Strategy

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WIE17125-100-R-9-1-2-FRA

British Geological Survey (BGS) - Borehole Scans



SE 30 NW 191
3320 0549

SE30NW19 — SITE INVESTIGATION BROADWAY

SE 30 NW 19
CEMENTATION GROUND ENGINEERING LTD.
SOIL MECHANICS SECTION

BORING RECORD

CONTRACT *Broadway, Barnsley.*

Bored for *B.C.C.*

Site Address *Broadway.*

Boring Commenced *23-2-71*

Type of Boring *Rotary Air Flush.*

Water Struck (1) *50'-0"* (2) (3)

BOREHOLE NO. *8.*

Report No. *1*

Ground Level

Boring Completed *3-3-71*

FOR OFFICE USE ONLY									
H.D.									
C.D.									
W.L.									

Remarks

Sheet No. 1

Description of Strata	Depth		Thickness	Samples		
	From	To		Ref. No.	Type	Depth
<i>Soil</i>	<i>0-0</i>	<i>1-0</i>	<i>1-00</i>			
<i>Sandy Clay</i>	<i>1-00</i>	<i>5-6</i>	<i>4-60</i>			
	<i>5-6</i>	<i>11-6</i>	<i>6-00</i>			
<i>Hard Grey Sandy Shale</i>	<i>11-6</i>	<i>27-6</i>	<i>16-00</i>			
<i>Soft Weathered Coal</i>	<i>27-6</i>	<i>29-2</i>	<i>1-80</i>			
<i>Shaley Grey Fireclay</i>	<i>29-2</i>	<i>41-0</i>	<i>11-10</i>			
<i>Siltstone</i>	<i>41-0</i>	<i>57-0</i>	<i>16-00</i>			
<i>Hard Grey Shale</i>	<i>57-0</i>	<i>80-8</i>	<i>23-10</i>			
<i>Black Shale</i>	<i>80-8</i>	<i>85-7</i>	<i>4-11</i>			
<i>Coal</i>	<i>85-7</i>	<i>86-5</i>	<i>0-10</i>			
<i>Seat Earth</i>	<i>86-5</i>	<i>86-11</i>	<i>0-60</i>			
<i>Coal</i>	<i>86-11</i>	<i>87-5</i>	<i>0-60</i>			
<i>Seat Earth</i>	<i>87-5</i>	<i>89-0</i>	<i>1-70</i>			
<i>Hard Grey Shale</i>	<i>89-0</i>	<i>91-7</i>	<i>2-10</i>			
<i>Continued</i>						

Code: *U*—Undisturbed Sample *D*—Large Disturbed Sample *J*—Jar Sample *W*—Water Sample

Checked by: Date: Driller's Signature Date:

This form to be returned to Head Office immediately the borehole is completed.

D. Yorkshire Water Sewer Map

Appendices

Foul and Surface Water Drainage Strategy

Document Reference: WIE17125

WIE17125-100-R-9-1-2-FRA

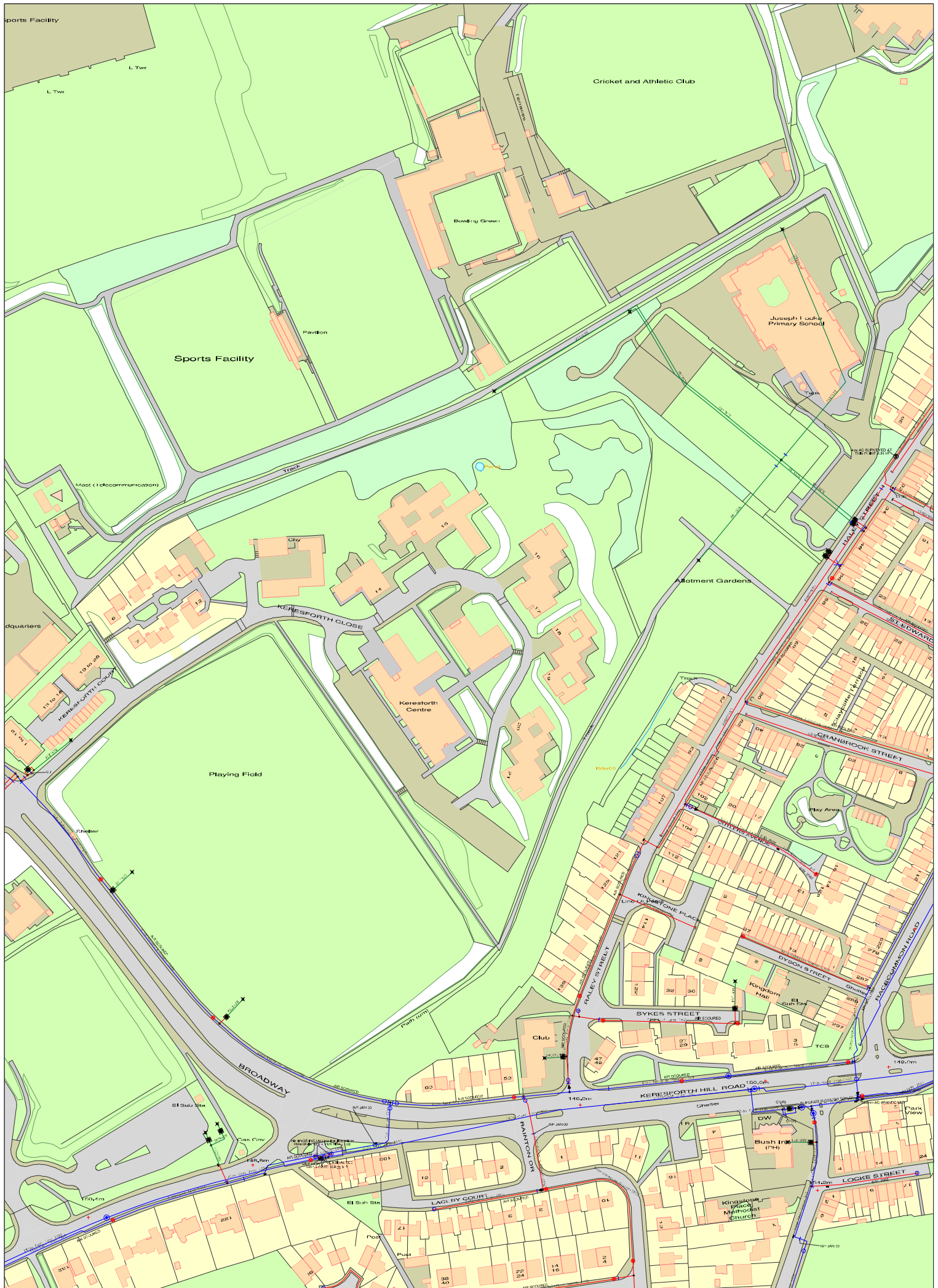
Sewer Legend

	Combined Sewer		S24 Combined Sewer
	Surface Water Sewer		S24 Surface Water Sewer
	Foul Sewer		S24 Foul Sewer
	Section 104 Sewer		Public Rising Main
	Pumping Station		Abandoned Sewer
	Public Sewage Treatment Works		Syphon Sewer & Vacuum Sewer
		+	Property Identifier

Water Legend

	Water Main 4" and below
	Water Main 4" and above
	Raw Water Main
	Private Water Main
	Fire Hydrant
	Pumping Station





Date Requested : 02/10/2017, 07:54:19
 Date Generated : 02/10/2017, 07:24:25

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Scale : 1:10000

The position and depth of any WW apparatus shown on this map are approximate.

Originator: Julie Brook, Safe Move,



UPN: Undated



E. MicroDrainage Calculations and Results

Appendices

Foul and Surface Water Drainage Strategy

Document Reference: WIE17125

WIE17125-100-R-9-1-2-FRA

Waterman Group		Page 1
Pickfords Wharf Clink Street London, SE1 9DG		
Date 17/12/2020 17:48 File TRI_TEMP_SC_01.SRCX	Designed by BMSS1 Checked by	
Innovyze Source Control 2019.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 10 Soil 0.450 Area (ha) 0.127 Urban 0.000 SAAR (mm) 770 Region Number Region 3 Results 1/s QBAR Rural 0.6 QBAR Urban 0.6 Q10 years 0.9 Q1 year 0.5 Q30 years 1.1 Q100 years 1.3		
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Waterman Group		Page 1
Pickfords Wharf Clink Street London, SE1 9DG		
Date 17/12/2020 17:53 File TRI_TEMP_SC_01.SRCX	Designed by BMSS1 Checked by	
Innovyze Source Control 2019.1		

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.354
Areal Reduction Factor	1.00
Area (ha)	0.127
SAAR (mm)	754
CWI	45.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	31.01
Greenfield Runoff Volume (m³)	24.711

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Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

Map

Ratio R

Cv (Summer)

Cv (Winter)

Impemeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 337 m³ and 482 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Waterman Group		Page 1
Pickfords Wharf Clink Street London, SE1 9DG		
Date 17/12/2020 17:47 File TRI_TEMP_SC_01.SRCX	Designed by BMSS1 Checked by	
Innovyze Source Control 2019.1		

ICP SUDS Mean Annual Flood

Input

Return Period (years)	10	Soil	0.450
Area (ha)	0.841	Urban	0.000
SAAR (mm)	770	Region Number	Region 3

Results 1/s

QBAR Rural	4.1
QBAR Urban	4.1
Q10 years	6.0
Q1 year	3.6
Q30 years	7.3
Q100 years	8.6

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Waterman Group		Page 1
Pickfords Wharf Clink Street London, SE1 9DG		
Date 17/12/2020 17:52 File TRI_TEMP_SC_01.SRCX	Designed by BMSS1 Checked by	
Innovyze Source Control 2019.1		

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	19.000
Ratio R	0.354
Areal Reduction Factor	1.00
Area (ha)	0.841
SAAR (mm)	754
CWI	45.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	31.01
Greenfield Runoff Volume (m ³)	163.637

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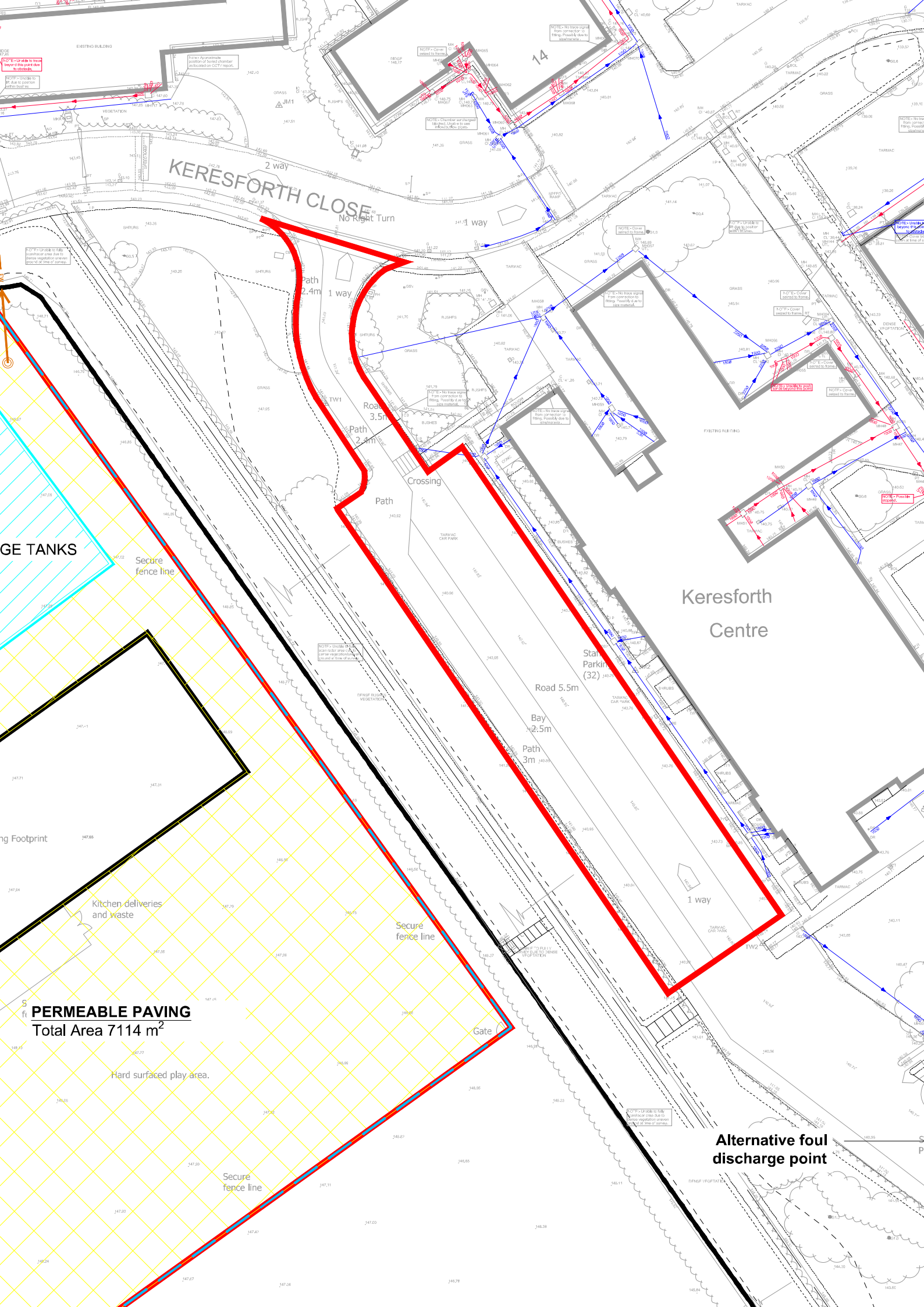
F. Drainage Strategy

Appendices

Foul and Surface Water Drainage Strategy

Document Reference: WIE17125

WIE17125-100-R-9-1-2-FRA



UK and Ireland Office Locations

