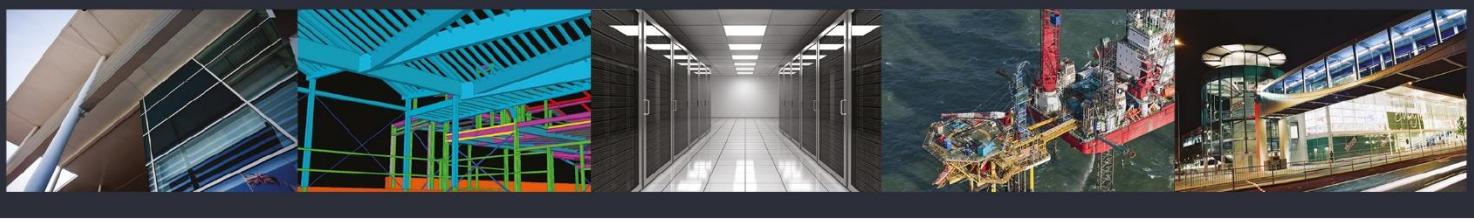
PINNACLE
CONSULTING ENGINEERS



Drainage Strategy Report

Peartree Lane Welwyn Garden City

One YMCA

5 June 2020

Prepared for:

Saunders Architects

STRUCTURAL • CIVIL • DUE DILIGENCE • ENGINEERING MASTERPLANNING
FLOOD MANAGEMENT • INFRASTRUCTURE DESIGN
PRE-DEVELOPMENT ENGINEERING • BIM • TRANSPORTATION

PINNACLE
CONSULTING ENGINEERS

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APPROVALS

	Name	Position	Date
Prepared by	Shohely Sultana	Civil Engineer	09.10.19
Reviewed by	Jawsy Jabbar	Associate	09.10.19
Approved by	David Meigh	Director	09.10.19

VERSIONS

Number	By	Date	Context
1.0	Shohely Sultana	03.10.19	For Comment
2.0	Shohely Sultana	09.10.19	Revised following comments
3.0	Sudeep Chongbang	27.05.20	Revised for HCC Comments
3.1	Sudeep Chongbang	05.06.20	Revised for HCC Comments

CONTENT

1 EXECUTIVE SUMMARY

The drainage strategy for the proposed development has incorporated the following:

- The proposed 0.671ha development is consist of hostel and maintenance/office units with adjacent car parks.
- The scheme proposed for this site comprised of 100 bed YMCA hostel and 43 residential dwellings with demolishment of existing buildings.
- The development site consists of a net increase of 16% in the proposed permeable area and 5.1% decrease of impermeable area.
- As a brownfield site, a well-defined surface and foul water sewer are identified in the Utility Survey. Both are discharging to the public sewer network of Thames Water authority in the vicinity of the development site.
- Upon referencing the records held by the British Geological Society map, the development site is found underlain with Lewes Nodular Chalk Formation and Seaford Chalk Formation.
- A Site-Specific infiltration test to BRE 365 is conducted by Delta-Simons in April 2020 to assess the viability of this proposed surface water strategy. Soil Infiltration rates of 4.5×10^{-5} m/s (good infiltration rate) and 7.0×10^{-6} m/s (poor infiltration rate) was found.
- A site-specific environmental report was produced by Delta-Simons in April 2020 to investigate for any potential risk of groundwater contamination. No significant source of contamination was found.
- Based on this infiltration rates and the location of the developments, the proposed surface water strategy involves the division of the entire site into two catchment areas.
- Catchment A will have a cellular storage volume of $117m^3$ with infiltration into the ground with satisfying the half-drain time requirements.
- Catchment B will have a cellular storage volume $173m^3$ with combined infiltration into the ground and a 5 l/s discharge rate into the Thames Water public sewer with satisfying the half-drain time requirements. Thames Water approval has been obtained for 5 l/s discharge rate.
- The surface water runoff from the existing carpark with an impermeable area of $787m^2$ will be collected using its existing drainage features. Refer to Appendix G for Proposed drainage plan.
- The proposal involves an average foul water discharge of 0.993l/s (peak flow 5.96l/s). This is proposed to connect into the existing Thames Water foul water sewer in the vicinity of the works. Thames Water has confirmed the capacity in their foul water sewer for this development run off.

2 INTRODUCTION

Pinnacle Consulting Engineers Ltd have been commissioned by Saunders Architects on behalf of YMCA to carry out a Drainage Strategy report for a proposed development of a site off Peartree Lane Welwyn Garden City AL7 3UL. A site location plan is enclosed in Appendix A.

The purpose of this report is to propose a viable and sustainable strategy for the management of foul water and surface water runoff (with climate change allowances). This will also require devising a feasible discharge location for both networks and ensuring the networks have the capacity to accommodate the proposed discharge rates.

2.1 Site description

The proposed 0.671ha development is centred on National Grid Reference (NGR) TL244125 (524409mE, 212593mN) at Peartree Lane, Welwyn Garden City, AL7 3UL within a predominantly residential/commercial area. The existing brownfield site comprises 1 and 2 storey buildings with car parking at the north of the site.

The site can be accessed from Peartree Lane. The site is bound to the North East by Peartree Farm, to North West by Carpark of another territory, to the South West by Landscaping and Peartree Lane runs along its southwestern boundary.

There are no fluvial features in the vicinity of the site. The nearest river Lea is approximately 2.1km to the South Western part of the site.

Figure 2.1 – Aerial View of the existing development site (approximate site boundary edged red)

2.2 Topography

The development site has a relatively shallow slope falling in the centre of the site. The highest level is 85.80m AOD and the lowest level is 82.20m AOD. No uniform sloping of the site is observed.

Details of existing development site levels are enclosed in Appendix B.

2.3 Geological ground conditions

The Geological conditions at the site detailed below in Table 2.1 are based on available records provided by the British Geological Survey (BGS) website.

Formation	Description
Artificial Ground (Made Ground)	No artificial deposits have been delineated on the BGS site maps.
Superficial Deposits (Drift Deposits)	Lowestoft Formation - Diamicton. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions (U). ice age conditions (U). These sedimentary deposits are glacigenic in origin. They are detrital, created by the action of ice and meltwater, they can form a wide range of deposits and geomorphologies associated with glacial and inter-glacial periods during the Quaternary.
Bedrock	Lewes Nodular Chalk Formation and Seaford Chalk Formation (undifferentiated) - Chalk. Sedimentary Bedrock formed approximately 84 to 94 million years ago in the Cretaceous Period. Local environment previously dominated by warm chalk seas. These sedimentary rocks are shallow-marine in origin. They are biogenic and detrital, generally comprising carbonate material (coccoliths), forming distinctive beds of chalk.

Table 2.1 – Geological Ground Conditions

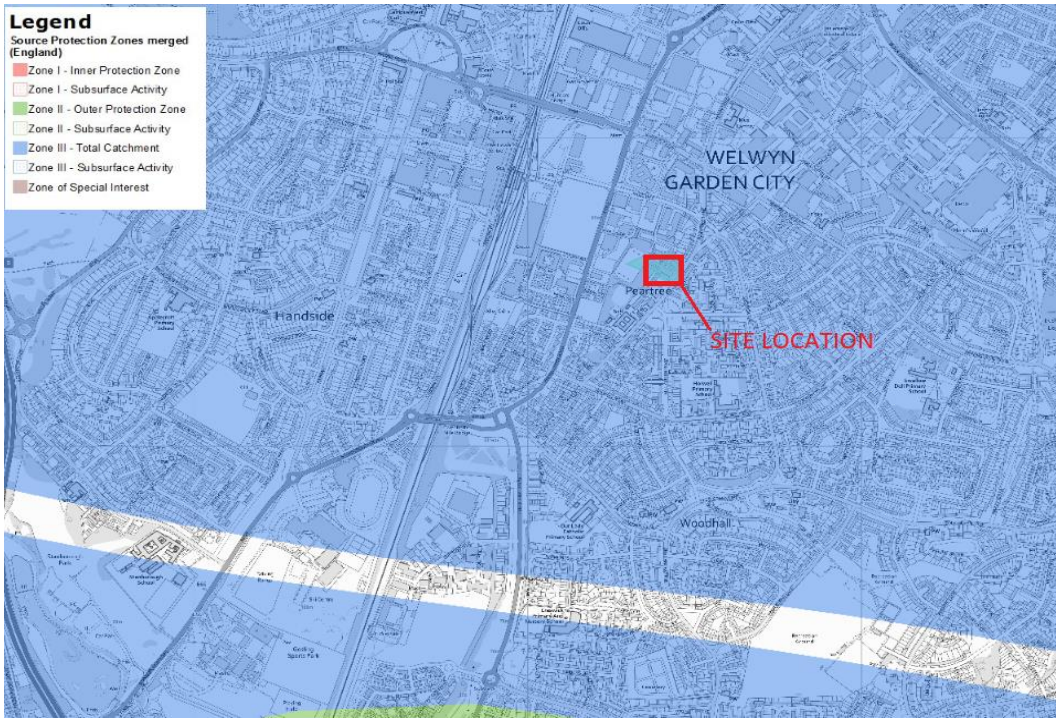


Figure 2.2 Extract of Groundwater Source Protection Zones Map of the Site from the Environmental Agency website.

An Environmental Site Investigation was carried out on the site in April 2020, where ground conditions were investigated for potential contaminants. During the investigation, Made ground was encountered across the site up to a maximum depth of 0.68m bgl (below ground level) and is generally comprised of a limited thickness of gravelly clayey sandy topsoil with brick and flint underlain by gravelly clay with brick fragments. Moreover, groundwater was found at 3.40m bgl. The Environmental Report is enclosed in Appendix J respectively.

Figure 2.2 depicts that the development site lies within the Source Protection Zone 3 which is described as the total area needed to support the abstraction or discharge from the protected groundwater source.

2.4 Flood Zone

The Environmental Agency's Flood map for planning indicates that the site is in Flood Zone 1 - little or no risk, with an annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000-year rainfall event) (see Figure 2.3). The nearest river (River Lea) is approximately 2.1km to the south-west of the site.

Figure 2.3 – Environment Agency Online Flood Map Extract (Approximate Site Extents Edged Red)

2.5 Proposed Development

The scheme proposes 100 bed YMCA hostel and 43 residential dwellings with the demolishment of existing development. The proposed development plans are enclosed in Appendix C respectively.

3 EXISTING DRAINAGE MANAGEMENT

3.1 Existing surface water management

A utility survey of the existing infrastructure within the site was conducted by Malcolm Hughes Charted Land Surveyors on the 9th of August 2019. Utility survey records are attached in Appendix E of this report; the records delineate all observed surface water networks within the site.

Surface water sewer operated/manages by Thames water runs along Peartree farm/ Peartree lane to the north-east. It appears this surface water sewer picks ups the run-off from the car parks, existing hostel buildings and form adjacent sites.

For the office units in the front of the site, the surface water runoff is infiltrated through Soakaway situated in the front of the site with existing Landscaping. Another surface water network is delineated for the north-western part of the building, but the outfall of this network is non-identified.

The existing finishing across the site was largely comprised of a large impermeable area with landscaping and vegetations roughly following its perimeter. The existing impermeable area which drained by the existing surface water sewers is approximately 5,083m².

3.2 Existing foul water management

The utility survey conducted by Malcolm Hughes Charted Land Surveyors also delineates the location of existing private foul water sewer. There are three separate foul water sewers identified discharging to the Thames water foul sewer network runs along the North-eastern part of the site. For the existing buildings and Carpark, the foul sewer is connected to the public sewer via Ø150mm pipe same goes for the existing hostel and office units to the other part of the site. For the existing development to the south-east of the site, the foul sewer is connected via Ø100mm pipe to the public sewer system runs along its south-eastern part.

4 PROPOSED SITE DRAINAGE

4.1 Surface Water Discharge

Traditional approaches to urban drainage have comprised of underground tanks and pipe networks. More recently, the benefits and opportunities to use Sustainable Drainage Systems (SuDS) have been realised and encouragement to use such systems is promoted throughout the Flood Risk Management policy at all levels. SuDS is a term which encompasses a variety of approaches to managing surface water in a way which is more sympathetic to the natural and human environment than conventional piped drainage systems. Management of surface water is an essential element for reducing flood risk and SuDS techniques are often designed to achieve this in a way that mimics the natural environment.

The Building Regulations (H3) states the priority for discharging surface water runoff from development is as follows:

1. Infiltration into the ground;

2. Discharge into a watercourse;

3. Discharge into a sewer.

Following the results of a site-specific infiltration test to BRE Digest 365, conducted in April 2020 by Delta-Simons, it can be confirmed (refer to Table 25.1 of the CIRIA "The *SuDS Manual*") that infiltration is a viable method of surface water discharge. Appendix J provides a plan and results of the soil infiltration soakaway tests. Infiltration values of $4.5x\ 10^{-5}$ m/s and $7.0x\ 10^{-6}$ m/s was recorded during the tests.

It should be noted that there is already a functioning soakaway within the site. However, given the historic use of the site, there may be a risk of groundwater contamination. Therefore, a Geo-Environmental investigation was conducted by Delta-Simons in April 2020 to investigate for any potential risk of groundwater contamination.

The Environmental report concluded that only marginal exceedances of PAHs, arsenic and lead were identified within shallow soils above stringent guidance values and are not considered significantly elevated. The overall risk to controlled water is considered low because the shallow Made Ground is likely to be excavated and removed from the site. Therefore, removing the identified source of contamination. Moreover, cohesive clay deposits have been identified above the mapped chalk, effectively limiting vertical migration of contamination. The use of interceptors is also recommended to mitigate any potential risk for groundwater contamination. The Environmental Site Investigation has confirmed that there are no Licensed Abstraction Records from groundwater for potable water supply within 250 m of the Site.

It can be seen from the enclosed drawings in Appendix D that the existing impermeable area for the site is 5,083m^2 and the proposed impermeable area is 4,824m^2, resulting in a net decrease of 259m^2 in the impermeable surface.

4.2 Local Constraints and Planning Policies

The information provided below is an extract from the Welwyn Hatfield Council was produced in 2005 found on the council website.

Policy R7 - Protection of Ground and Surface Water

Planning permission will not be granted for development which poses a threat to the quality of both surface and/or groundwater. Where proposals are acceptable the use of sustainable drainage systems will be encouraged, dependent on local site and underlying groundwater considerations.

Development on Floodplains and Flood Prevention

Floodplains act as storage and conveyancing areas for floodwater and may also have high environmental and amenity value. Floodplains therefore need safeguarding from inappropriate development. Any development, including raising the floor of the floodplain, may affect its storage capacity. This results in an increased risk of flooding and may affect other parts of the interconnected water system. The Environment Agency has identified the floodplains in the district, the majority of which are in the Green Belt. The Council will resist proposals after consultation with the Environment Agency for new development in these areas.

New development outside floodplains can result in increased problems of flooding downstream because of an increase in run-off from impermeable surfaces. There may be ways however of ameliorating the problem by the use of sustainable drainage systems including, for example, balancing ponds, swales and porous pavements. These techniques will require appropriate design and siting. The suitability of certain infiltration techniques will also depend on site specific groundwater considerations. There may also be opportunities for increasing biodiversity with sustainable drainage techniques. The Council will not allow development, after consultation with the Environment Agency, that would increase the risk of flooding downstream because of increased surface run-off.

Policy R8 - Floodplains and Flood Prevention

Within the floodplains identified on the Proposal Map, planning permission for development will not be granted where proposals would;

(i) Decrease the capacity of the floodplain to store flood water; or

(ii) Impede the flow of water; or

(iii) Increase the number of people and properties at risk from flooding. Planning permission for new development outside floodplains will not be granted where the proposals would result in an increase in flooding downstream because of increased run-off. The use of sustainable drainage systems will be encouraged, dependent on local site and underlying groundwater considerations.

Proposals for development necessary to prevent an increase in flooding will be considered in terms of their impact on biodiversity, the landscape and recreation."

The proposed site falls into the Flood Zone 1 and therefore not affecting any floodplains.

Policy R10 – Water Conservation Measures

New development will be expected to incorporate water conservation measures wherever applicable, including sustainable drainage systems, water storage systems, soft landscaping and permeable surface to help reduce surface water run-off.

Sustainable drainage measures have been proposed such as permeable paving at the car parking bays, soft landscaping features and infiltration soakaways.

4.3 Proposed Development Surface Water Drainage Strategy

The proposed development plan necessitates demolishment of existing structures and construction of new development. The surface water runoff from the proposed impermeable areas in catchment A and B (total area of 4037m^2) will be collected into two separate networks. Whereas, the surface water runoff from the existing carpark with an impermeable area of 787m^2 will be collected using its existing drainage features. This is due to the presence of underground electrical lines with potential high voltage in the vicinity of the car park and its associated easements which makes it disadvantageous to extend the development/surface water drainage features within the area. Refer to Appendix H for the catchment plan. It is also noteworthy to mention there is a significant increase in permeable areas from 1,633m^2 to 1,892m^2 (over 16%).

The Surface water runoff from the proposed surface finishing will be collected using an assortment of various devices including road gullies, rainwater downpipes, etc. The surface water runoff collected will be conveyed through a gravity piped network that will be filtered through petrol interceptors before allowing to infiltrate via cellular soakaways or discharge into the public sewer. Refer to Appendix G for the proposed drainage plan.

Based on the site geology gullies are proposed for the access road connecting to the main sewer and infiltrating through soakaways. The existing gullies within the car park area are retained. Refer to Appendix G for the proposed drainage plan.

The attenuation volume required for the proposed development has been modelled in MicroDrainage using the 'Quick Storage Estimate' programme. The results of the calculations are designed to meet the storage demand for all events up to and including a 1 in 100 years + climate change event (40%). Variables and results of the calculations are shown below.

4.3.1 Catchment A

Proposed hostel building area catchment A (1514 m^2) surface water network with infiltration soakaway satisfies the half-drain time requirement based on the measured infiltration rate of 4.5x 10^{-5} m/s in the catchment area. Please see the figures below.

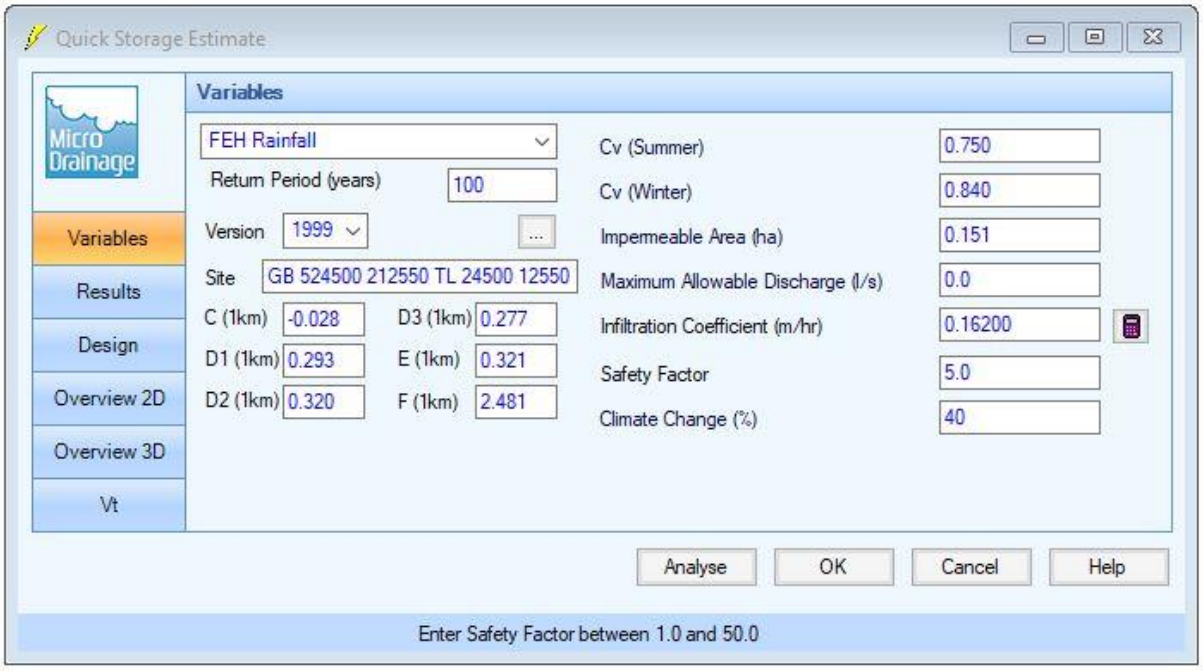


Figure 4.1 – Catchment A-Quick Storage Estimate Variables

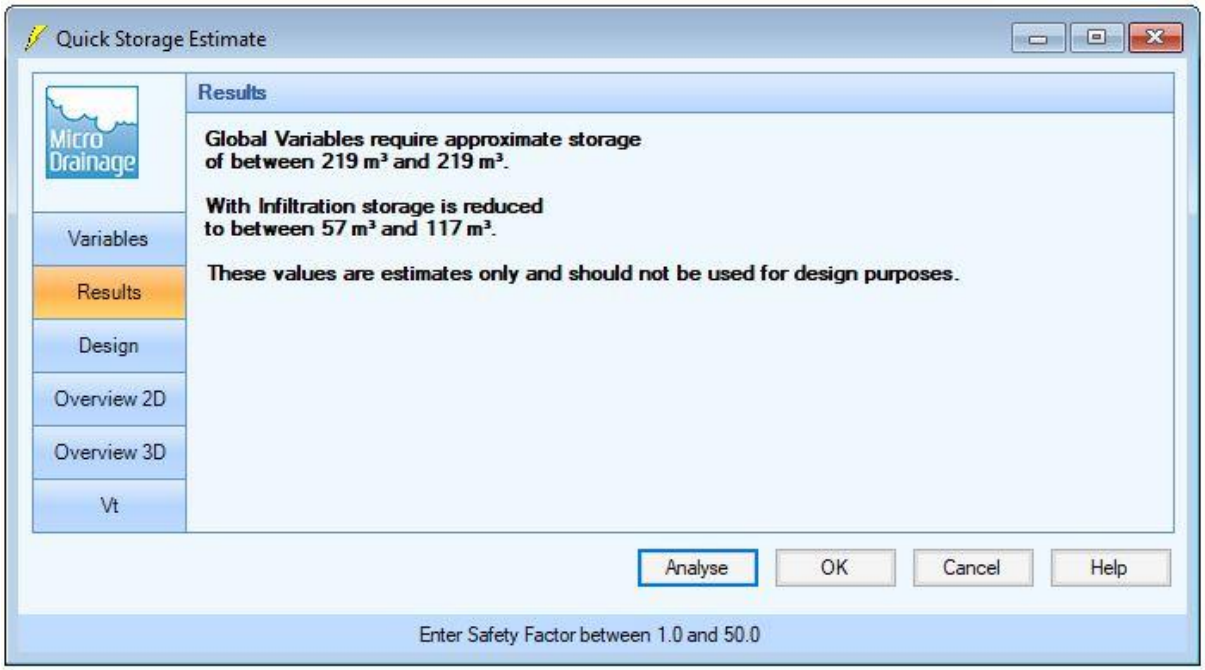


Figure 4.2 – Catchment A-Quick Storage Estimate Results

Based on the above estimate, the Catchment A will require attenuation volume of 117m^3.

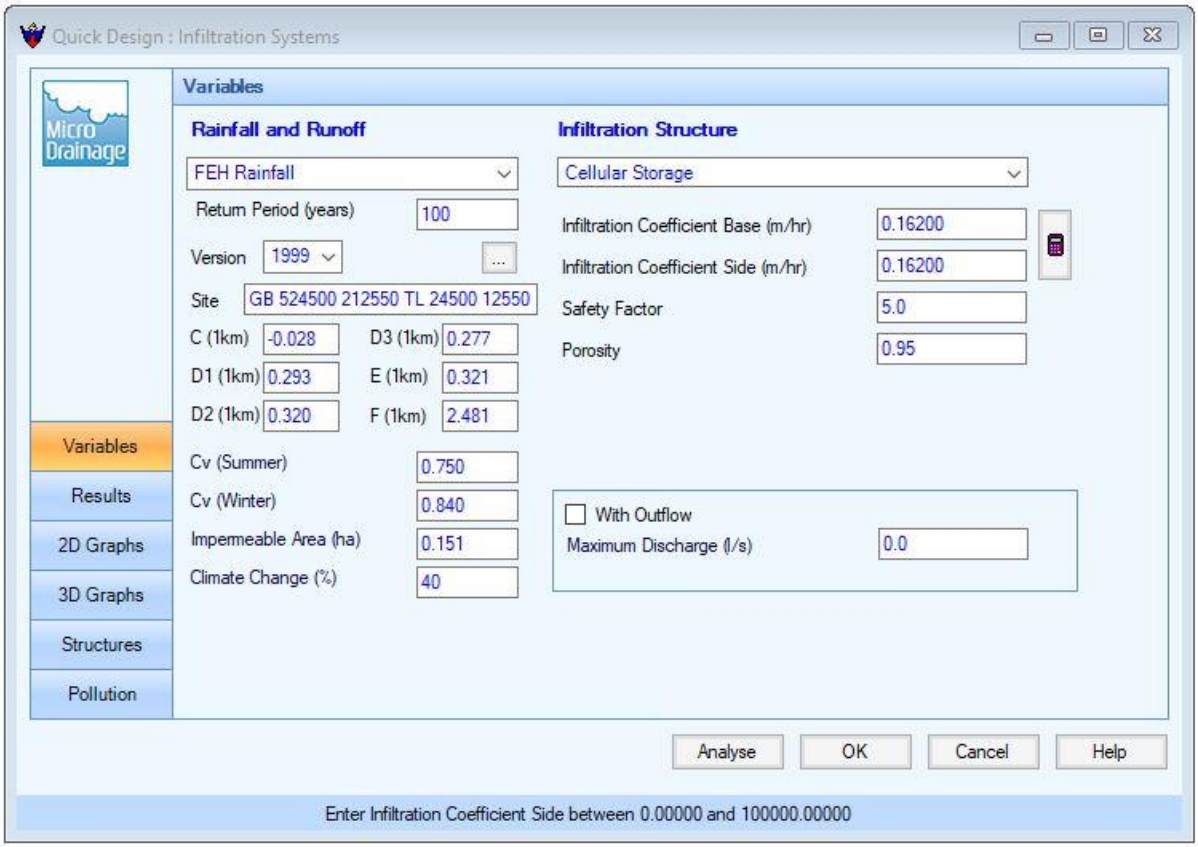


Figure 4.3 – Catchment A-Half Drain Time Calculation Variables

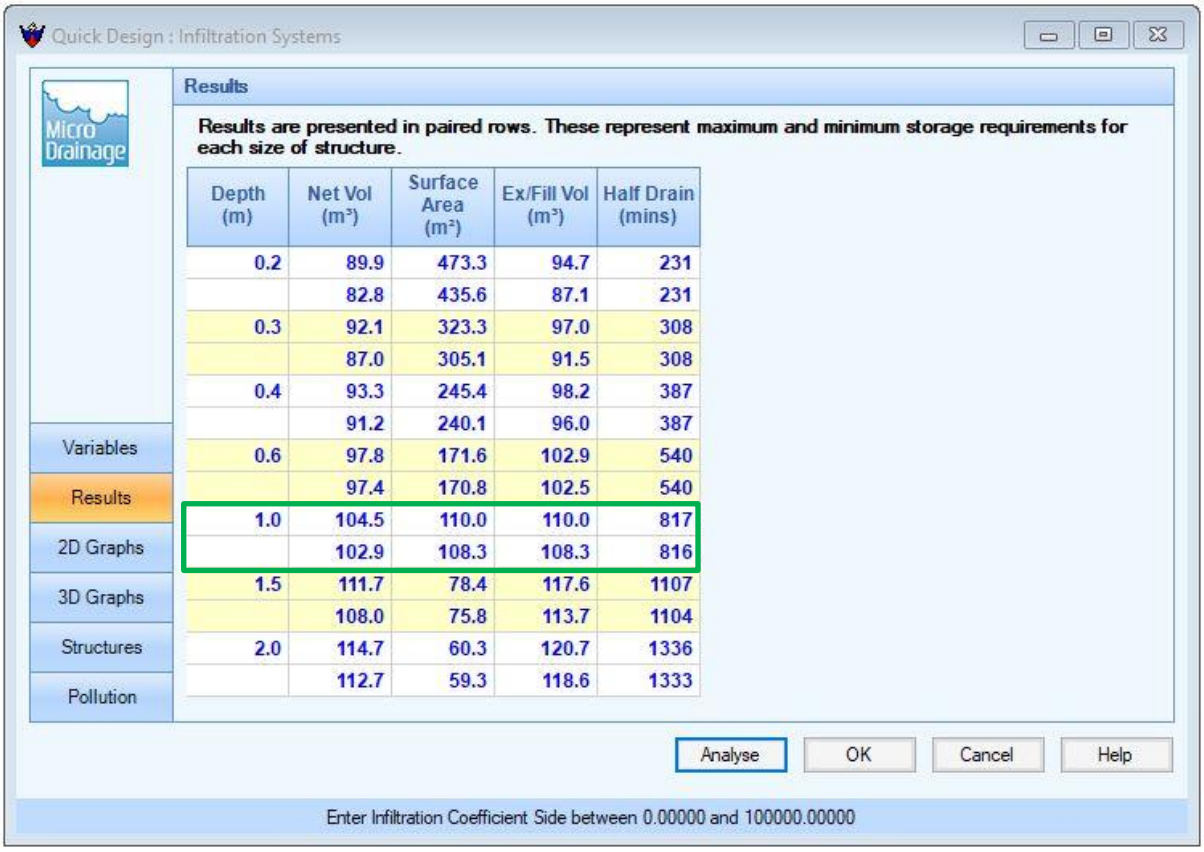


Figure 4.4 – Catchment A-Half Drain Time Calculation Results

Based on the above calculation, the Catchment A soakaway will have 817 minutes (<1440 minutes) half drain time at the 1 m deep soakaway.

Detailed drainage calculations for this catchment is appended in Appendix F.

4.3.2 Catchment B

Proposed residential building area catchment B (2523 m^2) surface water network with infiltration soakaway does not satisfy the half-drain time requirement based on the measured infiltration rate of 7.0x 10^{-6} m/s in the catchment area. Therefore, it is proposed to discharge some of the surface water runoff from this catchment into the public sewer at the greenfield rate.

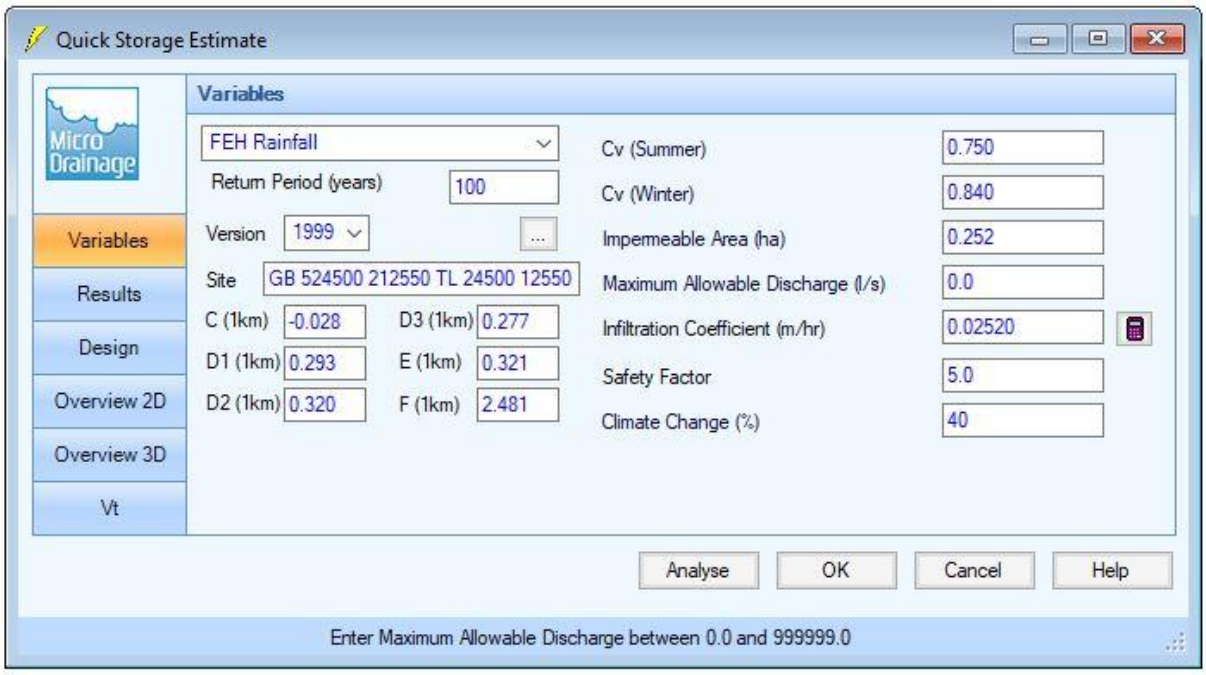


Figure 4.5 – Catchment B-Quick Storage Estimate Variables

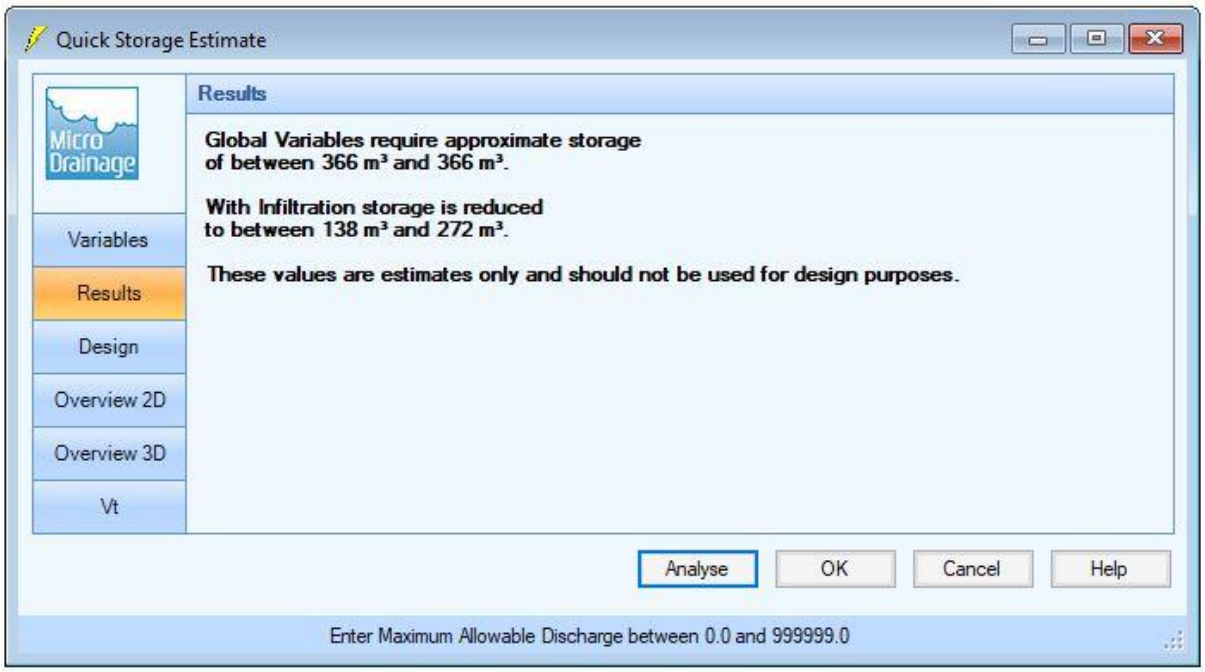


Figure 4.6 – Catchment B-Quick Storage Estimate Results

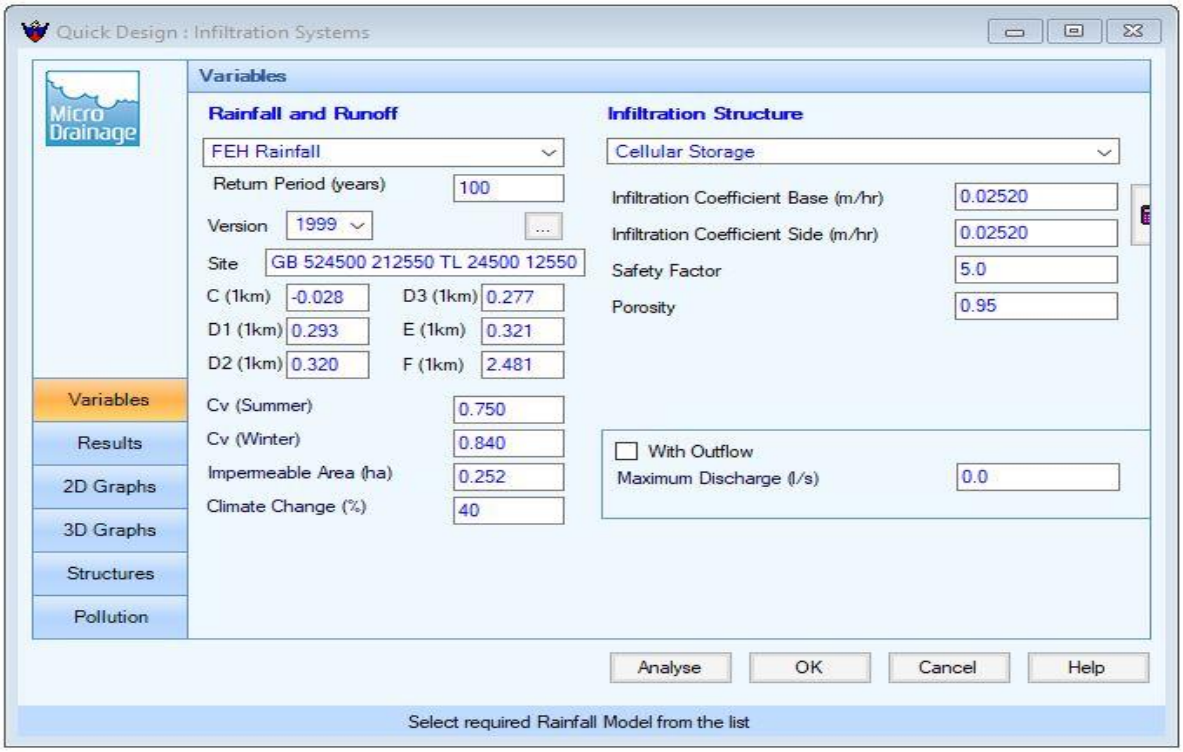


Figure 4.7 – Catchment B-Half Drain Time Calculation Variables

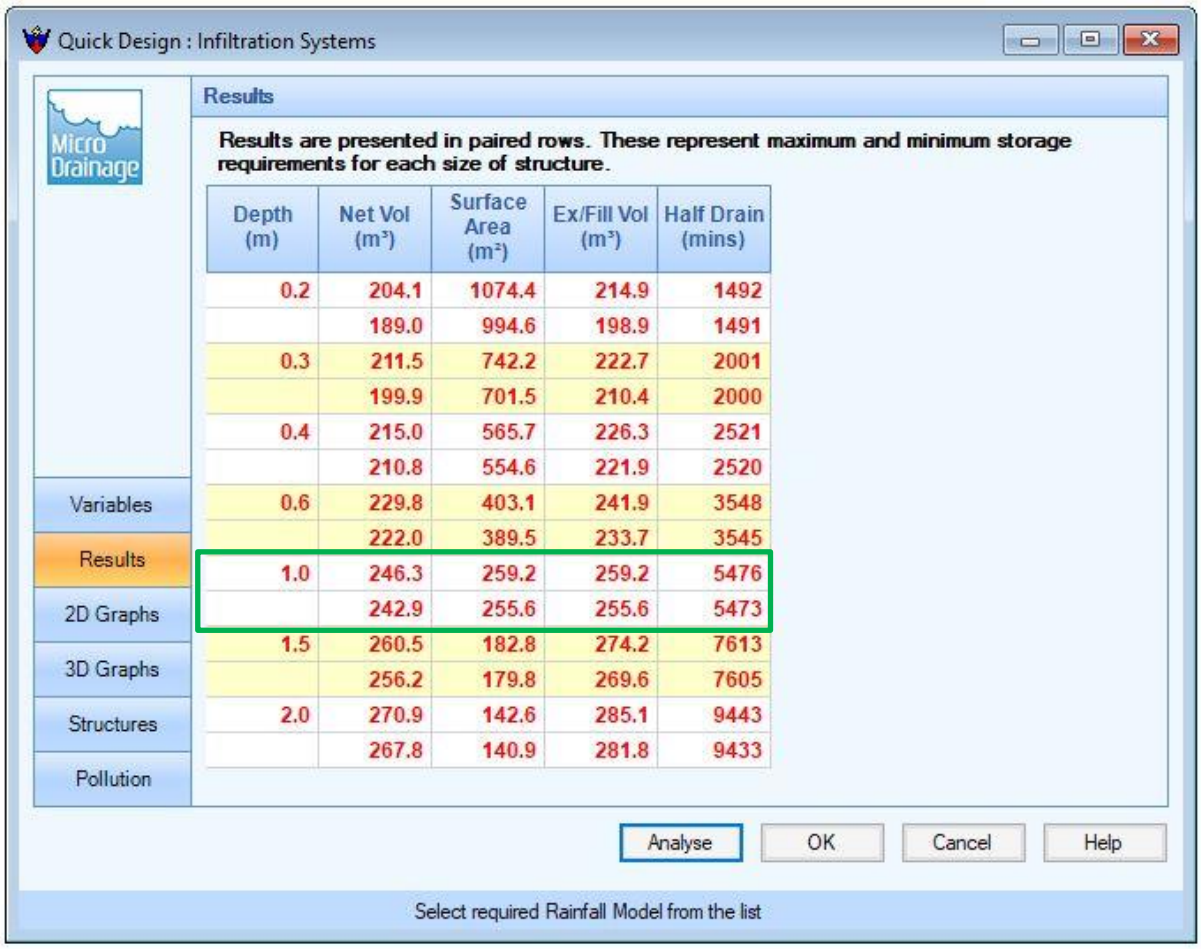
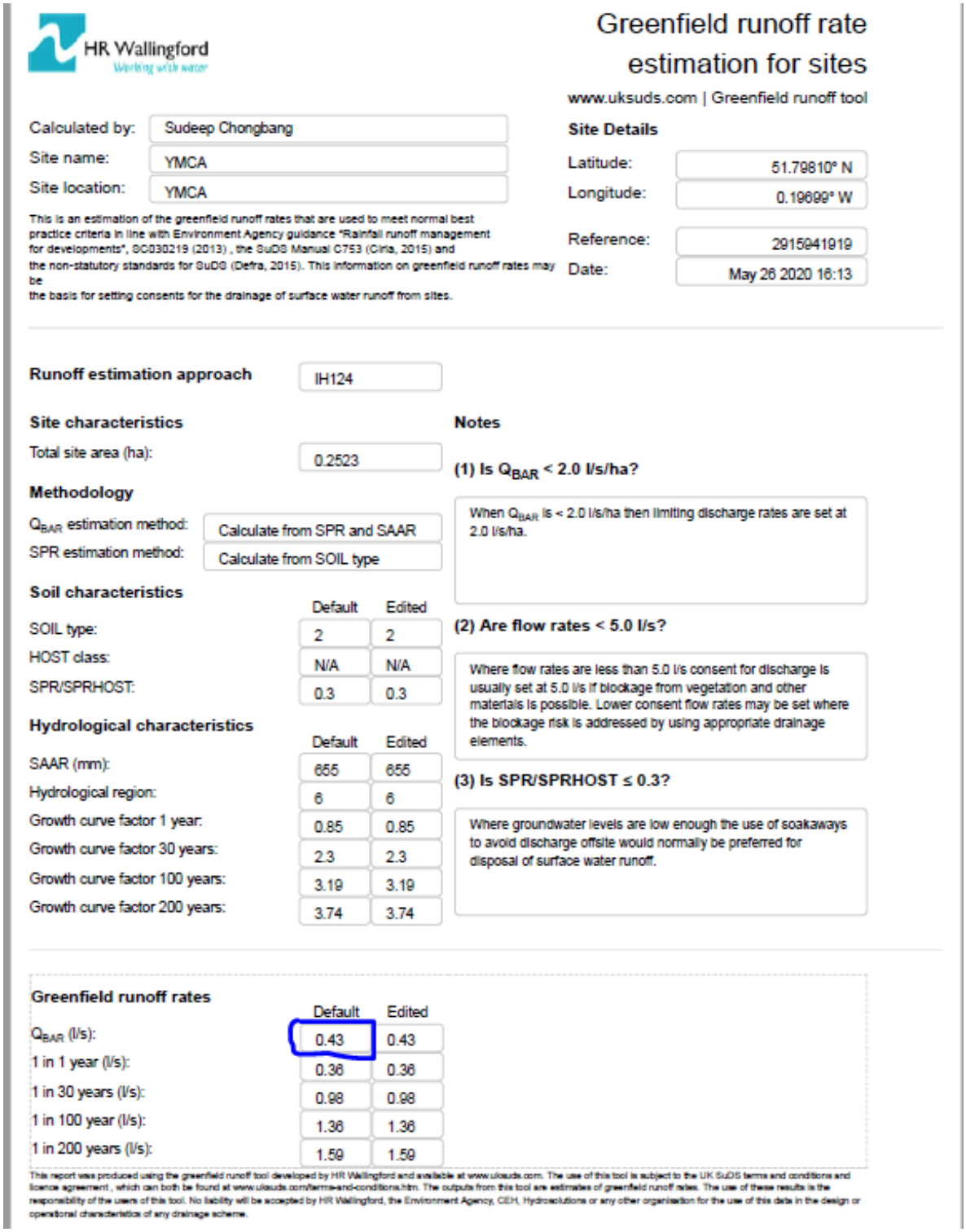


Figure 4.8 – Catchment B-Half Drain Time Calculation Results

Based on the above storage estimate, the Catchment B will require attenuation volume of 272m^3. However, based on the above half drain calculation, the Catchment B soakaway will have 5476 minutes (>1440 minutes) half drain time at the 1 m deep soakaway. Therefore, the proposed soakaway arrangement will not satisfy the BRE365 requirements.

Alternatively, a combined option of infiltration soakaway and discharge into the public sewer has been explored. Greenfield discharge rate for Catchment B is calculated below.



HR Wallingford
Working with water

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sudeep Chongbang
Site name:	YMCA
Site location:	YMCA

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	51.79810° N
Longitude:	0.19699° W
Reference:	2915941919
Date:	May 26 2020 16:13

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 0.2523

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	2	2
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.3

Hydrological characteristics

	Default	Edited
SAAR (mm):	655	655
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.43	0.43
1 in 1 year (l/s):	0.36	0.36
1 in 30 years (l/s):	0.98	0.98
1 in 100 year (l/s):	1.36	1.36
1 in 200 years (l/s):	1.59	1.59

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Figure 4.9 – Catchment B-Greenfield rate calculation

Based on the above calculation, the greenfield discharge rate for Catchment B is 0.43 l/s. Storage and Half drain time requirement were calculated using the 0.43 l/s discharge rate and found that the Half drain calculation is not satisfied. Refer to below calculations.

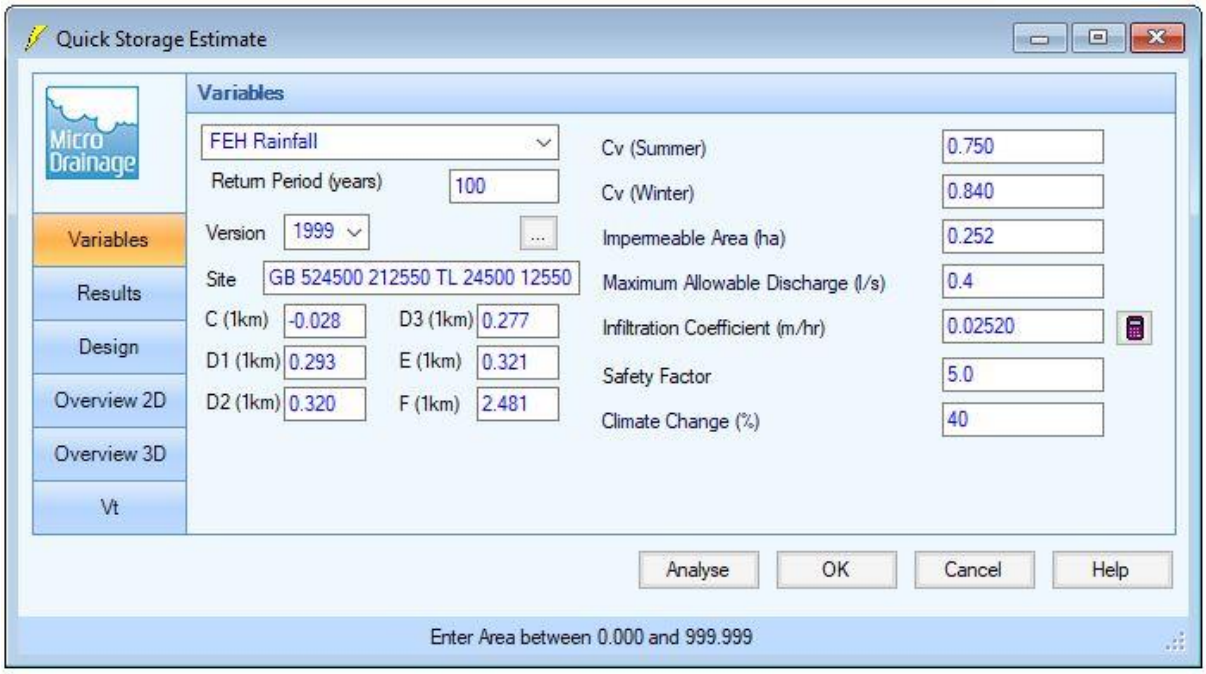


Figure 4.10 – Catchment B-Quick Storage Estimate with Greenfield Rate Discharge Variables

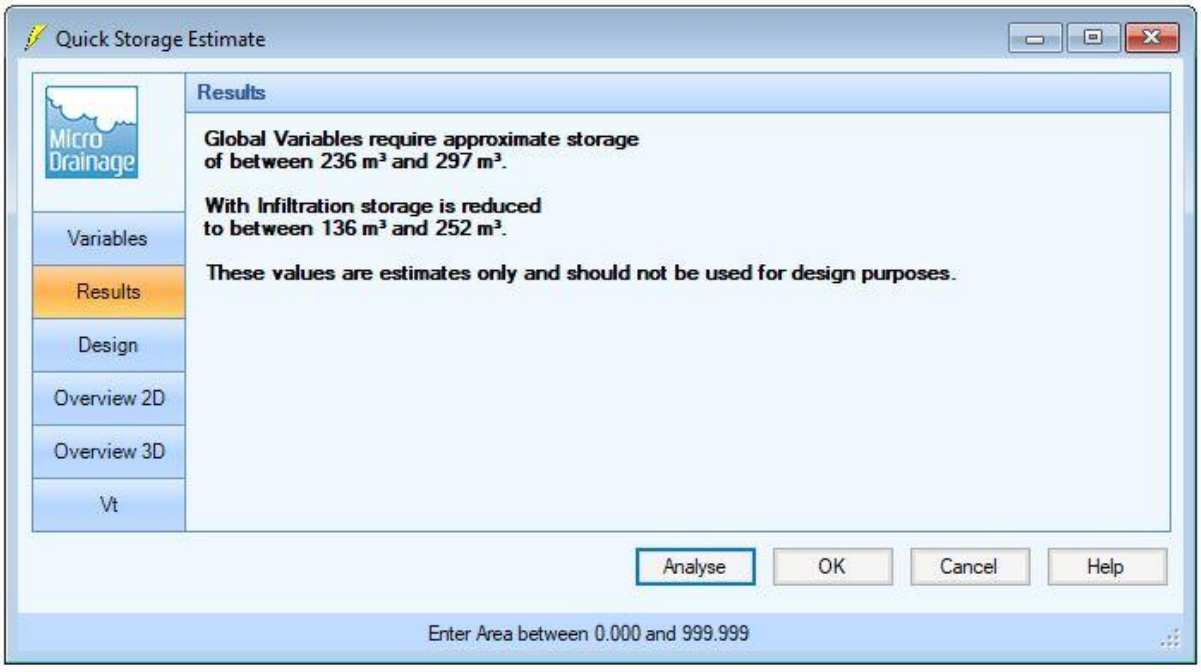


Figure 4.11 – Catchment B-Quick Storage Estimate with Greenfield Rate Discharge Results

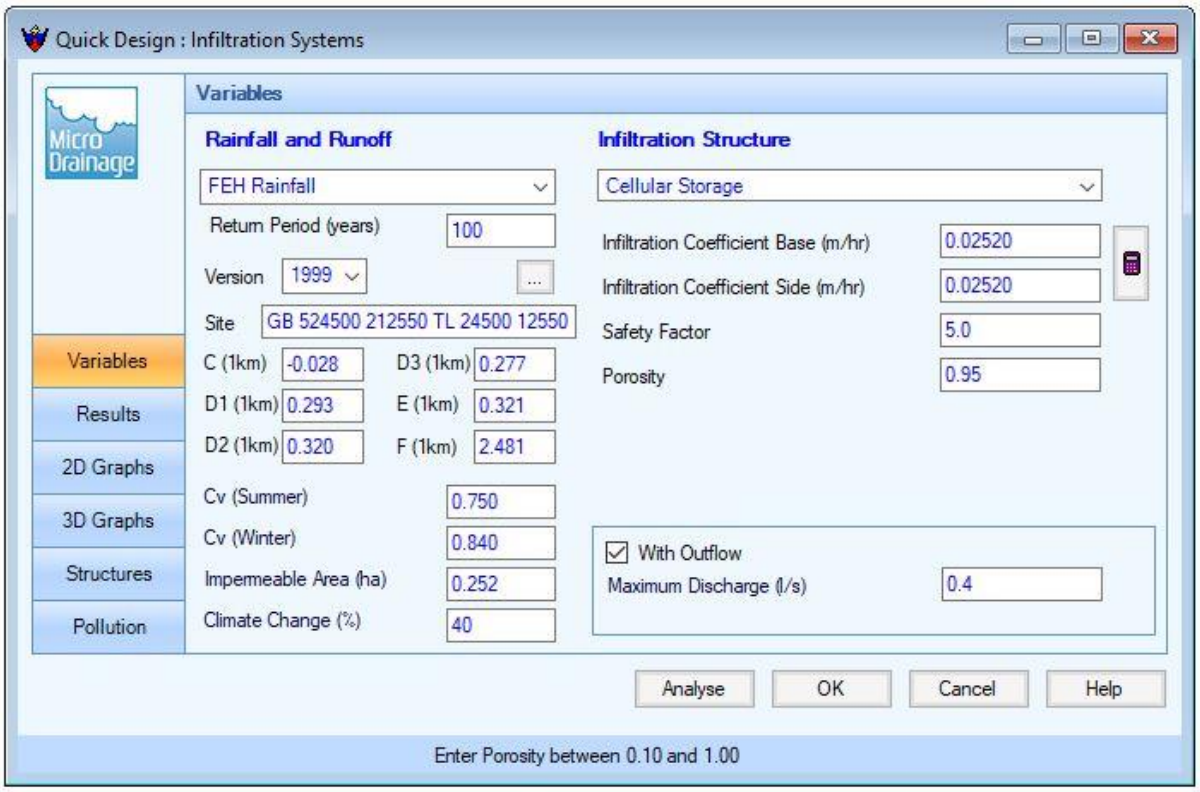


Figure 4.12 – Catchment B-Half Drain Time Calculation with Greenfield Rate Discharge Variables

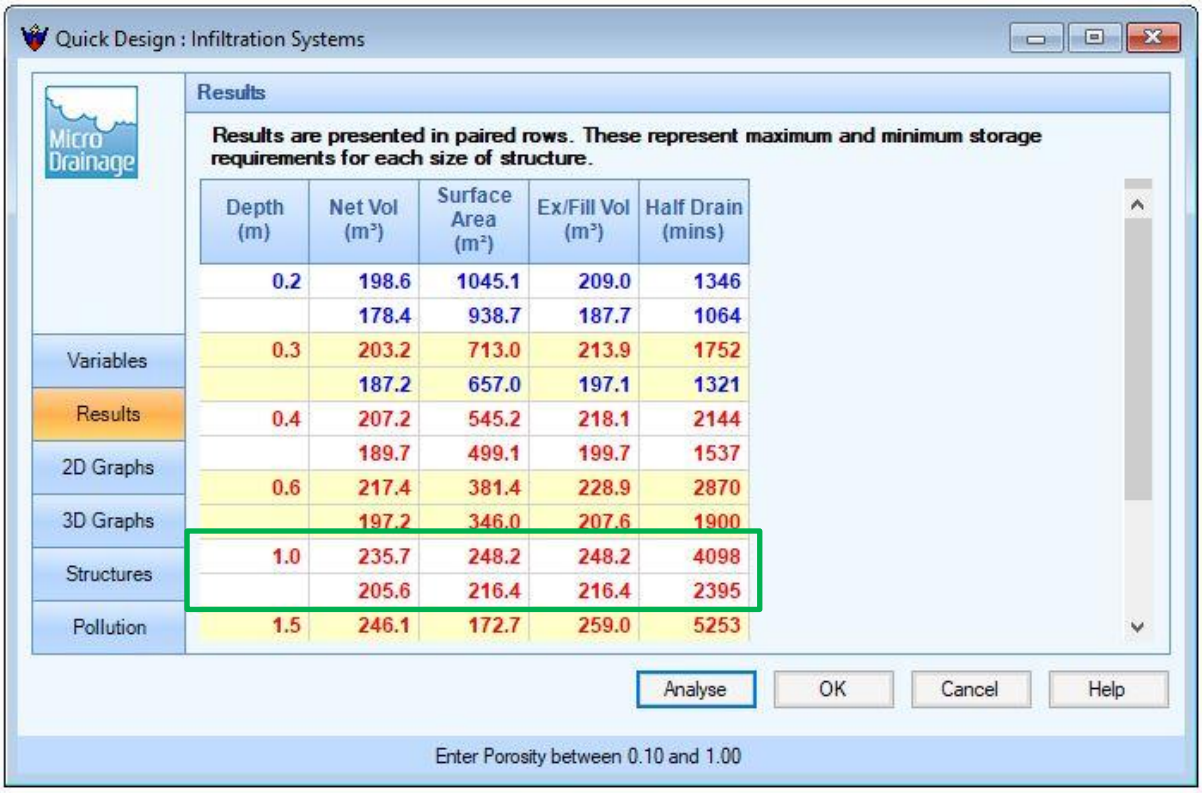


Figure 4.13 – Catchment B-Half Drain Time Calculation with Greenfield Rate Discharge Results

As the half drain time calculation is not satisfied with 0.43l/s discharge rate and there will be a risk of blockage, it is proposed to increase the discharge rate into the public sewer to 5 l/s. below calculations shows this scenario.

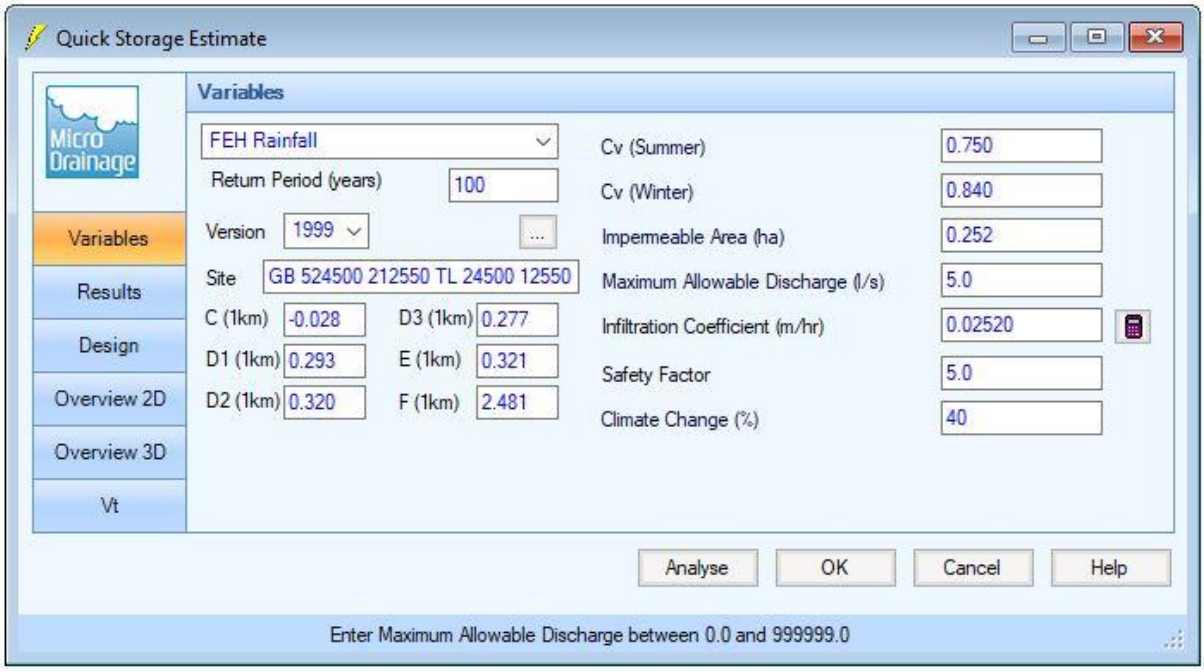


Figure 4.14 – Catchment B-Quick Storage Estimate with 5 l/s Discharge Variables

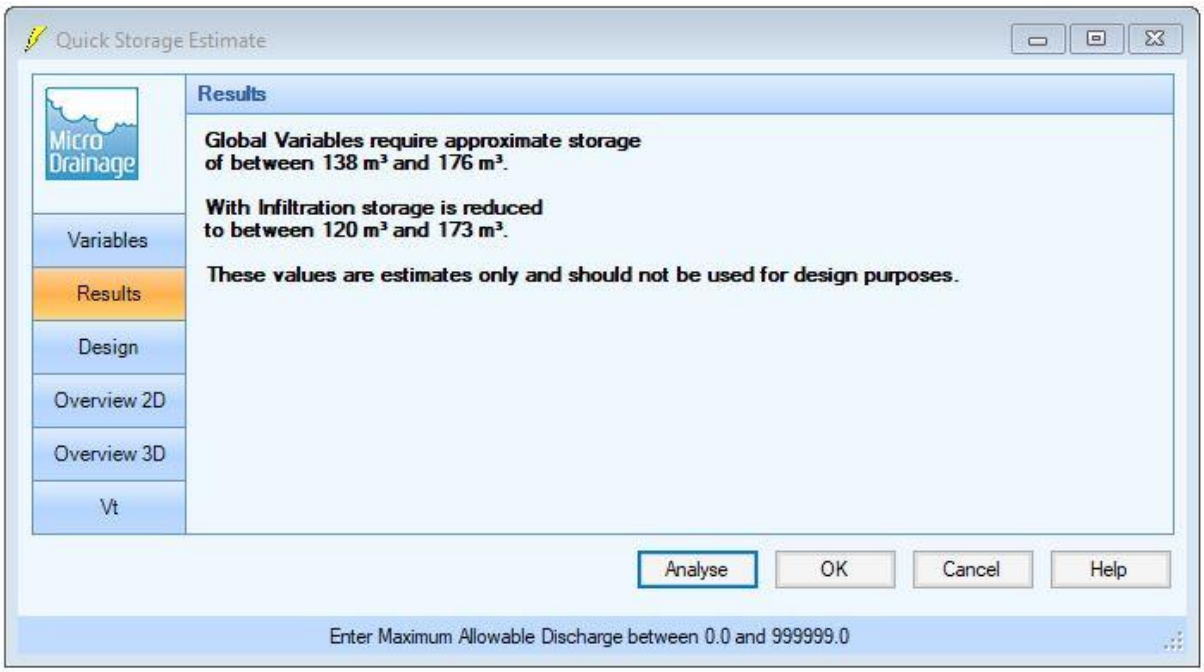


Figure 4.15 – Catchment B-Quick Storage Estimate with 5 l/s Discharge Results

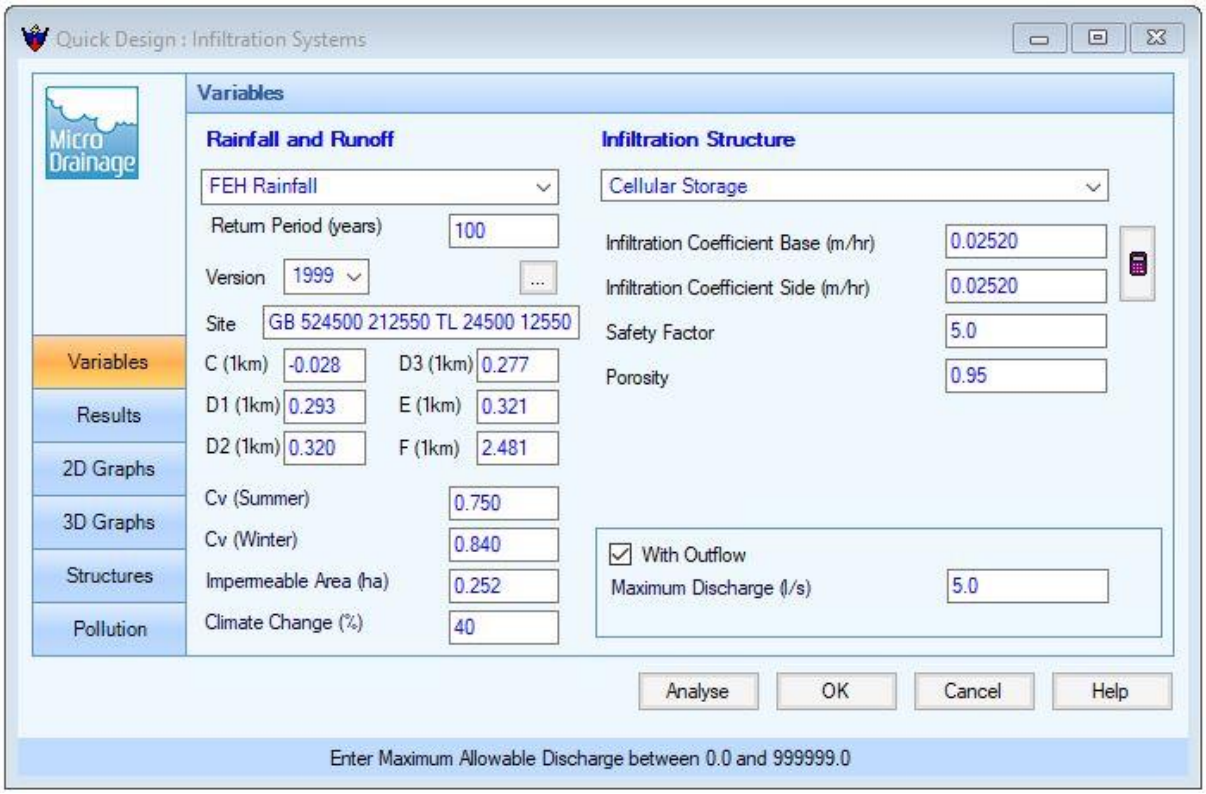


Figure 4.16 – Catchment B-Half Drain Time Calculation with 5 l/s Discharge Variables

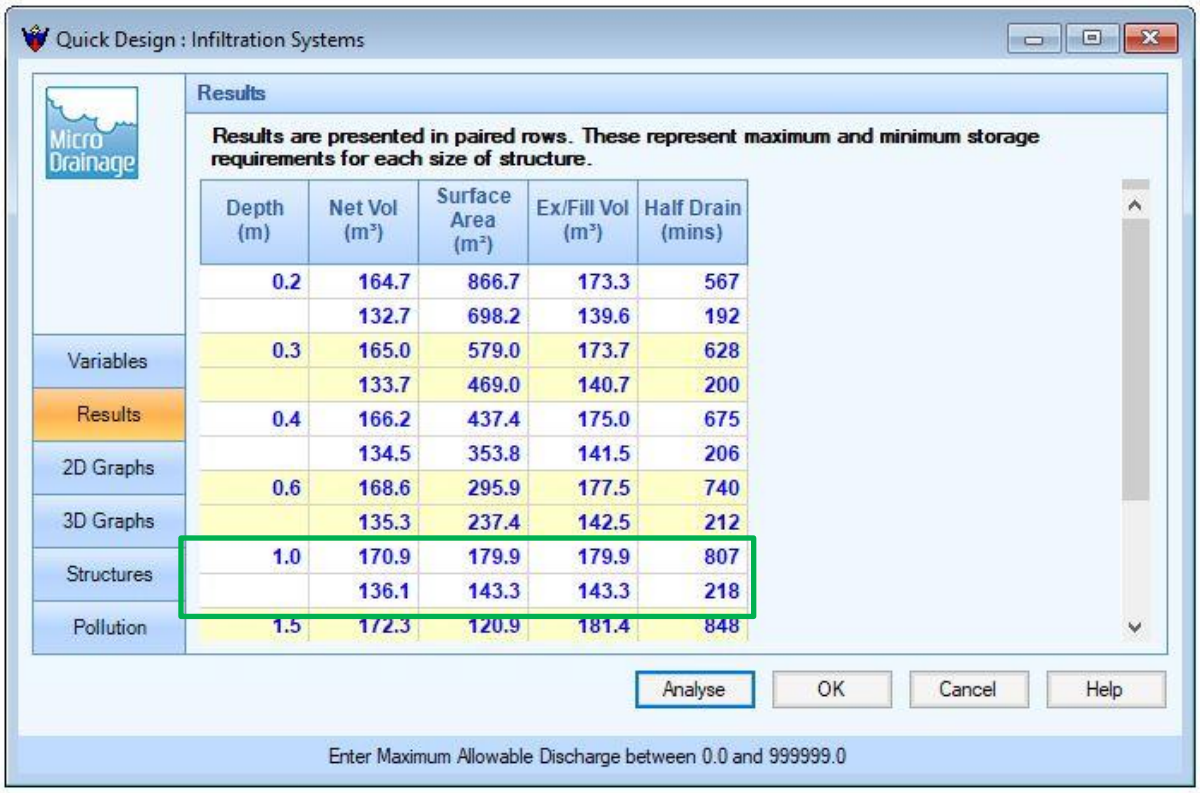


Figure 4.17 – Catchment B-Half Drain Time Calculation with 5 l/s Discharge Results

Based on the above storage estimate and the half drain time calculations, Catchment B soakaway will have a storage volume of 173m^3 with the combined discharge of infiltration and 5 l/s discharge rate into the public sewer and achieve the half drain time of 807 minutes (<1440 minutes).

A pre-development enquiry has been submitted and Thames Water has confirmed capacity in their surface water sewer for the 5 l/s discharge rate. Refer to Appendix K for Thames Water confirmation letter.

Detailed drainage calculations for this catchment is appended in Appendix F.

4.4 Proposed Development Foul Water Drainage Strategy

As presented in Appendix F- Foul water discharge calculation, the proposed development consists of 100 unit of hostel units and 43 of residential schemes. The peak and average flow for hostel units are 4.167l/s and 0.6945l/s. The residential units were estimated as 1.792l/s and 0.2987l/s respectively. The total peak flow discharge from the development site is 5.958l/s.

Thames Water has confirmed capacity in their foul water sewer for this site development foul water run off. Refer to Appendix K for Thames Water confirmation letter.

4.3 Maintenance Requirements

It is anticipated that a private management company will be employed to maintain the completed drainage network for the development incorporating the following activities and frequency for each SuDS component.

4.3.1 Gullies/Channels/Pipes/Manholes

All components are to be periodically cleaned of foreign particles and silt accumulation, on a quarterly basis. Components located in unadopted areas will be maintained by the landowner. Those located in adopted areas will be maintained by the adopting authority.

4.3.2 Oil Separators/ Petrol Interceptors

Units are to be inspected at least every six months in accordance with the manufacturer's recommendations. A log should be kept detailing the depth of oil found, any oil volume and silt removed, or cleaning carried out. Alarm probes should be removed and cleaned at each inspection.

4.3.3 Proprietary Systems

Proprietary systems will require routine maintenance by the owner to ensure continuing operation to design performance standards. A typical maintenance schedule is detailed below in table 14.2 from the CIRIA SuDS manual.

TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

4.3.4 Cellular Soakaway Storage Unit

The proposed Geolight (or equivalent) Soakaway unit includes a perforated/ slotted distribution pipe surrounded by granular material providing filtration and treatment for surface water flows. This will be installed with an associated filtration device (petrol interceptor, sponge gulley or other) to prevent the intake of debris and the treatment of hydrocarbon mixed in the surface water runoff. Size of the soakaway units must be appropriate for the scale and nature of the development. A typical maintenance schedule is detailed below in table 13.1 from the CIRIA SuDS manual.

Refer to Appendix G for proposed the proposed drainage layout.

TABLE 13.1 Operation and maintenance requirements for soakaways

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediment and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

4.4 Consultation with Hertfordshire County Council LLFA

Following comments were received from LLFA baes on our previous issue of the Drainage Strategy report. Our responses are included below under each item.

1. Full assessment of all existing sources of flooding on the development site.

A separate Flood Risk Assessment report has been prepared for the site assessing all the existing sources of flooding.

2. Clarification of the existing ground condition and contamination risk on the site.

Refer to Appendix J for the Environment Assessment report which provides the clarification on the existing ground conditions and the contaminations risks.

3. Clarification on the existing surface water drainage on the site.

Refer to Appendix G for the proposed drainage plan which identifies the existing drainage networks.

4. Details of the proposed drainage for the indicated road and car parking.

The presence of underground electrical lines with potential high voltage in the vicinity of the car park and its associated easements makes it disadvantageous to extend development/surface water drainage features within this boundary. The drainage strategy was developed keeping the car park and its existing drainage features as it is. The car park, therefore, forms part of the impermeable catchment for the overall site drainage strategy.

5. Clarification of the provided SuDS management stages.

Section 4.3 of the submitted Drainage strategy highlights the maintenance requirements of the proposed SUDs features. The revised drainage strategy report will further highlight the proximity of some region of the site to the Source Protection Zone. Further management stages included in the revised drainage strategy report.

6. Limiting the proposed discharge of surface water runoff from the site to Greenfield runoff rates.

Refer to the proposed development surface water drainage strategy on section 4.3 for further information.

7. Post-development calculations/modelling in relation to surface water for all rainfall events up to and including the 1 in 100 year return period, this must also include a +40% allowance for climate change.

Refer to Appendix F for the surface water post development drainage detailed calculations and simulation results.

8. Clarification of the provided drainage layout.

A revised drawing of the existing drainage pattern included in the revised drainage strategy. Clear separation zones of Soakaway from adjacent buildings highlighted. Refer to Appendix G for the proposed drainage plan which identifies the existing drainage networks.

9. If the drainage proposals are to infiltrate to ground then evidence of permeability should be provided, and test must be conducted in accordance with BRE Digest 365.

Refer to Appendix I for the infiltration test results report.

10. Evidence that if the applicant is proposing to discharge to the local sewer network that they have confirmation from the relevant water company or sewer network operator that they have the capacity to take the proposed volumes and runoff rates.

A pre-development enquiry has been submitted to Thames Water and the confirmation received for both the surface water and foul water discharge rates and their arrangements. Refer to Appendix K for Thames Water confirmation letter.

5 CONCLUSION

The proposed 0.671ha development is centred on National Grid Reference (NGR) TL244125 (524409mE, 212593mN) at Peartree Lane, Welwyn Garden City, AL7 3UL within a predominantly residential/commercial area. The existing brownfield site comprises 1 and 2 storey buildings with car parking at the north of the site.

There are no fluvial features in the vicinity of the site. The nearest river Lea is approximately 2.1km to the South Western part of the site.

The development site has a relatively shallow slope falling in the centre of the site. The highest level is 85.80m AOD and the lowest level is 82.20m AOD. No uniform sloping of the site is observed.

The Environmental Agency's Flood map for planning indicates that the site is in Flood Zone 1 - little or no risk, with an annual probability of flooding from rivers and the sea of less than 0.1% (1 in 1000-year rainfall event).

Based on the British Geological Society map, the development site is found underlain with Lewes Nodular Chalk Formation and Seaford Chalk Formation.

The development proposal consists of 100 bed YMCA hostel and 43 residential dwellings with the demolishment of existing development.

The proposed development contributes to a significant increase (16%) in permeable areas from 1,633m² to 1,892m².

In accordance with the Welwyn Hatfield Council Planning policy and the dictates of Building Regulation H3; the proposed Surface Water Strategy consists of Sustainable Urban Drainage System by focusing on the infiltration of resulting run-off into the ground.

A site-specific infiltration test to BRE Digest 365, conducted in April 2020 by Delta-Simons confirmed (refer to Table 25.1 of the CIRIA "The *SuDS Manual*") that infiltration is a viable method of surface water discharge. Appendix I provides a plan and results of the soil infiltration soakaway tests. A value of 4.5x 10^{-5} m/s and 7.0x 10^{-6} m/s was recorded during the tests.

A Site-Specific Environmental Report was produced by Delta-Simons in April 2020 to investigate for any potential risk of groundwater contamination and no significant source of contamination was identified. Only marginally elevated levels of PAHs, arsenic and lead were identified within shallow soils.

The surface water runoff from the proposed impermeable areas in catchment A and B (total area of 4037m^2) will be collected into two separate networks. Whereas, the surface water runoff from the existing carpark with an impermeable area of 787m^2 will be collected using its existing drainage features. This is due to the presence of underground electrical lines with potential high voltage in the vicinity of the car park and its associated easements which makes it disadvantageous to extend the development/surface water drainage features within the area. Refer to Appendix H for the catchment plan.

Catchment A will have a cellular storage volume of 117m^3 with infiltration into the ground with satisfying the half-drain time requirements. Catchment B will have a cellular storage volume 173m^3 with combined infiltration into the ground and a 5 l/s discharge rate into the Thames Water public sewer with satisfying the half-drain time requirements. Thames Water approval has been obtained for 5 l/s discharge rate.

The proposal involves an average foul water discharge of 0.993l/s (peak flow 5.96l/s). This is proposed to connect into the existing Thames Water foul water sewer in the vicinity of the works. Thames Water has confirmed the capacity in their foul water sewer for this development run off.

The proposed drainage system and the SuDS features to be maintained by a private management company based on the maintenance requirement set out on this report.

Appendix A – Existing Site Plan

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

SITE BOUNDARY

0 50MM ON A1 DWG. 50

REV	DESCRIPTION	BY	CHK	DATE
P01	PRELIMINARY	SS	JJ	01.10.2019

CLIENT
SAUNDERS ARCJITECTS

PROJECT
WGC-ONE YMCA
PEARTREE LANE

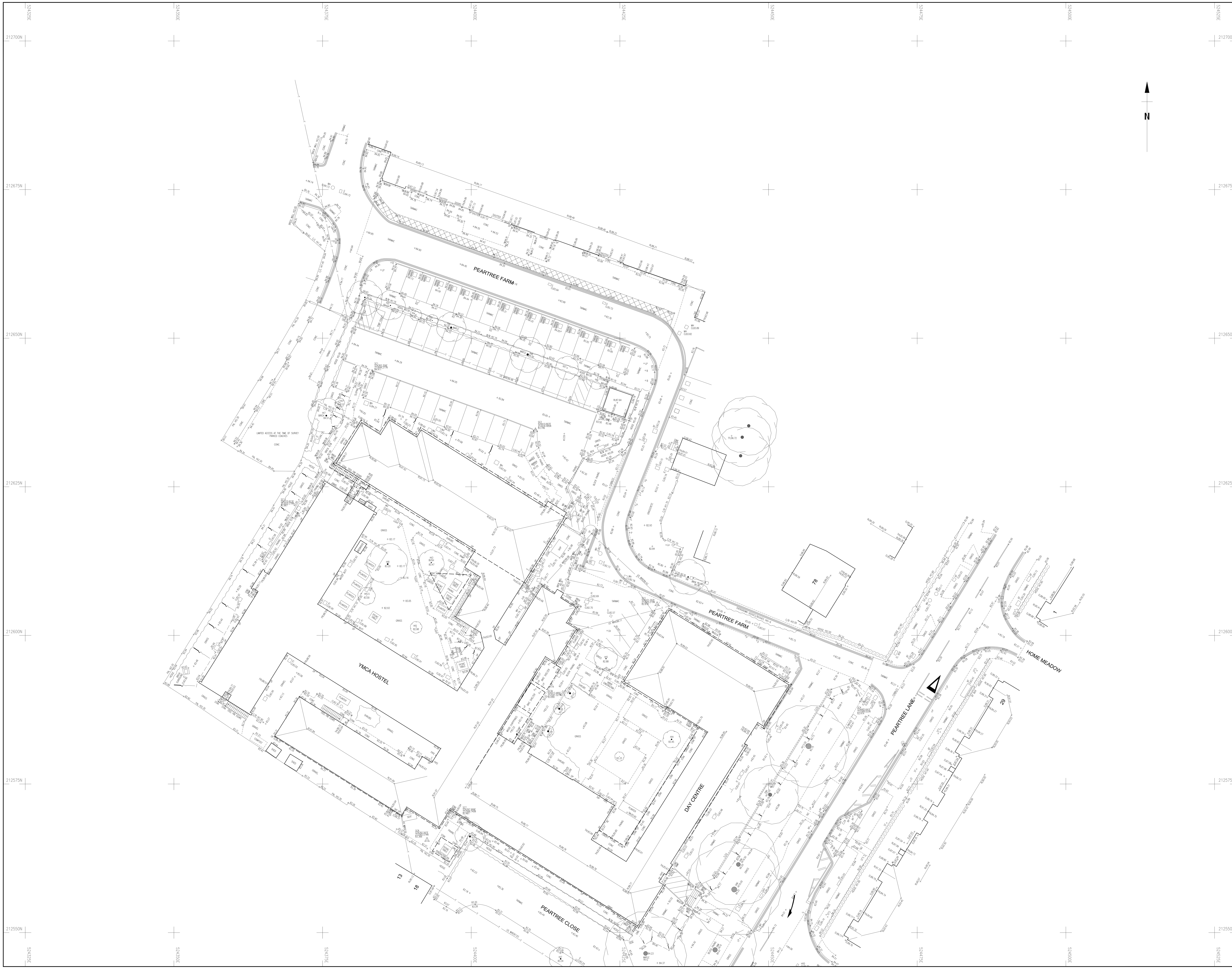
DRAWING TITLE
SITE LOCATION PLAN

PINNACLE CONSULTING ENGINEERS
ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS,
AL7 1HE. TELEPHONE: 01707 527 630
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
PRELIMINARY			
SCALE @ A1	DATE	DRAWN BY	CHECKED
1:250	OCT'19	SS	JJ
DRG NO.			REVISION
C190906-PIN-XX-XX-DR-C-0204			P01

REF: 190906

Appendix B – Topographic Survey Records

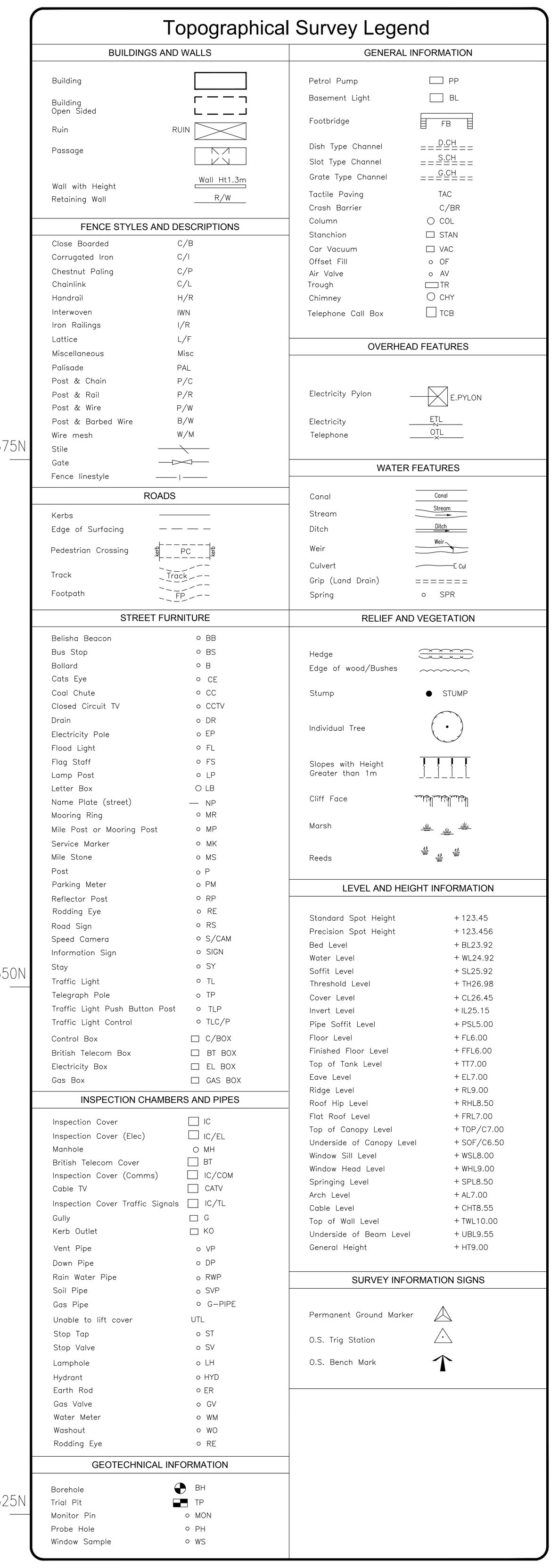


Survey Notes

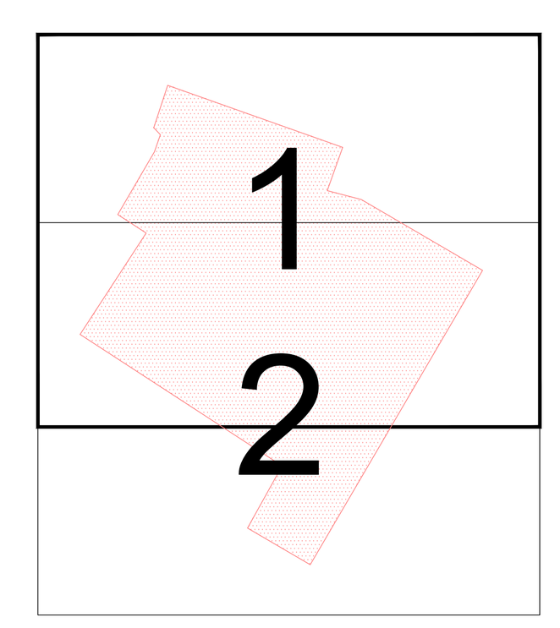
Grid: Local, plane, metric fixed to National Grid fixed at Stn SC5

Levels: OS datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes



Sheet Index



Rev.	Date	Description

MALCOLM HUGHES
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survey@mhls.co.uk

Accreditations

FS 14126

Client

SAUNDERS PARTNERSHIP
STUDIO FOUR, 37 BROADWATER ROAD
WELWYN GARDEN CITY, AL7 3AX

Project

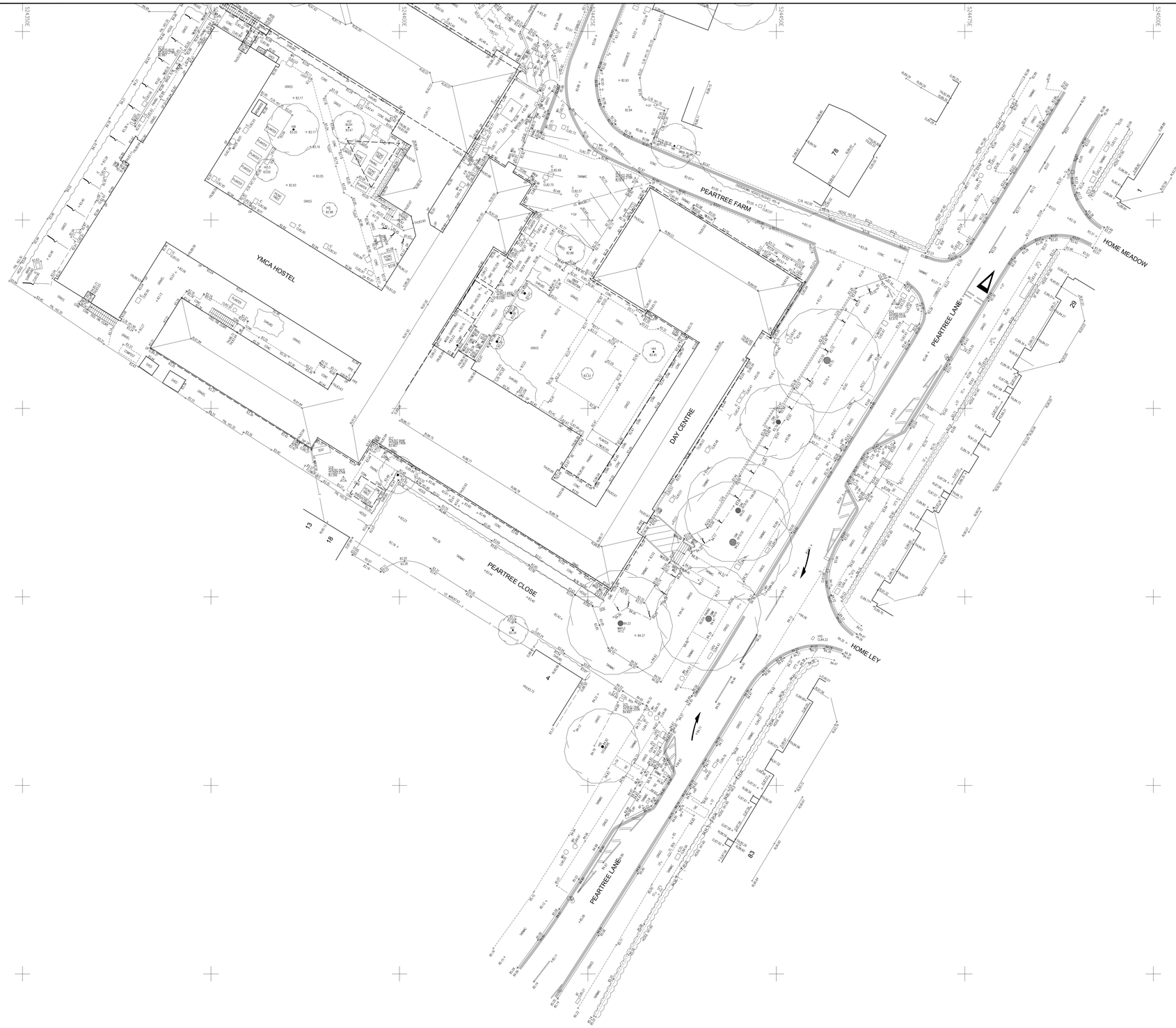
ONE YMCA, PEARTREE LANE
WELWYN GARDEN CITY
AL7 3UL

Drawing Title

TOPOGRAPHICAL SURVEY

Drawn By	CPT	28/07/19	Survey Date	June 2019
Checked by	SC	28/07/19	Scale	1:200 @ A0

Drawing No: 53948-1 | Revision:



Survey Notes

Grid: Local, plane, metric fixed to National Grid fixed at Stn SC5

Levels: OS datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes

Topographical Survey Legend

BUILDINGS AND WALLS

Building
Building Open Sided
Ruin (RUIN)
Passage
Wall with Height
Retaining Wall (R/W)

GENERAL INFORMATION

Petrol Pump (PP)
Basement Light (BL)
Footbridge (FB)
Dish Type Channel
Slot Type Channel
Grate Type Channel (Wall int'l 3m)
Tactile Paving (TAC)
Crash Barrier (C/BR)
Column (COL)
Stanchion (STAN)
Air Vacuum (AVC)
Offset Fill (OF)
Air Valve (A AV)
Trough (TR)
Chimney (CHY)
Telephone Call Box (TCB)

FENCE STYLES AND DESCRIPTIONS

Close Boarded C/B
Corrugated Iron C/I
Chestnut Paling C/P
Chainlink C/L
Hoardnail H/R
Interwoven I/W
Iron Railings I/R
Lattice L/T
Miscellaneous Misc
Palisade PAL
Post & Chain P/C
Post & Rail P/R
Post & Wire P/W
Post & Barbed Wire P/B
Wire mesh W/M
Stile
Gate
Fence linestyle

OVERHEAD FEATURES

Electricity Pylon (E.PYLON)
Electricity (E)
Telephone (T)

ROADS

Kerbs
Edge of Surfacing
Pedestrian Crossing (PC)
Track
Footpath

WATER FEATURES

Canal
Stream
Ditch
Weir
Culvert
Strip (Land Drain)
Spring (SPR)

STREET FURNITURE

Bellsha Beacon (BB)
Bus Stop (BS)
Bollard (B)
Cable Eye (CE)
Coal Chute (CC)
Closed Circuit TV (CCTV)
Drain (DR)
Electricity Pole (EP)
Flood Light (FL)
Flag Staff (FS)
Lamp Post (LP)
Letter Box (LB)
Name Plate (street) (NP)
Mooring Ring (MR)
Mile Post or Mooring Post (MP)
Service Marker (MK)
Mile Stone (MS)
Post (P)
Parking Meter (PM)
Reflector Post (RP)
Rodding Eye (RE)
Road Sign (RS)
Speed Camera (S/CAM)
Information Sign (SGN)
Stop (SY)
Traffic Light (TL)
Telegraph Pole (TP)
Traffic Light Push Button Post (TLP)
Traffic Light Control (TLC/P)
Control Box (C/BOX)
British Telecom Box (BT BOX)
Electricity Box (EL BOX)
Gas Box (GAS BOX)

RELIEF AND VEGETATION

Hedge
Edge of wood/Bushes
Stump (STUMP)
Individual Tree
Slopes with Height Greater than 1m
Cliff Face
Marsh
Reeds

INSPECTION CHAMBERS AND PIPES

Inspection Cover (IC)
Electricity Cover (Elec) (C/ELL)
Manhole (MH)
British Telecom Cover (BT)
Inspection Cover (Comms) (IC/COM)
Cable TV (CATV)
Inspection Cover Traffic Signals (IC/TL)
Gully (G)
Kerb Outlet (KO)
Vent Pipe (VP)
Down Pipe (DP)
Rain Water Pipe (RWP)
Soil Pipe (SVP)
Gas Pipe (G.I=PIPE)
Unable to lift cover (UTL)
Stop Tap (ST)
Stop Valve (SV)
Lamphole (LH)
Hydrant (HYD)
Earth Rod (ER)
Gas Valve (GV)
Water Meter (WM)
Washout (WO)
Rodding Eye (RE)

LEVEL AND HEIGHT INFORMATION

Standard Spot Height (+ 123.45)
Precision Spot Height (+ 123.456)
Bank Level (+ 84.23-92)
Boller Level (+ 84.24-92)
Soffit Level (+ 75.25-92)
Threshold Level (+ 74.06-98)
Cover Level (+ 0.26.45)
Invert Level (+ L25.15)
Pipe Soffit Level (+ P15.5.00)
Floor Level (+ F14.00)
Finished Floor Level (+ FFL6.00)
Top of Tank Level (+ TT7.00)
Eave Level (+ EL7.00)
Ridge Level (+ RL9.00)
Roof Hip Level (+ RHL8.50)
Flat Roof Level (+ FRL7.00)
Top of Canopy Level (+ TOP/C17.00)
Underside of Canopy Level (+ SOF/C16.50)
Window Sill Level (+ WSL8.00)
Window Head Level (+ WHL9.00)
Springing Level (+ SPL8.50)
Arch Level (+ AL7.00)
Cable Level (+ CHT8.55)
Top of Wall Level (+ TWL10.00)
Underside of Beam Level (+ UBL8.55)
General Height (+ H15.00)

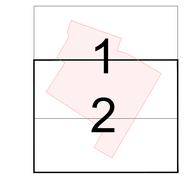
SURVEY INFORMATION SIGNS

Permanent Ground Marker
O.S. Trig Station
O.S. Bench Mark

GEOTECHNICAL INFORMATION

Borehole (BH)
Trial Pit (TP)
Monitor Pin (+ MON)
Probe Hole (+ PH)
Window Sample (+ WS)

Sheet Index



Rev.	Date	Description

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survey@mhla.co.uk

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WELWYN GARDEN CITY, AL7 3AX

Project
ONE YMCA, PEARTREE LANE
WELWYN GARDEN CITY
AL7 3UL

Drawing Title
TOPOGRAPHICAL SURVEY

Drawn By		Survey Date	
CPT	28/07/19	June 2019	
Checked by		Scale	
SC	28/07/19	1:200 @ A0	

Drawing No: 53948-2 Revision:

Appendix C – Proposed Development Plans

NOTES ©

This drawing to be read in accordance with the specification/Bills of Quantities and related drawings. No Dimensions to be scaled from this drawing. All stated dimensions to be verified on site and the Architect notified of any discrepancies.

0 50

Scale bar 50mm at 1:1

FOR PLANNING

REV	DATE	NOTE	IN

Project

YMCA
PEARTREE LANE
WELWYN GARDEN CITY

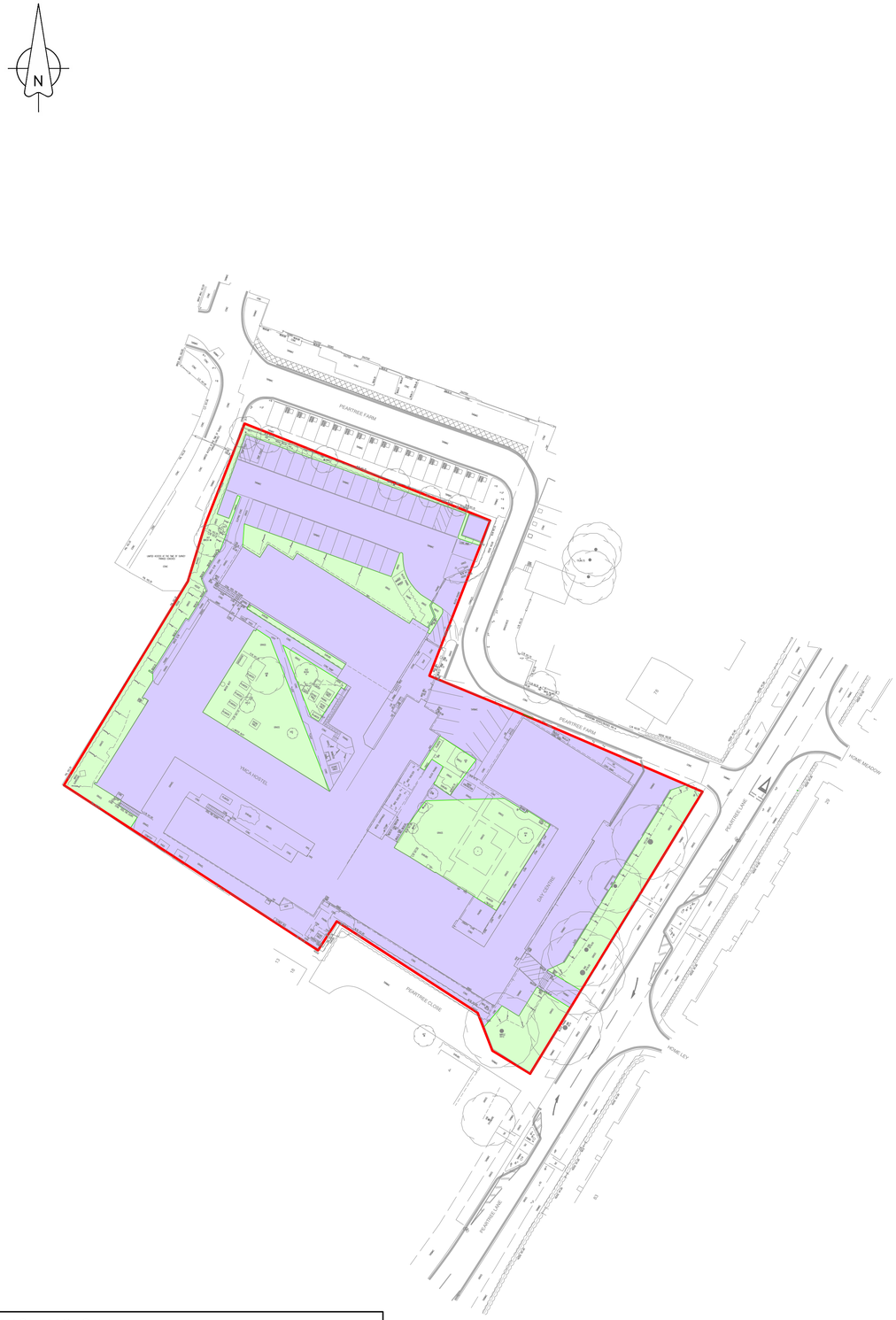
Title

PROPOSED SITE LAYOUT

Scale	Date
1:500 @A3	SEPT 2019
Drawn	Checked
SD	AL
Drawing Number	Revision
8057 / P101	-

Saunders
Architecture + Urban Design
saundersarchitects.com | 01707 385300 | London | Manchester | Bristol | Welwyn

Appendix D – Existing & Proposed Impermeable Areas



EXISTING SITE

TOTAL IMPERMEABLE AREA = 5,083 M²

TOTAL PERMEABLE AREA = 1633 M²

PROPOSED SITE

TOTAL IMPERMEABLE AREA = 4,824 M²

TOTAL PERMEABLE AREA = 1,892 M²

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
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4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

SITE BOUNDARY

PERMEABLE AREA

IMPERMEABLE AREA

0 50MM ON A1 DWG. 50

REV	DESCRIPTION	BY	CHK	DATE
P03	REVISED DRAWING	SC	JJ	05.06.2020
P02	ISSUED FOR PLANNING	SS	JJ	09.10.2019
P01	INFORMATION	SS	JJ	03.10.19

CLIENT

SAUNDERS ARCHITECTS ON BEHALF OF YMCA

PROJECT

WGC- ONE YMCA
PEARTREE LANE

DRAWING TITLE

EXISTING AND PROPOSED IMPERMEABLE AREAS

PINNACLE CONSULTING ENGINEERS

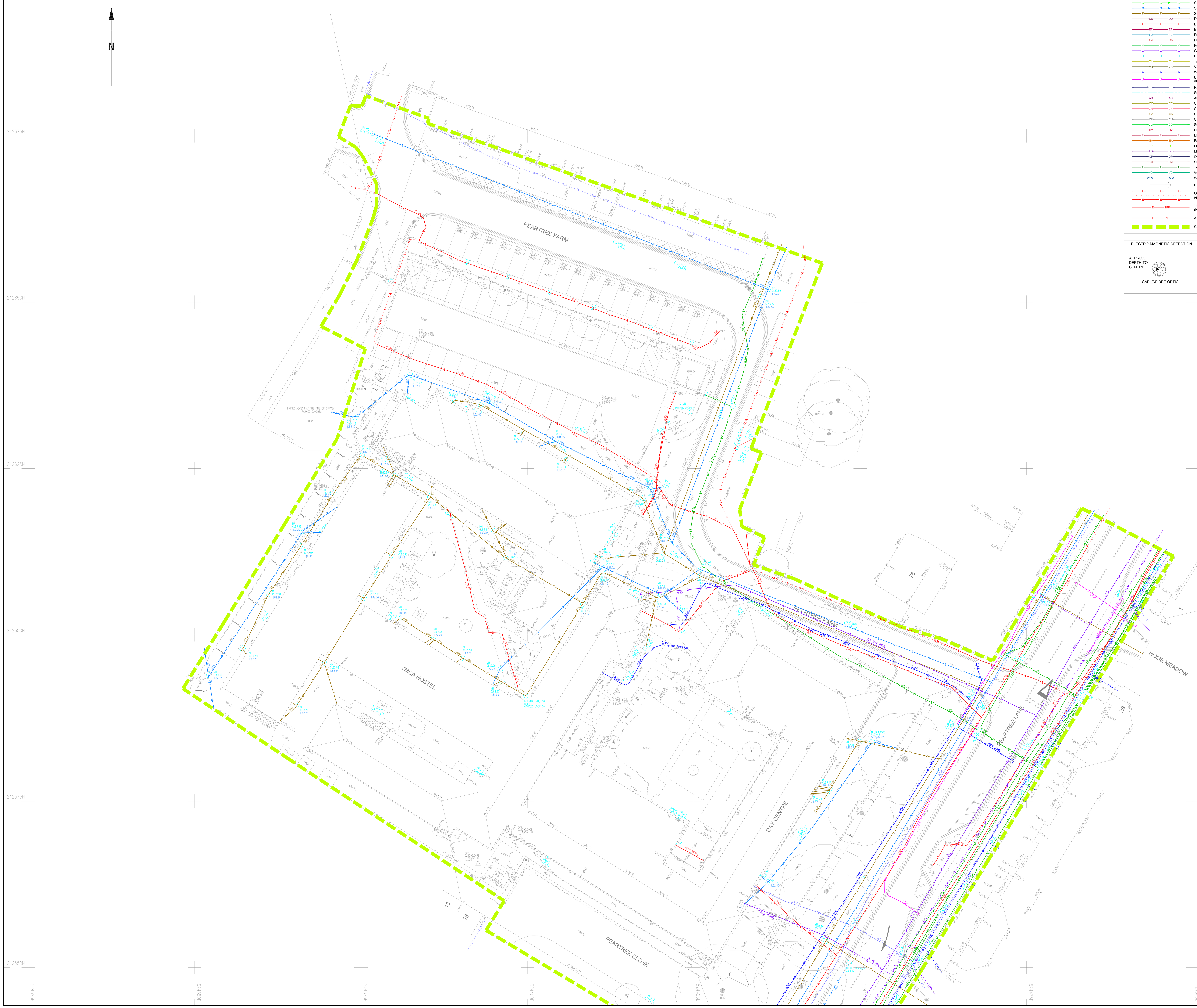
ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS,
AL7 1HE. TELEPHONE: 01707 527 630

NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
INFORMATION			
SCALE @ A1	DATE	DRAWN BY	CHECKED
1:500	OCT'19	SS	JJ
ORG NO.			REVISION
C190906-PIN-XX-XX-DR-C-0205			P03

REF: 190906

Appendix E – Utility Survey Records



UNDERGROUND SERVICES KEY

- A — Abandoned
- AD — Acid drain
- BT — British telecom
- TV — Cable TV
- CM — Communication cables
- C — Sewer combined
- S — Sewer surface water
- F — Sewer foul
- DU — Ducting
- E — Electric cables
- EF — Effluent pipes
- FU — Fuel line
- GA — Fuel gauge line
- V — Fuel vent line
- G — Gas pipes
- H — Heating pipes
- TL — Traffic light cables
- VR — Vapour recovery pipes
- W — Water pipes
- U — Unidentified GPR or electro location trace
- Rising main
- Scar trace
- AC — Alarm cables
- CC — CCTV cables
- CH — Chemical pipes
- CA — Compressed air pipes
- CU — Culvert
- CO — Sewer combined overflow
- HV — Electric HV cables
- P — Electric pilot cables
- EA — Earth cables
- FO — Fibre optic cables
- LG — LPG pipes
- OP — Oil pipes
- SM — Sludge main
- T — Telemetry cables
- VD — Vehicle detection pad
- W W — Wash water pipes
- End of trace
- E — Group of services representation
- E TFR — Taken from records (Not proven on site)
- E AR — Assumed route
- Services survey boundary

AR	Assumed Route	GPR	Ground Penetrating Radar
BD	Backdrop	TFR	Taken From Records
CR	Cable Riser	PE	Polyethylene Pipe
d	Depth	UTS	Unable To Survey
PR	Pipe Riser	UR	Unable To Rod
OF	Offset Fill	UT	Unable To Trace
T	Tank	NVP	No Visible Pipes
VR	Vapour Recovery Point		
UTL	Unable To Lift		

DISCLAIMER

Electromagnetic and ground penetrating radar techniques have been used in the location of underground services shown on this survey plan. These are interpretive procedures and we recommend that trial excavations should be undertaken to to confirm identification, location and depth of services where these are critical.

Please note that not all buried pipes, cable and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other utilities.

All reasonable effort and care has been made in searching available record drawings. The completeness of the underground service information supplied to and by us cannot be guaranteed.

NOTES

Where services are non-metallic or not proven on site, positions are taken from records, trench scars & surface detail.

Where stated, depth estimations are typically to the centre or top of the service. Depths to gravity sewers and drains are typically to invert levels, unless otherwise stated.

Where Ground Penetrating Radar (GPR) is quoted the depth is recorded to the assumed external crown of the feature.

The diagram below describes the depth information in more detail.

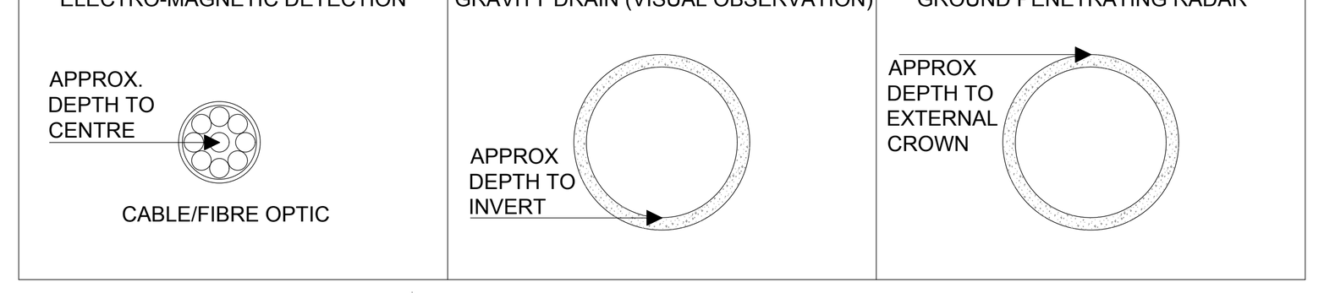
Where the precise position or depths of these features are critical to the design or siteworks they must be verified by the use of trial excavations.

Pipe sizes which cannot be obtained by visual survey are taken from utilities record drawings or marker plates where available.

Services shown as TFR (Taken From Records) have not been proven on site.

The CAD layering may contain further information.

TYPICAL FEATURE DEPTH ANNOTATION



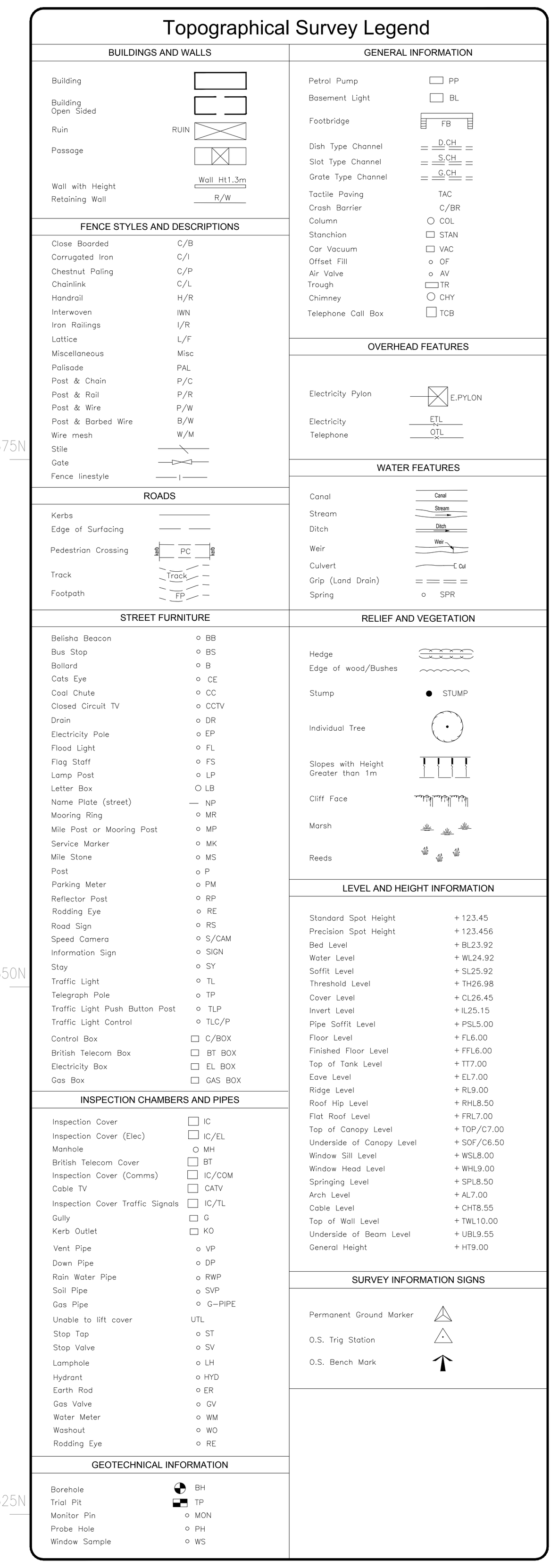
Survey Notes

Grid: Local, plane, metric fixed to National Grid fixed at Stn SC5

Levels: OS datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes

Topographical Survey Legend



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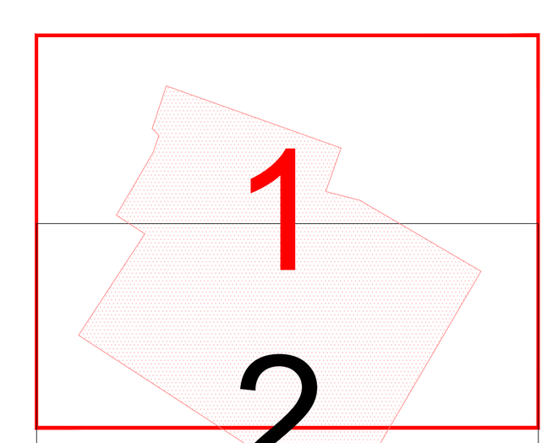

Rev.	Date	Description

MALCOLM HUGHES
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Accreditations

RICS · THE SURVEY ASSOCIATION · chartered ices · RISQS QUALIFIED · bsi. ISO 9001 Quality Management FS 14126

Client

SAUNDERS PARTNERSHIP
STUDIO FOUR, 37 BROADWATER ROAD
WELWYN GARDEN CITY, AL7 3AX

Project

ONE YMCA, PEARTREE LANE
WELWYN GARDEN CITY
AL7 3UL

Drawing Title

UTILITY SURVEY

Drawn By	CPT	09/08/19	Survey Date	August 2019
Checked by	DJ	09/08/19	Scale	1:200 @ A0

Drawing No: 53948/UG1 — Revision:

UNDERGROUND SERVICES KEY

- Abandoned
- Acid drain
- British telecom
- Cable TV
- Communication cables
- Sewer combined
- Sewer surface water
- Sewer foul
- Ducting
- Electric cables
- Effluent pipes
- Fuel line
- Fuel gauge line
- Fuel vent line
- Gas pipes
- Heating pipes
- Traffic light cables
- Vapour recovery pipes
- Water pipes
- Unidentified GPR or electro location trace
- Rising main
- Scar trace
- Alarm cables
- CCTV cables
- Chemical pipes
- Compressed air pipes
- Culvert
- Sewer combined overflow
- Electric HV cables
- Electric pilot cables
- Earth cables
- Fibre optic cables
- LPG pipes
- Oil pipes
- Sludge main
- Telemetry cables
- Vehicle detection pad
- Wash water pipes
- End of trace
- Group of services representation
- Taken from records (Not proven on site)
- Assumed route
- Services survey boundary

AR	Assumed Route
BD	Backdrop
CR	Cable Riser
d	Depth
PR	Pipe Riser
OF	Offset Fill
T	Tank
VR	Vapour Recovery Point
UTL	Unable To Lift
GPR	Ground Penetrating Radar
TFR	Taken From Records
PE	Polyethylene Pipe
UTS	Unable To Survey
UR	Unable To Rod
UT	Unable To Trace
NVP	No Visible Pipes

DISCLAIMER

Electromagnetic and ground penetrating radar techniques have been used in the location of underground services shown on this survey plan. These are interpretive procedures and we recommend that trial excavations should be undertaken to to confirm identification, location and depth of services where these are critical.

Please note that not all buried pipes, cable and ducts can be detected and mapped in consideration of their depth, location, material type, geology and proximity to other utilities.

All reasonable effort and care has been made in searching available record drawings. The completeness of the underground service information supplied to and by us cannot be guaranteed.

NOTES

Where services are non-metallic or not proven on site, positions are taken from records, trench scars & surface detail.

Where stated, depth estimations are typically to the centre or top of the service. Depths to gravity sewers and drains are typically to invert levels, unless otherwise stated.

Where Ground Penetrating Radar (GPR) is quoted the depth is recorded to the assumed external crown of the feature.

The diagram below describes the depth information in more detail.

Where the precise position or depths of these features are critical to the design or siteworks they must be verified by the use of trial excavations.

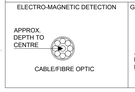
Pipe sizes which cannot be obtained by visual survey are taken from utilities record drawings or marker plates where available.

Services shown as TFR (Taken From Records) have not been proven on site.

The CAD layering may contain further information.

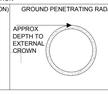
TYPICAL FEATURE DEPTH ANNOTATION

ELECTRO-MAGNETIC DETECTION



GRAVITY DRAIN (VISUAL OBSERVATION)

GROUND PENETRATING RADAR



Survey Notes

Grid: Local, plane, metric fixed to National Grid fixed at Stn SC5

Levels: OS datum from GNSS positioning converted using the National Geoid Model OSGM15

Notes

Topographical Survey Legend

BUILDINGS AND WALLS

- Building
- Building Open Sided
- Ruin (RUIN)
- Passage
- Wall with Height (Wall +H1.5m)
- Retaining Wall (R/W)

FENCE STYLES AND DESCRIPTIONS

- Close Boarded C/B
- Corrugated Iron C/I
- Chestnut Paling C/P
- Chainlink C/L
- Hurdle H/R
- Interwoven WN
- Iron Railings I/R
- Lattice L/F
- Miscellaneous Misc
- Palisade PAL
- Post & Chain P/C
- Post & Rail P/R
- Post & Wire P/W
- Post & Barbed Wire B/W
- Wire mesh R/W
- Stile
- Gate
- Fence linestyle

ROADS

- Kerbs
- Edge of Surfacing
- Pedestrian Crossing (PC)
- Track
- Footpath

STREET FURNITURE

- Bellstre Beacon
- Bus Stop
- Bollard
- Cable Eye
- Coal Chute
- Closed Circuit TV
- Drain
- Electricity Pole
- Flood Light
- Flag Staff
- Lamp Post
- Letter Box
- Name Plate (street)
- Mooring Ring
- Wire Post or Mooring Post
- Service Marker
- Wire Stone
- Post
- Parking Meter
- Reflector Post
- Rodding Eye
- Road Sign
- Speed Camera
- Information Sign
- Strip
- Traffic Light
- Telegraph Pole
- Traffic Light Push Button Post
- Traffic Light Control

INSPECTION CHAMBERS AND PIPES

- Inspection Cover
- Inspection Cover (Elec)
- Manhole
- British Telecom Cover
- Inspection Cover (Comms)
- Cable TV
- Inspection Cover Traffic Signals
- Gully
- Kerb Outlet
- Vent Pipe
- Down Pipe
- Rain Water Pipe
- Soil Pipe
- Gas Pipe
- Unable to lift cover
- Stop Tap
- Stop Valve
- Lamphole
- Hydrant
- Earth Rod
- Gas Valve
- Water Meter
- Washout
- Rodding Eye

GEOTECHNICAL INFORMATION

- Borehole
- Trial Pit
- Monitor Pin
- Probe Hole
- Window Sample

GENERAL INFORMATION

- Petrol Pump
- Basement Light
- Footbridge
- Dish Type Channel
- Slot Type Channel
- Grate Type Channel
- Tactile Paving
- Crash Barrier
- Column
- Stanchion
- Car Vacuum
- Offset Fill
- Air Valve
- Trough
- Chimney
- Telephone Call Box

OVERHEAD FEATURES

- Electricity Pylon (ELPYLON)
- Electricity
- Telephone

WATER FEATURES

- Canal
- Stream
- Ditch
- Weir
- Culvert
- Drip (Land Drain)
- Spring

RELIEF AND VEGETATION

- Hedge
- Edge of wood/Bushes
- Stump (STUMP)
- Individual Tree
- Slopes with Height Greater than 1m
- Cliff Face
- Marsh
- Reeds

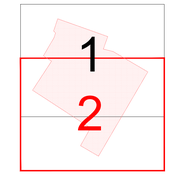
LEVEL AND HEIGHT INFORMATION

- Standard Spot Height
- Precision Spot Height
- Bench Mark
- Bottom Level
- Soffit Level
- Thickness Level
- Cover Level
- Invert Level
- Pipe Soffit Level
- Control Box
- Finish Level
- British Telecom Box
- Top of Tank Level
- Electricity Box
- Eave Level
- Gas Box
- Ridge Level
- Roof Hip Level
- Flat Roof Level
- Top of Canopy Level
- Underside of Canopy Level
- Window Sill Level
- Window Head Level
- Springing Level
- Arch Level
- Cable Level
- Top of Wall Level
- Underside of Beam Level
- General Height

SURVEY INFORMATION SIGNS

- Permanent Ground Marker
- O.S. Trig Station
- O.S. Bench Mark

Sheet Index



Rev.	Date	Description

MALCOLM HUGHES
CHARTERED LAND SURVEYORS
65 Cross Street, Sale, Manchester
M33 7HF, Tel: 0161 905 1265
www.malcolmhughes.co.uk
survey@mhls.co.uk

Accreditations: RICS, The Survey Association, Trimble ICES, Pas128

Client
SAUNDERS PARTNERSHIP
STUDIO FOUR, 37 BROADWATER ROAD
WELWYN GARDEN CITY, AL7 3AX

Project
ONE YMCA, PEARTREE LANE
WELWYN GARDEN CITY
AL7 3UL

Drawing Title
UTILITY SURVEY

Drawn By	CPT	09/08/19	
Checked by	DJ	09/08/19	
Survey Date		August 2019	
Scale		1:200 @ A0	

Drawing No: 53948/UG2

Revision:

Appendix F – Proposed Drainage Calculations

PINNACLE
CONSULTING ENGINEERS

Alchemy	3 Meridian Way	Woolverstone House	Grosvenor Court	Business Suite 5.01 D-1
Bessemer Road	Norwich	61 Berners Street	67a Patrick Street	WTC The Hague
Welwyn Garden City	Norfolk	London	Dun Laoghaire	Prinses Margrietplantsoen 33
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T: 01707 527 630	T: 01603 327 170	T: 0207 299 8299	T: +353 1231 1041	T: +31 70 240 0412

CLIENT / PROJECT	SHEET NO.	REVISION	PROJECT REF.
WGC-YMCA PEARTREE LANE	1	1	C190906
TITLE	PREPARED	CHECKED	DATE
FOUL WATER DESIGN FLOW RATES	SS	JJ	25.09.19

The reccomended basis for foul sewer design is 6DWF+10%. The multiplier "6" if used to estimate the conditions at peak flow. An additional 10% is factored into the DWF as a provision for infiltration; this is increased to an allowance of 20% in areas with a high water table.

Development	Flow Rates (l/day)			Number of Units	Provision for Infiltration	High Water Table	Peak Factor	Flow Rates (l/s)
Development 1								
General Housing	600	per	property	100	no	no	6	4.167
Development 2								
General Housing	600	per	property	43	no	no	6	1.792
Total:								**5.958**

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.017	4-8	0.131	8-12	0.003

Total Area Contributing (ha) = 0.151

Total Pipe Volume (m³) = 8.599

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	33.136	0.200	165.7	0.034	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	9.358	0.060	156.0	0.022	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.55	82.000	0.034	0.0	0.0	0.0	1.01	40.3	4.6
1.001	50.00	4.69	81.800	0.055	0.0	0.0	0.0	1.04	41.5	7.5

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.002	22.536	0.140	161.0	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.003	30.131	0.210	143.5	0.015	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.000	29.902	0.180	166.1	0.025	4.00	0.0	0.600	o	225	Pipe/Conduit	
2.001	18.285	0.105	174.1	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.002	12.258	0.075	163.4	0.012	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.003	7.472	0.340	22.0	0.006	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	2.305	0.015	153.6	0.003	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.005	2.305	0.015	153.7	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	19.373	0.000	0.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	5.934	0.000	0.0	0.006	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.002	50.00	5.06	81.740	0.069	0.0	0.0	0.0	1.03	40.9	9.3
1.003	50.00	5.52	81.600	0.084	0.0	0.0	0.0	1.09	43.3	11.4
2.000	50.00	4.49	82.090	0.025	0.0	0.0	0.0	1.01	40.2	3.4
2.001	50.00	4.80	81.910	0.039	0.0	0.0	0.0	0.99	39.3	5.3
2.002	50.00	5.00	81.805	0.052	0.0	0.0	0.0	1.02	40.6	7.0
2.003	50.00	5.05	81.730	0.057	0.0	0.0	0.0	2.80	111.5	7.8
1.004	50.00	5.55	81.315	0.145	0.0	0.0	0.0	1.27	89.5	19.6
1.005	50.00	5.58	81.250	0.145	0.0	0.0	0.0	1.27	89.5	19.6
1.006	50.00	7.75	81.235	0.145	0.0	0.0	0.0	0.15	10.5«	19.6
1.007	47.94	8.41	81.235	0.151	0.0	0.0	0.0	0.15	10.5«	19.6

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1.0	83.300	1.300	Open Manhole	1200	1.000	82.000	225				
S1.1	83.300	1.500	Open Manhole	1200	1.001	81.800	225	1.000	81.800	225	
S1.3	83.300	1.560	Open Manhole	1200	1.002	81.740	225	1.001	81.740	225	
S1.4	83.300	1.700	Open Manhole	1200	1.003	81.600	225	1.002	81.600	225	
S2.0	83.300	1.210	Open Manhole	1200	2.000	82.090	225				
S2.1	83.300	1.390	Open Manhole	1200	2.001	81.910	225	2.000	81.910	225	
S2.2	83.300	1.495	Open Manhole	1200	2.002	81.805	225	2.001	81.805	225	
S2.3	83.300	1.570	Open Manhole	1200	2.003	81.730	225	2.002	81.730	225	
S1.5	83.300	1.985	Open Manhole	1200	1.004	81.315	300	1.003	81.390	225	
								2.003	81.390	225	
PI	83.300	2.050	Open Manhole	1200	1.005	81.250	300	1.004	81.300	300	50
S1.6	83.300	2.065	Open Manhole	1200	1.006	81.235	300	1.005	81.235	300	
Dummy	83.300	2.065	Open Manhole	1200	1.007	81.235	300	1.006	81.235	300	
	83.300	2.065	Open Manhole	1200		OUTFALL		1.007	81.235	300	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S1.0	83.300	82.000	1.075	Open Manhole	1200
1.001	o	225	S1.1	83.300	81.800	1.275	Open Manhole	1200
1.002	o	225	S1.3	83.300	81.740	1.335	Open Manhole	1200
1.003	o	225	S1.4	83.300	81.600	1.475	Open Manhole	1200
2.000	o	225	S2.0	83.300	82.090	0.985	Open Manhole	1200
2.001	o	225	S2.1	83.300	81.910	1.165	Open Manhole	1200
2.002	o	225	S2.2	83.300	81.805	1.270	Open Manhole	1200
2.003	o	225	S2.3	83.300	81.730	1.345	Open Manhole	1200
1.004	o	300	S1.5	83.300	81.315	1.685	Open Manhole	1200
1.005	o	300	PI	83.300	81.250	1.750	Open Manhole	1200
1.006	o	300	S1.6	83.300	81.235	1.765	Open Manhole	1200
1.007	o	300	Dummy	83.300	81.235	1.765	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	33.136	165.7	S1.1	83.300	81.800	1.275	Open Manhole	1200
1.001	9.358	156.0	S1.3	83.300	81.740	1.335	Open Manhole	1200
1.002	22.536	161.0	S1.4	83.300	81.600	1.475	Open Manhole	1200
1.003	30.131	143.5	S1.5	83.300	81.390	1.685	Open Manhole	1200
2.000	29.902	166.1	S2.1	83.300	81.910	1.165	Open Manhole	1200
2.001	18.285	174.1	S2.2	83.300	81.805	1.270	Open Manhole	1200
2.002	12.258	163.4	S2.3	83.300	81.730	1.345	Open Manhole	1200
2.003	7.472	22.0	S1.5	83.300	81.390	1.685	Open Manhole	1200
1.004	2.305	153.6	PI	83.300	81.300	1.700	Open Manhole	1200
1.005	2.305	153.7	S1.6	83.300	81.235	1.765	Open Manhole	1200
1.006	19.373	0.0	Dummy	83.300	81.235	1.765	Open Manhole	1200
1.007	5.934	0.0		83.300	81.235	1.765	Open Manhole	1200

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.032	0.032	0.032
	User	-	100	0.002	0.002	0.034
1.001	User	-	100	0.018	0.018	0.018
	User	-	100	0.003	0.003	0.022
1.002	User	-	100	0.011	0.011	0.011
	User	-	100	0.003	0.003	0.014
1.003	User	-	100	0.015	0.015	0.015
2.000	User	-	100	0.023	0.023	0.023
	User	-	100	0.002	0.002	0.025
2.001	User	-	100	0.011	0.011	0.011
	User	-	100	0.003	0.003	0.014
2.002	User	-	100	0.004	0.004	0.004
	User	-	100	0.008	0.008	0.012
2.003	User	-	100	0.006	0.006	0.006
1.004	User	-	100	0.003	0.003	0.003
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	User	-	100	0.006	0.006	0.006
				Total	Total	Total
				0.151	0.151	0.151

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007		83.300	81.235	0.000	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	1
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Summer Storms	Yes

Synthetic Rainfall Details

Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Storm

Weir Manhole: Dummy, DS/PN: 1.007, Volume (m³): 3.6

Discharge Coef 0.544 Width (m) 1.200 Invert Level (m) 83.300

Storage Structures for Storm

Cellular Storage Manhole: Dummy, DS/PN: 1.007

Invert Level (m) 81.235 Safety Factor 5.0
Infiltration Coefficient Base (m/hr) 0.16200 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.16200

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	119.0	119.0	1.001	0.0	167.0
1.000	119.0	167.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	1	+0%	100/15 Summer				82.055	-0.170
1.001	S1.1	15 Winter	1	+0%	100/15 Summer				81.872	-0.153
1.002	S1.3	15 Winter	1	+0%	100/15 Summer				81.816	-0.149
1.003	S1.4	15 Winter	1	+0%	30/15 Summer				81.680	-0.145
2.000	S2.0	15 Winter	1	+0%	100/15 Summer				82.138	-0.177
2.001	S2.1	15 Winter	1	+0%	100/15 Summer				81.969	-0.166
2.002	S2.2	15 Winter	1	+0%	100/15 Summer				81.873	-0.157
2.003	S2.3	15 Winter	1	+0%	100/15 Summer				81.776	-0.179
1.004	S1.5	15 Winter	1	+0%	30/15 Summer				81.472	-0.143
1.005	PI	15 Winter	1	+0%	30/15 Summer				81.468	-0.082
1.006	S1.6	15 Winter	1	+0%	30/15 Summer				81.464	-0.071
1.007	Dummy	180 Winter	1	+0%	30/30 Winter				81.348	-0.187

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.13		5.1	OK	
1.001	S1.1	0.000	0.22		7.6	OK	
1.002	S1.3	0.000	0.25		9.3	OK	
1.003	S1.4	0.000	0.27		10.9	OK	
2.000	S2.0	0.000	0.10		3.8	OK	
2.001	S2.1	0.000	0.16		5.5	OK	
2.002	S2.2	0.000	0.20		7.0	OK	
2.003	S2.3	0.000	0.09		7.6	OK	
1.004	S1.5	0.000	0.34		18.3	OK	
1.005	PI	0.000	0.34		18.0	OK	
1.006	S1.6	0.000	0.93		18.0	OK	
1.007	Dummy	0.000	0.00		0.0	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	30	+0%	100/15 Summer				82.107	-0.118
1.001	S1.1	15 Winter	30	+0%	100/15 Summer				81.976	-0.049
1.002	S1.3	15 Winter	30	+0%	100/15 Summer				81.947	-0.018
1.003	S1.4	15 Winter	30	+0%	30/15 Summer				81.860	0.035
2.000	S2.0	15 Winter	30	+0%	100/15 Summer				82.181	-0.134
2.001	S2.1	15 Winter	30	+0%	100/15 Summer				82.032	-0.103
2.002	S2.2	15 Winter	30	+0%	100/15 Summer				81.951	-0.079
2.003	S2.3	15 Winter	30	+0%	100/15 Summer				81.822	-0.133
1.004	S1.5	15 Winter	30	+0%	30/15 Summer				81.705	0.090
1.005	PI	15 Winter	30	+0%	30/15 Summer				81.650	0.100
1.006	S1.6	180 Winter	30	+0%	30/15 Summer				81.606	0.071
1.007	Dummy	180 Winter	30	+0%	30/30 Winter				81.605	0.070

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.45		17.1	OK	
1.001	S1.1	0.000	0.80		27.3	OK	
1.002	S1.3	0.000	0.87		32.4	OK	
1.003	S1.4	0.000	0.89		36.1	SURCHARGED	
2.000	S2.0	0.000	0.34		12.8	OK	
2.001	S2.1	0.000	0.56		19.6	OK	
2.002	S2.2	0.000	0.74		25.6	OK	
2.003	S2.3	0.000	0.35		28.5	OK	
1.004	S1.5	0.000	1.16		61.6	SURCHARGED	
1.005	PI	0.000	1.15		61.4	SURCHARGED	
1.006	S1.6	0.000	0.62		12.1	SURCHARGED	
1.007	Dummy	0.000	0.00		0.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	ON
DVD Status	OFF
Inertia Status	OFF

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	100	+40%	100/15 Summer				83.233	1.008
1.001	S1.1	15 Winter	100	+40%	100/15 Summer				83.127	1.102
1.002	S1.3	15 Winter	100	+40%	100/15 Summer				83.025	1.060
1.003	S1.4	15 Winter	100	+40%	30/15 Summer				82.729	0.904
2.000	S2.0	15 Winter	100	+40%	100/15 Summer				82.556	0.241
2.001	S2.1	15 Winter	100	+40%	100/15 Summer				82.497	0.362
2.002	S2.2	15 Winter	100	+40%	100/15 Summer				82.402	0.372
2.003	S2.3	15 Winter	100	+40%	100/15 Summer				82.289	0.334
1.004	S1.5	15 Winter	100	+40%	30/15 Summer				82.189	0.574
1.005	PI	240 Winter	100	+40%	30/15 Summer				82.023	0.473
1.006	S1.6	240 Winter	100	+40%	30/15 Summer				82.023	0.488
1.007	Dummy	240 Winter	100	+40%	30/30 Winter				82.021	0.486

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.73		27.6	FLOOD RISK	
1.001	S1.1	0.000	1.29		44.3	FLOOD RISK	
1.002	S1.3	0.000	1.44		53.8	FLOOD RISK	
1.003	S1.4	0.000	1.60		64.6	SURCHARGED	
2.000	S2.0	0.000	0.66		25.0	SURCHARGED	
2.001	S2.1	0.000	0.96		33.8	SURCHARGED	
2.002	S2.2	0.000	1.23		43.0	SURCHARGED	
2.003	S2.3	0.000	0.56		46.2	SURCHARGED	
1.004	S1.5	0.000	2.11		112.3	SURCHARGED	
1.005	PI	0.000	0.34		18.3	SURCHARGED	
1.006	S1.6	0.000	0.94		18.1	SURCHARGED	
1.007	Dummy	0.000	0.00		0.0	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	0.000
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.180	4-8	0.072

Total Area Contributing (ha) = 0.252

Total Pipe Volume (m³) = 15.337

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	40.922	0.250	163.7	0.009	4.00	0.0	0.600	o	225	Pipe/Conduit	
1.001	36.156	0.220	164.3	0.014	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.002	13.856	0.085	163.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.67	82.430	0.009	0.0	0.0	0.0	1.02	40.5	1.2
1.001	50.00	5.26	82.180	0.023	0.0	0.0	0.0	1.02	40.4	3.1
1.002	50.00	5.49	81.960	0.052	0.0	0.0	0.0	1.02	40.6	7.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.003	18.151	0.110	165.0	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.004	32.014	0.195	164.2	0.007	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.005	8.576	0.035	245.0	0.056	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	44.144	0.270	163.5	0.008	4.00	0.0	0.600	o	300	Pipe/Conduit	
2.001	18.167	0.110	165.0	0.039	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	22.890	0.140	163.5	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	8.790	0.420	20.9	0.047	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.006	2.522	0.020	126.1	0.013	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.007	25.907	0.110	235.5	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.008	6.609	0.030	220.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.003	50.00	5.79	81.875	0.064	0.0	0.0	0.0	1.02	40.4	8.6
1.004	50.00	6.31	81.765	0.071	0.0	0.0	0.0	1.02	40.5	9.6
1.005	50.00	6.45	81.495	0.128	0.0	0.0	0.0	1.00	70.7	17.3
2.000	50.00	4.60	82.400	0.008	0.0	0.0	0.0	1.23	86.7	1.1
2.001	50.00	4.85	82.130	0.047	0.0	0.0	0.0	1.22	86.3	6.4
2.002	50.00	5.16	82.020	0.064	0.0	0.0	0.0	1.23	86.7	8.6
2.003	50.00	5.20	81.880	0.111	0.0	0.0	0.0	3.45	244.0	15.0
1.006	50.00	6.48	81.460	0.252	0.0	0.0	0.0	1.40	98.9	34.1
1.007	50.00	6.91	81.390	0.252	0.0	0.0	0.0	1.02	72.1	34.1
1.008	50.00	7.01	81.280	0.252	0.0	0.0	0.0	1.06	74.6	34.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S1.0	83.600	1.170	Open Manhole	1200	1.000	82.430	225				
S1.1	83.600	1.420	Open Manhole	1200	1.001	82.180	225	1.000	82.180	225	
S1.2	83.600	1.640	Open Manhole	1200	1.002	81.960	225	1.001	81.960	225	
S1.3	83.600	1.725	Open Manhole	1200	1.003	81.875	225	1.002	81.875	225	
S1.4	83.600	1.835	Open Manhole	1200	1.004	81.765	225	1.003	81.765	225	
S1.5	83.600	2.105	Open Manhole	1200	1.005	81.495	300	1.004	81.570	225	
S2.0	83.600	1.200	Open Manhole	1200	2.000	82.400	300				
S2.1	83.600	1.470	Open Manhole	1200	2.001	82.130	300	2.000	82.130	300	
S2.2	83.600	1.580	Open Manhole	1200	2.002	82.020	300	2.001	82.020	300	
S2.3	83.600	1.720	Open Manhole	1200	2.003	81.880	300	2.002	81.880	300	
S1.6	83.600	2.140	Open Manhole	1200	1.006	81.460	300	1.005	81.460	300	
								2.003	81.460	300	
PI	83.600	2.210	Open Manhole	1200	1.007	81.390	300	1.006	81.440	300	50
S1.7	83.600	2.320	Open Manhole	1200	1.008	81.280	300	1.007	81.280	300	
TW SW	83.600	2.350	Open Manhole	1200		OUTFALL		1.008	81.250	300	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	o	225	S1.0	83.600	82.430	0.945	Open Manhole	1200
1.001	o	225	S1.1	83.600	82.180	1.195	Open Manhole	1200
1.002	o	225	S1.2	83.600	81.960	1.415	Open Manhole	1200
1.003	o	225	S1.3	83.600	81.875	1.500	Open Manhole	1200
1.004	o	225	S1.4	83.600	81.765	1.610	Open Manhole	1200
1.005	o	300	S1.5	83.600	81.495	1.805	Open Manhole	1200
2.000	o	300	S2.0	83.600	82.400	0.900	Open Manhole	1200
2.001	o	300	S2.1	83.600	82.130	1.170	Open Manhole	1200
2.002	o	300	S2.2	83.600	82.020	1.280	Open Manhole	1200
2.003	o	300	S2.3	83.600	81.880	1.420	Open Manhole	1200
1.006	o	300	S1.6	83.600	81.460	1.840	Open Manhole	1200
1.007	o	300	PI	83.600	81.390	1.910	Open Manhole	1200
1.008	o	300	S1.7	83.600	81.280	2.020	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	40.922	163.7	S1.1	83.600	82.180	1.195	Open Manhole	1200
1.001	36.156	164.3	S1.2	83.600	81.960	1.415	Open Manhole	1200
1.002	13.856	163.0	S1.3	83.600	81.875	1.500	Open Manhole	1200
1.003	18.151	165.0	S1.4	83.600	81.765	1.610	Open Manhole	1200
1.004	32.014	164.2	S1.5	83.600	81.570	1.805	Open Manhole	1200
1.005	8.576	245.0	S1.6	83.600	81.460	1.840	Open Manhole	1200
2.000	44.144	163.5	S2.1	83.600	82.130	1.170	Open Manhole	1200
2.001	18.167	165.0	S2.2	83.600	82.020	1.280	Open Manhole	1200
2.002	22.890	163.5	S2.3	83.600	81.880	1.420	Open Manhole	1200
2.003	8.790	20.9	S1.6	83.600	81.460	1.840	Open Manhole	1200
1.006	2.522	126.1	PI	83.600	81.440	1.860	Open Manhole	1200
1.007	25.907	235.5	S1.7	83.600	81.280	2.020	Open Manhole	1200
1.008	6.609	220.3	TW SW	83.600	81.250	2.050	Open Manhole	1200

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.009	0.009	0.009
1.001	User	-	100	0.014	0.014	0.014
1.002	User	-	100	0.021	0.021	0.021
	User	-	100	0.009	0.009	0.030
1.003	User	-	100	0.005	0.005	0.005
	User	-	100	0.006	0.006	0.011
1.004	User	-	100	0.001	0.001	0.001
	User	-	100	0.006	0.006	0.007
1.005	User	-	100	0.022	0.022	0.022
	User	-	100	0.021	0.021	0.044
	User	-	100	0.010	0.010	0.054
	User	-	100	0.003	0.003	0.056
2.000	User	-	100	0.008	0.008	0.008
2.001	User	-	100	0.015	0.015	0.015
	User	-	100	0.001	0.001	0.016
	User	-	100	0.002	0.002	0.019
	User	-	100	0.005	0.005	0.024
	User	-	100	0.002	0.002	0.026
	User	-	100	0.013	0.013	0.039
2.002	User	-	100	0.003	0.003	0.003
	User	-	100	0.005	0.005	0.008
	User	-	100	0.006	0.006	0.014
	User	-	100	0.002	0.002	0.017
2.003	User	-	100	0.019	0.019	0.019
	User	-	100	0.023	0.023	0.041
	User	-	100	0.006	0.006	0.047
1.006	User	-	100	0.012	0.012	0.012
	User	-	100	0.002	0.002	0.013
1.007	-	-	100	0.000	0.000	0.000
1.008	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.252	0.252	0.252

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.008	TW SW	83.600	81.250	81.250	1200	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

Online Controls for Storm

Hydro-Brake® Optimum Manhole: S1.7, DS/PN: 1.008, Volume (m³): 4.4

Unit Reference	MD-SHE-0105-5000-1000-5000
Design Head (m)	1.000
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	105
Invert Level (m)	81.280
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	5.0	Kick-Flo®	0.637	4.1
Flush-Flo™	0.296	5.0	Mean Flow over Head Range	-	4.3

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5
0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9
0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3
0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7
0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1
0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5
0.800	4.5	2.400	7.5	6.000	11.6		
1.000	5.0	2.600	7.8	6.500	12.1		

Storage Structures for Storm

Cellular Storage Manhole: S1.7, DS/PN: 1.008

Invert Level (m) 81.280 Safety Factor 5.0
Infiltration Coefficient Base (m/hr) 0.02520 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.02520

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	184.0	184.0	1.001	0.0	246.0
1.000	184.0	246.0			

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	1	+0%	100/15 Summer				82.457	-0.198
1.001	S1.1	15 Winter	1	+0%	100/15 Summer				82.222	-0.183
1.002	S1.2	15 Winter	1	+0%	30/15 Summer				82.025	-0.160
1.003	S1.3	15 Winter	1	+0%	30/15 Summer				81.945	-0.155
1.004	S1.4	15 Winter	1	+0%	30/15 Summer				81.837	-0.153
1.005	S1.5	15 Winter	1	+0%	30/15 Summer				81.634	-0.161
2.000	S2.0	15 Winter	1	+0%	100/15 Summer				82.423	-0.277
2.001	S2.1	15 Winter	1	+0%	100/15 Summer				82.187	-0.243
2.002	S2.2	15 Winter	1	+0%	100/15 Summer				82.084	-0.236
2.003	S2.3	15 Winter	1	+0%	100/15 Summer				81.938	-0.242
1.006	S1.6	15 Winter	1	+0%	30/15 Summer				81.622	-0.138
1.007	PI	15 Winter	1	+0%	30/15 Summer				81.532	-0.158
1.008	S1.7	120 Winter	1	+0%	30/30 Winter				81.388	-0.192

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.03		1.3	OK	

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S1.1	0.000	0.08		2.9	OK	
1.002	S1.2	0.000	0.18		6.5	OK	
1.003	S1.3	0.000	0.21		7.7	OK	
1.004	S1.4	0.000	0.22		8.5	OK	
1.005	S1.5	0.000	0.27		14.7	OK	
2.000	S2.0	0.000	0.02		1.2	OK	
2.001	S2.1	0.000	0.08		5.9	OK	
2.002	S2.2	0.000	0.10		7.9	OK	
2.003	S2.3	0.000	0.08		13.5	OK	
1.006	S1.6	0.000	0.56		29.5	OK	
1.007	PI	0.000	0.45		29.4	OK	
1.008	S1.7	0.000	0.06		3.4	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	30	+0%	100/15 Summer				82.480	-0.175
1.001	S1.1	15 Winter	30	+0%	100/15 Summer				82.267	-0.138
1.002	S1.2	15 Winter	30	+0%	30/15 Summer				82.235	0.050
1.003	S1.3	15 Winter	30	+0%	30/15 Summer				82.201	0.101
1.004	S1.4	15 Winter	30	+0%	30/15 Summer				82.153	0.163
1.005	S1.5	15 Winter	30	+0%	30/15 Summer				82.061	0.266
2.000	S2.0	15 Winter	30	+0%	100/15 Summer				82.445	-0.255
2.001	S2.1	15 Winter	30	+0%	100/15 Summer				82.248	-0.182
2.002	S2.2	15 Winter	30	+0%	100/15 Summer				82.156	-0.163
2.003	S2.3	15 Winter	30	+0%	100/15 Summer				82.063	-0.117
1.006	S1.6	15 Winter	30	+0%	30/15 Summer				82.032	0.272
1.007	PI	15 Winter	30	+0%	30/15 Summer				81.855	0.165
1.008	S1.7	60 Winter	30	+0%	30/30 Winter				81.620	0.040

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.11		4.3	OK	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.001	S1.1	0.000	0.29		11.1	OK	
1.002	S1.2	0.000	0.63		22.3	SURCHARGED	
1.003	S1.3	0.000	0.75		27.3	SURCHARGED	
1.004	S1.4	0.000	0.85		32.1	SURCHARGED	
1.005	S1.5	0.000	0.90		48.1	SURCHARGED	
2.000	S2.0	0.000	0.05		4.3	OK	
2.001	S2.1	0.000	0.32		24.0	OK	
2.002	S2.2	0.000	0.41		31.8	OK	
2.003	S2.3	0.000	0.32		51.5	OK	
1.006	S1.6	0.000	1.99		104.5	SURCHARGED	
1.007	PI	0.000	1.61		103.9	SURCHARGED	
1.008	S1.7	0.000	0.09		5.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 524500 212550 TL 24500 12550
C (1km)	-0.028
D1 (1km)	0.293
D2 (1km)	0.320
D3 (1km)	0.277
E (1km)	0.321
F (1km)	2.481
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

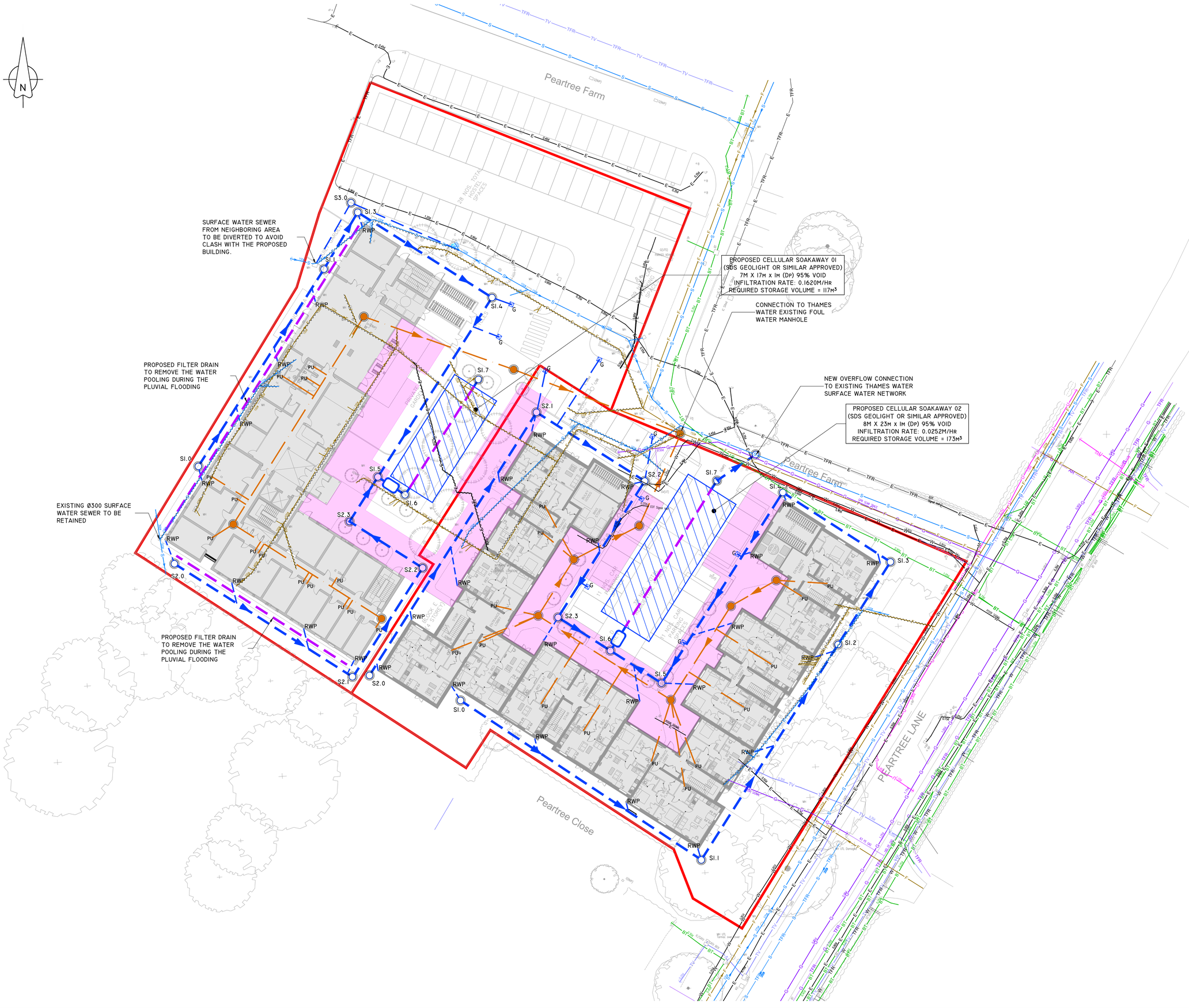
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	S1.0	15 Winter	100	+40%	100/15 Summer				83.590	0.935
1.001	S1.1	15 Winter	100	+40%	100/15 Summer				83.574	1.169
1.002	S1.2	15 Winter	100	+40%	30/15 Summer				83.533	1.348
1.003	S1.3	15 Winter	100	+40%	30/15 Summer				83.456	1.356
1.004	S1.4	15 Winter	100	+40%	30/15 Summer				83.331	1.341
1.005	S1.5	15 Winter	100	+40%	30/15 Summer				83.110	1.315
2.000	S2.0	15 Winter	100	+40%	100/15 Summer				83.214	0.514
2.001	S2.1	15 Winter	100	+40%	100/15 Summer				83.207	0.777
2.002	S2.2	15 Winter	100	+40%	100/15 Summer				83.170	0.850
2.003	S2.3	15 Winter	100	+40%	100/15 Summer				83.114	0.934
1.006	S1.6	15 Winter	100	+40%	30/15 Summer				82.987	1.227
1.007	PI	15 Winter	100	+40%	30/15 Summer				82.437	0.747
1.008	S1.7	120 Winter	100	+40%	30/30 Winter				82.060	0.480

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	S1.0	0.000	0.20		7.7	FLOOD RISK	
1.001	S1.1	0.000	0.48		18.4	FLOOD RISK	
1.002	S1.2	0.000	0.93		32.8	FLOOD RISK	
1.003	S1.3	0.000	1.15		41.5	FLOOD RISK	
1.004	S1.4	0.000	1.27		48.1	FLOOD RISK	
1.005	S1.5	0.000	1.57		84.3	SURCHARGED	
2.000	S2.0	0.000	0.10		8.2	SURCHARGED	
2.001	S2.1	0.000	0.49		36.0	SURCHARGED	
2.002	S2.2	0.000	0.64		49.3	SURCHARGED	
2.003	S2.3	0.000	0.53		86.5	SURCHARGED	
1.006	S1.6	0.000	3.45		181.0	SURCHARGED	
1.007	PI	0.000	2.79		180.4	SURCHARGED	
1.008	S1.7	0.000	0.09		5.0	SURCHARGED	

Appendix G – Proposed Drainage Strategy



GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

- SITE BOUNDARY
- PROPOSED BUILDING
- PROPOSED SURFACE WATER
- PROPOSED FOUL WATER
- PROPOSED PERFORATED PIPE
- EXISTING SURFACE WATER
- EXISTING FOUL WATER
- EXISTING DRIANAGE SEWER TO BE ABANDONED
- PROPOSED PETROL INTERCEPTOR
- PROPOSED SURFACE WATER SOAKAWAY
- 5M BUFFER ZONE FOR SOAKAWAY
- PROPOSED GULLY
- EXISTING GULLY TO BE RETAINED
- POP-UP
- RAIN WATER PIPE
- ELECTRICAL CABLES
- WATER PIPES
- CABLE TV
- GAS PIPES
- UNIDENTIFIED GPR OR ELECTRO LOCATION TRACE

0 50MM ON A1 DWG. 50

REV	DESCRIPTION	BY	CHK	DATE
P04	REVISED DRAINAGE PLAN	SC	JJ	05.06.2020
P03	REVISED DRAINAGE PLAN	SC	JJ	21.05.2020
P02	ISSUED FOR PLANNING	SS	JJ	09.10.2019
P01	PRELIMINARY	SS	JJ	03.10.2019

CLIENT
SAUNDERS ARCHITECTS ON BEHALF OF YMCA

PROJECT
WGC-ONE YMCA
PEARTREE LANE

DRAWING TITLE
PROPOSED DRAINAGE STRATEGY

PINNACLE CONSULTING ENGINEERS
ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS,
AL7 1HE. TELEPHONE: 01707 527 630
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
INFORMATION			
SCALE @ A1	DATE	DRAWN BY	CHECKED
1:250	OCT'19	SS	JJ
DRG NO.			REVISION
C190906-PIN-XX-XX-DR-C-0206			P04

REF: 190906

Appendix H – Proposed Catchments Plan

GENERAL NOTES

1. DO NOT SCALE THIS DRAWING. WORK ONLY TO FIGURED DIMENSIONS.
2. FOR ALL RELEVANT NOTES, REFER TO STRUCTURAL AND CIVIL ENGINEERING PERFORMANCE SPECIFICATION.
3. ANY DISCREPANCIES ARE TO BE REPORTED TO PINNACLE CONSULTING ENGINEERS IMMEDIATELY.
4. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT ENGINEERS, ARCHITECTS AND SUB-CONTRACTORS DRAWINGS AND DETAILS.

LEGEND

- SITE BOUNDARY
- CATCHMENT A: 1514M² IMPERMEABLE AREA
- CATCHMENT B: 2523M² IMPERMEABLE AREA
- 787M² IMPERMEABLE AREA- SURFACE WATER RUNOFF COLLECTED VIA EXISTING GULLIES

0 50MM ON A1 DWG. 50

REV	DESCRIPTION	BY	CHK	DATE
P04	REVISED CATCHEMENT AREAS	SC	JJ	05.06.2020
P03	REVISED CATCHEMENT AREAS	SC	JJ	21.05.2020
P02	ISSUED FOR PLANNING	SS	JJ	09.10.2019
P01	PRELIMINARY	SS	JJ	03.10.2019

CLIENT
SAUNDERS ARCHITECTS ON BEHALF OF YMCA

PROJECT
WGC-ONE YMCA
PEARTREE LANE

DRAWING TITLE
CATCHMENT AREAS

PINNACLE CONSULTING ENGINEERS
ALCHEMY,
BESSEMER ROAD,
WELWYN GARDEN CITY,
HERTS,
AL7 1HE. TELEPHONE: 01707 527 630
NORWICH | LONDON | DUBLIN | THE HAGUE

DRAWING STATUS			
INFORMATION			
SCALE @ A1	DATE	DRAWN BY	CHECKED
1:250	OCT'19	SS	JJ
DRG NO.		REVISION	
C190906-PIN-XX-XX-DR-C-0207		P04	

REF: 190906

Appendix I – Infiltration Tests

Delta-Simons Environmental Consultants
3 Henley Way, Doddington Road, Lincoln LN6 3QR
www.deltasimons.com

Limited Factual Soakaway Infiltration Report

WGC-One YMCA, Peartree Lane, Welwyn Garden City

Presented to **Pinnacle Consulting Engineers**

Issued: April 2020

Delta-Simons Project Number: 20-0093.01

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
1	Final	1st April 2020				
				Jessica Rowe Consultant	Redmond Parker-Dunn Principal	Paul Huteson Associate

1.0 Context and Purpose

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Pinnacle Consulting Engineers (the "Client") to undertake BRE365 Infiltration testing at the existing YMCA Site, 90 Peartree Lane, Welwyn Garden City, AL7 3UL (the "Site"). A Site Location Map is included as Figure 1.

Delta-Simons has concurrently undertaken environmental investigation at the Site which is reported under a separate cover:

- Environmental Report, WCG-One YMCA, Peartree Lane, Welwyn Garden City, Delta-Simons Project No. 20-0093.01, dated March 2020.

It is understood that the proposed development comprises the demolition of all structures at the Site and the construction of a four-storey 100 bed YMCA Hostel and a 2, 3 and 4 storey building providing up to 43 residential apartments as detailed in Welwyn Hatfield Borough Council Planning Application 6/2019/2714/OUTLINE.

The purpose of this Report is to provide information on the soil infiltration rates beneath the Site to support the Client for drainage design. It is proposed at this stage that surface water drainage will be by two soakaways in the central area of the Site, via interceptors. Correspondence with the Local Planning Authority has been provided by the Client, indicating the requirement of a ground investigation to assess the presence of contamination (reported under a separate cover) and provide infiltration data.

The test locations were indicated by the Client, however following a Site walkover, limited access was available to the area of the proposed soakaways, as such the location of the testing was amended and agreed with the Client.

2.0 Limitations

Delta Simons standard limitations are included as Appendix A. In addition, the following specific limitations apply to this assessment:

- Access was limited in the area of the proposed soakaways.

3.0 Mapped Ground Conditions

From the British Geological Survey (BGS) Geology of Britain Viewer the Site is indicated as being underlain by superficial Diamicton deposits of the Lowestoft Formation. In addition, superficial sand and gravel deposits of the Kesgrave Catchment Subgroup may encroach onto Site in the northern area. The underlying bedrock is mapped as the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated).

The ground conditions identified during the investigation generally comprised gravelly sandy Made Ground to a maximum depth of 0.68 m bgl underlain by natural firm sandy gravelly clays.

4.0 Soakage Testing

Soakage testing was undertaken in general accordance with BRE Digest 365: Soakaway Design [Ref. 1].

The soakage testing comprised excavating two trial pits to depths of approximately 0.95 m bgl and 1.0 m bgl. The locations and depths of the tests were provided by the Clients engineer, however, due to access restrictions and utilities, positions had to be amended and agreed with the Client. The geology at each trial pit location was logged. A gravel pack and monitoring pipes were then installed in the trial pits and the remaining void was backfilled with arisings. The remaining spoil was graded back to original ground level.

The gravel pack in each test location was then filled with water and the depth to water from ground level recorded at intervals over a period of up to 24 hours.

The soakage test data was recorded and used to calculate the soil infiltration rate for each location.

Test results are provided in Appendix B and summarised below. The approximate locations of the soakage tests are shown in Figure 2.

Location	Test Depth Range (m bgl)	Geology	Infiltration Rate (m/s)
SA101	0.50 -1.00	Sandy gravel clay	$4.5x10^{-5}$
SA102	0.50 – 1.00	Sandy gravel clay	$7.0x10^{-6}$

5.0 References

Ref 1: BRE Digest 365: Soakaway Design, BRE 2016.

Enclosures:

Figures

Figure 1 Site Location Map

Figure 2 Intrusive Location Plan

Appendices

Appendix A Limitations

Appendix B Soakaway Test Results

Figure 1 – Site Location Map

Scale: 1 / 500,000 @ A4

LEGEND

Site Boundary

Scale: 1 / 10,000 @ A4

deltasimons
Environment - Health & Safety - Sustainability

TITLE:
Site Location Map
WCG- One YMCA
Peartree Lane, Welwyn Garden City

DRAWN BY: JR	SCALE: To Scale@A4
CHECKED BY: AH	REVISION: 1
DATE: 13th March 2020	

PROJECT NO: 20-0093

FIGURE NO: 1

Figure 2 – Intrusive Location Plan

LEGEND

Site Boundary

SAx BRE365 Infiltration Test

FOR PLANNING

REV	DATE	NOTE	IN

Project

YMCA
PEARTREE LANE
WELWYN GARDEN CITY

Title

PROPOSED SITE LAYOUT

Scale	Date
1:500 @A3	SEPT 2019
Drawn: SD	Checked: AL
Drawing Number: 8057 / P101	Revision: -

Saunders
Architecture + Urban Design

saundersarchitects.com | 01707 385300 | London | Manchester | Bristol | Welwyn

Site Plan provided by Client

deltasimons
Environment - Health & Safety - Sustainability

TITLE:
Approximate Intrusive Location Plan
WCG-One YMCA
PeartreeLane, Welwyn Garden City

DRAWN BY:	SCALE:	PROJECT NO:
JR	Not to Scale	20-0093.01
CHECKED BY:	REVISION:	FIGURE NO:
RPD	1	2
DATE: 24th March 2020		

Appendix A – Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Due to the evolving regulatory climate specific to Per Fluoro Alkyl Substances (PFAS), the scope of works is not intended to be conclusive as it relates to the identification of any PFAS related issues. While Delta-Simons may advise its Client if Delta-Simons becomes aware of the use of PFAS at the subject property, Delta-Simons makes no representation nor accepts any liability that any or all PFAS issues have been identified and/or revealed to its client through its scope of work, as presented herein.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

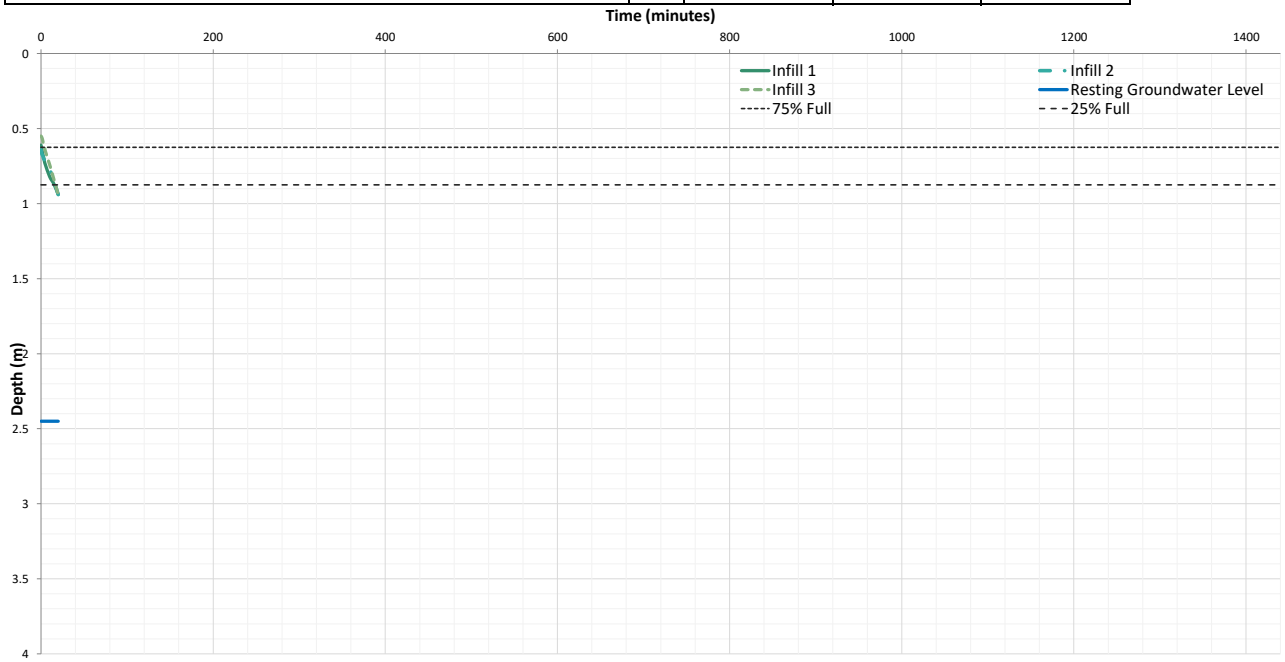
This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

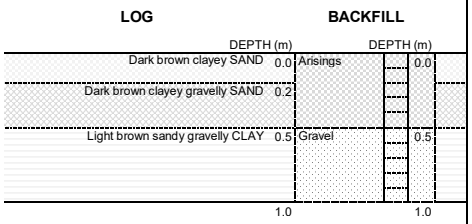
Appendix B – Soakaway Test Results

	units	Infill 1	Infill 2	Infill 3
Length	m		1.70	
Width	m		0.60	
Depth	m		1.00	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		2.45	
Depth of first reading	m	0.61	0.64	0.55
Depth of final reading	m	0.94	0.94	0.94
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		No	No	No
Depth at 75% full/effective depth	m	0.69	0.72	0.65
Depth at 25% full/effective depth	m	0.86	0.87	0.84
Time at 75% full/effective depth	mins	3.08	4.25	4.92
Time at 25% full/effective depth	mins	13.75	15.83	15.13
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.06	0.05	0.07
Mean surface area for outflow (50% full/effective depth)	m^2	1.78	1.71	1.92
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	10.67	11.58	10.21
Soil infiltration rate, f =	m/s	0.00005174	0.00004506	0.00005929
or	m/s	5.2E-05	4.5E-05	5.9E-05

Recommended soil infiltration rate	
4.5E-05	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results
YMCA Peartree Lane, Welwyn Garden City
Pinnacle Consulting Engineers

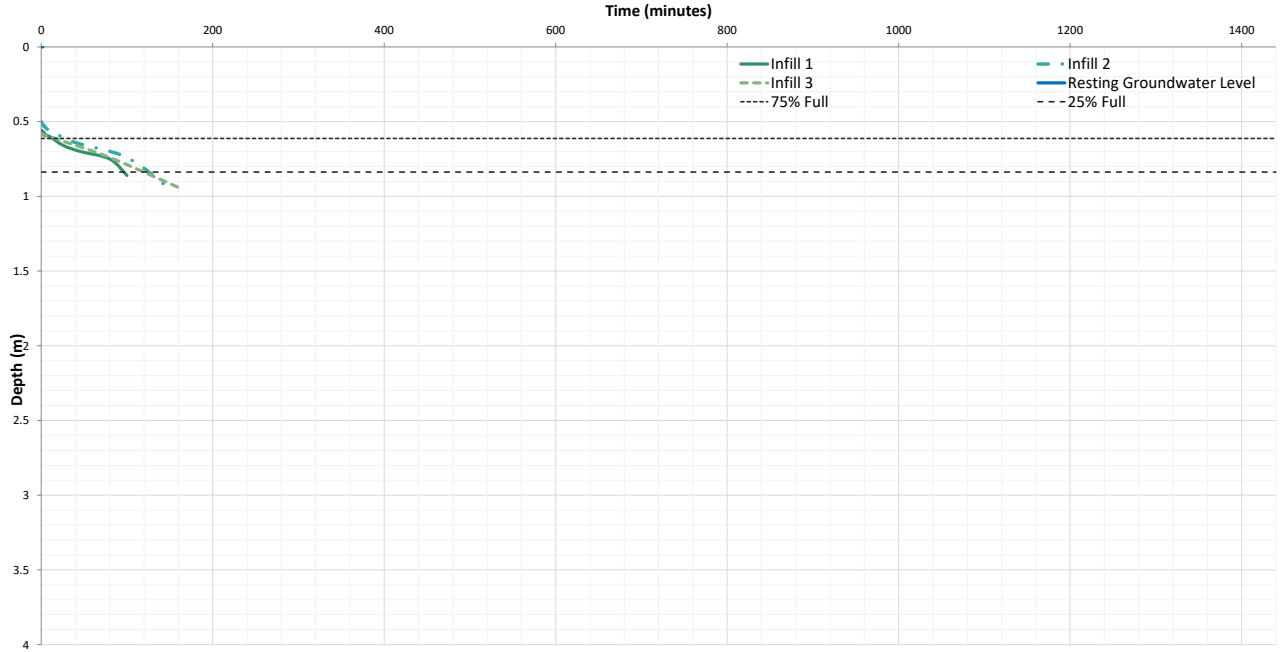
In accordance with BRE Digest 365 (2016)

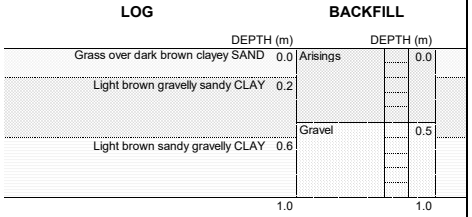
DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 20-0093.01	
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA101	
DATE: 06/03/2020			

	units	Infill 1	Infill 2	Infill 3
Length	m		1.70	
Width	m		0.60	
Depth	m		0.95	
Gravel type			Standard	
Voids ratio			0.35	
Resting groundwater level at time of testing	m		0.00	
Depth of first reading	m	0.56	0.50	0.58
Depth of final reading	m	0.86	0.95	0.94
Did soakage test reach 25% of maximum fill depth?		Yes	Yes	Yes
Did soakage test reach near empty?		No	Yes	Yes
Depth at 75% full/effective depth	m	0.64	0.61	0.67
Depth at 25% full/effective depth	m	0.79	0.84	0.86
Time at 75% full/effective depth	mins	19.33	29.69	46.25
Time at 25% full/effective depth	mins	86.36	123.21	127.00
Vp75 - 25 (volume outflowing between 75% and 25% full/effective depth)	m^3	0.05	0.08	0.07
Mean surface area for outflow (50% full/effective depth)	m^2	1.71	2.06	1.87
tp75 (time for the water level to fall from 75% to 25% full/effective depth)	mins	67.03	93.53	80.75
Soil infiltration rate, f =	m/s	0.00000779	0.00000697	0.00000729
or	m/s	7.8E-06	7.0E-06	7.3E-06

Recommended soil infiltration rate	
7.0E-06	m/s

Note:
Where water level reaches nearly empty (5% full), soil infiltration based on 'Full' depth. Where water level did not reach nearly empty (5% full), soil infiltration rate is based on 'Effective' drainage achieved only. Where water level did not fall below 25% of the maximum fill level, this is considered to be a 'Failed' test.





deltasimons

TITLE: Soakaway Test Results
YMCA Peartree Lane, Welwyn Garden City
Pinnacle Consulting Engineers

In accordance with BRE Digest 365 (2016)

DRAWN BY: CB	SCALE: Not to Scale	PROJECT NUMBER: 20-0093.01	
CHECKED BY: SS	REVISION: 1	SOAKAWAY NUMBER: SA102	
DATE: 06/03/2020			

Appendix J – Environmental Report

Environmental Report

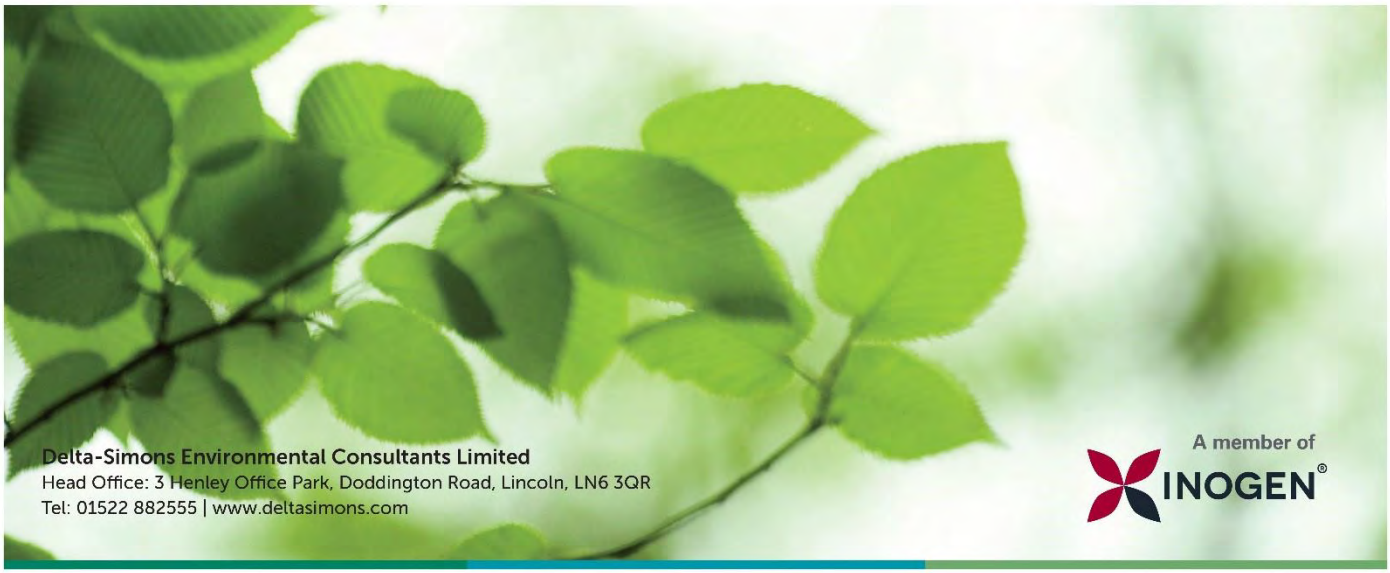
WGC-One YMCA, Peartree Lane, Welwyn Garden City

Presented to **Pinnacle Consulting Engineers**

Issued: April 2020

Delta-Simons Project No. 20-0093.01

deltasimons



Delta-Simons Environmental Consultants Limited
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Tel: 01522 882555 | www.deltasimons.com

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Report Details

Client	Pinnacle Consulting Engineers
Report Title	Environmental Report
Site Address	YMCA, 90 Peartree Lane, Welwyn Garden City, AL7 3UL
Project No.	20-0093.01
Report Date	1st April 2020
Delta-Simons Contact	Redmond Parker-Dunn (Redmond.parker-dunn@deltasimons.com)

Quality Assurance

Issue No.	Status	Issue Date	Comments	Author	Technical Review	Authorised
1	Final	1st April 2020				
				Jessica Rowe Consultant	Redmond Parker-Dunn Principal	Paul Huteson Associate

About us

Delta-Simons is a trusted, multidisciplinary environmental consultancy, focused on delivering the best possible project outcomes for customers.

Specialising in Environment, Health & Safety and Sustainability, Delta-Simons provide support and advice within the property development, asset management, corporate and industrial markets. Operating from ten locations - Lincoln, Birmingham, Bristol, Dublin, Leeds, London, Manchester, Newcastle, Norwich and Nottingham - we employ over 100 environmental professionals, bringing experience from across the private consultancy and public sector markets.

Delta-Simons is proud to be a founder member of the Inogen® Environmental Alliance, a global corporation providing multinational organisations with consistent, high quality and cost effective environmental, health, safety, energy and sustainability solutions. Inogen assists multinational clients by resolving liabilities from the past, addressing today's requirements and delivering solutions for the future. With more than 200 offices located on every continent, more than 6,430 staff worldwide, and projects completed in more than 120 countries, Inogen provides a single point of contact for diverse markets as Automotive, Chemical, Consumer Products & Retail, Financial, Food & Beverage, Healthcare, Insurance, Manufacturing, Non Profit Organisations, Oil & Gas, Real Estate, Services Firms, Technology and Transportation, among others.

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1.0 Introduction

1.1 Authorisation

Delta-Simons Environmental Consultants Limited ("Delta-Simons") was instructed by Pinnacle Consulting Engineers (the "Client") to prepare anEnvironmental Assessment for YMCA, 90 Peartree Lane, Welwyn Garden City, AL7 3UL (the "Site"). A Site Location Map is included as Figure 1.

1.2 Context & Purpose

It is understood that the proposed development comprises the demolition of all structures at the Site and the construction of a four-storey 100 bed YMCA Hostel and a 2, 3 and 4 storey building providing up to 43 residential apartments as detailed in Welwyn Hatfield Borough Council Planning Application 6/2019/2714/OUTLINE. The Proposed Site Layout is included as Drawing 1.

Correspondence with the Local Planning Authority has been provided by the Client, indicating the requirement of a ground investigation to assess the potential presence and associated mobilisation of contamination beneath the Site as part of the proposed surface water drainage strategy for the Site. This investigation does not represent a Geotechnical investigation.

The following Third-Party information has been made available to Delta-Simons for review:

- Argyle Environmental, Site Solutions Combined, Ref. AEL-0046-TSC-959119, dated December 2018.

In addition, Delta-Simons has produced a factual BRE365 infiltration report , dated 1st April 2020, which is reported under a separate cover.

The scope of the investigation and layout of this report has been designed with consideration of guidance on Land Contamination: Risk Management pages of the GOV.UK web pages, the relevant requirements of the National Planning Policy Framework 2019 (NPPF) (paragraphs 170 & 178-180)[1] and the Planning Practice Guidance (Land Affected by Contamination)[2].

The project was carried out to an agreed brief as set out in Delta-Simons' proposal dated January 2020 (Ref. 20-0093.01).

This Report has been based on a review of a previous Third-Party report together with fieldworks comprising soil sampling. Selected soil samples were scheduled for laboratory chemical analysis. Monitoring was carried out on the Site for water levels and concentrations of hazardous ground gas.

The results of the sampling, with the relevant laboratory work, have been presented in the Appendices.

The methods of desk study and fieldworks have been described in Section 2.

The interpretation of the results has been presented as a table in Section 3 with desk study, a conceptual site model (CSM) and initial risk assessment based on the source-pathway-receptor principle and recommendations for aspects of planning design and construction.

1.3 Scope

The scope of works performed for this Report comprised the following:

- Review of previous Third-Party report;
- Soil sampling;
- In-situ penetration testing;
- Laboratory testing;
- Ground gas monitoring; and

[1] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/779764/NPPF_Feb_2019_web.pdf
[2] https://www.gov.uk/guidance/land-affected-by-contamination

- Contamination assessment.

1.4 Limitations

The assessment is limited to the issues agreed within the proposal for the works. Notes on limitations associated with this assessment are provided in Appendix A.

Due to the presence of buildings, associated infrastructure and pedestrian access intrusive locations were limed to accessible areas of the Site to not disrupt the overall operation of the facility.

2.0 Investigation Methodology

2.1 Desk Study

The following third-party information has been provided to Delta-Simons, which should be read in conjunction with this Report:

- Argyle Environmental, SiteSolutions Combined, Ref. AEL-0046-TSC-959119, dated December 2018.

2.2 Conceptual Site Model

A Conceptual Site Model (CSM) represents the relationships between contaminant sources, pathways and receptors. Where all three components may be present on a risk basis an identification and assessment of Possible Pollutant Linkages (PPL) is achieved. Assessing risk in land contamination underpins the "suitable for use" approach adopted for Part 2A of the EPA 1990 regulatory regime and government guidance on land affected by contamination (published 12 June 2014 on gov.uk web site).

Risk is based on the assessor's judgement and a Delta-Simons standard approach. The standard approach is derived from government guidance and uses definitions and a matrix system derived from government guidance and CIRIA document C552 (Contaminated land risk assessment. A Guide to Good Practice).

Sources are listed as part of hazard identification and for this report typically comprise soil and groundwater contaminants on-Site, or off-site where potentially mobile across property boundaries. Ground gas hazards are always considered mobile and subject to ground conditions. Waste items including asbestos are also considered, as are; soil stockpiles, chemical stores and obviously presented invasive weeds.

Relevant potential receptors are considered to include:

- R1 - Construction workers.
- R2 - Third parties during construction (adjacent site users and adjacent residents).
- R3 - Future residents.
- R4 - The underlying Aquifer / Controlled waters.
- R5 - The Built Environment (new buildings and infrastructure).
- R6 – Plants/ vegetable/ livestock in any proposed landscaped areas.

Relevant potential pathways are considered to include:

- P1 - Direct contact, ingestion or inhalation of soil bound contaminants / dust during redevelopment.
- P2 - Inhalation of vapours associated with contamination.
- P3 - Migration of ground gas into on-site buildings causing asphyxiation or risk of explosion.
- P4 - Leaching of contamination into groundwater followed by migration to the wider environment or surface waters.
- P5 - Direct contact between aggressive ground conditions and new infrastructure.
- P6 – Plant and animal uptake.

Where hazards are identified, a Preliminary Risk Assessment (PRA) is undertaken to assess the PPL, and to apply a justified risk ranking (very low - high). Where the PPL is sufficient to result in land being considered as 'contaminated land' under the terms of Part 2A of the Environmental Protection Act (EPA) 1990, a Significant Pollutant Linkage (SPL) may be defined.

A revised CSM is presented which takes into account the relevant findings of the field and laboratory outcomes.

Appendix B also contains the applied risk definitions and matrices.

2.3 Planning, Health & Safety (CDM), Setting Out & Services

Unless otherwise stated, the investigation has been planned on a scope of works agreed with the Client which is typically based on multiples of one day on-Site with various drilling and sampling equipment, or a measured amount of drilling and testing.

For most projects Delta-Simons adopts a role equivalent to principal contractor (PC) where none exists for the project and complies a construction phase plan (CPP) The CPP is incorporated into a comprehensive Health and Safety Plan with relevant information, risk assessments and method statements where applicable intended to keep the field staff safe.

Clients are requested to provide all service plans in original form from suppliers so a service avoidance risk assessment (SARA) can be undertaken as part of a formal Site-specific Health and Safety Plan. The SARA is based on guidance provided in HSG47 Avoiding danger from underground services.

Exploratory hole and subsequent sample locations are selected to provide suitable coverage of the Site, having regard for the likely presence of services and any other constraints such as existing structures and sub-structures. Where applicable, suspected emissions locations, or geological variations may have been targeted.

The locations of the investigations are shown on Figure 3 and the field records are provided in Appendix C.

2.4 Dynamic Sampler Boreholes

Dynamic sampler borehole systems are not explicitly described in Eurocodes, or in the relevant British Standard BSENISO 22475-1:2006 Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution.

The dynamic sampler system comprises a series of varying diameter metal tubes of 1 m or 2 m length, which allows a liner to be inserted. The tubes are driven into the ground using a percussive weight falling through a standard drop onto an anvil attached to solid rods, and withdrawn by use of a hydraulic jack. The soil is pushed into the tube/liner during the driving, and samples are recovered from the tube once it has been split for description. Alternatively, liners are omitted and the metal tubes have slots or windows cut into the sides where samples can be taken directly by hand. The liner method potentially offers a lower degree of sample disturbance.

The system can achieve typical depths of around 3 m to 5 m in favourable soil conditions. The system is limited by coarse gravel or other large fragments, and also in wet sands where the hole collapses. Some casing systems exist. The details of the ground conditions encountered are presented on the relevant field record sheets, which also detail the type and depths of samples taken and the results of any in-situ tests. Other relevant information may also be recorded including groundwater levels and details of any standpipe installations.

2.5 Standpipe Installations

Three of the dynamic sampler boreholes has been fitted with a gas/water monitoring standpipe of 50 mm internal diameter UPVC slotted and plain casing to the required depth as appropriate, capped by a gas tap bung and cover generally in accordance with BSENISO 22475-1:2006 for an open standpipe. The locations of the monitoring installations are shown on Figure 3.

2.6 Standard Penetration Tests

Standard penetration testing is undertaken generally in accordance with BS EN ISO 22476-2:2005+A1:2011 *Geotechnical investigation and testing. Field testing. Standard probing*

2.7 Monitoring Groundwater & Ground Gas

Groundwater monitoring is undertaken using an electronic dip meter, which records the depth to water in a standpipe. Ground gas composition and flow monitoring is undertaken where standpipes have been installed. Both flow (litres per hour) and composition (%) are measured using an infra-red gas monitor, calibrated for methane, carbon dioxide & oxygen. Records are also taken of atmospheric pressure. The monitoring field records are presented in Appendix D.

2.8 Chemical Analysis

The results of the chemical analysis are presented in Appendix E.

2.9 Generic Quantitative Risk Assessment (GQRA)

Human Health

In the absence of a statutory contamination thresholds in the UK a set of Generic Assessment Criteria (GAC derived principally using the Contaminated Land Exposure Assessment (CLEA) Framework have been adopted to assess the significance of the contamination encountered. The values adopted are for a residential without plant uptake end-use.

The Delta-Simons methodology for GQRA comprises comparison of limited chemical analysis results with the criteria for the most sensitive plausible end-use scenario in the proposed scheme.

Exceedance of criteria indicates that risk above “minimal” level may exist in a worst-case scenario across the whole Site. The precautionary principle is applied with respect to protection of human health recommending; further risk assessment (increased characterisation including extents/zones), or site-wide remediation.

If no criteria exceedance is observed, recommendations for further risk assessment, or remediation due to uncertainty over full characterisation of the Site.

Post-report action should be Site-specific and based on a Client’s resource/risk profile in undertaking developments in accordance with any regulator requirements. Under the planning control, the responsibility for a safe development remains with the Developer.

Controlled Waters

For the purposes of assessment of risks to controlled waters, where water samples have been obtained these have been compared to appropriate water quality standards.

Ground Gas

Two rounds of ground gas monitoring have been undertaken as part of this assessment, the results of which are provided in Appendix D.

3.0 Results & Interpretation

3.1 Desk Study

A brief desk study is provided below using readily available online resources and a review of existing Third-Party information for the Site, which should be read in conjunction with this Report.

Site Description & Walkover (Reconnaissance, Internet Air Photography)	Delta-Simons undertook a Site visit on 6th March 2020. A Site Layout Plan is included as Figure 2. Relevant Features identified during the walkover are summarised below. The Site was occupied by an active YMCA Hostel comprising a mixture of one and two storey buildings of brick construction. No access was afforded inside the existing buildings. Vehicular access and parking was noted along the northern area of the Site. The Site surfacing was noted to mainly comprise of either concrete and macadam in pedestrian and vehicular routes. The remainder of the Site comprised two soft landscaped courtyards in the central areas and soft landscaped areas along western, northern and eastern boundaries. A number of mature trees were noted along the eastern boundary. A number of manhole covers indicating buried utilities were noted across the Site. The car parking area in the north was noted to be raised by approximately 0.5 m above the remaining Site topography. In addition, a retaining wall approximately 1.0 m high was noted along the western area of the Site as part of a raised soft landscaped area. No evidence was observed during the Site walkover of potential Asbestos Containing Materials (ACMs), however, the presence within existing building construction cannot be discounted. The presence for plant/ boiler rooms within buildings cannot be discounted.
Proposed Development	It is understood that the proposed development of the Site comprises the demolition of all structures and the construction of a four-storey 100 bed YMCA Hostel and a 2, 3 and 4 storey building providing up to 43 residential apartments. The Proposed Site Layout is included as Drawing 1.
Environmental Setting	From the British Geological Survey (BGS) Geology of Britain Viewer the Site is indicated as being underlain by superficial Diamicton deposits of the Lowestoft Formation. In addition, superficial sand and gravel deposits of the Kesgrave Catchment Subgroup may encroach onto Site in the northern area. The underlying bedrock is mapped as the Lewes Nodular Chalk Formation and Seaford Chalk Formation (Undifferentiated). Given the current developed nature of the Site, Made Ground is likely to be present, however, is anticipated to be limited in thickness. The EA classify the superficial deposits of the Lowestoft Formation and Kesgrave Catchment Subgroup as Secondary A and Secondary Undifferentiated Aquifers, respectively. The bedrock is classified as a Principal Aquifer. The EA data also indicates that the Site is located within a Zone III Total Catchment Source Protection Zone (SPZ).
Previous Report Review (Argyle Environmental, 2018)	Delta-Simons has been provided with the following Third-Party report: ▲ Argyle Environmental, SiteSolutions Combined, (Ref. AEL-0046-TSC-959119), dated 7th December 2018. Historically the Site formed part of Peartree Farm comprising farmyard buildings in the northern area of the Site from the earliest map edition dated 1878. The Site remained in agricultural use until circa 1938 when a building is noted in the southern area of the Site mapped as a Youth Hostel and Club. Alterations to the farm buildings in the north of the Site are noted circa 1985. The farm buildings are assumed demolished prior to

	1990 as they are no longer mapped and the Youth Hostel is noted to occupy the majority of the Site area. The Site remains consistent until present day. The surrounding area has historically comprised a number of industrial uses with associated tanks, most notable a chemical works located 30 m to the north, a garage warehouse and corporation yard. There are five licenced abstractions located within 1 km of the Site, the closest of which is located approximately 360 m west, relating to the abstraction from groundwater for chemicals: process water. The nearest surface water feature is located approximately 240 m south-west of the Site. Pertinent entries within 250 m of the Site include; ▲ Six Registered Radioactive Substances, all of which relate to Roche Products Ltd, the closest is located approximately 180 m west; ▲ A Registered Landfill Site located approximately 200 m north west of the Site relating to a Landfill accepting aqueous effluent waste and industrial effluent treatment sludge, the input rate is noted as small (<10,000 tonnes per year); ▲ One Registered Waste Treatment or Disposal Site located approximately 160 m west of the Site relating to the above Landfill Site; ▲ Thirty-eight Contemporary Trade Directory Entries, the closest of which is an active tyre repair and rereading entry located approximately 25 m north of the Site; and ▲ Five areas of potentially infilled land (water), the closest of which is located approximately 30 m south west of the Site, recorded in 1939 mapping. The Site was considered to have a moderate to high environmental sensitivity and the risk of contaminants being present was considered low to moderate. No further recommendations were required in terms of contamination. The Site was also considered at low to moderate risk of flooding.
Key Contaminants and Initial CSM Aspects	The Site has historically been in agricultural use, including farm yard prior to redevelopment as a Youth Hostel. On-Site potential sources of contamination include: ▲ Made Ground associated with historical construction/demolition; ▲ Small-scale oil/fuel spills from parked vehicles/plant and machinery related to the historical development and agricultural use; ▲ Potential plant/boiler rooms within existing buildings; ▲ Potential asbestos within existing building construction; and ▲ Unrecorded sources. Off-Site potential sources of contamination are limited to infilled land (water) in the surrounding area and industrial uses a chemical works. The off-Site infilled land and landfill may represent potential sources of ground gas, however, underlying cohesive deposits would mitigate migration. The presence of Made Ground is suspected given the current development. Deep Made Ground may be considered as a gas source, if present. The Site overlies a Secondary A Aquifer, Secondary Undifferentiated Aquifer and Principal Aquifer with respect to the superficial and bedrock geology. The Site is located within a Zone III Source Protection Zone. There is uncertainty because unrecorded potentially contaminative activities could have taken place.

3.2 Fieldworks Interpretation

<table>
<tr><td>Scope of Investigation</td><td>Dynamic Sampler Boreholes– 5 No.
Monitoring Well Installs – 3 No.
Monitoring rounds – 2 No.
Site Area = 0.67 hectares.</td></tr>
<tr><td>Site Specific Investigation Limitations</td><td>Intrusive locations were set out to avoid underground services.</td></tr>
<tr><td>Geology from the Investigation Works</td><td>Made Ground was encountered across the Site generally comprising a limited thickness of gravelly clayey sandy Topsoil with brick and flint underlain by gravelly clay with brick fragments. Made Ground was identified to a maximum depth of 0.68 m bgl.
The underlying natural soils comprised soft to firm light brown slightly sandy gravelly clay and clayey gravelly sands with flints. Coarse sandy flint gravel was identified within DS103 between 3.40 m bgl and 4.00 m bgl.
There were no visual or olfactory indications of significant contamination.
The natural soil was considered to be generally representative of the published superficial geology for the Site of the Lowestoft Formation.
Bedrock (chalk) was not encountered.
Groundwater was identified during drilling within DS105 only at 3.50 m bgl.
See Appendix C for further details.</td></tr>
<tr><td>Groundwater in Standpipes</td><td>Two monitoring visits were completed on 10th and 17th March 2020.
A summary of the readings is provided below:
<table>
<tr><th>Borehole</th><th>Maximum Depth to Water (m bgl)</th><th>Minimum Depth to water (m bgl)</th><th>Response Zone</th></tr>
<tr><td>DS101</td><td>Dry</td><td>Dry</td><td>Lowestoft Formation</td></tr>
<tr><td>DS103</td><td>Dry</td><td>Dry</td><td>Lowestoft Formation</td></tr>
<tr><td>DS105</td><td>1.51</td><td>1.47</td><td>Lowestoft Formation</td></tr>
</table>
See Appendix D for further details.</td></tr>
<tr><td>Gas in Standpipes</td><td>Two monitoring visits were completed on 10th and 17th March 2020.
The worst-case gas scenario is summarised below.
<table>
<tr><th rowspan="2">Borehole</th><th>Methane (%v/v)</th><th>Carbon Dioxide (%v/v)</th><th>Oxygen (%v/v)</th><th>Steady Flow (l/hr)</th><th colspan="2">GSV/CS</th></tr>
<tr><th>Max</th><th>Max</th><th>Min</th><th>Max</th><th>GSV</th><th>CS</th></tr>
<tr><td>DS102</td><td><0.1</td><td>1.4</td><td>17.4</td><td>0.1</td><td>0.0014</td><td>1</td></tr>
<tr><td>DS103</td><td><0.1</td><td>0.8</td><td>18.2</td><td><0.1</td><td>0.0008</td><td>1</td></tr>
<tr><td>DS105</td><td><0.1</td><td>0.5</td><td>19.2</td><td><0.1</td><td>0.0005</td><td>1</td></tr>
<tr><td rowspan="2">Date</td><td colspan="5">Conditions During Monitoring Round</td></tr>
<tr><td colspan="4">Atmospheric Pressure (mb) (Trend)</td><td colspan="2">Weather Conditions</td></tr>
<tr><td>10/03/20</td><td colspan="4">994 (Steady)</td><td colspan="2">Dry</td></tr>
<tr><td>17/03/20</td><td colspan="4">1022 (Rising)</td><td colspan="2">Dry</td></tr>
</table>
Note:
GSV = Gas Screening Value as per CIRIA C665</td></tr>
</table>

CS = Characteristic Situation as per CIRIA C665

See Appendix D for further details.

Chemical Analysis

Five samples were scheduled for the following analytes: selected heavy metals suite, Total Petroleum Hydrocarbons (TPH) (total), TPH CWG, BTEX, MTBE, speciated Polycyclic Aromatic Hydrocarbons (PAH) (EPA-16), leachable metals and asbestos screen.

Slight exceedances of arsenic and lead have been identified above the applied Generic assessment Criteria (GAC) for residential without plant uptake end use within shallow Made Ground from a single location (DS101 at 0.15 m bgl). Arsenic has been identified at 41 mg/kg marginally above the stringent GAC of 40 mg/kg and lead recorded at 330 mg/kg marginally above the GAC of 310 mg/kg.

Slightly elevated individual PAH compounds above the applied GAC have also been identified within a single sample collected from DS104 at 0.30 m bgl, summarised in the table below.

Parameter	Maximum Concentration (Mg/kg)	Screening Value (Source)	Volatile	Location
PAHs				
Benzo(b)fluoranthene	5.1	3.9[LQM]	N	DS104
Benzo(a)pyrene	4.3	3.2[LQM]	N	DS104
Dibenzo(a,h)anthracene	0.66	0.31[LQM]	N	DS104

Further elevated concentrations of hydrocarbons, sPAH and heavy metals were not identified above their respective GAC.

Asbestos has been identified within one sample from DS105 at 0.5 m bgl as Chrysotile, quantified as <0.001%.

The leachable metal results have been compared against the GAC for Potable Waters given the underlying Secondary A and Principal Aquifers. Concentrations of lead have been identified marginally above very stringent GAC of 10 µg/l in two samples; DS103 (0.20 m bgl) at 13 µg/l and DS104 (0.30 m bgl) at 11 µg/. However, the results are not considered representative of real-life processes and represent a worst-case laboratory conditions.

See Appendix E for further details.

Contamination

The Site has historically been in agricultural use, including farm yard prior to redevelopment as a Youth Hostel.

Marginally elevated individual PAH compounds, arsenic and lead have been identified above the stringent applied GAC and slightly elevated leachable lead has also been identified in two locations. Further concentrations of heavy metals, PAHs and TPH was not identified above generic assessment criteria.

Asbestos fibres have been identified within one location (DS105) as Chrysotile, quantified as <0.001%.

Given the identified concentrations of arsenic, lead and sPAH are marginally above stringent GAC, the risk to Human Health (construction workers/ future maintenance workers and future Site users) is considered low. Furthermore, the Site is to be covered predominantly in buildings or hardstanding, effectively encapsulating the soils and preventing direct contact.

It is recommended that proposed new landscaped areas have a minimum 450 mm clean certified layer of topsoil. Should landscaped areas be proposed for the growing of fresh produce, the depth of clean cover should be increased to 600 mm, with appropriate geotextile membrane.

	Given significantly elevated concentrations of contaminants have not been identified, and the geology has been identified as predominantly cohesive, the risk to controlled waters is considered very low risk.
Fresh Water Pipes	The Local Water Authority should be contacted at an early stage in order that any abnormal costs can be calculated, if required.
Ground Gas	Potential sources of ground gas are limited to Made Ground and off-Site infilled land and landfill. The gas monitoring recorded low concentrations of ground gases and low flow. Methane was not detected above 0.1 %v/v and carbon dioxide was identified at a maximum concentration of 1.4 %v/v. The ground gas regime beneath the Site has been classified as a Characteristic Situation 1, in line with CIRIA C665.
Groundwater/ Drainage	The natural ground conditions at the Site were found to be variable sandy clays and clayey sand. Groundwater was encountered at approximately 1.50 m bgl within one location during return monitoring visits. BRE365 Infiltration testing has been undertaken at the Site. This is reported under sperate cover and should be read in conjunction with this Report.
Conclusions and Recommendations	The Site has historically been in agricultural use prior to redevelopment as a Youth Hostel. The Site is proposed for the demolition of existing buildings and the construction of a four-storey 100 bed YMCA Hostel and a 2, 3 and 4 storey building providing up to 43 residential apartments. It is also understood that the development will comprise surface water drainage to two soakaways in the central area of the Site, via interceptors. Significant contamination has not been identified in the shallow soils, however, elevated PAHs, arsenic and lead have been identified within shallow Made Ground. It is considered that the risk to future Site users will be mitigated through hardstanding and clean cover. The risk to controlled water is also considered low, given the following; ▲ Marginal exceedances of PAHs, arsenic and lead have been identified within shallow soils above stringent guidance values and are not considered significantly elevated; ▲ The shallow Made Ground is likely to be excavated and removed from Site in the areas of proposed surface water drainage, as such removing the identified source; ▲ Interceptors are proposed prior to water entering the proposed soakaways; ▲ Cohesive clay deposits have been identified above the mapped chalk, effectively limiting vertical migration of contamination; and ▲ There are no Licensed Abstraction Records from groundwater for potable water supply within 250 m of the Site. The following development abnormals should be considered appropriate at this stage: ▲ A ‘hotspot’ protocol to be put in place during any sub-surface works for groundworkers to act upon should potential contamination be identified; ▲ Consultation with the Local Water Authority to confirm the requirements for upgraded potable water pipes; ▲ Additional soil testing (WAC) may be required to optimise off-Site disposal of soils;

	▲ An asbestos survey of the current buildings should be undertaken prior to demolition; and ▲ Importation of suitable certified topsoil for any proposed for any proposed landscaped areas.

Pollutant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
Marginally elevated concentrations of PAHs within shallow Made Ground in DS104 0.3 m bgl. Marginally elevated arsenic and lead within Made Ground in DS101 at 0.15 m bgl. Slightly elevated leachable lead within Made Ground from DS103, DS104 and DS105. Detectable concentrations of heavy metals, PAHs and TPH in shallow soils. Potential contamination in areas not directly investigated.	Direct contact, ingestion or inhalation of soil bound contaminants / dust during redevelopment and the inhalation of vapours	Construction workers. Third parties during construction (adjacent site users and adjacent residents). Future residents.	**Low Risk**	Detectable concentrations of heavy metals and PAHs have been identified in shallow Made Ground. However, the Site is to mainly be covered in hardstanding, as such, the risk to future Site users is considered low. Should areas of landscaping be proposed a clean certified layer of suitable for use topsoil will be required. Given the identified elevated PAHs, arsenic and lead, the short-term risk to construction workers would be mitigated by the use of PPE and provision of suitable welfare facilities. This recommendation should be captured in Site health and safety documentation and in maintenance plans. A hotspot protocol should be in place for groundworkers to act upon should potential contamination be identified.
	Direct contact between aggressive ground conditions and new infrastructure.	The Built Environment (new buildings and infrastructure)	**Low Risk**	The Local Water Authority should be contacted to understand their requirements for upgraded water pipes.
	Leaching of contamination into groundwater followed by migration of groundwater to the wider groundwater environment or surface waters.	The underlying Secondary A Aquifer, Secondary Undifferentiated and Principal Aquifer/ Controlled waters.	**Very Low Risk**	Significant contamination has not been identified at the Site within shallow soils. However, marginally elevated PAHs, arsenic and lead have been identified above stringent guidance values. Hardstanding within the development will further mitigate the risk by restricting any infiltration and subsequent mobilisation of any soil contaminants. In addition, leachable lead has been marginally identified above the guidance value for potable water, however, is not considered representative of general environmental conditions, as such the risk is considered low. The Site is located within a Zone III Source Protection Zone.
Hazardous Ground Gas.	Migration of ground gas into on-site buildings causing asphyxiation or risk of explosion.	The Built Environment (new buildings and infrastructure) Future residents.	**Very Low Risk**	Following two rounds of ground gas monitoring, low concentrations of Carbon dioxide were recorded at a maximum concentration of 1.4%v/v. The Site can provisionally be classified as a Characteristic Situation 1.

Standard risk definitions and matrices are presented in Appendix D.

Pollutant Linkage Assessment				
Source(s)	**Pathway(s)**	**Receptor(s)**	**Risk Rating**	**Justification & Mitigation (if required)**
Chrysotile Asbestos identified within shallow Made Ground form DS105 and 0.5 m bgl. Potential ACMs within existing building construction.	Direct contact of inhalation of Asbestos fibres.	Future Site users. Groundworkers during the redevelopment or during any subsurface maintenance works.	**Low to Moderate Risk**	Asbestos has been identified within a single location (DS105 at 0.5 m bgl), quantified as <0.001%. The risk for further asbestos to be present within Made Ground cannot be discounted. A full asbestos survey should be undertaken prior to demolition of the current buildings and structures.

Figure 1 – Site Location Map

Scale: 1 / 500,000 @ A4

LEGEND

Site Boundary

Scale: 1 / 10,000 @ A4

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TITLE:
Site Location Map
WCG- One YMCA
Peartree Lane, Welwyn Garden City

DRAWN BY: JR	SCALE: To Scale@A4
CHECKED BY: AH	REVISION: 1
DATE: 13th March 2020	

PROJECT NO: 20-0093

FIGURE NO: 1

Figure 2 – Site Layout Plan

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TITLE:
Site Layout Plan
WCG-One YMCA
PeartreeLane, Welwyn Garden City

DRAWN BY: JR	SCALE: Not to Scale	PROJECT NO: 20-0093.01	
CHECKED BY: RPD	REVISION: 1	FIGURE NO: 2	
DATE: 24th March 2020			

Figure 3 – Approximate Intrusive Location Plan

LEGEND

- Site Boundary
- DSx Dynamic Sampler Borehole
- (s) Standpipe Installation

FOR PLANNING

REV	DATE	NOTE	IN

Project

YMCA
PEARTREE LANE
WELWYN GARDEN CITY

Title

PROPOSED SITE LAYOUT

Scale 1:500 @A3 | Date SEPT 2019
Drawn SD | Checked AL
Drawing Number 8057 / P101 | Revision -

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Site Plan provided by Client

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Environment - Health & Safety - Sustainability

TITLE:
Approximate Intrusive Location Plan
WCG-One YMCA
PeartreeLane, Welwyn Garden City

DRAWN BY:	SCALE:	PROJECT NO:
JR	Not to Scale	20-0093.01
CHECKED BY:	REVISION:	FIGURE NO:
AH	1	3
DATE: 13th March 2020		

Drawing 1 – Proposed Development Plan

NOTES ©

This drawing to be read in accordance with the specification/Bills of Quantities and related drawings. No Dimensions to be scaled from this drawing. All stated dimensions to be verified on site and the Architect notified of any discrepancies.

0 50

Scale bar 50mm at 1:1

FOR PLANNING

REV	DATE	NOTE	IN

Project

YMCA
PEARTREE LANE
WELWYN GARDEN CITY

Title

PROPOSED SITE LAYOUT

Scale	Date
1:500 @A3	SEPT 2019
Drawn	Checked
SD	AL
Drawing Number	Revision
8057 / P101	-

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Appendix A - Limitations

Limitations

The recommendations contained in this Report represent Delta-Simons professional opinions, based upon the information listed in the Report, exercising the duty of care required of an experienced Environmental Consultant. Delta-Simons does not warrant or guarantee that the Site is free of hazardous or potentially hazardous materials or conditions.

Delta-Simons obtained, reviewed and evaluated information in preparing this Report from the Client and others. Delta-Simons conclusions, opinions and recommendations has been determined using this information. Delta-Simons does not warrant the accuracy of the information provided to it and will not be responsible for any opinions which Delta-Simons has expressed, or conclusions which it has reached in reliance upon information which is subsequently proven to be inaccurate.

This Report was prepared by Delta-Simons for the sole and exclusive use of the Client and for the specific purpose for which Delta-Simons was instructed. Nothing contained in this Report shall be construed to give any rights or benefits to anyone other than the Client and Delta-Simons, and all duties and responsibilities undertaken are for the sole and exclusive benefit of the Client and not for the benefit of any other party. In particular, Delta-Simons does not intend, without its written consent, for this Report to be disseminated to anyone other than the Client or to be used or relied upon by anyone other than the Client. Use of the Report by any other person is unauthorised and such use is at the sole risk of the user. Anyone using or relying upon this Report, other than the Client, agrees by virtue of its use to indemnify and hold harmless Delta-Simons from and against all claims, losses and damages (of whatsoever nature and howsoever or whensoever arising), arising out of or resulting from the performance of the work by the Consultant.

Appendix B - Risk Definitions

Contaminated Land Risk Definitions

The following methodology is based on the methodology presented in CIRIA C552 Contaminated Land Risk Assessment: A Guide to Good Practice 2001. It requires the classification of the:

- Magnitude of the potential consequence (severity) of the Risk occurring: and
- Magnitude of the Probability (likelihood) of the Risk occurring.

The classifications are then compared to indicate the risk presented by each pollutant linkage.

Consequence to Receptor Definition Matrix

	Human Health	Controlled Waters	Buildings/Services
Severe Consequence	Acute or chronic permanent impact on human health.	Sensitive controlled water pollution ongoing, or just about to occur.	Catastrophic collapse
Medium Consequence	Chronic permanent impact on human health	Gradual pollution of sensitive controlled water	Degradation of materials
Mild Consequence	Chronic temporary impact on human health	Gradual pollution of non-sensitive controlled water	Damage to building rendering it unsafe.to occupy (eg foundation damage resulting in instability).
Minor Consequence	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc).	Slight discoloration of water	Easily repairable effects of damage to buildings, structures and services, i.e discoloration of concrete

Probability Definitions

Probability	Definition in Context
Higher	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution. Positive evidence of source, pathway and receptor.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term. Suspect source, pathway, and receptor
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term No evidence of hazard, pathway, and receptor

Standard Risk Matrix

		Consequence/Magnitude of impact			
		Severe	Medium	Mild	Minor
Probability	**High**	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/low	Low
	Low Likelihood	Moderate	Moderate/low	Low	Very Low
	Unlikely	Moderate/low	Low	Very Low	Very Low

Classified risks and likely action

Significance Level	Definition/Comments
Very High Risk	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required. Demonstrable contaminated land situation, highest threat & liability level, urgent action recommended.
High Risk	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term. Likely contaminated land situation, risk assessment and action recommended.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, if is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term. Plausible contaminated land situation, risk assessment and possible action recommended.
Low Risk	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild. Unlikely contaminated land situation, possible risk assessment and possible action.
Very Low Risk	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe. Negligible risk, no action recommended except vigilance for changes in conditions.

Geotechnical Risk Classification

The geohazards listed in the report within Section 4 follow guidance presented in Clayton, C.R.I. (2001) *Managing Geotechnical Risk*, Thomas Telford and the Highways Agency document HD22/08 '*Managing Geotechnical Risk*' (2008) which aims to identify and manage the geotechnical risks associated with a scheme throughout its lifespan, from planning to construction to maintenance.

For each geohazard the probability of the hazard occurring (P) has been considered together with the impact it would have (I) if it were to happen to calculate the risk rating between 1 and 25.

Risks that fall within Moderate, Significant and Severe categories below are considered to be ***substantial*** and are therefore listed within the report.

Probability	**(P)**
Very Likely (VLk)	5
Likely (Lk)	4
Plausible (P)	3
Unlikely (U)	2
Very Unlikely (VU)	1

X

Impact	**(I)**
Very High (VH)	5
High (H)	4
Medium (M)	3
Low (L)	2
Very Low (VL)	1

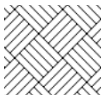
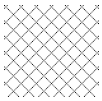
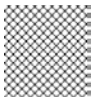
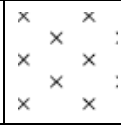
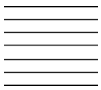
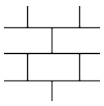
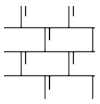
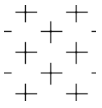
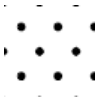
=

(R)	**Risk**
20 – 25	Severe
15 – 19	Substantial
10 – 14	Moderate
5 – 9	Minor
1 – 4	Negligible

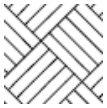
Appendix C - Key to Logs, Field Records & Compliance Certificates

KEY TO BOREHOLE AND TRIAL PIT LOGS

MATERIAL LEGENDS

	Topsoil		Made Ground		Bituminous Material
	Concrete		Clay		Silt
	Sand		Gravel		Peat
	Cobbles		Boulders		Mudstone
	Siltstone		Sandstone		Limestone
	Chalk		Coal		Breccia
	Conglomerate		Igneous		Metamorphic
	Pyroclastic (volcanic ash)		Gypsum		Shale
	Ironstone		Bedrock (Unidentified)		Void

INSTALLATION/BACKFILL LEGENDS

	Sand		Gravel		Bentonite/Grout
	Arisings		Concrete		Plain Pipe
	Slotted Pipe				

Legend symbols in general accordance with BS 5930:1999+A2:2010 and standard industry practice.

KEY TO BOREHOLE AND TRIAL PIT LOGS

SAMPLE TYPES

ACM	Asbestos Containing Material Sample
B	Bulk Disturbed Sample
BLK	Block Sample
C	Core Sample
CBR	Undisturbed Sample for California Bearing Ratio Test – 154mm diameter
D	Disturbed Sample - Tub
ES	Soil Sample for Environmental Testing
EW	Water Sample for Environmental Testing
G	Gas Sample
U	Undisturbed Driven Tube Sample – 70/102mm diameter, 450mm long
W	Water Sample

TEST TYPES

CPT	Cone Penetrometer Test (kN/m^2)
FID	Flame Ionisation Detector Test (ppm)
HV	In-Situ Hand Sheer Vane Test (kN/m^2)
PID	Photoionisation Detector Test (ppm)
SPT (S)	Standard Penetration Test – Split Spoon Sampler
SPT (C)	Standard Penetration Test – Solid 60 Degree Cone

CORE DETAILS

If	Fracture Spacing (mm) – Minimum, Average, Maximum
NI	Non-Intact where >25 fracture spacings per metre
TCR	Total Core Recovery (%)
SCR	Solid Core Recovery (%)
RQD	Rock Quality Designation (%)
AF	Air Flush Return (%)
WF	Water Flush Return (%)

WATER COLUMN DETAILS

	Water Strike
	Water Level

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Project No: 20-0093.01 | Hole ID: DS101 | Page: 1 of 1

Project: WGC-One YMCA, Peartree Lane, Welwyn Garden City

Dynamic Sampler Log

Date: 06/03/2020 | Client: Pinnacle Consulting Engineers

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
MADE GROUND: Grass over dark brown slightly gravelly clayey fine to medium SAND. Gravel is fine to medium subangular to subrounded flint and brick fragments. (TOPSOIL).		0.20	(0.20)	82.89			0.15	ES	ES1			
MADE GROUND: Dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint and occasional brick fragments.		0.60	(0.40)	82.49								
Soft dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangualr to subrounded flint. (LOWESTOFT FORMATION)		0.80	(0.20)	82.29								
Soft to firm light orangish brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to medium angular to subrounded flint. (LOWESTOFT FORMATION)		1.20	(0.40)	81.89						1.20	SPT(S) N=23 (4,5/5,6,6,6)	
Medium dense light brown slightly clayey gravelly fine to medium SAND. Gravel is fine to coarse angular to rounded flint. (LOWESTOFT FORMATION)		3.00	(1.80)	80.09						2.00	SPT(S) N=17 (4,5/4,5,4,4)	
Firm light brown slightly sandy gravelly CLAY. Gravel is fine to medium subangular to subrounded flint. Sand is fine to medium (LOWESTOFT FORMATION)		3.33	(0.33)	79.76						3.00	SPT(S) N=16 (4,4/4,4,4,4)	
Firm light brown slightly sandy CLAY. Sand is fine to medium. Including rare medium subrounded flints. (LOWESTOFT FORMATION)		4.50	(1.17)	78.59						4.00	SPT(S) N=15 (3,4/4,3,4,4)	
Firm dark brown slighly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint and chalk nodules. (LOWESTOFT FORMATION)		5.00	(0.50)	78.09						5.00	SPT(S) 50 (25 for 140mm/50 for 190mm)	
Borehole complete at 5.00 m bgl.												

Remarks:
1. Logged in general accordance with BS 5930:2015.2. Borehole installed to 5 m bgl, with 50mm diameter standpipe, gas bung and traffic strength flush cover.3. Borehole remained dry upon completion.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration (min)	Depth Water	Depth Base	Diameter

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale:
E524385.37 N212618.12	83.09	Dynamic Sampling	Premier 110	AH	JR	PH	1:30

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Project No: 20-0093.01 | Hole ID: DS102 | Page: 1 of 1

Project: WGC-One YMCA, Peartree Lane, Welwyn Garden City

Dynamic Sampler Log

Date: 06/03/2020 | Client: Pinnacle Consulting Engineers

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
MADE GROUND: Grass over dark brown slightly gravelly clayey fine to medium SAND. Gravel is fine to medium subangular to subrounded flint and brick fragments. (TOPSOIL).		0.30	(0.30)	82.68								
MADE GROUND: Light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint and brick fragments.		0.68	(0.38)	82.30			0.60	ES	ES1			
Firm brown mottled grey slightly sandy CLAY. Sand is fine to medium. Including occasional fine to medium subangular to subrounded flints. (LOWESTOFT FORMATION)		2.00	(1.32)	80.98								
Dark brown slightly clayey gravelly fine to medium SAND. Gravel is fine to coarse angular to subangular flint. (LOWESTOFT FORMATION)		2.85	(0.85)	80.13								
Firm dark brown slighly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		5.00	(2.15)	77.98								
Borehole complete at 5.00 m bgl.												

Remarks:
1. Logged in general accordance with BS 5930:2015.2. Borehole backfilled with arisings.3. Borehole remained dry upon completion.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration (min)	Depth Water	Depth Base	Diameter

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale:
E524377.53 N212604.54	82.98	Dynamic Sampling	Premier 110	AH	JR	PH	1:30

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Project No: 20-0093.01 | Hole ID: DS103 | Page: 1 of 1

Project: WGC-One YMCA, Peartree Lane, Welwyn Garden City

Dynamic Sampler Log

Date: 06/03/2020 | Client: Pinnacle Consulting Engineers

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
MADE GROUND: Gravel over dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular flint, brick fragments and glass.		0.30	(0.30)	82.84			0.20	ES	ES1			
MADE GROUND: Light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint and brick fragments.		0.60	(0.30)	82.54								
Soft light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint. (LOWESTOFT FORMATION)		1.20	(0.60)	81.94						1.20	SPT(S) N=5 (1,1/1,2,1,1)	
Soft light brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		2.60	(1.40)	80.54						2.00	SPT(S) N=10 (2,3/2,3,2,3)	
Light brown slightly clayey gravelly fine to medium SAND. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		3.00	(0.40)	80.14						3.00	SPT(S) N=16 (3,4/4,4,4,4)	
Firm light brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		3.40	(0.40)	79.74								
Brown sandy subangular to subrounded fine to coarse flint GRAVEL. Sand is fine to coarse. (LOWESTOFT FORMATION)		4.00	(0.60)	79.14						4.00	SPT(S) N=22 (4,4/5,5,6,6)	
Firm to stiff dark brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint and rare chalk nodules. (LOWESTOFT FORMATION)		5.00	(1.00)	78.14						5.00	SPT(S) N=37 (8,8/9,9,9,10)	
Borehole complete at 5.00 m bgl.												

Remarks:
1. Logged in general accordance with BS 5930:2015.2. Borehole installed to 5 m bgl, with 50mm diameter standpipe, gas bung and traffic strength flush cover.3. Borehole remained dry upon completion.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration (min)	Depth Water	Depth Base	Diameter

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale:
E524382.40 N212584.51	83.14	Dynamic Sampling	Premier 110	AH	JR	PH	1:30

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Project No:	Hole ID:	Page:
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Project: WGC-One YMCA, Peartree Lane, Welwyn Garden City

Dynamic Sampler Log

Date: 06/03/2020

Client: Pinnacle Consulting Engineers

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
MADE GROUND: Grass over dark brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to medium subangular to subrounded flint.(TOPSOIL)		0.15	(0.15)	82.80								
MADE GROUND: Dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded flint and brick fragments. Sand is fine to coarse.		0.50	(0.35)	82.45			0.30	ES	ES1			
Soft light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint. (LOWESTOFT FORMATION)		1.12	(0.62)	81.83								
Firm light brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		3.10	(1.98)	79.85								
Firm light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint. (LOWESTOFT FORMATION)		5.00	(1.90)	77.95								
Borehole complete at 5.00 m bgl.												

Remarks:
1. Logged in general accordance with BS 5930:2015.2. Borehole backfilled with arisings.3. Borehole remained dry upon completion.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration (min)	Depth Water	Depth Base	Diameter

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale:
E524415.42 N212595.37	82.95	Dynamic Sampling	Premier 110	AH	JR	PH	1:30

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Project No:	Hole ID:	Page:
20-0093.01	DS105	1 of 1

Project: WGC-One YMCA, Peartree Lane, Welwyn Garden City

Dynamic Sampler Log

Date: 06/03/2020

Client: Pinnacle Consulting Engineers

Description of Strata	Legend	Strata Depth (m bgl)	Strata Thickness (m)	Reduced Level (mAOD)	Casing Diameter (mm)	Water	Sample Details: Depth (m)	Sample Details: Type	Sample Details: Ref	Test Details: Depth (m)	Test Details: Results	Backfill
MADE GROUND: Grass over dark brown slightly gravelly clayey fine to medium SAND. Gravel is fine to medium subangular flint and brick fragments. (TOPSOIL).		0.15	(0.15)	83.14								
MADE GROUND: Dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular to subrounded flint and brick fragments. Sand is fine to coarse.		0.60	(0.45)	82.69			0.50	ES	ES1			
Soft light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint. (LOWESTOFT FORMATION)		1.00	(0.40)	82.29								
Firm light brown slightly sandy gravelly CLAY. Sand is fine to medium. Gravel is fine to coarse angular to subrounded flint. (LOWESTOFT FORMATION)		3.00	(2.00)	80.29						1.20	SPT(S) N=27 (4,5/5,7,7,8)	
										2.00	SPT(S) N=30 (5,6/7,7,8,8)	
Firm light brown slightly sandy slightly gravelly CLAY. Sand is fine to medium. Gravel is fine to medium subangular to subrounded flint. (LOWESTOFT FORMATION)		5.00	(2.00)	78.29		3.50 ▼				3.00	SPT(S) N=30 (5,6/7,7,8,8)	
										4.00	SPT(S) N=11 (3,2/3,2,3,3)	
Borehole complete at 5.00 m bgl.										5.00	SPT(S) N=23 (5,5/5,6,6,6)	

Remarks:
1. Logged in general accordance with BS 5930:2015.2. Borehole installed to 5 m bgl, with 50mm diameter standpipe, gas bung and traffic strength flush cover.3. Groundwater was encountered at 3.50 m bgl.

Water Strike			Water Level		Borehole Diameter	
Date	Time	Depth Strike	Duration (min)	Depth Water	Depth Base	Diameter
		3.50 m				

Coordinates:	Elevation (mAOD):	Drilled By:	Plant Used:	Logged:	Checked:	Approved:	Scale:
E524431.20 N212575.46	83.29	Dynamic Sampling	Premier 110	AH	JR	PH	1:30

Appendix D - Monitoring Records

Site Name	WGC-One YMCA, Peartree Lane, Welwyn Garden City				**Job number**		20-0093.01				**WEATHER**	**Start**	**End**						
											Time	10.15	10.45						
Client	Pinnacle Consulting Engineers				**Recorded by**		LD				**Pressure (mb)**	994	994						
											Wind speed (m/s)	11.00	11.00						
Date (DD/MM/YYYY)	10/03/2020										**Wind Dir. (from)**	W	W						
Gas Analyser	GFM435 (Gas Kit 5) - 12233				**Visit Number**		1				**Temperature (°C)**	11.00	11.00						
Readings at start	**CH_4 (% v/v)**	<0.1	**CO_2 (% v/v)**	<0.1	**O_2 (% v/v)**		20.2	**H_2S (ppm)**	0		**Dry/Rain/Snow/Ice**	DRY	DRY						
Instrument used			Dip meter		**Water levels measured to**		Ground Level												
General comments											**Rising/Falling Trend (for the three days before visit)**	STEADY							

Ref	GROUND GAS													GROUNDWATER			Notes
	Flow		CH_4		CO_2		O_2		H_2S	CO	VOC	Differential (Relative) Pressure	Atmos. Pressure	Depth to free product	Depth to water	Depth to base	(e.g. water colour, sheen, odour, damage to well or gas tap, flooded ground etc.) For Depth to Product state: Not detected is product looked for but absent Not applicable if the instrument used is not capable of detecting product
	l/hr		% v/v		% v/v		% v/v		ppm								
	Max	Steady	Max	Steady	Max	Steady	Min	Steady	Max	Max	Max	mb	mb	m	m	m	
	The formulae require that only numbers, "<0.1" for ground gas and flow or "DRY" for groundwater are entered in the sheet																
BH101	<0.1	<0.1	<0.1	<0.1	0.8	0.8	18.5	18.5	0.0	0.0	NR	0.0	994	NR	NR	4.92	DRY AT BASE
BH103	0.1	<0.1	<0.1	<0.1	0.8	0.8	18.2	18.2	0.0	0.0	NR	0.0	993	NR	NR	4.90	DRY AT BASE
BH105	<0.1	<0.1	<0.1	<0.1	0.5	0.5	19.4	19.4	0.0	0.0	NR	1.0	993	NR	1.51	4.94	

Site Name	WGC-One YMCA, Peartree Lane, Welwyn Garden City	Job number	20-0093.01	WEATHER	Start	End
				Time	12.10	12.40
Client	Pinnacle Consulting Engineers	Recorded by	LD	Pressure (mb)	1022	1022
				Wind speed (m/s)	6.00	6.00
Date (DD/MM/YYYY)	17/03/2020			Wind Dir. (from)	SW	SW
Gas Analyser	GFM435 (Gas Kit 5) - 12233	Visit Number	2	Temperature (°C)	13.00	13.00

Readings at start	CH_4 (% v/v)	<0.1	CO_2 (% v/v)	<0.1	O_2 (% v/v)		19.8	H_2S (ppm)	0		Dry/Rain/Snow/Ice	DRY	DRY
Instrument used			Dip meter		Water levels measured to		Ground Level						
General comments											Rising/Falling Trend (for the three days before visit)	RISING	

Ref	GROUND GAS													GROUNDWATER			Notes
	Flow		CH_4		CO_2		O_2		H_2S	CO	VOC	Differential (Relative) Pressure	Atmos. Pressure	Depth to free product	Depth to water	Depth to base	(e.g. water colour, sheen, odour, damage to well or gas tap, flooded ground etc.) For Depth to Product state: Not detected is product looked for but absent Not applicable if the instrument used is not capable of detecting product
	l/hr		% v/v		% v/v		% v/v		ppm			mb	mb	m	m	m	
	Max	Steady	Max	Steady	Max	Steady	Min	Steady	Max	Max	Max						
	The formulae require that only numbers, "<0.1" for ground gas and flow or "DRY" for groundwater are entered in the sheet																
BH101	0.1	0.1	<0.1	<0.1	1.4	1.4	17.4	17.4	0.0	0.0	NR	1.0	1018	-	NR	4.93	DRY AT BASE
BH103	<0.1	<0.1	<0.1	<0.1	0.6	0.6	19.7	19.7	0.0	0.0	NR	1.0	1018	-	NR	4.92	DRY AT BASE
BH105	<0.1	<0.1	<0.1	<0.1	0.4	0.4	19.2	19.2	0.0	0.0	NR	1.0	1018	-	1.47	4.94	

Appendix E - Chemical Analysis

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Analytical Report Number : 20-91543

Project / Site name:	Peartree Lane, Welwyn	**Samples received on:**	09/03/2020
Your job number:	20-0093.01	**Samples instructed on:**	10/03/2020
Your order number:	DS53453	**Analysis completed by:**	16/03/2020
Report Issue Number:	1	**Report issued on:**	16/03/2020
Samples Analysed:	5 leachate samples - 5 soil samples		

Signed: _____

Zina Abdul Razzak
Senior Quality Specialist

For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement. Application of uncertainty of measurement would provide a range within which the true result lies. An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-91543

Project / Site name: Peartree Lane, Welwyn

Your Order No: DS53453

Lab Sample Number				1466933	1466934	1466935	1466936	1466937
Sample Reference				DS101	DS102	DS103	DS104	DS105
Sample Number				ES1	ES1	ES1	ES1	ES1
Depth (m)				0.15	0.60	0.20	0.30	0.50
Date Sampled				06/03/2020	06/03/2020	06/03/2020	06/03/2020	06/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	15	12	21	12	9.4
Total mass of sample received	kg	0.001	NONE	1.3	1.4	1.1	0.98	1.2
Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-	-	-	-	Chrysotile
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-	-	-	-	< 0.001
Asbestos Quantification Total	%	0.001	ISO 17025	-	-	-	-	< 0.001
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.2	8.0	8.0	8.8	8.1
Water Soluble Sulphate as SO_4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	34	16	37	270	40
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.017	0.0081	0.019	0.13	0.020
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	16.9	8.1	18.7	134	20.1
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.62	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.15	< 0.05
Fluorene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.39	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	0.38	< 0.05	1.3	5.2	0.41
Anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	1.4	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.75	< 0.05	1.7	11	1.1
Pyrene	mg/kg	0.05	MCERTS	0.66	< 0.05	1.5	9.2	1.1
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.39	< 0.05	0.95	4.9	0.78
Chrysene	mg/kg	0.05	MCERTS	0.49	< 0.05	1.0	4.3	0.85
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	0.48	< 0.05	0.98	5.1	0.91
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	0.21	< 0.05	0.55	2.6	0.54
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.35	< 0.05	0.72	4.3	0.78
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.24	< 0.05	0.39	2.6	0.57
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	0.66	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.31	< 0.05	0.51	2.8	0.68
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	4.26	< 0.80	9.64	55.2	7.68
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	41	23	28	28	21
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.0	0.4	1.5	0.6	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	37	31	28	32	28
Copper (aqua regia extractable)	mg/kg	1	MCERTS	59	24	79	42	27
Lead (aqua regia extractable)	mg/kg	1	MCERTS	330	110	270	180	170
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	40	29	33	35	27
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	260	130	190	170	170

Analytical Report Number: 20-91543

Project / Site name: Peartree Lane, Welwyn
Your Order No: DS53453

Lab Sample Number				1466933	1466934	1466935	1466936	1466937
Sample Reference				DS101	DS102	DS103	DS104	DS105
Sample Number				ES1	ES1	ES1	ES1	ES1
Depth (m)				0.15	0.60	0.20	0.30	0.50
Date Sampled				06/03/2020	06/03/2020	06/03/2020	06/03/2020	06/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Monoaromatics & Oxygenates								
Benzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
o-xylene	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Petroleum Hydrocarbons								
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0	< 2.0	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0	< 8.0	< 8.0
TPH-CWG - Aliphatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	< 2.0	< 2.0	2.4	13	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	< 10	< 10	< 10	70	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	17	< 10	18	120	11
TPH-CWG - Aromatic >EC35 - EC40	mg/kg	10	NONE	< 10	< 10	< 10	< 10	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	24	< 10	30	200	15
TPH (C35 - C40)	mg/kg	10	MCERTS	< 10	< 10	< 10	< 10	< 10

Analytical Report Number: 20-91543
Project / Site name: Peartree Lane, Welwyn
Your Order No: DS53453

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
1466937	DS105	0.50	147	Loose Fibres	**Chrysotile**	< 0.001	**< 0.001**

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number: 20-91543

Project / Site name: Peartree Lane, Welwyn

Your Order No: DS53453

Lab Sample Number				1466938	1466939	1466940	1466941	1466942
Sample Reference				DS101	DS102	DS103	DS104	DS105
Sample Number				ES1	ES1	ES1	ES1	ES1
Depth (m)				0.15	0.60	0.20	0.30	0.50
Date Sampled				06/03/2020	06/03/2020	06/03/2020	06/03/2020	06/03/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (dissolved)	µg/l	1.1	ISO 17025	6.8	9.1	2.3	6.6	7.6
Boron (dissolved)	µg/l	10	ISO 17025	< 10	< 10	< 10	< 10	< 10
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08	< 0.08	< 0.08
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.4	1.0	2.1	6.2	3.4
Copper (dissolved)	µg/l	0.7	ISO 17025	11	4.9	14	19	9.1
Lead (dissolved)	µg/l	1	ISO 17025	2.8	3.8	13	11	10
Mercury (dissolved)	µg/l	0.5	ISO 17025	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
Nickel (dissolved)	µg/l	0.3	ISO 17025	2.1	< 0.3	0.8	0.8	1.7
Selenium (dissolved)	µg/l	4	ISO 17025	< 4.0	< 4.0	< 4.0	< 4.0	< 4.0
Zinc (dissolved)	µg/l	0.4	ISO 17025	11	8.2	58	32	78

Analytical Report Number : 20-91543

Project / Site name: Peartree Lane, Welwyn

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
1466933	DS101	ES1	0.15	Brown clay and loam with gravel and vegetation.
1466934	DS102	ES1	0.60	Brown clay and loam with gravel and vegetation.
1466935	DS103	ES1	0.20	Brown clay and loam with gravel.
1466936	DS104	ES1	0.30	Brown loam and clay with gravel and vegetation.
1466937	DS105	ES1	0.50	Brown clay and sand with gravel.

Analytical Report Number : 20-91543

Project / Site name: Peartree Lane, Welwyn

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
D.O. for Gravimetric Quant if Screen/ID positive	Dependent option for Gravimetric Quant if Screen/ID positive scheduled.	In house asbestos methods A001 & A006.	A006-PL	D	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	L038-PL	D	MCERTS
TPH Chromatogram in Soil	TPH Chromatogram in Soil.	In-house method	L064-PL	D	NONE
TPH in (Soil)	Determination of TPH bands by HS-GC-MS/GC-FID	In-house method, TPH with carbon banding and silica gel split/cleanup.	L076-PL	D	NONE
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS

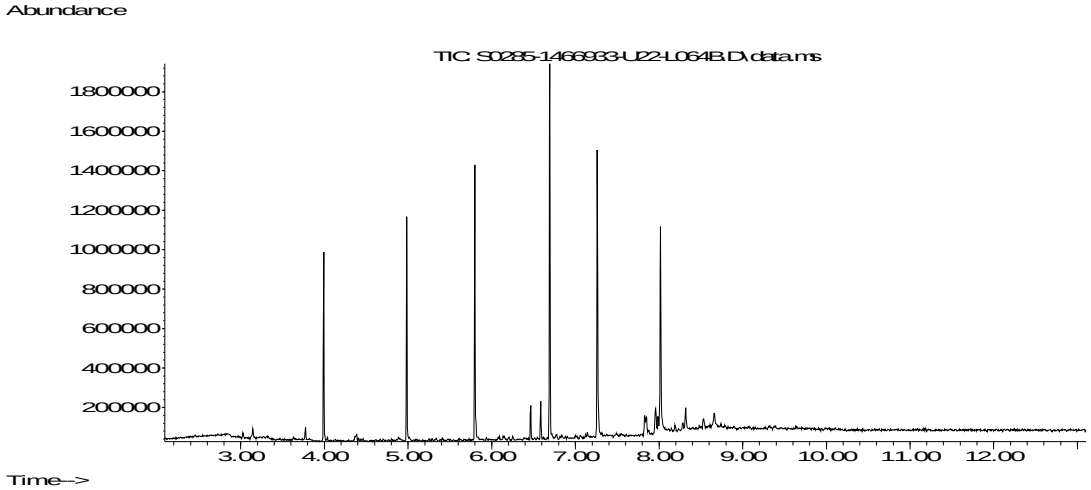
Analytical Report Number : 20-91543

Project / Site name: Peartree Lane, Welwyn

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Water (PrW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.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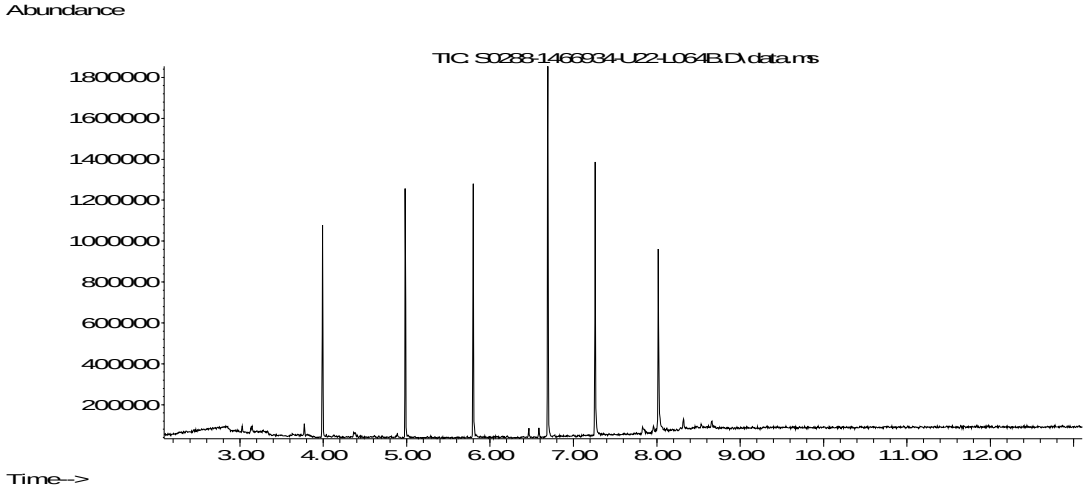
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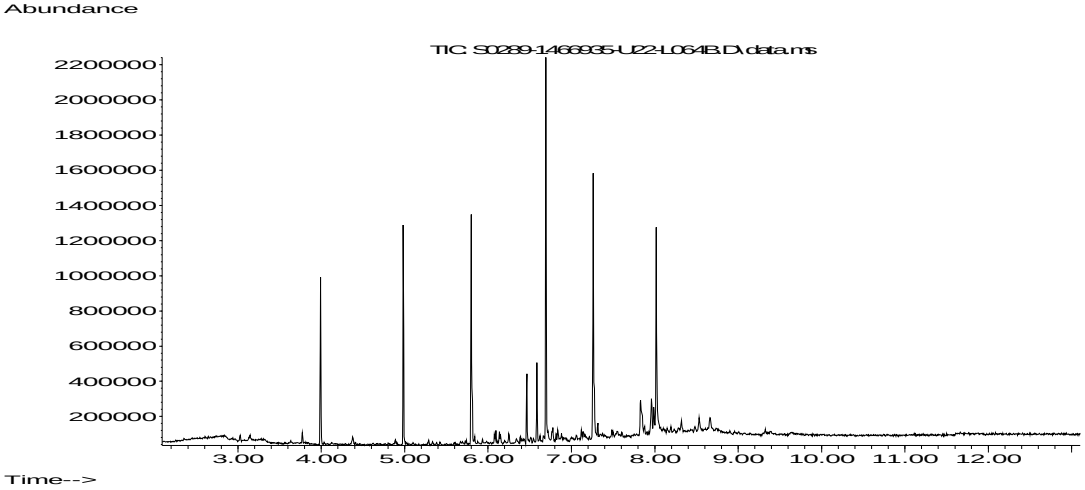
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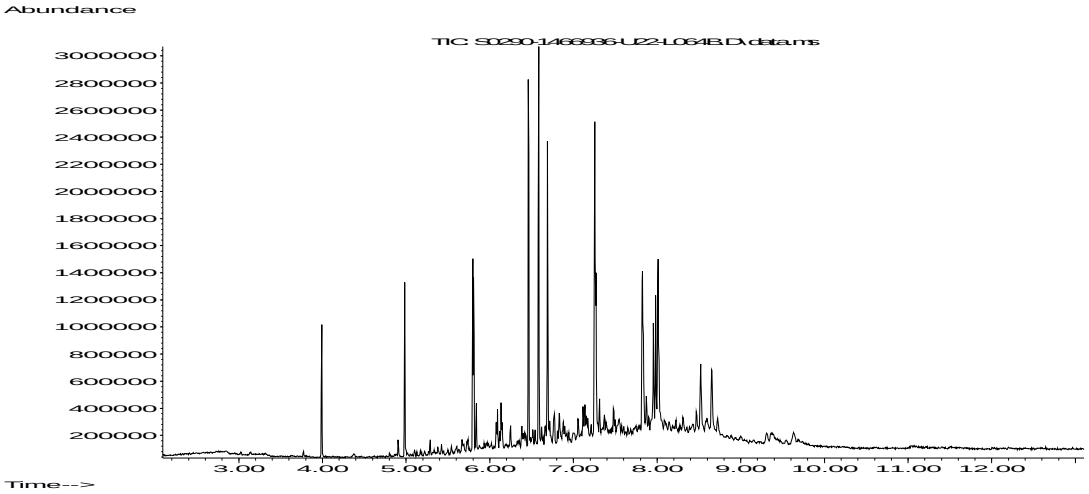
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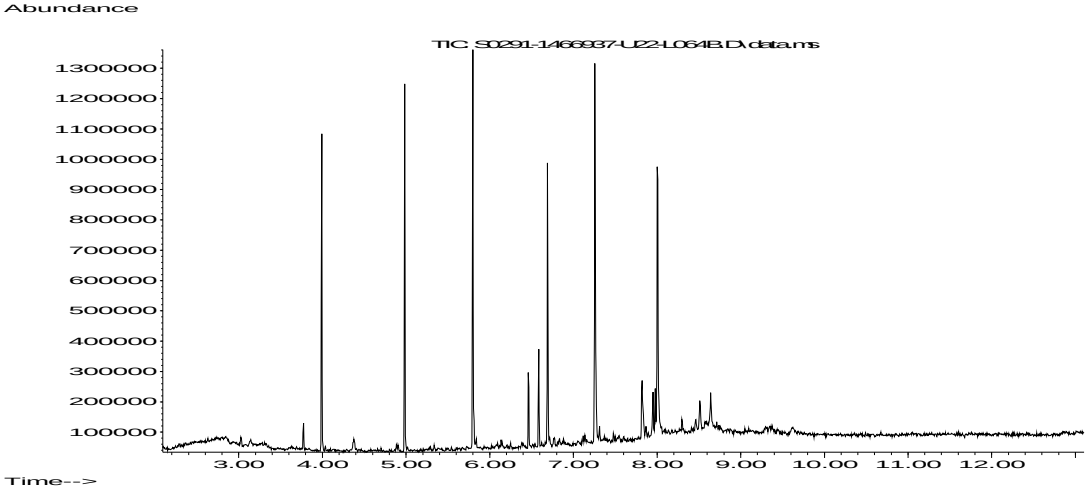
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Appendix K – Thames Water Confirmation Letter

Mr Sudeep Chongbang

Pinnacle Consulting Engineers
Alchemy,
Bessemer Road,
Welwyn Garden City,
Hertfordshire,
AL7 1HE

Wastewater pre-planning
Our ref **DS6074438**

04 June 2020

Pre-planning enquiry: Capacity Confirmation

Dear Sudeep,

Thank you for providing information on your development.

Site: 1 YMCA, 90 Peartree Lane, Welwyn Garden City, Hertfordshire - AL7 3UL

Existing site: Brownfield.
Proposed site: Hostel (100 beds), Flats (43 units) & day Nursery.
Proposed foul water discharge by gravity into foul sewer downstream of manhole TL24124501
Proposed surface water discharge via soakaways for catchment A (Impermeable Area-1,356m2) & for 5.0 l/s for catchment B (Impermeable Area-2,523m2) into surface sewer manhole TL24124504.

We're pleased to confirm that there will be sufficient foul water and surface water capacity in our sewerage network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you've any further questions, please contact me on 0800 009 3921.

Yours sincerely

Zaid Kazi

Thames Water
Developer Services – Sewer Adoptions Team

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